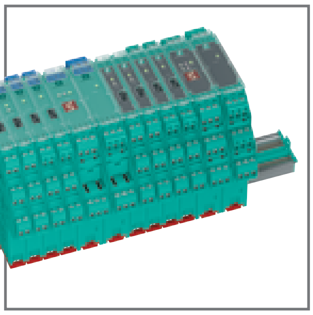
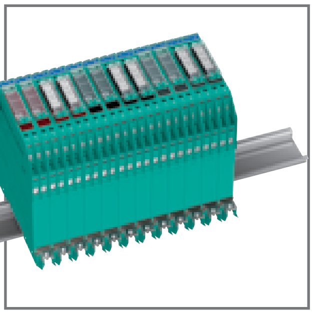
PROCESS AUTOMATION

INTERFACE TECHNOLOGY

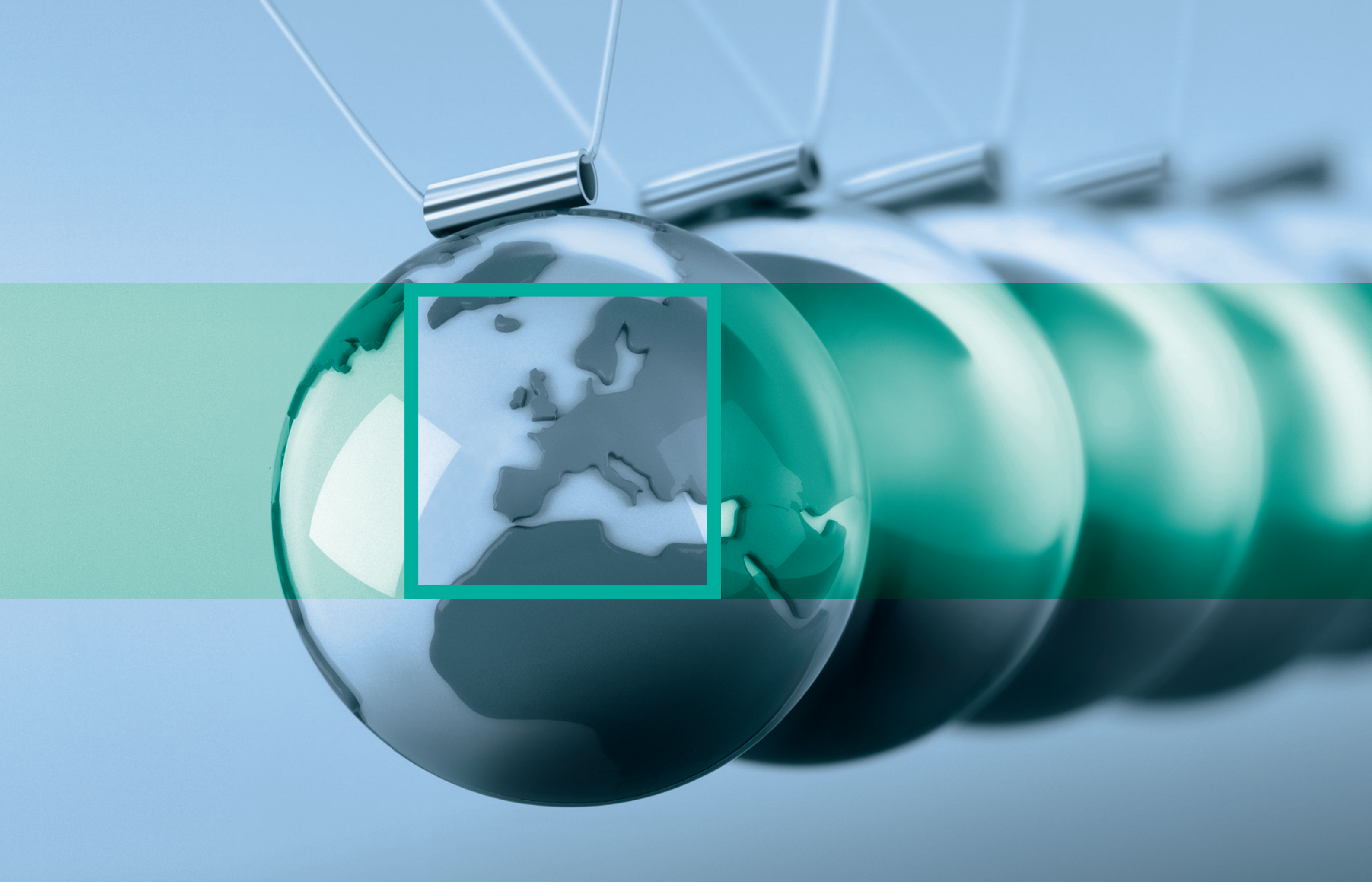
ENGINEER'S GUIDE

INTRINSIC SAFETY
SURGE PROTECTION
HART INTERFACE SOLUTIONS
SIGNAL CONDITIONING





PEPPERL+FUCHS
PROTECTING YOUR PROCESS



About Pepperl+Fuchs

Pepperl+Fuchs is a leading developer and manufacturer of electronic sensors and components for the global automation market. For more than 60 years, our continuous innovation, high quality products, and steady growth has guaranteed us continued success.

One Company – Two Divisions

PEPPERL+FUCHS – PROTECTING YOUR PROCESS

The **Process Automation Division** is a market leader in intrinsically safe explosion protection. We offer comprehensive, application-oriented system solutions, including customer-specific control cabinet solutions for the process industry. A large portfolio of components is available from our various product lines: isolated barriers, fieldbus infrastructure solutions, remote I/O systems, HART interface solutions, level measurement devices, purge and pressurization systems, industrial monitors and HMI solutions, power supplies, separator alarm systems for oil and petrol separators, signaling equipment, lighting as well as emergency shutdown equipment and accessories.

PEPPERL+FUCHS – SENSING YOUR NEEDS

The main target markets of the **Factory Automation Division** are machine and plant construction, the automotive industry, storage and material handling, printing and paper industry, packaging technology, process equipment, door, gate and elevator construction, mobile equipment, renewable energies.
With the invention of the inductive proximity sensor in 1958, the company set an important milestone in the development of automation technology. Under the motto "Sensing your needs", customers benefit from tailor-made sensor solutions for factory automation. The division offers a wide product range of industrial sensors whether it’s inductive, photoelectric or ultrasonic sensors, rotary encoders, identification systems, barcodes, code readers for data-matrix-codes and vision sensors.

PEPPERL+FUCHS

Pepperl+Fuchs worldwide

We're There When You Need Us

A global presence enables Pepperl+Fuchs to offer the best of both worlds: extremely high engineering standards combined with efficient, low-cost manufacturing facilities.

A worldwide presence means we have exactly what you need to make your process efficient and reliable. It means the most advanced technical expertise in the business is standard with every Pepperl+Fuchs product.

It means we have the largest and most ingenious staff of seasoned and skilled engineers and field representatives in the industry. It means we're there when you need us – anywhere in the world.

Pepperl+Fuchs offers proven industry expertise through market-based, customer-focused products that provide answers to the toughest application problems. Our target industries are involved with chemicals, pharmaceuticals, oil & gas, petrochemicals, and other areas including wastewater treatment and power technology. In all industrial areas, Pepperl+Fuchs is both a supplier and partner for end users, control systems manufacturers, system integrators and engineering contractors. We set the standard by offering the best product, service and support in the world. From our expert application analysis and global key account management, to our on-site engineering of new systems and technical support after the sale, we stand solidly behind every product we build.

North and Central America
Twinsburg, Ohio, USA

Asia Pacific
Singapore

Western Europe
Antwerp, Belgium

Middle East and India
Dubai

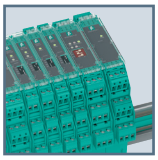
Northern Europe
Oldham, UK

Southern and Eastern Europe
Milan, Italy

South America
São Paulo, Brazil

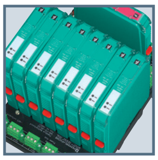
Germany
Committed to engineering excellence, our worldwide headquarters is located in Mannheim, Germany. More than 600 specialists are dedicated to continuing our heritage of high quality and innovation.

Interface Technology



Interface technology guarantees a safe, reliable, and efficient signal transmission between your field device and the control system. We offer intrinsic safety isolated barriers, HART Interface Solutions, and Zener Barriers in DIN rail styles or Termination Board solutions; signal conditioners for general-purpose areas; and a wide variety of power supplies and accessories.

Fieldbus Infrastructure



FieldConnex® is a comprehensive fieldbus infrastructure that provides solutions for connecting your instruments to a controller. A wide range of products are designed for fast installation and commissioning. A unique High-Power Trunk concept uses Segment Protectors and FieldBarriers to provide power to each device. The Advanced Diagnostic Module lets you monitor the physical layer remotely, in real time.

Remote I/O

Remote I/O systems provide a way to communicate effectively with a modern DCS and proven legacy field devices. RPI and LB/FB Remote I/O connect a wide range of digital and analog sensors and actuators to process control systems over a fieldbus. A variety of gateways are available to make use of different bus protocols.

Purge and Pressurization

Purge and pressurization products offer a safe and economical approach to installing electrical equipment in hazardous locations. By creating a safe area inside an enclosure, general-purpose equipment can be used in hazardous areas. Pepperl+Fuchs offers a full range of Type X, Y, Z, Ex nP, and Ex px purge and pressurization equipment for use in Zones/Divisions 1 and 2.

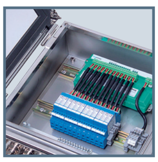
Level Measurement and Corrosion Monitoring

Our measurement devices are available in 4 mA to 20 mA, FOUNDATION Fieldbus and PROFIBUS PA interfaces. They are designed for point and continuous applications and are suitable for a wide range of materials and industries. CorrTran MV is a 2-wire, multivariable HART transmitter that evaluates general and localized (pitting) corrosion on line and in real time.

Visualization and HMI

HMI systems enable optimum control, operation, and monitoring of production processes. Our product line provides industrial PC components and visualization equipment used in hazardous areas focusing on equipment used for the human interface to automation systems. These include intrinsically safe electronic display and control device systems, Ex PC systems, intrinsically safe weighing and dosing terminals, and intrinsically safe data collection systems.

Cabinet Solutions



Our cabinet solutions unit offers expert development, manufacture and commissioning of a wide range of solutions including marshalling cabinets, displays and annunciators, distribution panels, control room cabinets, fieldbus panels, custom operator interface solutions, standard and customer fieldbus junction boxes and fieldbus power cabinets.

Intrinsic Safety

Intrinsic safety (IS) is a protection technique used within various hardware packages that limits the energy within an electronic circuit to a point that is safe to operate within a hazardous (explosive) location.

Surge Protection

Surge protection comes in a wide variety of configurations to protect electronic equipment from damage and provides long-term system operation reliability. It also diverts harmful voltage transients and current spikes to ground.

HART Interface Solutions

HART (**H**ighway **A**ddressable **R**emote **T**ransducer) is a popular digital, fieldbus protocol that solves a wide range of applications. It is used to communicate with field devices, configure and monitor the status of the system, and indicate process variables.

Signal Conditioning

Signal conditioning is an important part of any automation system where electrical isolation, electronic signal conversion, and measurement accuracy are critical characteristics of the control loop architecture.

Table of Contents

We are pleased you have selected the Pepperl+Fuchs' Interface Technology Engineer's Guide as your application-solution resource. This Engineer's Guide is much more than just a catalog of data sheets and specifications: it also includes a technology section with information about the principles behind field signals, explosion protection and functional safety. Appropriate application examples illustrate the main features. We hope this Engineer's Guide is used a valuable resource in your daily activities and that Pepperl+Fuchs is your first choice for Interface Technology for the Process Automation industry.

Technology

The Technology portion of this catalog is divided into four sections: Basic Principles, Explosion Protection and Intrinsic Safety, Functional Safety (SIL), and Applications and Practical Solutions.

The "Field Signals – Basic Principles" section looks in detail at analog and digital signal transmission. HART communication methods are also described in depth.

The section "Overview of Explosion Protection and Intrinsic Safety" contains a detailed analysis of the various types of hazardous area and the protection methods deployed to ensure the safe use of devices within them. Light is shed on the intrinsic safety protection method and its history, development, operating principles and standards.

The "Functional Safety (SIL)" section contains an introduction to the subject of functional safety and a brief guide to SIL within the process industry. This section also lists the most important standards, terms and definitions, such as PFD (**P**robability of **F**ailure on **D**emand), T_{proof} and SFF (**S**afe **F**ailure **F**raction).

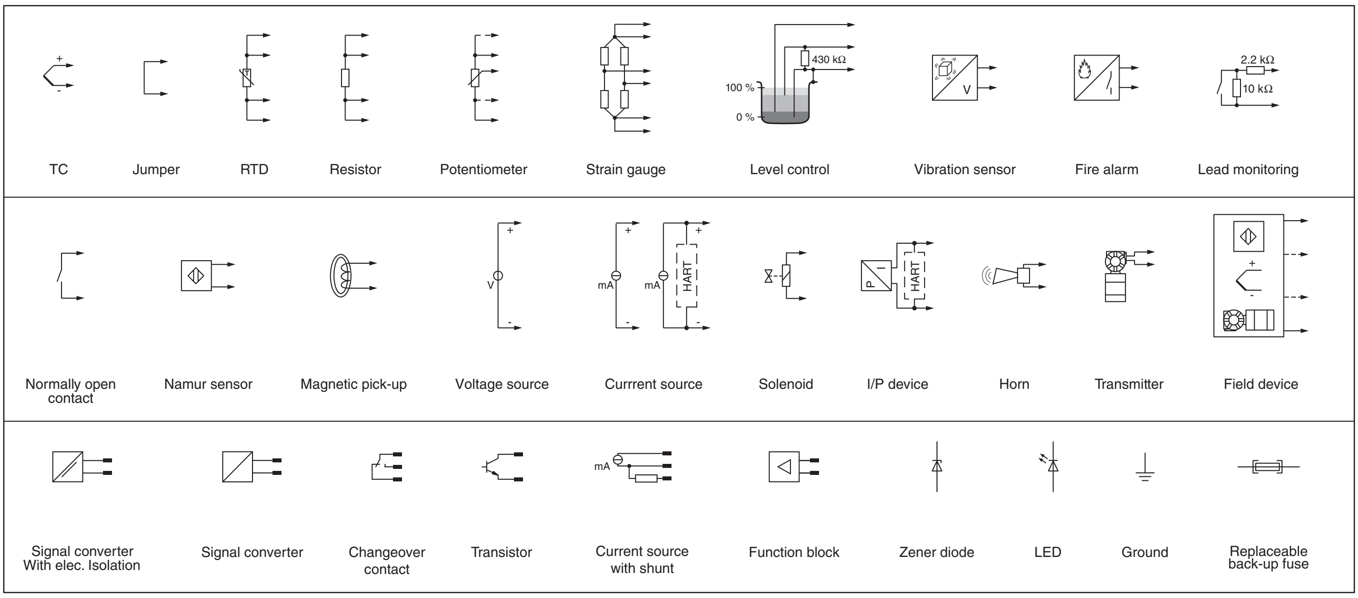
The major process applications are examined in the section entitled "Applications and Practical Solutions" with the help of examples that are both easy to read and understand. This section makes numerous references to products listed in this Engineer's Guide. It contains a summary of the potential applications for digital and analog I/Os and should always be referred to when you need application support for one of our large product families, such as the K-System, H-System, Z-System or SB-System.

Symbology

The following symbols are used in this Engineer's Guide:

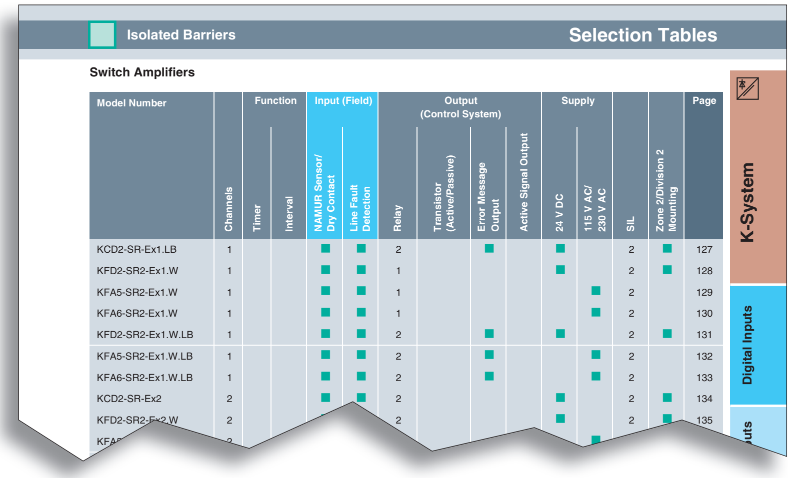
Isolated Barriers | Zener Barriers | Surge Protection | HART Interface Solutions | Signal Conditioners

The following chart shows electrical symbols used in the connection diagrams:



Product Selection Tables

Product selection tables are located at the beginning of each section, making it easy to find the product you need.


Isolated Barriers — Selection Tables

Switch Amplifiers

Model Number	Channels	Timer	Interval	NAMUR Sensor/ Dry Contact	Line Fault Detection	Relay	Transistor (Active/Passive)	Error Message Output	Active Signal Output	24 V DC	115 V AC/ 230 V AC	SIL	Zone 2/Division 2 Mounting	Page
KCD2-SR-Ex1.LB	1			■	■	2		■		■		2	■	127
KFD2-SR2-Ex1.W	1			■	■	1				■		2	■	128
KFA5-SR2-Ex1.W	1			■	■	1					■	2		129
KFA6-SR2-Ex1.W	1			■	■	1					■	2		130
KFD2-SR2-Ex1.W.LB	1			■	■	2		■		■		2	■	131
KFA5-SR2-Ex1.W.LB	1			■	■	2		■			■	2		132
KFA6-SR2-Ex1.W.LB	1			■	■	2		■			■	2		133
KCD2-SR-Ex2	2			■	■	2				■		2	■	134
KFD2-SR2-Ex2.W	2			■	■	2				■		2	■	135

Product Data Pages

The product data sheets contain all of the relevant data necessary to select and specify the equipment. It includes four major sections: Features, Function, Technical Data, and Diagrams. Surrounding these key elements are navigation tools necessary to help identify the product including special colors, markings, and symbols.

Comprehensive product information can be found at www.pepperl-fuchs.com.

Model number **Primary function**

Product highlights

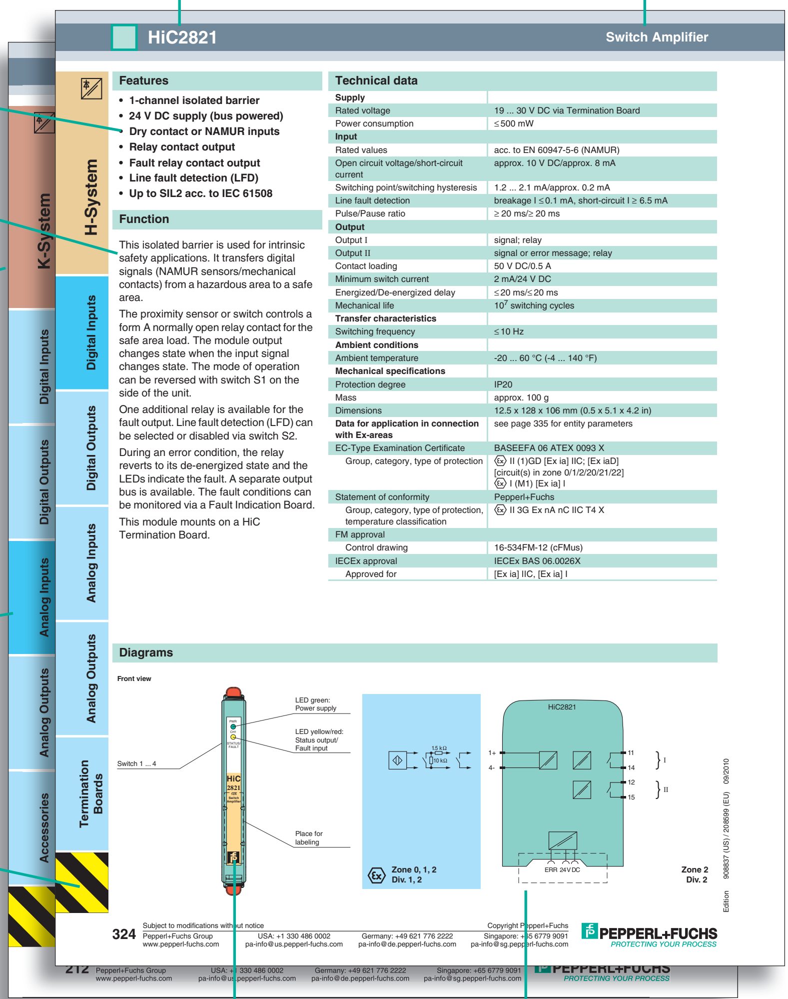
Function description

Color-coded navigation tabs

- K-System
- H-System
- Z-System
- SB-System
- Surge Protection

- Hazardous area products
- Safe area products
- Surge Protection Solutions, HART Interface Solutions

SIL rating designator


HiC2821 Switch Amplifier

Features
- 1-channel isolated barrier
- 24 V DC supply (bus powered)
- Dry contact or NAMUR inputs
- Relay contact output
- Fault relay contact output
- Line fault detection (LFD)
- Up to SIL2 acc. to IEC 61508

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls a form A normally open relay contact for the safe area load. The module output changes state when the input signal changes state. The mode of operation can be reversed with switch S1 on the side of the unit.

One additional relay is available for the fault output. Line fault detection (LFD) can be selected or disabled via switch S2.

During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault. A separate output bus is available. The fault conditions can be monitored via a Fault Indication Board.

This module mounts on a HiC Termination Board.

Technical data

Supply	
Rated voltage	19 ... 30 V DC via Termination Board
Power consumption	≤ 500 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal or error message; relay
Contact loading	50 V DC/0.5 A
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0093 X
Group, category, type of protection	II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] I (M1) [Ex ia] I
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	II 3G Ex nA nC IIC T4 X
FM approval	
Control drawing	16-534FM-12 (cFMus)
IECEx approval	IECEx BAS 06.0026X
Approved for	[Ex ia] IIC, [Ex ia] I

Diagrams

Front view drawing **Connection diagram**

Since the company was founded 60 years ago, Pepperl+Fuchs has blazed a continuous trail of innovation and has meanwhile established itself as the world's leading supplier to the process industry. We are continually benefitting from our many years of experience. To maintain our leading position, we continue to expand into new markets and are constantly on the lookout for new ways of diversifying our product portfolio. Our products are all designed with the requirements of our customers in mind and help them overcome the challenges posed by their applications. The Engineer's Guide is intended to help you appreciate our vision. The next time your are thinking about interface technology, you will automatically think of Pepperl+Fuchs.

Planning Tools

CAD Data

The 2D and 3D data of our interface modules are there to make control cabinet planning easier. The new EPLAN macros help in the design of your electrical systems. Download the CAD data for the interface modules from www.pepperl-fuchs.com.

H-System

The H-System redefines Termination Board technology and ensures precise signal processing between intrinsically safe field devices and the automation system. Planning and installation time is significantly reduced through the use of plug-in system solutions. Termination Boards can be installed quickly and easily in safe areas and Zone 2/Div. 2 hazardous areas and act as carriers for the galvanically isolated H-System modules. The installation and removal of interface modules is done very easily without the need for tools. The circuit can be interrupted during operation for servicing or maintenance purposes simply by removing the interface module.

Compact Small HiC2841, HiC2842 Switch Amplifiers with High-Speed Transistor Output (from page 326)

Two new switch amplifiers in small HiC enclosures are available for high-speed pulse sequences. Both versions have high-speed, short-circuit proof transistor output stages for wear-free and bounce-free switching.

HiC2851 Switch Amplifier for Safety Sensors (page 328)

For increased safety requirements with switching signals, the H-System now also has a switch amplifier for SN safety sensors in SIL3. Its small design enables space-saving setups to be realized. The NAMUR compatible switching output provides line fault transparency back to the controller. The result is improved fault detection and much less wiring.

HiD2024 4-channel SMART Transmitter Power Supply (page 362)

This 4-channel transmitter power supply offers the highest packing density as well as boasting a unique additional function. With the HiD2024, every single channel can be used as a transmitter power supply or as a current driver for actuators – all this in an enclosure just 18 mm across.

New 1-channel Temperature Converter HiD2081 (page 374)

The HiD2081 is a 1-channel temperature converter that is part of the H-System product line. It is the ideal device for customers who want to use a single channel solution for single loop integrity or low I/O count applications. The existing 2-channel version is the HiD2082 and both versions are available with a DTM for easy programming and configuration. The devices are intended to be mounted on HiD Termination Boards.

HART Termination Boards with H-System HART Multiplexer (from page 559)

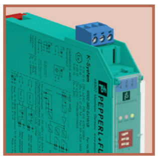
The HART Termination Boards provide connectivity to devices in the field via an innovative termination panel design coupled with the powerful Multiplexer HiDMux2700. The HART Multiplexer allows you to connect your HART instrumentation to any asset management system, and to exploit the intelligence in those devices for diagnostics, maintenance, automatic documentation and online configuration. We can even offer custom termination panels for many DCS manufacturer's.

K-System

The K-System covers a wide range of galvanically isolated interface modules for installing on 35 mm DIN mounting rails. The extensive program of isolated barriers for applications in hazardous areas and signal conditioners for non-Ex applications covers more than 200 different models for every conceivable task. To reduce wiring and installation costs, K-System isolated modules can be installed on the Power Rail. The Power Rail is an insert for the DIN mounting rail and has integrated conductors that supply power to the rear of the isolated modules. A line for the collective error message is also provided. The low level of power dissipation of the interface modules enables them to be installed vertically or horizontally without derating or distance between the devices.

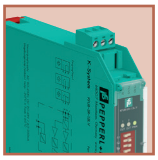
New Device Designs

The advantages of larger label carriers and protected operating elements are now also available on the 20 mm wide KF interface module. Electrical functionality remains exactly as before. In addition to their new design, the signal conditioners now have a gray front panel to differentiate them more clearly from the Ex i isolated barriers used in hazardous area.



KFD2-SOT2-Ex1.N Switch Amplifier with Line Fault Transparency (page 147)

Like all Pepperl+Fuchs switch amplifiers, the new KFD2-SOT2-Ex1.N supplies a NAMUR sensor in the field and evaluates its signals. A new feature of this device is the NAMUR compatible output to the controller. The NAMUR output signal transfers the line faults of the field signal and those from the control circuit. Compared to conventional outputs, this saves an additional fault message input in the controller, with a corresponding reduction in the wiring. Thus, the signal transfer and monitoring of all leads takes place in a single loop in SIL2.

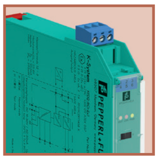


KFU8-SR-1.3L.V Switch Amplifier with Time Response (page 582)

The new KFU8-SR-1.3L.V switch amplifier has a powerful 3-wire sensor supply and enables transient switching signals to be filtered using an in-built timer function. This allows brief trip value overranges in level monitoring applications to be suppressed. For international applications, the wide-range power supply offers the highest degree of flexibility and a narrow range of devices.

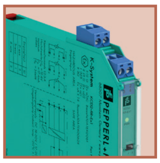
KFD0-RSH-1* Safety Relay Modules in SIL3 (from page 605)

Safety relay modules switch the widest range of loads and voltages from 24 V DC to 230 V AC at the field level. The special design of the output stages (ETS, **E**nergized **t**o **S**afe and DTS, **D**e-energized **t**o **S**afe) makes these new modules suitable for applications up to SIL3. The devices are compatible with various controller outputs and their test pulses.



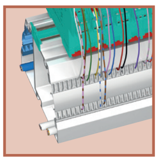
KFD2-RCI-Ex1 Solenoid Driver in SIL3 (page 190)

The new KFD2-RCI-Ex1 solenoid drivers enable installation costs in shutdown systems to be significantly reduced. Compared with conventional SIL3 safety circuits with two field circuits, the power supply for the safety valve and the diagnosis communications on the KFD2-RCI-Ex1 can be provided by a single field circuit. This facilitates a safe switch off and high availability with only one current circuit in the field – and all that in SIL3.



New Repeater KCD2-RR-Ex1 in the Small 12.5 mm Housing (page 249)

The KCD2-RR-Ex1 is a resistance repeater in our small 12.5 mm housing. It transfers the resistance of the field loop directly to the control side I/O device. All connections on the field side are equipped with line fault detection for optimal performance. The advantage of using a resistance repeater in this type of application is that the input card for the controller requires no setup. For example, when using a Pt100, the temperature value is accessed directly in the DCS. No scaling of the input card is necessary since the resistance is transferred through the repeater without any changes. With its short rise time, it can also be used in multichannel, multiplexed input cards. In Ex applications, it simply installs in the field loop and provides intrinsic safety protection and isolation. It is also useful in non-Ex applications to prevent ground loops from occuring.



Wide Range of System Accessories (from page 283)

The wide range of accessories simplifies the planning and installation of system components. Whether you need cage clamp terminals or cable ducts, we have a simple solution to every problem. Power supplies and power feed modules are available to ensure a reliable installation and supply. Software, programming adapters and sensor simulators simplify the commissioning of the interface level.

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Field Signals – Basic Principles

Introduction

Interface technology provides many different device functions for evaluating and transferring sensor signals. Its primary task is to isolate, transform and amplify signals between the field circuit and the control circuit.

If an intrinsically safe sensor is deployed in an explosive atmosphere, then the device must include an approved protection device (barrier). We refer to these barriers as isolated barriers. If this protection device is not required, then a signal conditioner is used. Figure 1 illustrates the structural principle of an isolated module.

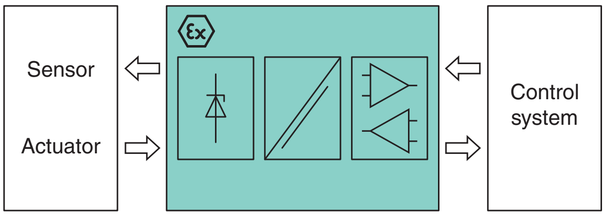

Figure 1 Interface technology - isolating, amplifying and transforming signals

The isolated modules below are represented in simplified form with only their galvanic isolation.

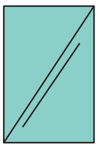

Figure 2 Simplified representation of isolated modules

Galvanic Isolation

In the field of automation engineering, the electrical isolation of two circuits is termed galvanic isolation.

Galvanic isolation is necessary:

- to protect personnel when mains-operated devices are used with low, protective voltage
- to avoid measurement errors: electrical isolation of the power supply of measuring instruments from the circuit of the voltage to be measured, or electrical isolation in the measuring signal path
- to prevent ground loops and electromagnetic interference when transferring analog and digital signals

If several electrical values with different reference potentials are to be measured simultaneously, then the measuring circuits must be galvanically isolated from each other.

If galvanic isolation is implemented in a systematic manner, it will form effective protection against electromagnetic interference. Even if long cable does not have a physical conductive connection, the cables may be susceptible to interference that can be transferred to signal inputs. These so-called common mode noises are kept away from the signal inputs by means of galvanic isolation. Protection against irradiated electromagnetic interference is also improved through galvanic isolation.

With galvanic isolation in interface modules, the field side and the control side are isolated from one another. If the supply voltage is also galvanically isolated, this is referred to as 3-port isolation.

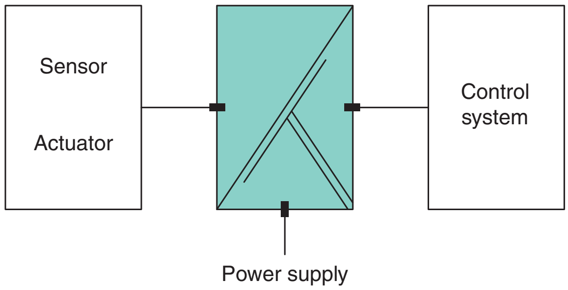

Figure 3 3-port isolation in modern isolated modules

Galvanic isolation can be implemented by a transformer or optocoupler. In these cases, the signal transfer takes place via a magnetic field or by means of light.

Transformer/Transmitter

The device used predominantly for galvanic isolation is the transformer primarily when power is supplied from the mains supply (mains transformer). A transformer is used for voltage adjustment (transformation) but galvanic isolation from the mains is also achieved. This prevents the risk of interaction between mains voltage and the isolated secondary circuits. This is achieved by means of two coils that are electrically isolated from one another (see Figure 4). If the transformer passes signals between the primary and secondary, then it is known as a transmitter.

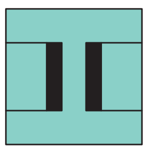

Figure 4 Galvanic isolation using a transformer

Transformers and transmitters both operate on the same principle. With a transformer there is a high level of efficiency, while with a transmitter, optimum maintenance of signal quality is the main focus.

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Optocoupler

Optocouplers comprise a light-emitting diode and a receiving light-sensitive transistor. Both these components are contained in a common housing that protects them from external light.

Optocouplers enable digital as well as analog signals to be transmitted, but they cannot be used to transfer energy.

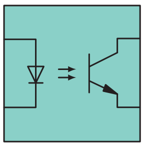

Figure 5 Galvanic isolation using an optocoupler

Process Automation Signals

Devices are differentiated according to signal direction (relative to a reference point) and signal form to allow them to be grouped more usefully according to device type and application.

Signal Direction

To ensure that the language used for communicating with the user is unambiguous, Pepperl+Fuchs has established a specification with regard to signal direction. A distinction is made between input and output signals based on signal direction. The reference point is the connection on the field side of the device. In the case of input signals (Figure 6), sensor signals or switching signals are transferred from the field to the control. Output signals (Figure 7) move from the control to the actuator in the field.

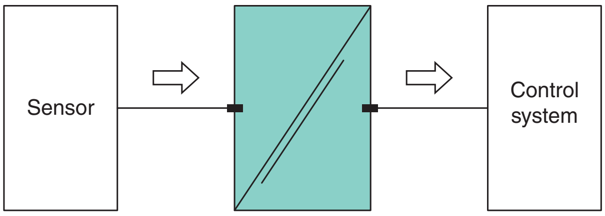

Figure 6 Input signals

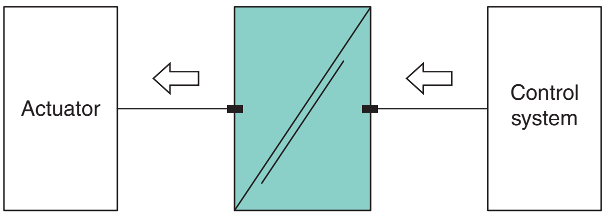

Figure 7 Output signals

Signal Form

Signal form is distinguished between digital (discrete) and analog signals. The signal form is important when selecting the proper isolated barrier or signal conditioner.

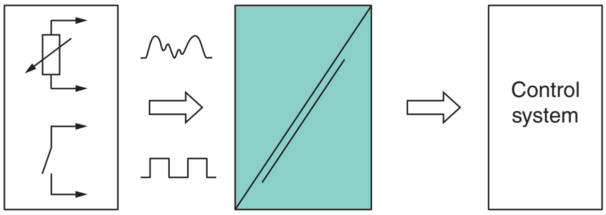

Figure 8 Analog and digital input signals

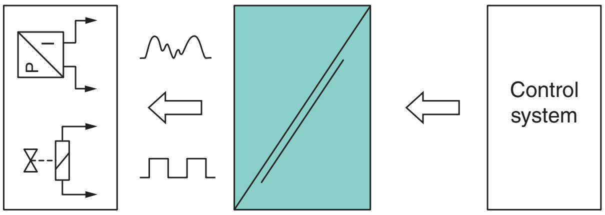

Figure 9 Analog and digital output signals

HART Communication

HART describes bidirectional, digital communication between intelligent field devices and host systems. It was developed in the late 1980s with the aim of simplifying the exchange of data with SMART field devices.

The bidirectional communication of the HART protocol fully exploits the potential of intelligent field devices:

- simple configuration of field devices
- universal field devices with high functionality
- asset management (preventive maintenance)

This HART data is also available to the user for analog process control applications, in which the classical, analog 4 mA to 20 mA interface is used in a two-wire system.

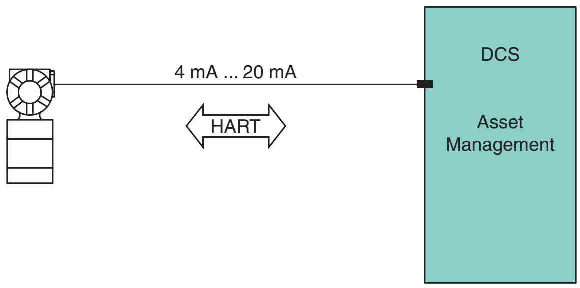

Figure 10 Transfer of additional process variables via 4 mA to 20 mA line

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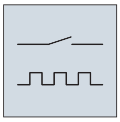
Digital Input Signals



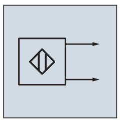
In open-loop and closed-loop control systems, the task of monitoring static states (positions) and rotating or oscillating movements is extremely important. Movements, such as lifting or swiveling, as well as quantities, rotational speeds or flow-through need to be evaluated and monitored. A large number of sensor and interface modules are available for these different tasks.

The measurement chain generally consists of an element (sensor) for detecting the process variable and an interface module for sensor power and signal processing. Sensors mounted on rotating shafts or on machines with a linear movement can be used to provide the pulses.

Sensors

Sensors are available in many different physical measurement principles and in many different electrical versions. This section only considers the electrical interface between the sensor and the control unit. The details of the different measuring principles can be found in the documents provided by the relevant sensor manufacturer. The electrical interface between the sensor and sensor power supply is largely standardized and can be divided into two variants. Depending on the application, sensors with 2- or 3-wire connections are used.

2-Wire- (NAMUR) Sensors



2-wire sensors in accordance with IEC 60947-5-6 are loop-powered and are resistant to short circuit and overloading. They need a small independent supply current (typically 0.8 mA) to ensure functionality. Its two conductor design generally allows for the easy replacement of a mechanical switch. A DC interface in accordance with IEC 60947-5-6 (electric travel sensor, DC interface for travel sensor and switch amplifier) is widely used as the standard interface used in the chemical and petrochemical sectors and is the generally recognized standard for so-called NAMUR sensors. Because of its advantages, this type of interface is used in an increasing number of applications in safe areas. The 2-wire sensor operates on a quasi-analog basis.

The current in the sensor circuit is influenced by the distance from a metal object. The trip points for the analog input signal up to this point will be formed or evaluated in interface modules with a digital input, such as switch amplifier or frequency converter. These trip points are specified in the IEC 60947-5-6 standard (between 1.2 mA and 2.1 mA at, typically, 8.2 V). This specification ensures compatibility between sensors and interface modules from all the different manufacturers.

Because sensors of this type have a defined minimum and maximum current, it is easy to add two more values for lead breakage and short circuit monitoring (below the minimum current and above the maximum current). In fact, IEC 60947-5-6 specifies the guide values (lead breakage in the control circuit is $I < 0.1$ mA, short circuit is $I > 6$ mA). Figure 11 shows the typical characteristic curve for a NAMUR sensor according to IEC 60947-5-6.

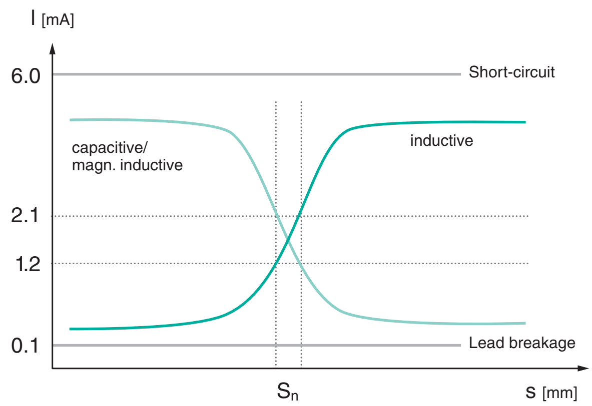


Figure 11 Characteristic curve for a NAMUR sensor acc. to IEC 60947-5-6

The upper and lower lines show the values for lead breakage and short circuit, while the middle lines represent the values for the trip points (the hysteresis lies between the trip points). Because NAMUR sensors do not include signal evaluation, they have far fewer components than similar sensors with a built-in switch output. This is the main reason NAMUR sensors are generally smaller in size to an equivalent non-NAMUR sensor (shorter threaded tubes on cylindrical sensors). NAMUR sensors (acc. to IEC 60947-5-6) are currently available with all the most common physical principles, in the form of

- inductive sensors,
- capacitive sensors,
- magnetic inductive sensors and
- photoelectric sensors.

Due to these properties, the NAMUR sensor, unlike a mechanical contact, is perfectly suited for applications with higher switching frequencies.

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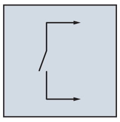
Mechanical Switches



Digital switching signals can also be created with a switch contact. The disadvantage of mechanical switches over electronic transistors is their limited life time. Mechanical switches have a negligible resistance, closed = 0 Ω and open = ∞ Ω. When these switches are used with switch amplifiers, controls or logic control units, it should be noted that it is not possible to monitor breakage and short circuit on the leads without additional circuitry.

If a resistor is connected in parallel with the switch, this results in a low base current, which is used to detect lead breakages (Figure 12, channel I). An additional serial resistor reduces the maximum switching current under the threshold below which a short circuit is detected. This auxiliary circuit allows the benefits of line monitoring to be used with switch contacts (Figure 12, channel II).

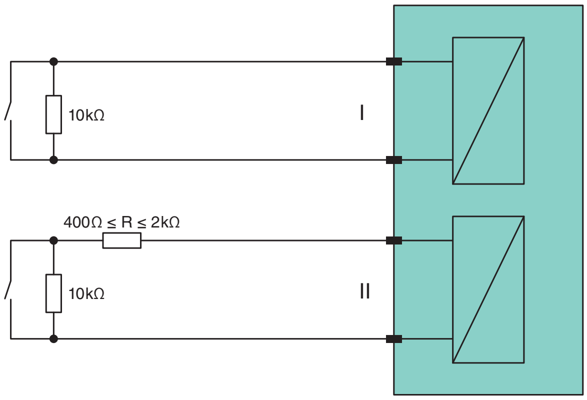
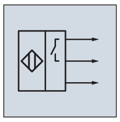


Figure 12 Auxiliary circuit for line fault detection

3-Wire Sensors

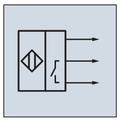
3-wire sensors are energized on two conductors, while the third lead transfers the switching signal. 3-wire sensors have an output that is switched high (PNP switch), switched low (NPN switch) or pull-push switched. Depending on the switching power of the output stage, loads can be connected directly to the sensor. 3-wire sensors are encountered in almost all areas of factory automation and are considered standard sensors.

High Switched Sensor (PNP)



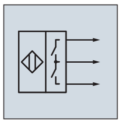
In the case of the high switched 3-wire sensor, the output is switched against the supply line. If the signal is processed in an interface module or control input, care should be taken to ensure that the relevant input is designed for the circuit with the supply voltage.

Low Switched Sensor (NPN)



The low switched 3-wire sensor draws the switching signal to ground. If the signal is processed in an interface module or control input, a pull-up resistor is required for passive inputs. The low switched sensor is used less often than a PNP version.

Pull-Push Switched Sensor



In the case of the pull-push switched 3-wire sensor, the signal switches between the supply voltage and the minus lead. This switch is mainly used for fast switching processes, as in rotary encoders.

Evaluation of Static Signals

In the case of static signals, the frequency information is not evaluated. Switch amplifiers or controls transfer and interpret only the current switch state. The only change to the input signal that can be made is with regards to switch delay. In the case of timers, the digital input signal is used to trigger one-shot functions. However, the counting of pulses for batch processes tends to be classified among the static signals.

Depending on the application, numerous device functions are available for processing the static signals.

Switch Amplifier

The switch amplifier powers the sensor, monitors the input signal (Figure 16, a) for line faults and transfers the input signal 1:1 to the output side (Figure 16, b).

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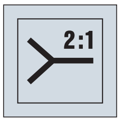
Signal Transfer with 2:1 Technology



With conventional connection technology (Figure 13), each digital sensor is connected separately to the control unit (switch amplifier, PLC) using a 2-wire cable.

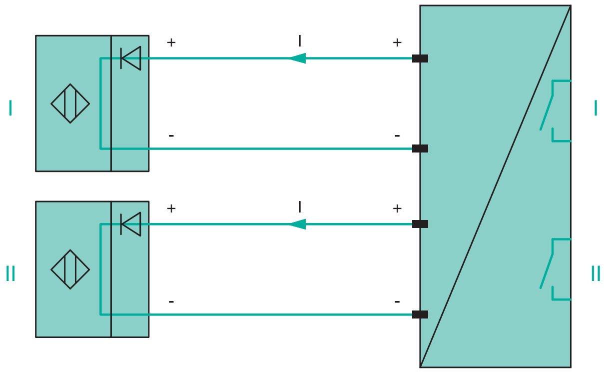


Figure 13 Conventional wiring of two sensor

Using 2:1 technology, the signals from two sensors can be transferred to the control cabinet via just a single pair of cables, thereby reducing the wiring overhead by 50 %.

This patented 2:1 system from Pepperl+Fuchs is simple but effective. When connecting two digital sensors with a polarity protection function in a "non-parallel" configuration on a single cable pair, both sets of information are transmitted simultaneously.

The special electronic evaluation function of the switch amplifier (KFD2-SRA-Ex4) reverses the polarity of the low-frequency supply voltage, thus activating only one of the "non-parallel" connected sensors for each half wave (see Figure 14 and Figure 15).

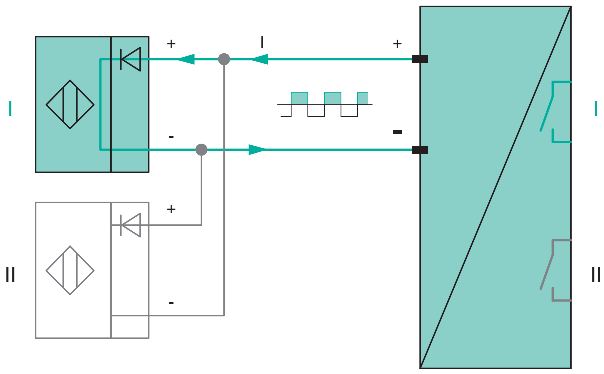


Figure 14 Activation of sensor I with 2:1 technology (positive half wave)

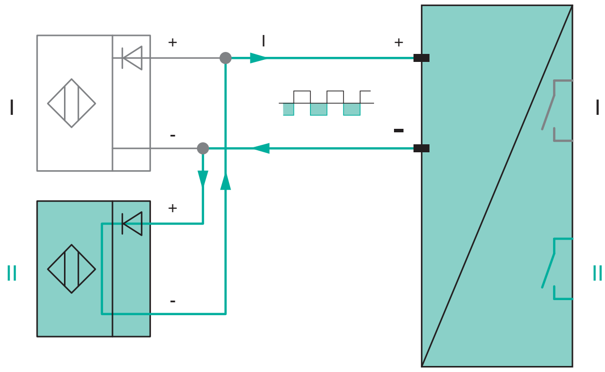


Figure 15 Activation of sensor II with 2:1 technology (negative half wave)

According to the polarity, sensor I or sensor II transfers its signal to the signal amplifier, which divides these signals into two separate output channels. 2:1 technology is suitable for all digital 2-wire sensors or mechanical switches with integrated reverse polarity protection.

Proximity switches are generally equipped with polarity protection and can be connected directly on a 2:1 circuit. Only the "non-parallel" connection criteria must be observed. Where the reverse polarity protection diode is not integrated, Pepperl+Fuchs provides special clamps with integrated diodes (F-KDR-Ex2). Due to the cyclic reversal of polarity of the power supply, this process has limitations for applications with frequencies above 5 Hz.

The benefit of 2:1 technology lies in the significant reduction in wiring overhead, especially in application scenarios in which digital signals occur in pairs directly at a measuring point.

Possible uses for this technology include position feedback of valves and rotary drives, minimum/maximum manometers, magnet-operated immersion probes in level measurement and flow measurements with mono-stable inductive proximity sensors.

A particularly important synergy is created with the combination of 2:1 sensors and Pepperl+Fuchs technology: one sensor and one cable supply two signals. Plant expansion is another ideal application for 2:1 technology, particularly in situations where additional signals must be routed via existing and possibly fully utilized field wiring. Where laying further cables would be very difficult, additional signals can use the existing wiring via the 2:1 technology.

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Serial Switching Function

In principle, the serial switching function is the same as the switch amplifier function. In the case of the logic control units, the input pulses are switched 1:1 to the output. This means that the input pulses can be processed in applications such as counters for service purposes (Figure 16, b).

Pulse Divider Function

In the case of logic control units, the input pulses are divided by the selected value and switched to the output (Figure 16, c). A constant frequency is not sent to the output, rather, a number of pulses per time unit. The output pulses can occur at irregular intervals. If there are packages of pulses at the input that cannot be transmitted quickly enough to the output, these are accumulated in the device and sent to the output during pauses. The pulse divider function can be used in applications involving the display of scaled consumption when measuring flow of eccentric gear counters.

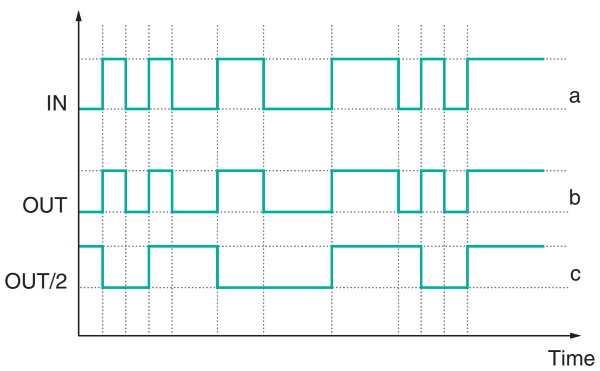

Figure 16 Static signals

Rotational Direction Detection

If the rotational direction of a machine is significant, this is determined from two shifted input signals. In the case of worm drives or tunnel ventilation systems, it is essential that the correct direction of rotation is monitored.

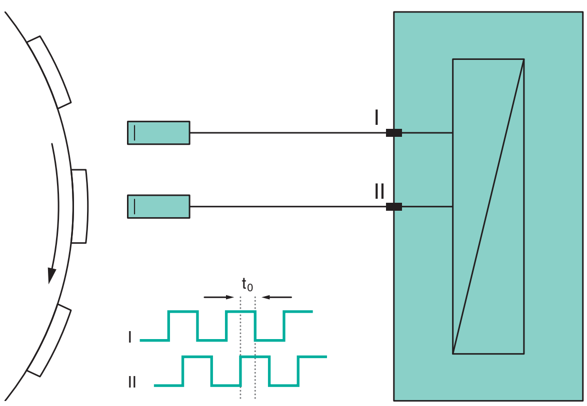

Figure 17 Determining the direction of rotation

In order to reliably determine the direction of rotation, the two input signals must "overlap" It is not possible to provide information about the direction of rotation when one of the two input signals is missing.

This can happen if

- the sensor is incorrectly adjusted (no overlap)
- the sensor is never damped ("dropped")
- the sensor is faulty
- the system vibrates and oscillates around the trip point of an input without the second input being damped. This would give the false impression of an input frequency. For the evaluation, this means "no overlap".

If an intermittent overlap is detected due to vibrations, this can cause the direction of rotation relay to "chatter". This is remedied by the reset input, which stops the relay while the system is idle.

Synchronization Monitoring

Two pulse sequences are compared during synchronization monitoring. If the difference exceeds a set trip value, an output is switched.

Application Example

Synchronous drives are important for spindle lifting equipment shown in Figure 18. The pulse sequences for every spindle are recorded and compared for this purpose. The maximum permissible deviation of the pulse reading is set as the trip value. If the trip value (differential pulse number) is exceeded, the relay de-energizes and the drive that is running fast is slowed. When the difference has reached zero, the relay is energized again.

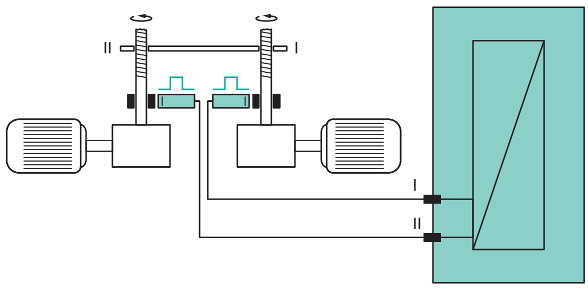

Figure 18 Monitoring spindle lifting equipment for misalignment

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What happens if the direction of the lifting equipment changes? At present, more input pulses have been counted at input I (Figure 19). In the event of a change of direction, drive I would need to run faster to prevent misalignment. However, this would mean even more pulses at input I. As soon as the trip value would be exceeded, drive II would start, increasing misalignment. For this reason, the "change of direction" input must be activated when changing direction. The sign in front of the difference is changed, so that drive I can execute twice as many pulses up to the trip value. The direction change input is level-triggered, i. e.

- if it is inactive, then difference = pulse I – pulse II
- if it is active, then difference = pulse II – pulse I.

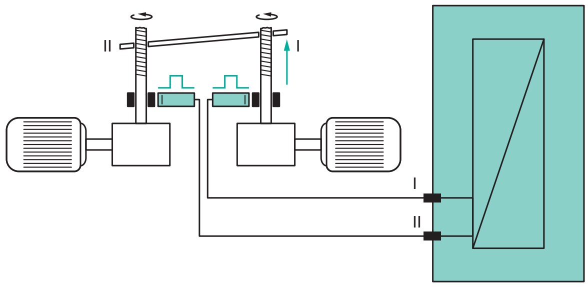

Figure 19 Monitoring for misalignment with change of direction

Evaluating Frequency Signals

When a time link between the input pulses must be recorded, we refer to this as a frequency evaluation. Evaluating the exact frequency of digital signals is a complex and technically demanding procedure. The evaluated frequency can range from a few mHz (0.001 Hz) to several kHz (12 kHz). If an evaluation factor such as pulse/revolution is taken into account, the input frequency can also be displayed in rpm. Examples of interface modules that measure frequency are speed monitors and frequency converters. How is the frequency of a pulse sequence evaluated?

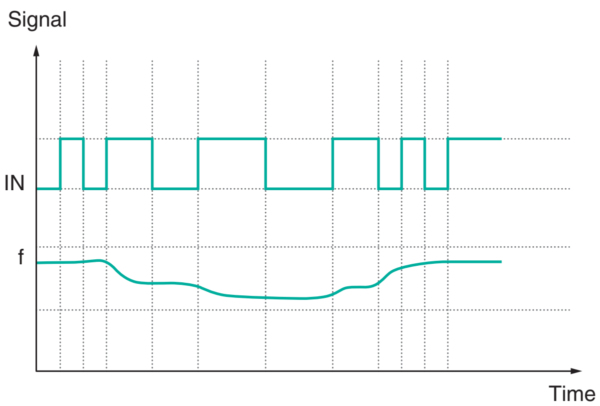

Figure 20 Frequency evaluation

Measurement using Resettable Time Relay

This is the most simple type of frequency measurement; however, it is only used for monitoring and not for measurement. In this method, a timer is started with a time base corresponding to the rotational speed to be monitored. Every input pulse resets the time of the timer. If the timer is not reset within the assigned limit, the output switches states. This corresponds to under-speed. A similar evaluation occurs in an over-speed application.

Measurement using Procedure for Measuring Cycle Duration

The procedure for measuring cycle duration involves measuring the period between two or more consecutive input pulses. This yields the frequency:

Frequency = pulses/measured time

This makes it possible to identify any deviation from a set frequency after just two pulses. This measurement principle also enables acceptable response times in applications with relatively long pulse intervals. If the response time of the frequency measurement is to be reduced, the number of pulses per revolution must be increased. This can be achieved by fitting a cam plate to the physical measurement structure. However, it is necessary to ensure that the intervals between the cams are constant, otherwise, variations will result in the measured values.

The measuring period depends directly on the duration of the input pulses. The more input pulses generated per revolution, the shorter the measuring period. Precise monitoring of rotational speed requires that the segment plates, switching targets or switching cams should be distributed evenly. At higher frequencies, variations can be balanced by the formation of mean values (integration).

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Average Determination

To suppress signal jumps in non-symmetrical damping elements, it is possible to form a floating mean for the number of cycles. The diagram below, shows a pulse sequence with cycles of varying duration.

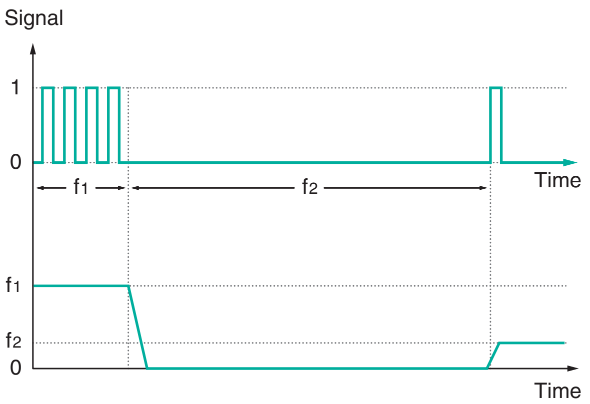

Figure 21 Pulse sequence with cycles of varying duration

If mean values were not formed, then the result would fluctuate considerably.

By forming a mean value over several cycles, it is possible to damp the signal, although larger variations will still be apparent. Effects with different cycle durations generally only occur with non-symmetrically formed segment plates; even differently aligned screw heads on a shaft can lead to variations in cycle duration. That is why it often makes sense to work with just one operation element per revolution at higher rotational speeds.

Limits to the Procedure for Measuring Cycle Duration

What happens if the rotational speed drops sharply, i. e. the machine brakes quickly? To begin with, it is not possible to detect any further pulses. An integrated measuring procedure must be activated for this purpose. Even when the machine is stopped, the frequency cannot be immediately set to 0 Hz. In theory, the asymptotically decreasing process can take an infinite amount of time.

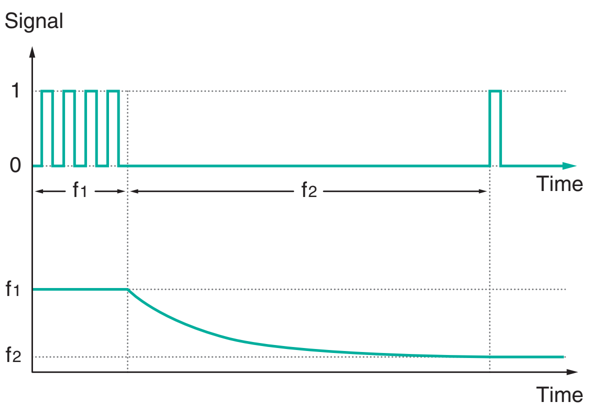

Figure 22 Sharp drop in rotational speed

Overrun Protection

For noise immunity, a filter is inserted in front of pulse inputs of frequency converters. Input frequencies (including noise frequencies) higher than the limiting frequency of this filter can no longer be processed. The device then detects a standstill (no pulses). This unwelcomed situation can be avoided if a safety margin below the maximum measuring frequency for the device is maintained. In this case, it is also important to note the pulse width for narrow pulses.

Frequency Measurement Functions of Devices

The last sections describe the detection of dynamic pulse signals (frequency measurement). Relevant device functions are available for any application scenario.

Standstill and Rotational Speed Monitoring

Trip value monitoring involves monitoring whether the input frequency drops below (Min Alarm) or rises above (Max Alarm) a given trip value.

Min/Max Alarm

In the case of the Min Alarm (see Figure 23), the measurement value is monitored for failure to reach a trip point, while Max Alarm monitors whether this value is exceeded. A hysteresis is entered to prevent the output from constantly changing its status when the value measured oscillates around the trip point. The mode of operation can be chosen whether the switch outputs are active or passive after the trip point is reached.

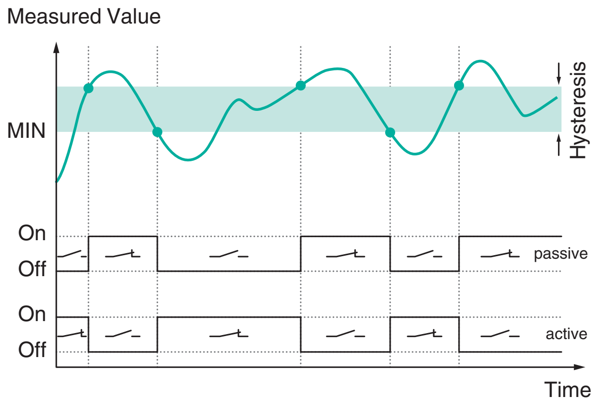

Figure 23 Measurement overrange (Min Alarm)

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Start-up Override

If a machine is monitored for standstill (Min Alarm), the relevant output relay indicates a fault if the frequency level drops below the minimum setting. The fault prevents the machine from restarting. Start-up override enables the trip value monitoring to be suppressed for a given period. The relay is set to OK status for the duration of the start-up override. This prevents the rotational speed from falling below the set value at start-up. Figure 24 shows how the relays respond to the relevant start-up override time. If the time is too short ($t_C < T$), the relay will switch briefly before the set frequency is reached and an alarm will output.

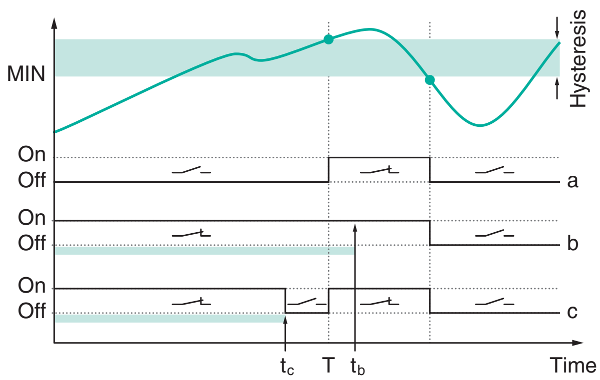

Figure 24 Start-up override time

The start-up override is edge-triggered. If the contact remains closed after the time has expired, the start-up override only becomes active again when the contacts are opened. The edge trigger means that it is possible to start the start-up override at device start-up (Power ON).

Frequency Current Conversion

If the rotational speed is to be measured and processed in a control, then conversion to a standard signal is required. Figure 25 shows the conversion to a 0/4 mA to 20 mA standard signal. However, it can also be converted to a 0/2 V to 10 V standard signal.

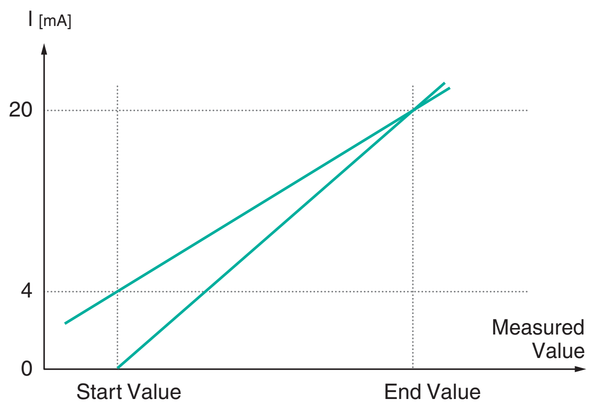

Figure 25 Frequency current conversion

Slip Monitoring

Two input frequencies are compared during slip monitoring. An alarm is emitted if the difference is continuously too great. Brief overranges in start-up procedures are ignored.

Application Example 1

A conveyor belt is to be monitored for slippage in order to limit wear and tear or to prevent the risk of fire. If the belt is blocked, then the two input frequencies will differ. If a trip value is set to the maximum permissible slip, this relay switches if exceeded and thus allows the drive to be switched off safely. A restart inhibit feature prevents continuous activation/deactivation.

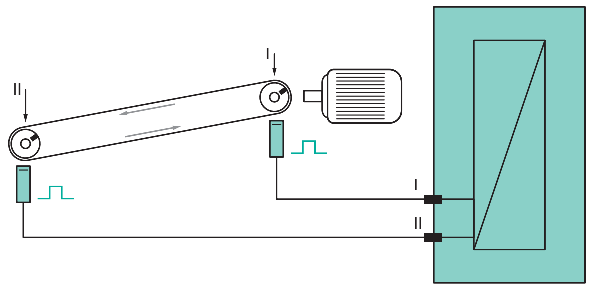

Figure 26 Slip monitoring for a conveyor belt

If there is a conversion ratio (see Figure 27) between two frequencies, it can be taken into account with an internal divider.

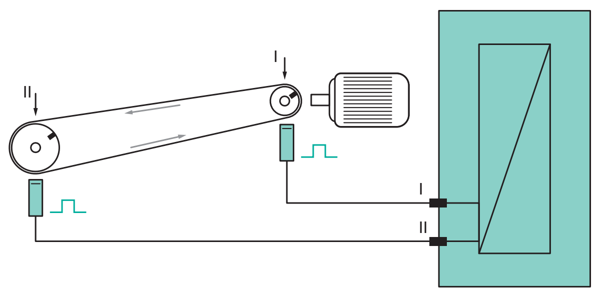

Figure 27 Slip monitoring for a conveyor belt with conversion ratio

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Technology
Basic Principles
Ex Protection Intrinsic Safety
Functional Safety
Applications

Application Example 2

A sliding clutch should be monitored for slip. If the output is blocked, then the two input frequencies will differ. If a trip value is set to the maximum permissible slip, this relay switches if exceeded and thus allows the drive to be switched off safely.

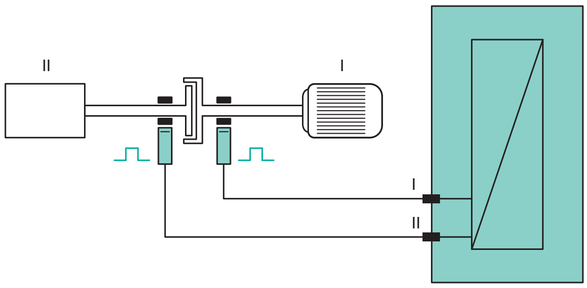
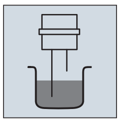


Figure 28 Slip monitoring for a sliding clutch

Conductive Measurement Processes



Conductive measurement processes are especially suitable for measuring level trip values. Potential uses extend to all fields in which conductive, fluid media require measurement, control or regulation. This enables to implement trip value measurement (overrun, dry run) as well as minimum/maximum controls.

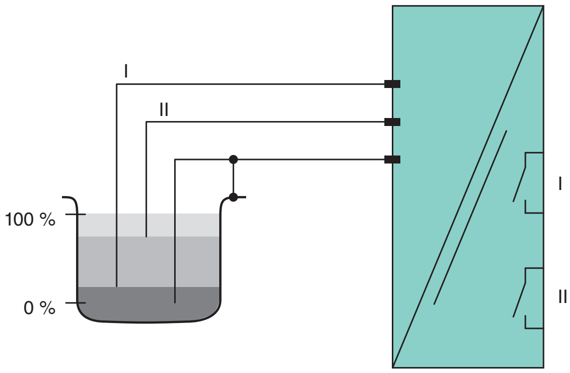
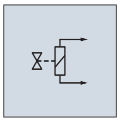


Figure 29 Conductive measurement process

If the electrodes are immersed in a conductive liquid, a small alternating current flows. This alternating current is fed in to the electrodes and evaluated by the conductive switch amplifier. By using an alternating voltage at the electrodes, corrosion of the probe rods and electrolytic destruction of the filling material are avoided.

Digital Output Signals



Many factors determine whether the combination of a valve and a solenoid driver is suitable. A number of factors must be considered to ensure that intrinsically safe valves will work and will also satisfy all criteria for intrinsic safety.

The technical data for the valve and the solenoid driver should be used in a worst-case calculation to ensure that the valve will work even when the valve and solenoid driver tolerances are unhelpful or the ambient temperature is raised.

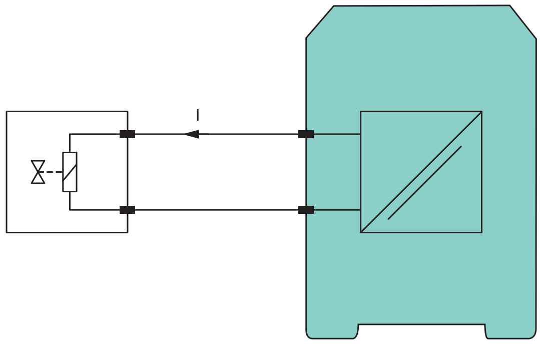


Figure 30 Combination of valve with solenoid driver

The Valve

To start at the simplest level, a valve acts like an electromechanical relay, consisting of a coil with a connected mechanism. The following parameters must be set in order to control a valve reliably:

- Minimum switching voltage U_{min}
  If the minimum switching voltage is exceeded, the valve is reliably actuated.
- Minimum switching current I_{min}
  If the minimum switching current is exceeded, the valve is reliably actuated.
- Holding current I_{hold}
  A less relevant parameter in terms of practical application is holding current; if the current falls below this value, the actuated valve is released again.

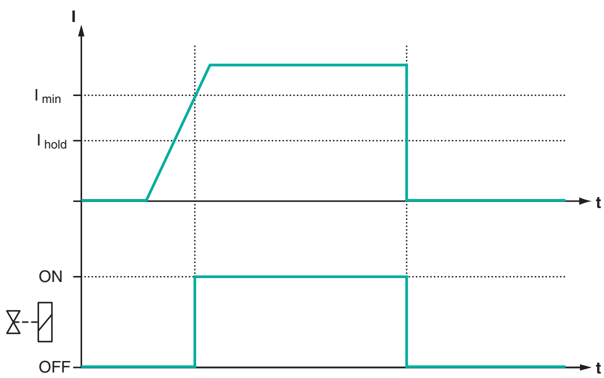


Figure 31 Valve current characteristic

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- Winding resistance R_v
  The specific resistance of metals is temperature-dependent and increases with temperature. Thus, the winding resistance of the valve is also not constant. In calculations, the maximum winding resistance (at maximum operating temperature) should be used. If the data sheet specifies only the resistance at the nominal temperature, then the factor 1.004/K (copper) can be used to calculate the value at maximum operating temperature.
- Voltage U_{DIO} of internal diodes
  The voltage drop U_{DIO} of any polarity protection diodes that may be installed in the valve must be taken into account. This data is rarely specified in the data sheets and are only of significance if U_{min} is not specified.

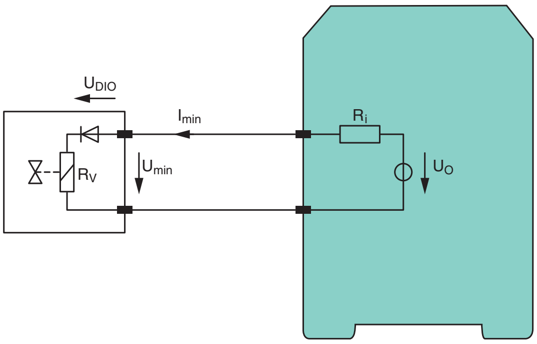

Figure 32 Valve on the solenoid driver

The minimum switching voltage U_{min} above which the valve is actuated reliably can be calculated from I_{min}, R_v and U_{DIO}.

$$U_{min} = U_{DIO} + R_v \times I_{min}$$

Solenoid Driver

In principle, the solenoid driver consists of a voltage source with internal resistance. The key values open-circuit voltage and internal resistance can be used to perform the functional considerations for the circuit.

- Open-circuit voltage U_o
  Open-circuit voltage is the terminal voltage on the output when there is no current flowing (I = 0).
- Internal resistance R_i
  The internal resistance reduces the available voltage depending on the output current.

Connection of Valve with Solenoid Driver

Taking into account the maximum line resistance R_{Lmax} and using the technical data, a suitable solenoid driver for an existing valve can be determined.

The aim of this calculation is to find a line resistance that enables the field circuit to be operated. Figure 33 produces the following equation:

$$U_o - U_{min} = (R_L + R_i) \times I_{min}$$

If this equation is reformulated around $\mathbf{R_L}$, it produces the line resistance that must not be exceeded.

$$R_L = R_{Lmax} = (U_o - U_{min}) / I_{min} - R_i$$

If the minimum voltage $\mathbf{U_{min}}$ of the valve is not specified, then the following formula can also be determined from Figure 33.

$$U_o - U_{DIO} = (R_L + R_i + R_v) \times I_{min}$$

$$R_L = R_{Lmax} = (U_o - U_{DIO}) / I_{min} - (R_i + R_v)$$

Negative values of $\mathbf{R_L}$ mean that the selected solenoid driver cannot be used with this valve.

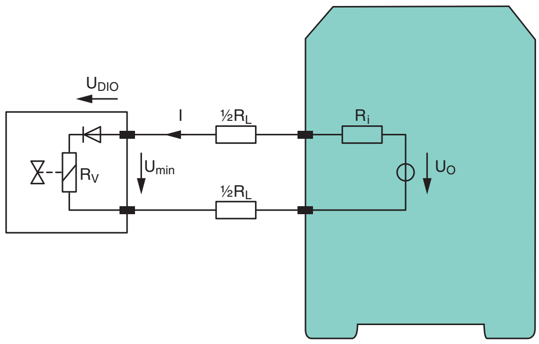

Figure 33 Configuration with line resistance

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Example 1

The maximum line resistance and maximum line length should be determined from the combination of valve and solenoid driver.

Valve:	Herion 2053
	I_{min} = 13 mA
	U_{min} = 19 V
Solenoid driver:	KFD2-SL2-Ex*
	R_i = 272 Ω
	U_o = 24 V

The following maximum line resistance results:

R_{Lmax} = (24 V – 19 V) / 0.013 A – 272 Ω = 113 Ω

For a specific cable resistance of 59 Ω/km (0.6 mm^2) the maximum cable length is calculated at approx. 2 km (1.243 mi). The correct operation of the field circuit is thus ensured, though a safety-related consideration using the Ex characteristics should still be carried out.

Example 2

Valve:	Samson 3775-13
	R_v (60 °C) = 4640 Ω
	I_{min} = 3.75 mA
	U_{min} = 18.6 V
	U_{DIO} = 0 V (not specified)
Solenoid driver:	KFD2-SL2-Ex*
	R_i = 272 Ω
	U_o = 24 V

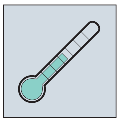
The following maximum line resistance results:

R_{Lmax} = (24 V – 18.6 V) / 0.00375 A – 272 Ω = 1168 Ω

Here too, correct operation is ensured.

Analog Input and Output Signals

Temperature Signals



Temperature is a very frequently measured physical value and can be difficult to record in process and automation technology. From system monitoring to process optimization, temperature measurement plays a vital role. The use of electrical temperature sensors range from the most diverse chemical processes and applications in mechanical engineering to temperature measurement in energy production. Process and response speeds, material consumption, return, product properties and quality depend on the accuracy, reliability and speed with which temperatures are measured. The temperature has a decisive influence on process effectiveness, energy consumption and other process parameters, such as solvent requirements or drying level. The life time of machinery is also influenced by temperature conditions.

In many branches of industry, the main issue is to be able to use the information from reliable temperature measurements for control and regulatory functions. The increased demand for precision and reliability in temperature measurements in recent years have led to a situation in which many system operators have also had to review the suitability and performance of their temperature measuring equipment.

The most commonly used sensors for industrial temperature measurement are resistance thermometers and thermocouples. These types of sensor enable almost all the most common industrial measurement requirements to be met.

Resistance thermometers (RTD's) are recognized as the more accurate and stable (in terms of measuring properties) temperature sensors. Thermocouples on the other hand, with its various types can be used to measure temperatures from -250 °C to +3000 °C (-418 °F to 5432 °F). Thermocouples are regarded as robust and versatile. Resistance thermometers can be used in the range between -200 °C and +850 °C (-418 °F to 1562 °F).

One key property that is shared is that their initial values are available in the form of electrical signals that are relatively easy to transfer to the measurement and control instruments for processing and display. Resistance thermometers and thermocouples can be produced with very narrow tolerances. Because they can be interchanged directly, these sensors are very commonly used.

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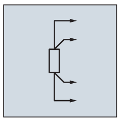
Resistance Thermometers (RTD)



While thermocouples are used to measure temperature differences, the electrical resistance of a metallic conductor depends on the absolute temperature. There is no reference point for a known temperature as with thermocouples. The following effect is used to determine the temperature using electrical resistance: Resistance increases as the temperature rises. Platinum is commonly used as a metallic resistor in industrial measurement technology. It has a high chemical resistance, is relatively easy to process and has reproducible electrical properties. Platinum resistors are standardized in EN 60751 and IEC 751. This ensures their interchangeability. As with thermocouples, the signal strengths of resistance thermometers are relatively low.

Variants of Platinum Resistors

For platinum resistors with a nominal resistance of 100 Ω (Pt100) at 0 °C the changes amount to approx. 0.4 Ω/K. With a nominal resistance of 100 Ω and a measured current of 1 mA, the output signal is around 400 µV/K. Thus, the output signals of the resistance thermometers are still larger than those of the thermocouples by a factor of one to two. Signal deviations of around 4 Ω/K can be achieved with Pt1000 platinum resistors that have a nominal resistance of 1000 Ω at 0 °C (32 °F). However, these resistors are very susceptible to mechanical stresses at high temperatures because extremely thin wires are used. Pt10 resistors are preferred for measurements over 600 °C (1112 °F), because they use comparatively thick wires that are robust at high temperatures.

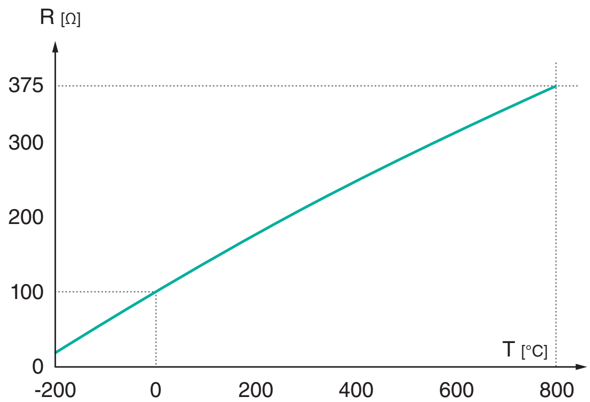


Figure 34 Resistance temperature characteristic curve Pt100

Measurement Methods

With modern, digital interface modules that allow very precise results to be achieved with minimal measuring currents, it is now no longer necessary to build measuring bridges. Temperature acquisition uses high-precision digital A/D conversion circuits. Thus, the problem lies not in the recording of the measuring signal but rather in falsification by wire resistances. In the case of industrial applications, there are often long distances between the measurement location and the evaluation units. These distances are bridged with copper instrument cables. From a metrology perspective, the wire is a resistor switched in series in relation to the measuring resistor. This wire resistance has a direct impact on the measurement result and must therefore be taken into account. In the simplest scenario, the wire resistance represents a constant additive contribution to the result. It can easily be taken into consideration by measuring the line resistance during start-up and subtracting this value from the overall resistance. However, this method cannot be used to record the temperature-related variations in wire resistances. In order to be able to take account of errors caused by this effect, resistance thermometers for precision measurements are mostly equipped with one or two additional connection wires (3- or 4-wire connection).

2-Wire Connection

In case of the 2-wire connection, a constant current I is applied to the measuring circuit. The voltage drop over the measuring circuit resistance 2 x R_L + R_T produces U_1. The wire resistance must be extrapolated to determine the temperature. The contributions of the line resistors 2 x R_L to the overall resistance can only be determined through a separate measurement (without measurement resistor). For this, the measurement lines are shorted directly on the measurement resistor and U_x measured.

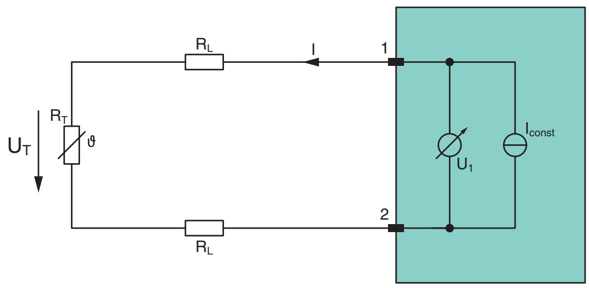


Figure 35 The principle of 2-wire connection

The measured value results from:

$$U_T = U_1 - U_x$$

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Continuous correction of the line resistance during measurement is not possible. That is why the supply cables should not be longer than about 100 m (109.36 yd) in the case of the 2-wire connection. The resistance of a 1 m (1.09 yd) long copper cable with a cross section of 1 mm^2 is approx. 0.017 Ω. Consequently, in this case, a wire resistance of about 1.7 Ω is likely. Changes to resistance due to the influence of temperature are included in the result. If the cable lengths are greater, so that higher wire resistances are unavoidable, you should use 3- or 4-wire connections.

3-Wire Connection

In order to measure the line resistance R_L and its changes, a third wire is laid directly to the connector point at the measurement resistor. The wire resistance of this line has no influence on measurement because the supply current does not pass through it. Thus, the voltage is measured directly on the measurement resistor.

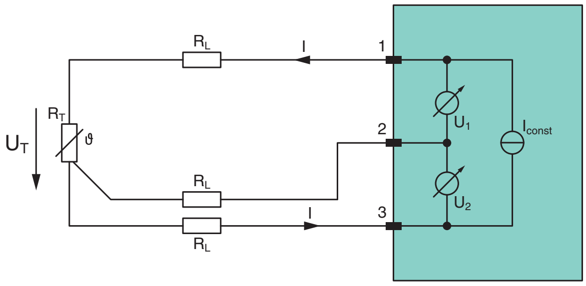


Figure 36 The principle of 3-wire connection

Voltage U_2 can be used to determine the line resistance R_L in the current path at terminal 3. Because the voltage drops of the wires are identical at terminals 1 and 3, the measured value U_T can be determined:

$$U_T = U_1 - U_2$$

In this method the wire resistances are not determined separately. Instead, it is assumed that the wire resistances are the same in both circuit paths. Thus, the key requirements for precise results are that the specific resistance and thermoelectric properties of the supply cables should be constant over the entire effective length. Naturally, all wires must be subject to the same temperature gradient. In practice 3-wire connections are used on cable lengths up to about 500 m (546.8 yd). The wire resistances are then almost 10 Ω.

4-Wire Connection

In the setup shown in Figure 37, it is ensured that two measurement lines are applied to terminals 2 and 3. The circuit is used to suppress the errors caused by the wire resistances; however, a good constant current source is required.

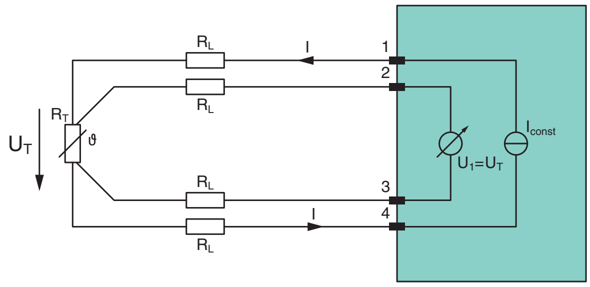


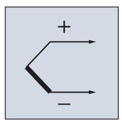
Figure 37 The principle of the 4-wire connection

This means that the wire resistance is no longer of any significance and even different resistances on the individual wires do not falsify the measured result.

$$U_T = U_1$$

When designing resistance thermometers with 3- and 4-wire connections, it is necessary to ensure that the supply cables are laid to the measurement resistor, which is not the case with all thermometers. The connection is often made in the connection head in such constructions. This once again produces the problems with the wire resistance and temperature-dependent influences over the length of the actual thermometer. Because of the comparatively small distance between the connection head and the measurement resistor, these errors are much smaller than with the 2-wire connection.

Thermocouples



If an electrical conductor is in a temperature gradient, a stream of electrons occurs inside the conductor, caused by an electromotive force (EMC) proportionate to the temperature gradient. The amount and direction of this electromotive force depend on the size of the temperature gradient and on the conductor material (Figure 38). The measured voltage between the two free ends of the conductor produces a voltage difference that depend on the temperature difference and the thermoelectric characteristics of the conductor. This phenomenon, known as the **Seebeck Effect**, was discovered by T. J. Seebeck in 1822.

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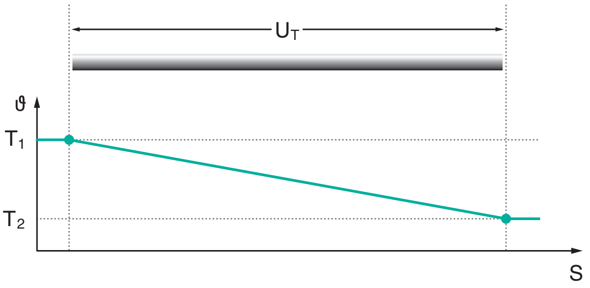

Figure 38 Link between temperature gradient and conductor material

The Thermocouple

To get a usable thermocouple for metrology purposes, two metal conductors with different thermoelectric properties are connected at one end (measuring point). A voltage is then formed between the two free conductor ends that depends on the temperature difference between the connection point, the free ends and the two conductor materials. Hence the name thermocouple. In this case, it is important that the thermoelectrical forces are produced in the range of the temperature gradients and not just, as is often incorrectly assumed, at the connection point (measuring point) of the two conductors.

This is important for the practical application of thermocouples because this gives rise to a demand for conductors with physically and chemically homogeneous properties along the entire length. The thermal voltage U_T results irrespective of the intermediate temperature profile, provided that the two conductors in the thermocouple have uniform thermoelectrical characteristics over their entire length.

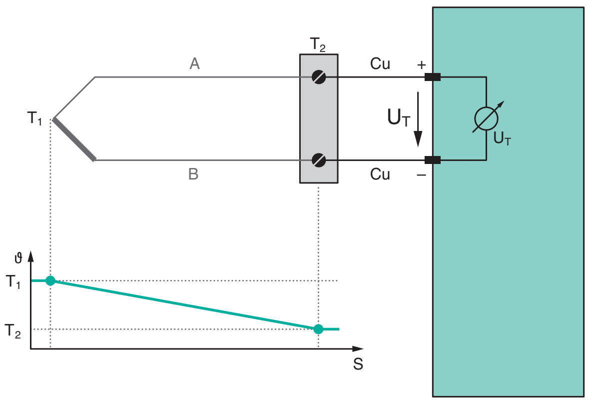

Figure 39 Thermal voltage U_T

Likewise, the connection points at which the thermocouple (A/B) is connected with connection leads or a display device must share the same temperature (T_2). If this condition is not met, this leads to unwanted thermal voltages at the connection points, so that the measurement results are not correct.

The measuring point (T_1) is the point where the two thermo wires are welded, soldered or twisted together. This is the actual sensor in the medium to be measured. The two thermal elements are connected to the compensating or thermo wires at the two contact points, so that the thermocouple is connected to the reference junction (T_2). In Figure 39, the reference junction is the end of the copper leads at which the thermal voltage U_T is finally measured. A thermocouple is a device for measuring temperature difference. It should not be confused with a temperature sensor for measuring absolute temperature. It is only by measuring the temperature at the junction that it is possible to draw a conclusion about the absolute temperature of the measuring point.

There are many different thermocouples available on the market with different Seebeck coefficients. Figure 40 shows Seebeck coefficients for a number of thermocouples whose thermal voltages are in the range of a few µV per degree of temperature difference. A number of tables showing the basic values of the thermal voltages for all commonly used thermocouples for the temperatures in their areas of application are available, enabling the temperature values to be determined.

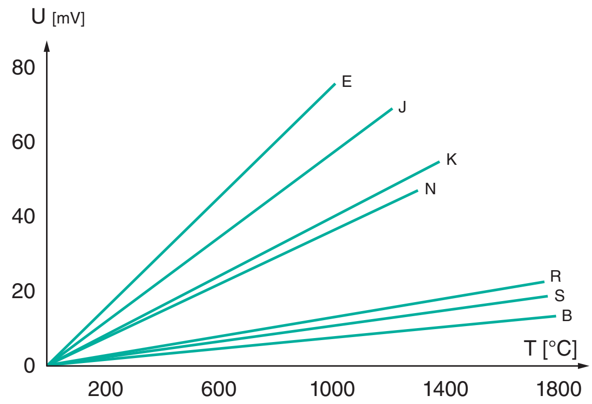

Figure 40 Seebeck coefficients for thermocouples

Summary of the Functioning Principle

- The combination of two different metals in a temperature gradient produces an electrical thermal voltage.
- Thermocouples only produce an output signal in the area of the temperature gradient.
- Thermocouples are temperature sensors that measure a difference in temperature. They cannot be used to determine absolute temperatures.

Reference Junction Compensation

As already mentioned, the output signal of thermocouples is a measure of the temperature difference between the measurement point and reference junction. To use thermocouples to determine absolute temperature, it is necessary, for instance, to keep the reference junction at a constant and above all known temperature.

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One easy way to maintain a constant reference junction temperature is commonly used in laboratory applications: the reference junction is immersed in iced water that is in a thermodynamically balanced state. If this is pure iced water, a constant temperature level with a safety of 1 mK is established at 0 °C (32 °F).

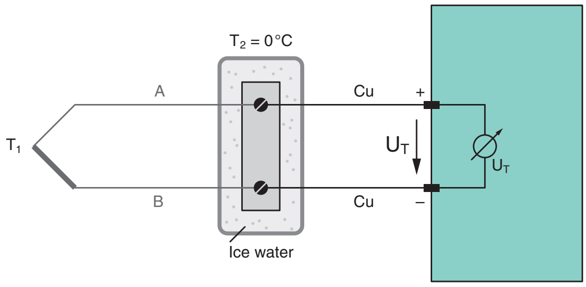

Figure 41 Reference junction with iced water

All that is required for a practical application is a thermos vessel filled with ice. This method was also used to determine the basic values of the thermocouples. The thermal voltages of the basic voltages therefore refer to a temperature of 0 °C (32 °F). However, this method does require the iced water to be checked constantly and topped up with ice. It is therefore clearly unsuitable for industrial applications. The fact is that a reference junction temperature of 0 °C (32 °F) is just a random definition because this temperature can be achieved with comparative ease. However, any temperature can be used as the reference junction temperature. Thermostats were developed for industrial use in order to be able to keep the reference junction at a known and constant temperature.

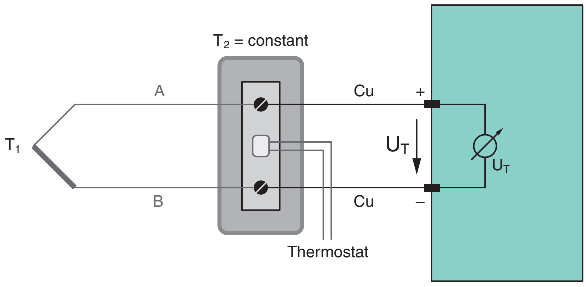

Figure 42 Structural principle of a thermostat

The method of continuously measuring the reference junction temperature rather than regulating it is even easier. If the terminal temperature is known and is identical at both terminals, this can be used as the reference junction temperature.

Internal and External Cold Junction Compensation

As discussed before, two methods are used for reference junction compensation in industrial measurement technology. During internal cold junction compensation, the temperature at the terminal is measured with a separate temperature sensor and is used as the correction value.

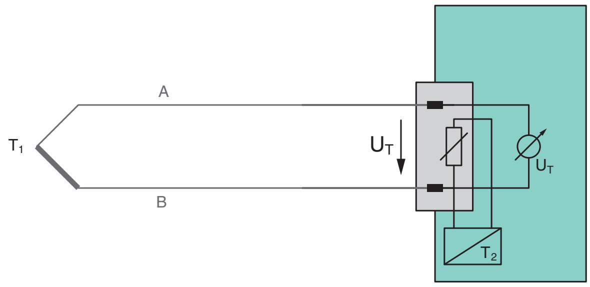

Figure 43 Internal cold junction compensation

In the other case, external cold junction compensation, the reference junction is contained in a tempered device, the reference junction thermostat. The temperature is kept constant through heating or cooling. This constant value must be used for correction in the signal converter. Such a device is only practical if the signals from several thermocouples need to be transferred over a long distance. In this case, it is only necessary to wire the distance from the temperature sensor to the thermostat with high-grade thermal material.

The distance from the thermostat to the measuring station can be bridged with less expensive copper cables. Many of the current interface modules developed for operation with thermocouples have connection points for connecting thermocouples directly without the need for a separate reference junction. Such instruments have a separate internal reference point where the terminal temperature is measured with an integrated measurement resistor.

Comparison between Thermocouples and Resistance Thermometers

While having many advantages, thermocouples also have a number of important disadvantages. Foremost among these is the inevitable lack of metallurgic homogeneities in thermal wires. This has a direct influence on the achievable precision and the long-term stability of the sensors. In addition, thermocouples have a non-linear temperature/voltage ratio and exhibit signs of hysteresis. To this is added the additional costs for thermal wires and extension wires, the need for a reference point and, finally, the relatively weak output signal.

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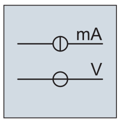
Resistance thermometers are much more precise and stable than thermocouples and also permit a much better resolution. At present, resistance thermometers offer the best possible measuring precision with electric temperature sensors. However, they can only be used in a very limited temperature range, usually between -200 °C and +350 °C (-328 °F to 662 °F). Special construction measures enable temperatures of +850 °C (1562 °F) to be reached, while thermocouples made from special alloys can measure up to 2500 °C (4532 °F). The temperature patterns of measurement resistors are much less complicated than the thermoelectric properties of thermocouples, making linearization and signal amplification much simpler. For instance, a conventional Pt100 measurement resistor with a measured current of 1 mA delivers an output signal of 3 mV to 4 mV with a temperature change of 10 K.

On the other hand, resistance thermometers also have their weaknesses. In comparison with the single-point measuring probe of the thermocouple, resistance thermometers measure the entire volume of the measurement resistor. They are less robust and respond more slowly than thermocouples. Resistance thermometers require a power source and the spontaneous heating effect must be taken into account during the design and installation phases. Resistance thermometers are two to three times more expensive than comparable thermocouples. However, modern thin film sensors are narrowing the performance gap between the two types of sensor.

Criterion	Thermocouples	Resistance thermometers
Accuracy	Good	Very good
Area of application	Large temperature range	Small temperature range
Price	Economical	Relatively expensive
Measuring point	Single-point	Over the entire length of the measuring resistor
Response times	Short	Long
Dimensions	Very small versions are possible	Comparatively large sensor surface
Reference junction	Required	Not required
Surface temperature measurement	Suitable	Generally unsuitable
Vibration resistance	Very robust	Relatively sensitive
Supply with measured current	Not required	Required
Spontaneous heating	Does not occur	Must be taken into account
Long-term stability	Satisfactory	Excellent
Robustness	Very good	Good
Connection cables	Thermal material or special materials	Copper instrument cables

Table 1 Comparison between thermocouples and resistance thermometers

Current/Voltage Standard Signal



The 0/2 V to 10 V voltage signal and the 0/4 mA to 20 mA current signal have established themselves as the standard. Analog sensor signals from temperature sensors, load cells, strain gauges, resistance measuring bridges, as well as digital frequency signals, are converted into one of the two standard signals for processing in a wide variety of measurement, regulatory and control tasks. This offers the measurement and control technician an easy-to-measure standard signal common to all manufacturers.

Measurement value signals are converted into standard signals via signal converters. Figure 44 shows a signal converter (A) which converts a resistance signal into a standard signal for further processing in control (B). If the sensor and signal converter form a single unit, they are referred to as a transmitter.

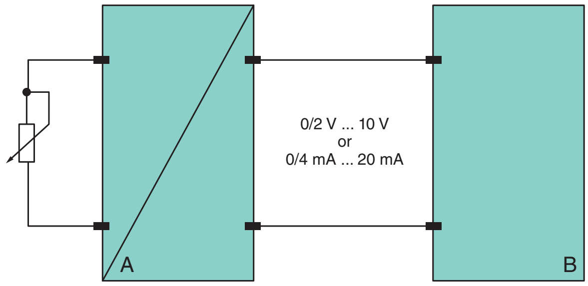


Figure 44 Conversion of sensor signals into standard signals

The sensor characteristic curve is assigned to the standard signal in the signal converter. The start of the measurement value (0 %) is assigned to the 0/4 mA or 0/2 V signal, while the end of the measurement value (100 %) is assigned accordingly to the 20 mA or 10 V signal. With simple sensors the scaling can also be carried out in the control.

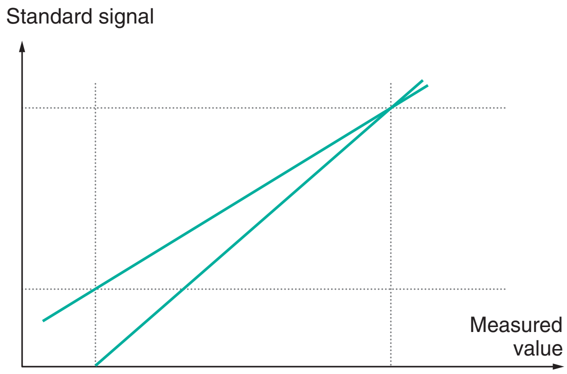


Figure 45 Assignment of measured values to standard signals

Technology
Basic Principles
Ex Protection Intrinsic Safety
Functional Safety
Applications

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Value Ranges of Standard Signals

When we refer to the 0/4 mA to 20 mA standard signal, we must also define whether this is a signal in the range 0 mA to 20 mA or 4 mA to 20 mA. What is the reason for the 4 mA to 20 mA range? Wouldn't it be much easier always to start with 0 mA? It would then be much easier to convert measured current into a percentage of the measured value range. There are two reasons for using 4 mA as the starting value:

1. A loop powered signal converter or 2-wire transmitter uses the current range between 0 mA and 4 mA to supply its electronics and to evaluate the sensor measurement signal.
2. The initial value of 4 mA is used for the live zero detection of the measuring circuit. If a lead breakage occurs, for example, the measuring circuit current returns to 0 mA. The valid current values must be higher in order to be able to identify this value clearly as a measuring circuit error.

For more diagnostic options, the NAMUR organization published NAMUR recommendation NE43, dividing the value range of the current signal into several areas.

Valid, defined measurement value information is transferred within the range from 3.8 mA to 20.5 mA. Failure information is available when the signal current is < 3.6 mA or > 21 mA, i. e. is outside of the range for measured value information.

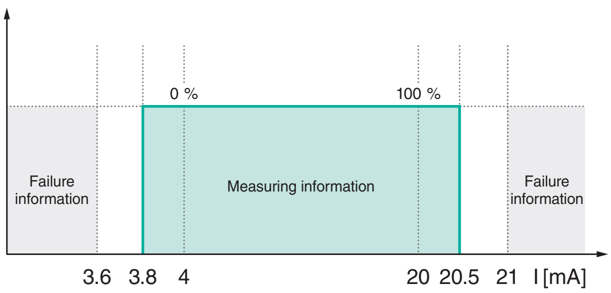
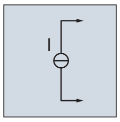


Figure 46 Validity range according to NAMUR NE43

The same applies to the 0/2 V to 10 V standard signal.

However, the application has little to do with ideal conditions, so that a number of important points have to be noted during project planning.

0/4 mA to 20 mA Standard Signal



Two things should be noted with the 0/4 mA to 20 mA interface. Which is the current source and which the current sink? We also refer to active and passive current output. As already discussed, the measurement value information relates to the amount of current, not its direction. For a better understanding, let's take a brief look at the electrical basis for the current output.

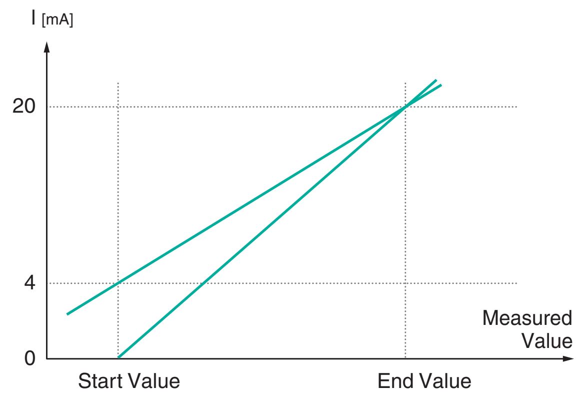


Figure 47 0/4 mA to 20 mA standard signal

Active Current Output (Current Source)

The active current output (Figure 48, device B) tries to use the current source to output a value I_{const} that corresponds to the measured value. This current source can be located in a 4-wire transmitter or in an interface module. The current is transferred via the wiring with line resistance R_L for evaluation in device A. Evaluation always consists of a measurement resistor R_S and a voltage-measuring component (display, A/D converter, etc.). The evaluation can be carried out in a control or measured value display for example.

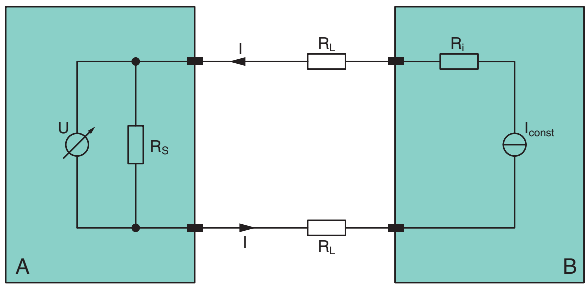


Figure 48 Active current output

Another application for current sources is the controlling of an actor (e. g. valve or actuator, Figure 49). Instead of being measured, an output signal is controlled here. In the case of the valve, the opening cross section and thus the volume of flow between 0 % and 100 % is controlled by means of the analog standard signal.

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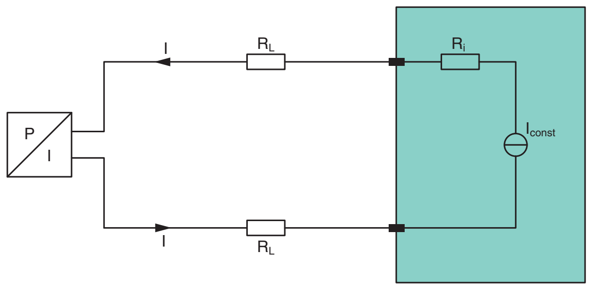


Figure 49 Valve control

In the case of the active current output (current source) as in Figure 48, the following should be noted. The current I brings about a voltage drop in all the resistance portions (R_L, R_S, R_i) of the circuit. This minimum voltage must be available to the current source in order to be able to maintain the current. The following example should clarify this. Assuming that the current source has a maximum output voltage of 24 V, then the resistance in the current circuit with a current of 22 mA can be a maximum of

$$R = U / I = 24\ V / 22\ mA = 1090\ \Omega.$$

For this reason, you should note the maximum permissible load for devices with active current output (current source). This information is contained in the data sheets.

Passive Current Output (Current Sink)

The configuration of the passive current output is shown in Figure 50. Device A consists of a power supply U and current measurement using measuring resistor R_S and voltmeter U. Device B with its passive current output (current sink) is connected to device A via wiring R_L.

Device B can be a transmitter, a loop powered signal converter or an interface module with passive current output. Device A is in practical terms a transmitter power supply. However, it can also be a voltage supply or the analog input of a PLC.

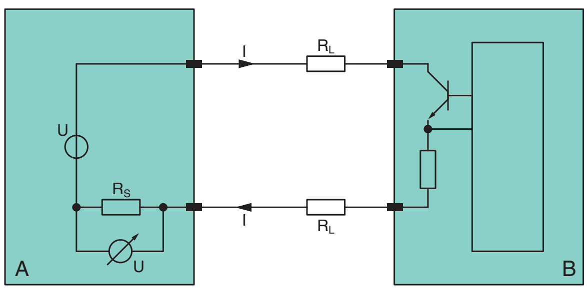
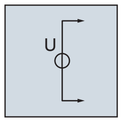


Figure 50 Passive current output

The passive current output (device B) changes its input resistance and thus the current in the conductor loop. The current value corresponds to the measured value to be transferred. In control unit A, measuring resistor R_S is used to convert this current value to a voltage and evaluate it.

The following should be noted. If device B is a 2-wire transmitter, this still needs a certain voltage value for its own function in order to act as a current sink. Most 2-wire transmitters operate at voltages > 12 V. The line resistances R_L must be taken into account here. Restrictions also apply at maximum voltage. Energy is generated in the current sink (device B) that corresponds to the product of applied voltage and signal current. Details of the maximum voltage at the passive current output can be found in the data sheets.

0/2 V to 10 V Standard Signal



The 0/2 V to 10 V standard signal is mainly used in factory and building automation. The transfer distances are not as great here as in process automation. As well as the 0/2 V to 10 V signal, the 0/1 V to 5 V signal is also occasionally encountered.

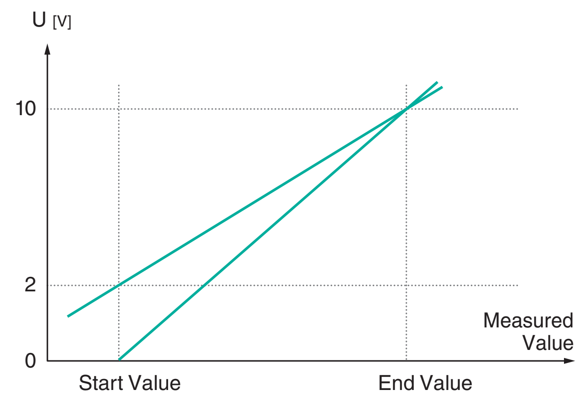


Figure 51 0/2 V to 10 V standard signal

Figure 52 shows the principal structure of the transfer route with a signal converter (A) that converts a sensor signal into a 0/2 V to 10 V standard signal and transfers it to the control (B).

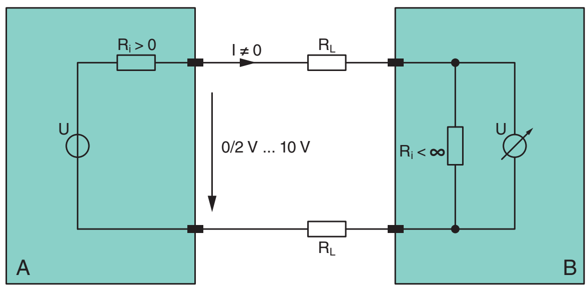


Figure 52 Signal transfer

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The signal converter (A) outputs the signal value 0/2 V to 10 V, which is transferred to the control (B) by means of the two lines. This voltage should be measured as precisely as possible in the control. The voltage measurement should have the highest possible resistance, but resistance should not be too high because of possible susceptibility to faults. The input resistance R_i of most controls lies between 10 kΩ and 50 kΩ. When analyzing faults, an input resistance of 10 kΩ is assumed. With a signal of 10 V, the current is

$I = U / R = 10\ V / 10\ k\Omega = 1\ mA.$

Because of the wire resistances, which can be approximately 50 Ω when the distance between signal converter A and control B is 1 km, there is already a drop of 50 mV with a current of 1 mA. This corresponds to a transfer error of 0.5 %, which is acceptable for application in factory and building automation.

Conversion of a 0/4 mA to 20 mA Signal into a 0/2 V to 10 V Signal with a Measurement Resistor

If the signal converter (A) has a 0/4 mA to 20 mA output, but control (B) has a 0/2 V to 10 V input, the signal must be converted with a measurement resistance (250 Ω or 500 Ω).

With

$U = R \times I = 500\ \Omega \times 20\ mA$

the measured current can be converted into a measured voltage. This is possible in principle; however, it leads to transfer errors that have to be corrected by re-scaling the control (B). The problem lies in the input resistor of the voltage input. The current is divided into 2 partial currents I_1 and I_2. Figure 53 shows the pattern with an input resistance of 10 kΩ. The signal current of 20 mA is not converted to 10 V, but simply to about 9.5 V. Rescaling is required in the control (B).

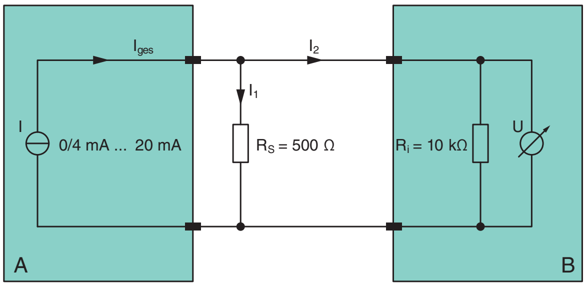

Figure 53 Current/voltage conversion with a measurement resistor

The solution with an additional active current/voltage converter in the current circuit is more elegant (Figure 54).

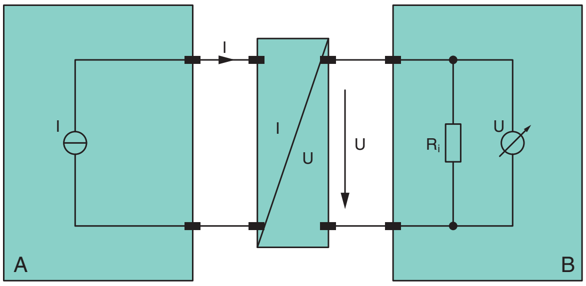

Figure 54 Current/voltage conversion with a signal converter

Summary

Little Variance in the Signals

A lot of different measurement information is processed in the control. The conversion to a standard signal enables all measured values with multi-channel input cards of a single type to be recorded. This reduces the storage of various sensor input cards from temperature sensors (Pt100, thermocouples) to measuring bridge inputs.

Interoperability

As soon as all manufacturers convert their sensor signals to a standard signal, the user can evaluate these directly without complex adjustment and specification.

Ease of Measurement

Simple universal measuring devices with current and voltage inputs are sufficient when checking measuring circuits. In addition, no knowledge of the sensor signal is required. It is enough to assign the input characteristic curve to the standard signal.

Reliable Transfer

The sensors are not normally located directly next to signal evaluation. If high resistance sensor signals are transferred over long cable distances, faults can occur.

Live Zero (Shifted Zero Point)

Raising the standard signal to 2 V to 10 V or 4 mA to 20 mA enables line faults such as lead breakages or short circuit to be detected.

Superimposing of Digital Sensor Information

The 4 mA to 20 mA standard signal can be superimposed with digital HART signals in order to parameterize or read intelligent sensors.

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HART Communication

HART is a bi-directional form of communication between intelligent field devices and host systems that is used predominantly in process automation. It was developed at the end of the 1980s to facilitate the exchange of data with SMART field devices, and is based on the Bell 202 telecommunication standard. HART (**H**ighway **A**ddressable **R**emote **T**ransducer) is now the standard for process instrumentation, with the majority of the more than 24 million intelligent actuators and sensors being HART compatible. These field devices are used for tasks such as valve control and the measuring of process variables like flow, level, temperature, pressure or pH value, and have proved their worth over many years in the field. This technology is also reliable, easy to use and highly efficient. The asset management system uses HART communications to read the status and diagnostic information from the field devices.

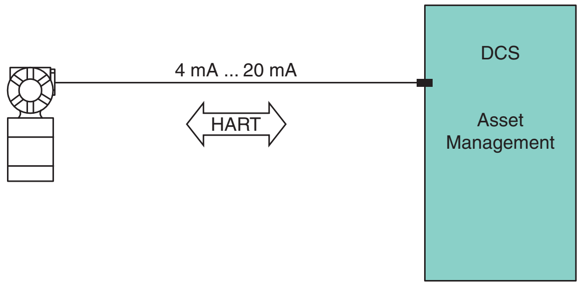

Figure 55 Transfer of additional process variables via the 4 mA to 20 mA line

Applications and Benefits

The bi-directional communication of the HART protocol fully exploits the potential of intelligent field devices. Otherwise, additional digital process data can only be utilized with the help of a consistent digital fieldbus infrastructure. With HART, these data are available to the user even in an analog process control system. The conventional, analog 4 mA to 20 mA interface in a 2-wire system can also continue to be used. This protects investments that have already been made. HART is compatible with a variety of different host systems, ranging from DCS or PLC through asset management and security systems to HART communicator (HHT – **H**ART **H**andheld **T**erminal).

The key advantages of HART are:

- straightforward diagnosis of field devices (asset management)
- simple configuration of field devices
- universal field devices with wide-ranging functionality

Frequency Shift Keying

The HART protocol employs **F**requency **S**hift **K**eying (FSK) technology. Here, the digital signal is produced using the frequencies 1,200 and 2,200 Hz (corresponding to 1 and 0) and superimposed on the analog 4 mA to 20 mA control signal on the existing lines – without interrupting or interfering with the analog signal.

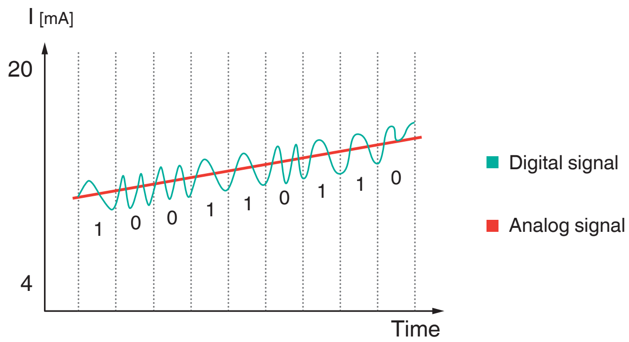

Figure 56 Simultaneous transfer of analog and digital signals

This enables information to be exchanged at a transfer rate of 1,200 Bps (Bits per second). In burst mode, up to three signal updates per second can be transferred by a field device.

Master/Slave Communication

HART is a protocol for Master/Slave communication that caters for up to two master devices – primary and secondary. The primary devices are the host devices, while the secondaries may, for instance, be HART communication devices. These devices can be installed as additional devices without any adverse effect on communications between the field device and the primary master. There are two basic modes of communication with the field device. The mode used mainly is Command and Answer mode, in which the field device is polled to provide dynamic measured values or instrument data. Burst mode is used in order to increase the sampling rate. Here, the field device delivers an updated measured value three to four times per second without needing to be polled. However, this data transfer method is only worthwhile in point-to-point topologies.

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Point-to-Point and Multidrop

HART signal circuits can be configured either as a point-to-point connection or as a multidrop network. With point-to-point topology, the measuring circuit in a HART application contains a HART compatible field device that is linked to a control via an analog 4 mA to 20 mA interface in a conventional 2-wire system. HART communication with the master (asset management) also takes place over this line connection.

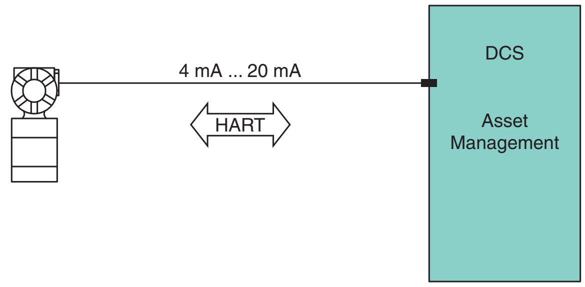

Figure 57 HART measuring circuit as a point-to-point solution

The multidrop solution likewise uses 2-wire technology for transferring digital data between up to 15 field devices. All the devices are supplied from one voltage source and with a constant current consumption. The process values and bi-directional diagnostic information are transferred purely digitally. This topology is especially suitable for process values that change only slowly. The advantage lies in the reduced amount of wiring involved.

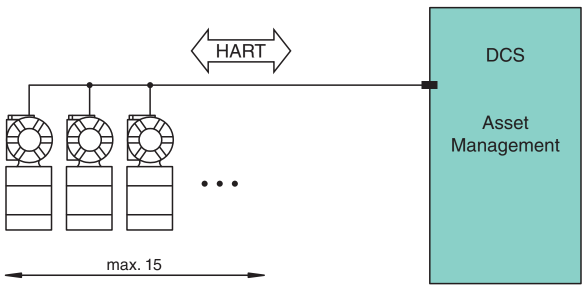

Figure 58 Multidrop operation with purely digital transfer

The Electrical Signals

To ensure that high-quality HART signals are available throughout the measuring circuit, the transfer path must meet certain criteria. We differentiate here between field circuits with transmitters and actuators.

Field Circuits with Transmitter

A conventional 2-wire measuring circuit consists of a transmitter, a power supply and a measured value display. The transmitter is supplied by the power supply and outputs the measured value in the form of a variable current consumption (4 mA to 20 mA signal). The display in the measuring circuit indicates the transferred current value.

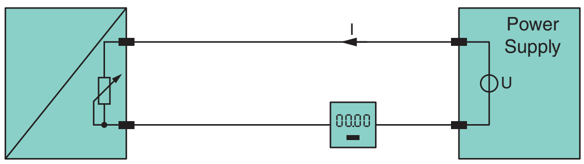

Figure 59 Conventional 2-wire measuring circuit

If communication with the transmitter in the field is to take place for the diagnosis or configuration purposes, this is done using a voltage signal from the master that the transmitter (slave) can capture and evaluate. The transmitter can only reply with a variable current consumption. In other words it varies its current consumption in the communication cycle.

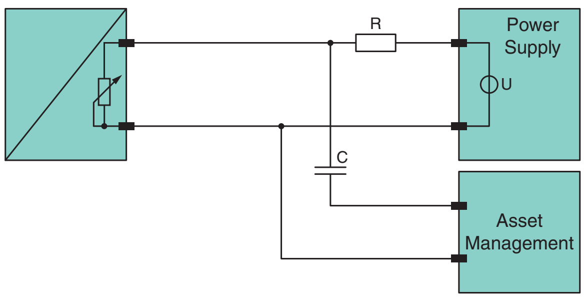

Figure 60 Digital communication in the field circuit

The transmitter uses a HART current signal for communication, while the power supply or communicator uses a HART voltage signal.

The master, an asset management system or a HART communicator, is connected in parallel with the measuring circuit and modulates the voltage signals to the measuring circuit. To prevent the voltage signals from the asset management system and the current signals from the transmitter being attenuated by the low-resistance voltage source, a so-called HART resistor > 230 Ω is required before this voltage source. To make sure that any DC currents that may be present cannot affect the high-precision field measurement circuit, the HART signals are coupled capacitively.

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In the case of high-speed analog measurement inputs from control systems and controls that have no HART functionality, the HART signal can, under certain circumstances, be detected and interpreted as a measuring fluctuation. In order to avoid this it is advisable to connect a 20 µF attenuation capacitor on the card's input in parallel in the output circuit. This RC filter, consisting of a HART resistor and HART filter, brings about good attenuation of the HART signal.

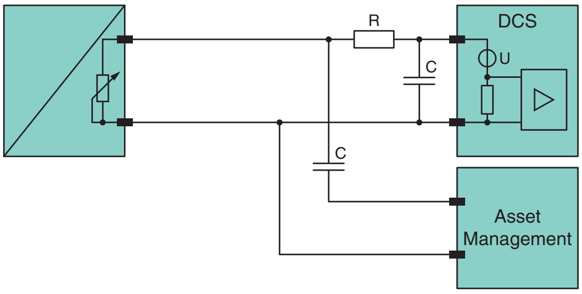

Figure 61 HART filter for fast AI cards

Field Circuits with Actuators

Where actuators are used, we have different conditions. To control the actuator a current is applied to it by the control system. Thus, the control system can only output HART signals by altering its impedance – i. e. using voltage. To communicate with the actuator, HART current signals must be injected.

Galvanic Isolation of HART Signals

For the dependable, safe transfer of measured values in analog measuring circuits galvanic isolation is recommended. This is achieved either using signal conditioners or, in hazardous circuits, isolated barriers. Isolated barriers not only isolate the signals but also restrict the energy input to the field for safety reasons. This (HART) isolated module, which was mentioned above under measuring circuit, is transparent for HART signals in both directions and often has the requisite HART resistor already integrated. Asset management in the form of a Multiplexer or HART communicator outside the control system is connected capacitively to the measuring circuit.

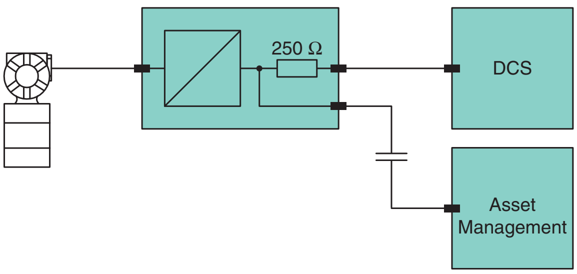

Figure 62 Signal circuit with isolated barrier and capacitive coupling of asset management

HART Interface Solutions (HIS)

To enable HART communication to be set up, Pepperl+Fuchs supplies a variety of components that together make up the so-called **H**ART **I**nterface **S**olution (HIS). This includes devices for single circuits as well as Multiplexers for up to 256 field devices and wireless HART products. The HART Interface Solution is rounded off with wiring systems.

HART Loop Converter

The HART Loop Converter is a device for individual signal circuits. The **H**ART **L**oop **C**onverter (HLC) converts the digital HART signals into a maximum of three analog 4 mA to 20 mA current signals. Here, up to four digital HART variables are captured and made available to a PCS in the form of analog signals. The four HART variables enable not only the actual measured result but also process parameters such as pressure and temperature to be determined and used selectively to control the process. This additional functionality for the control and monitoring of the production process provided by the installed HART field device is possible without any additional cabling or modification of the infrastructure. If required, the HLC can also be programmed to enable a single digital value to be split (signal splitting) and output on three analog channels and made available to a variety of systems. In addition, two different modes are possible. If the field device is operating in burst mode, an updated measured value is output three to four times every second, with each value being confirmed by the HLC within 100 ms. If the field device does not support this mode, the HLC will switch into Command and Answer mode. In this mode, the field device is polled for the dynamic measured values at the maximum possible sampling frequency.

If the HLC is being used as a transmitter power supply (active mode), it supplies the transmitter and issues a HART command to switch it into burst mode.

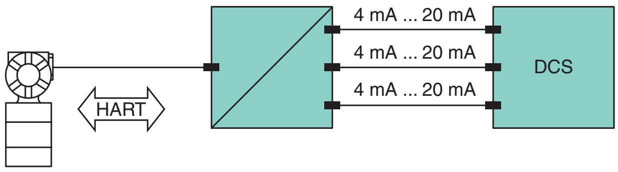

Figure 63 Signal transmission using the HART Loop Converter (HLC) – active mode

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Technology
Basic Principles
Ex Protection Intrinsic Safety
Functional Safety
Applications

If the passive input of the HLC is connected in parallel to an existing measuring circuit, it switches the transmitter into burst mode and converts the HART signals into analog values.

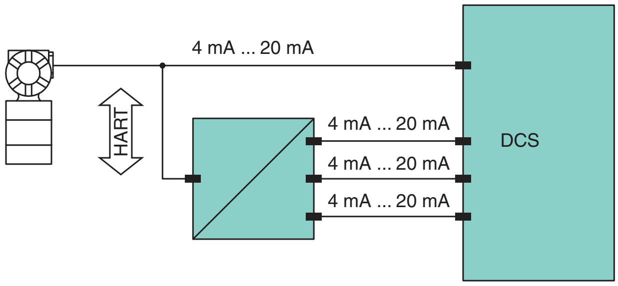

Figure 64 Signal transmission using the HART Loop Converter (HLC) – passive mode

HART Multiplexer

If the HART Multiplexer is being employed as a HART Master for multiple measuring circuits, it will be able to control up to 256 field devices. If fully configured with HART Slaves, this number increases to no less than 7936. Each channel is switched through for communication in succession.

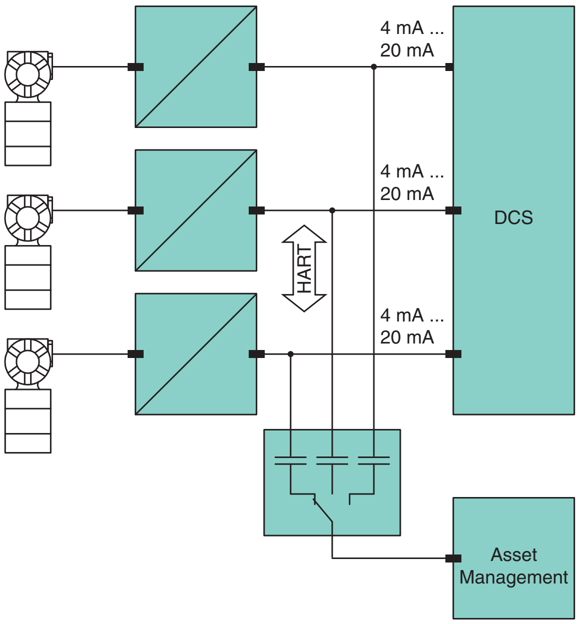

Figure 65 Multi-channel signal transmission and coupling of HART Multiplexers

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Overview of Explosion Protection and Intrinsic Safety

Hazardous Locations and Protection Methods

Introduction

This document deals with the physical principles and fundamentals of explosion protection and with the legal situation of the two division model (North America) and the three zone model (Europe and IEC countries) of hazardous (classified) locations. Regardless of geographic location, the physical principles of explosion protection are identical. What differenciates one country from another are national deviations and varying requirements associated with the explosion protection methods. In very general terms, we can differenciate between the IEC and North American concepts.

After World War II, the increased use of oil and its derivatives brought the construction of a great number of plants for extraction, refining, and transformation of the chemical substances needed for technological and industrial development.

The treatment of dangerous substances, where there exists the risk of explosion or fire that can be caused by an electrical spark or hot surface, requires specifically defined instrumentation, located in a hazardous location. It also requires interfacing signals coming from a hazardous location to be unable to create the necessary conditions to ignite and propagate an explosion.

This risk of explosion or fire has been the limiting factor when using electrical instrumentation because energy levels were such that the energy limitation to the hazardous location was difficult, if not impossible, to obtain. For this reason, those parts of the process that were considered risky were controlled with pneumatic instrumentation.

The introduction of semiconductor devices (transistors first and, subsequently, integrated circuits), along with the capability to reduce the working voltages and energy levels, made the energy-limitation protection technique, called intrinsic safety, easier to apply when using electronic instrumentation in hazardous locations. Thus, a more economical and more efficient solution to the problem was created.

The purpose of this publication is to:

- explain the principles on which the protection techniques against the danger of explosion are based
- present intrinsic safety and its application to anyone who faces the problems relative to design, installation, and maintenance

Introduction to Intrinsic Safety

In England, the 1913 methane gas explosion in a coal mine caused the loss of many lives. The inquiring commission in charge of the investigation debated at length whether or not the explosion was caused by the low-voltage signaling system that was used to advise the surface crew that coal cars were ready to be brought to the surface.

The signaling system, composed of a set of batteries and a bell, was activated by shorting, with a metallic tool or by hand, two bare conductors routed along the mine's galleries (refer to Figure 1). The system was considered safe because the low voltage and current level in the circuit were within recognized safety parameters.

The research that followed revealed that the most important factor in determining the safety of an electrical circuit is the energy stored in the circuit. Without the use of proper limitation methods, the inductive energy stored in the bell and wiring produced energy levels sufficient enough to generate an electric arc that was able to ignite the dangerous air/gas mixture – causing the fatal explosion.

The concept of intrinsic safety was born.

The electrical apparatus and its associated circuits had to be designed in a manner that would prevent the generation of arcs, sparks, or thermal effects that could ignite a potentially dangerous substance, during both normal and fault conditions of the circuit.

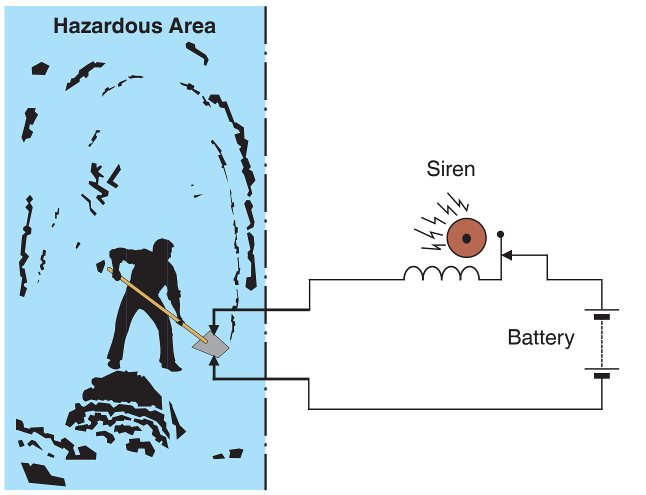

Figure 1 Mine signaling system erroneously considered safe causes an explosion

The first regulation for testing and certification of signaling systems for mines was issued. Subsequently, the study of the lighting mechanism was expanded to include alternative current (AC) circuits and other dangerous gas mixtures.

The intrinsic safety concept was then applied to the surface industries where explosive atmospheres, i. e., containing hydrogen or acetylene, are easier to ignite than the methane present in coal mines.

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Physical Fundamentals of Explosion Protection

Ignition Triangle

From a chemical point of view, oxidation, combustion, and explosion are all exothermic reactions with different reaction speeds. For such reactions to take place, it is essential that the following three components be present simultaneously in suitable proportions:

- Fuel: flammable vapors, liquids or gases, or combustible dusts or fibers,
- Oxidizer: generally air or oxygen,
- Ignition energy: electrical or thermal.
- These three components are identified in the ignition triangle displayed in Figure 2.

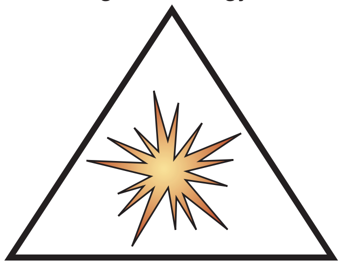

Figure 2 Ignition triangle

Once the reaction is ignited, depending on how the exothermic energy is released, the results can be a controlled combustion, flame wave, or explosion.

All protection methods used today are based on eliminating one or more of the triangle components in order to reduce the risk of explosion to an acceptable level. In a properly designed safety system, it is generally acceptable that two or more independent faults must occur, each one of low probability, before a potential explosion can occur.

There are also materials that can explode spontaneously without supplied energy; however, this subject will not be addressed here. This publication deals with the prevention of explosions that can be ignited.

Explosive Mixture Characteristics

The risk of an ignition of an air/gas mixture depends on the probability of the simultaneous presence of the following two conditions:

- Formation of flammable or explosive vapors, liquids or gases, or combustible dusts or fibers with atmosphere or accumulation of explosive or flammable material;
- Presence of an energy source – electrical spark, arc, or surface temperature – that is capable of igniting the explosive atmosphere present.

It is possible to draw an ignition characteristic for each type of fuel. The characteristic curves of hydrogen and propane are illustrated in Figure 3. A **M**inimum **I**gnition **E**nergy (MIE) exists for every fuel and represents the ideal ratio of fuel to air. At this ratio, the mixture is most easily ignited. Below the MIE, ignition is impossible for any concentration.

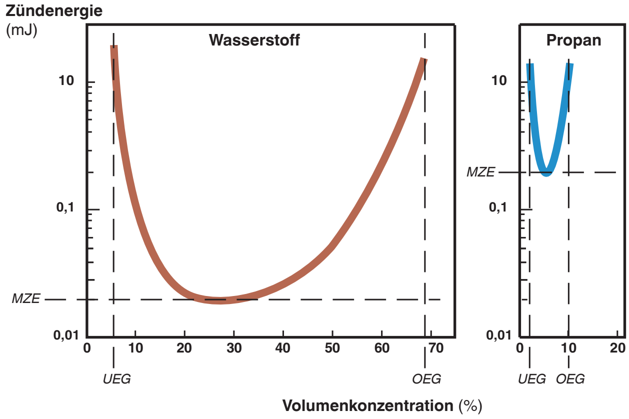

Figure 3 Ignition energy in relation to hydrogen and propane air/gas concentration

For a concentration lower than the one corresponding to the MIE, the quantity of energy required to ignite the mixture increases until a concentration value is reached below which the mixture cannot be ignited due to the low quantity of fuel. This value is called the **L**ower **E**xplosive **L**imit (LEL). In the same way, when increasing the concentration the energy requirement increases, and a concentration value is identified above which ignition cannot occur due to the low quantity of an oxidizer. This value is called the **U**pper **E**xplosive **L**imit (UEL).

For example, the following table lists the explosive characteristics of hydrogen and propane.

	MIE	LEL	UEL
Hydrogen	20 µJ	4 %	75 %
Propane	180 µJ	2 %	9.5 %

Table 1 Explosive characteristics of hydrogen and propane

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From a practical point of view, LEL is more important and significant than UEL because it establishes, percentage-wise, the minimum quantity of gas needed to create an explosive mixture. This data is important when classifying hazardous locations.

The MIE (minimum energy required to ignite an air/gas mixture in the most favorable concentration) is the factor upon which the intrinsic safety technique is based. With this technique, the energy released by an electrical circuit, even under fault conditions, is limited to a value lower than the MIE.

Ignition Temperature

The minimum ignition temperature of an air/gas mixture is the temperature at which the explosive atmosphere ignites without electrical energy being supplied.

This parameter is important because it establishes the maximum surface temperature allowed for devices located in a hazardous location, under both normal and fault conditions. This must always be lower than the ignition temperature of the gas present.

Flash-point Temperature

The flash-point temperature is a characteristic of a volatile liquid, and it is defined as the lowest temperature at which the liquid releases sufficient vapors that can be ignited by an energy source.

Since a liquid above its flash point constitutes a source of danger, this parameter must be considered when classifying locations.

Evaluation of Explosion Risk

In any situation involving an explosive material, the risk of ignition must be taken into account. Generally, this evaluation will involve industry specialists, safety and mechanical engineers as well as chemists and other critical facility personnel.

In addition to the nominal rating of materials under consideration, parameters related to the process involved are especially important in the evaluation. As an example, the risk of explosion may be caused by the evaporation of a liquid or by the presence of liquid sprayed under high pressure.

It is also important to know what atmospheric conditions are present normally and abnormally. The range of concentration between the explosion limits generally increases as the pressure and temperature of the mixture increases. The relationship between explosion limits and flash point for ethyl alcohol is illustrated in Figure 4.

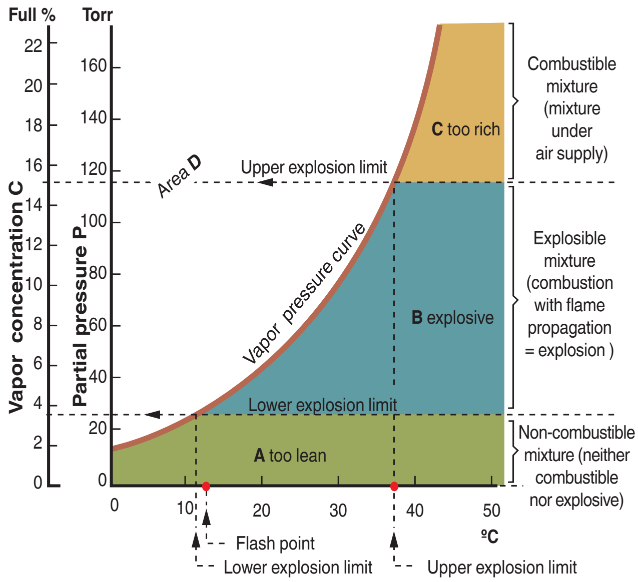

Figure 4 Graph representing the vapor pressure of ethyl alcohol

The atmosphere is capable of exploding within the explosion limits and is shown as area B of the image. Area A is below the LEL; therefore, the mixture is no longer capable of ignition since it is too "lean". The mixture is also not capable of ignition in area C since it is too "rich" (i. e. the oxygen content is too low for an explosion). If air is introduced, the mixture will again become flammable.

In the area surrounding the vapor pressure curve (area D), mixtures are in equilibrium; therefore, a gas that is handled or stored within the critical temperature range of area B is explosive.

The flash point is generally a few degrees above the lower explosive limit. A liquid is considered flammable if its flash point is below 38 °C (100.4 °F) while it is considered combustible if its flash point is above 38 °C (100.4 °F).

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Classification of Hazardous Areas

Although the physical principles of explosion protection are the same worldwide and are not differentiated, the procedures determined by national legislation in the approximately 100-year history of explosion protection have resulted in various solutions.

Hazardous Areas and Apparatus

Determining hazardous areas in a plant is normally performed by experts of various disciplines. It may be necessary for chemists, process technologists, and mechanical engineers to cooperate with an explosion protection expert in order to evaluate all hazards. The possible presence of a potentially explosive atmosphere as well as its properties and the duration of its occurrence must be established.

Hazardous areas are most frequently found in places where there is a possibility of an emission of flammable gas or dust. The hazardous area can occur in normal operation, in the event of a fault, or due to wear and tear of seals or other components.

A hazardous area ranges from the area of release to areas in which the affected substance is so diluted with air that ignition is no longer possible (LEL). The extent of the area is dependent on the type and quantity of released gases, degree of ventilation, or other similar conditions.

Many areas are designated as hazardous due to the presence of flammable gas. However the hazard associated with flammable dust is equally significant, since dispersed dust can also lead to explosions. An explosion hazard due to flammable dust can occur in various sectors of industry, for example, food products (e. g. confectionery, starch, flour, feed yeast), plastics, timber, rubber, furniture, textiles, pesticides, medicines, dyes, coal, metals (e. g. aluminum, chrome, iron, magnesium and zinc) as well as in electricity generation from fossil fuels.

Today, expressed in rather simple terms, we can differentiate between the IEC and the North American procedure. The differences lie in the categorization of hazardous areas, the design of apparatus, and the installation technology of electrical systems. The categorization of these areas is carried out in North America in accordance with the National Electrical Code NFPA 70, article 500 according to material groups (Class I: gases, vapors, and mist; Class II: dust; Class III: fibers and suspended particles) and a further categorization according to the probability of occurrence of these materials being present in a potentially hazardous quantity (Division 1 and Division 2).

Two Division Model

Hazardous areas are dependent on the type of flammable materials present and are divided into the following three categories:

Class I	Locations containing flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors
Class II	Locations containing combustible dusts
Class III	Locations containing fibers and flyings

Table 2

The probability of occurrence of these materials is taken into consideration through the classification into divisions:

	Class I (Gases and Vapors) In accordance with NEC 500.5 and CEC J18-004	**Class II (flammable Dust or Powder)** In accordance with NEC 500.6 and CEC 18-008	**Class III (flammable Fibers or suspended Particles)** Divisions in accordance with NEC 500.7 and CEC 18-010
Division 1	Areas containing dangerous concentrations of flammable gases, vapors or mist continuously or occasionally under normal operating conditions.	Areas containing dangerous concentrations of flammable dusts continuously or occasionally under normal operating conditions.	Areas containing dangerous concentrations of flammable fibers or suspended particles continuously or occasionally under normal operating conditions.
Division 2	Areas probably not containing dangerous concentrations of flammable gases, vapors or mist under normal operating conditions.	Areas probably not containing dangerous concentrations of flammable dusts under normal operating conditions.	Areas probably not containing dangerous concentrations of flammable fibers or suspended particles under normal operating conditions.

Table 3

Classes of hazardous areas are divided into sub-groups dependent on the type of flammable gas or vapor present:

Class I	**Group A**	Atmospheres containing acetylene
	Group B	Atmospheres containing hydrogen and flammable process gasses with more than 30 % hydrogen by volume, or gases or vapors posing a similar risk level such as butadiene and ethylene oxide
	Group C	Atmospheres such as ether, ethylene or gases or vapors posing a similar risk level
	Group D	Atmospheres such as acetone, ammonia, benzene, butane, cyclopropane, ethanol, gasoline, hexane methanol, methane, natural gas, naphtha, propane or gases or vapors posing a similar risk level
Class II	**Group E**	Atmosphere containing combustible metal dusts, including aluminum, magneium and their commercial alloys, or other combustible dusts whose particle size, abrasiveness and conductivity present similar hazards in the use of electronical equipment
	Group F	Atmospheres containing combustible carbonaceous dusts including carbon black, charcoal, coal, or coke dusts that have more than 8 percent total entrapped volatiles, or dusts that have been sensitized by other materials so that they present an explosion hazard
	Group G	Atmospheres containing combustible dusts not included in Group E or Group F, including fluor, grain, wood, plastic, and chemicals

Table 4

The sub-groups and the gases contained within each sub-group are based on the **M**aximum **E**xperimental **S**afe **G**ap (MESG) or the **M**inimum **I**gnition **C**urrent (MIC).

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Class III

- Class III hazardous locations are those that are hazardous because of the presence of easily ignitible fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures.
- Class III, Division 1 locations are those in which easily ignitible fibers or flyings are handled, manufactured or used.
- Class III, Division 2 locations are those in which easily ignitible fibers or flyings are stored or handled.
- Locations belonging in this class usually include parts of textile mills, cotton gins, flax-processing plants, clothing manufacturing plants, woodworking plants, etc.
- Easily ignitible fibers and flyings include rayon, cotton, sisal, hemp, cocoa fiber, kapok, Spanish moss, excelsior, etc.
- Class III locations are not further subdivided.

Figure 5 shows a gas tank with a fixed roof and vent as a typical example of a Class I hazardous area applicable in North America with categorization into Divisions 1 and 2.

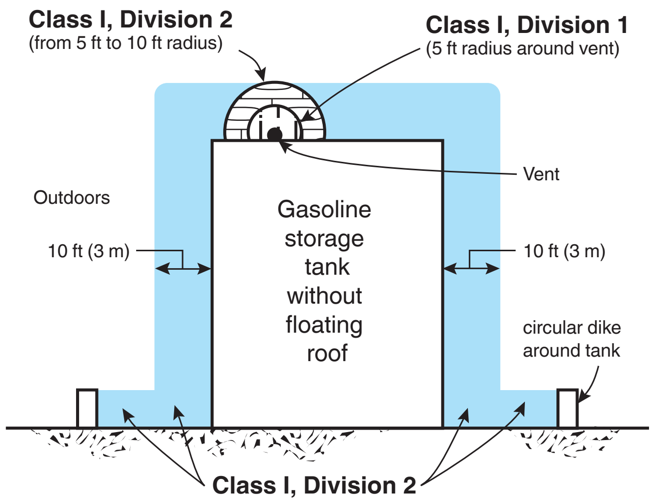

Figure 5 *Schematic of a division-based area classification of a fuel tank with fixed lid and breather*

Zone Model in North America and Canada

In 1988 in Canada, plants for Class I applications were transferred to the 3-zone concept of the IEC. For plants built after 1988, the 3-zone concept is mandatory (CEC, 1988 edition). In 1996 in North America, the NEC 505 section was introduced for Class I applications. Since the time of this addition to the NEC, area classification according to the IEC zones has been an option for companies.

Class I (Gases and Vapors)

Zones in accordance with NEC 505.5 and CEC 18-006:

Zone 0	Areas containing dangerous concentrations of flammable gases, vapors, or mist continuously or for long periods under normal operating conditions.
Zone 1	Areas containing dangerous concentrations of flammable gases, vapors, or mist during normal operating conditions, during repair or maintenance operations, or because of leakage.
Zone 2	Areas likely to contain not containing dangerous concentrations of flammable gases, vapors, or mist under normal operating conditions.

Table 5

However, in North America the traditional division practice dominates and the opportunity for zone classification is seen as secondary. As a comparison, the division practice in North America is compared to the zone practice in Europe in the following section.

Three Zones Model

The European zone practice is described in IEC/EN 60079-10. In accordance with this standard, any area in which there is a probability of a flammable gas or dispersed dust to exist must be classified into one of the following areas.

Zone 0	An area in which an explosive air/gas mixture is continuously present or present for long periods.
Zone 1	An area in which an explosive air/gas mixture is likely to occur in normal operation.
Zone 2	An area in which an explosive air/gas mixture is unlikely to occur; but, if it does, only for short periods of time.
Zone 20	An area in which a combustible dust cloud is part of the air permanently, over long periods of time or frequently.
Zone 21	An area in which a combustible dust cloud in air is likely to occur in normal operation.
Zone 22	An area in which a combustible dust cloud in air may occur briefly or during abnormal operation.

Table 6

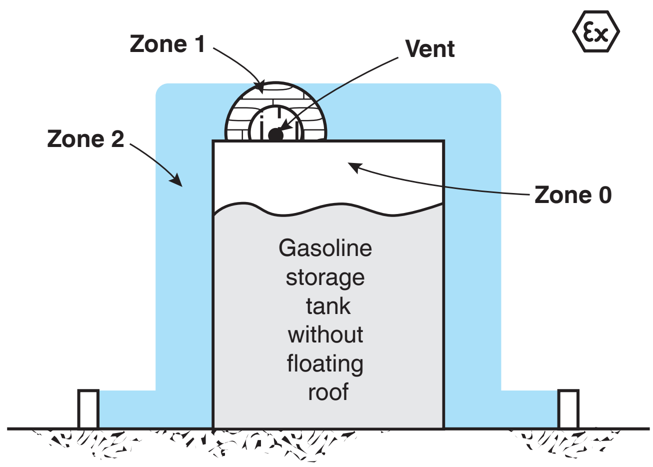

Figure 6 *Schematic of a zone-based area classification of a fuel tank with fixed lid and breather*

In practical implementation, relevant national regulations for zone classification, installation, and operation of a plant are to be observed. These national regulations may differ or support IEC regulations.

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Classification of Apparatus for Zones

European standard EN 60079-0 requires apparatus to be subdivided into two groups:

Group I	Apparatus to be used in mines where the danger is represented by methane gas and coal dust.
Group II	Apparatus to be used in surface industries where the danger is represented by gas and vapor that has been subdivided into three groups: A, B and C. These subdivisions are based on the **M**aximum **E**xperimental **S**afe **G**ap (MESG) for an explosionproof enclosure or the **M**inimum **I**gnition **C**urrent (MIC) for intrinsically safe electrical apparatus.

Table 7

The groups indicate the types of danger for which the apparatus has been designed. Since Group I is intended for mines, this subject will not be addressed in this publication.

Group II concerns above-ground industries (electrical apparatus for hazardous areas with potentially explosive gas (dust) atmosphere except firedamp hazardous mining areas) and is subdivided into II G (gases) and II D (dusts).

Differences between Division and Zone Practices

The following table shows the differences between the North American and European practices, regarding the classification of hazardous locations.

Method	Constant risk	Occasional risk	Risk only in the case of a fault
Division	Division 1		Division 2
Zone	Zone 0/20	Zone 1/21	Zone 2/22

Table 8 Classification of hazardous areas

It is evident from the above table that Zone 2/22 (IEC/Europe) and Division 2 (North America) are almost equivalent, while Division 1 includes the corresponding Zones 0/20 and 1/21. An instrument designed for Zone 1/21 cannot necessarily be directly used in Division 1. In the stated definition from the cited standard, no quantification of the expressions "long period of time" for Zone 0/20, "can be present" for Zone 1/21 and Division 1, and "not normally present" for Zone 2/22, is given.

The main difference between the North American and the European classification of hazardous locations is that there is currently no direct equivalent to the European Zone 0 in the North American system. Zone 0 is therefore the most dangerous. An instrument designed for Zone 0 must be incapable of generating or accumulating sufficient energy to ignite the fuel mixture.

In Europe, the apparatus are certified on the basis of design and construction characteristics. From a practical point of view, the two systems are equivalent even if there are minor differences, as shown in the following table.

Materials	Apparatus classification		Ignition energy
	Europe (* IEC)	North America	
Methane	Group I (mining)	Class I, Group D	
Acetylene Hydrogen Ethylene Propane	Group IIC Group IIC Group IIB Group IIA	Class I, Group A Class I, Group B Class I, Group C Class I, Group D	> 20 µJ > 20 µJ > 60 µJ > 180 µJ
Conductive dust (metal) Non-conductive dust (carbon) Cereal/flour	Group IIIC* Group IIIB* Group IIIB*	Class II, Group E Class II, Group F Class II, Group G	
Fibers/suspended particles	Group IIIA*	Class III	

Table 9 Classification of apparatus in North America, IEC and Europe

* The current IEC 60079-0 standard now contains dust protection requirements and defines dust atmospheres as Groups IIIC, IIIB and IIIA. Caution: according to directive 94/9/EC, explosion protection for dust atmospheres is still listed as Group II D in Europe.

Each subgroup of Group II and of Class I is associated with a certain number of gases having an ignition energy included in the value reported and is represented by the gas referenced in the above table that is used in certification tests.

Group IIC and Class I, Groups A and B are the most dangerous because they require the lowest level of ignition energy. An apparatus designed for these groups must be incapable of igniting, by electrical means, any potentially explosive air/gas mixture.

Classification of Surface Temperature for Divisions and Zones

Apparatus installed directly in a hazardous area must be classified for the maximum surface temperature that the device will produce under normal operation or in the event of a fault. The maximum surface temperature must be below the minimum ignition temperature of the gas present.

In the USA and Canada (as in Europe), six temperature classes are differentiated, T1 to T6. The classes T2, T3, and T4 are however divided into further subclasses, as indicated in the following table.

Maximum temperature °C	°F	Temperature class in North America
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

Table 10 Classification of surface temperature

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Each gas is allocated to a temperature class according to its ignition temperature. Please note that for all specific mixtures, there is no connection between ignition energy and ignition temperature.

Hydrogen for example has a minimum ignition energy of 20 µJ and an ignition temperature of 560 °C (1040 °F), whereas acetaldehyde has an ignition energy of over 180 µJ and an ignition temperature of 140 °C (284 °F).

An apparatus classified for a particular temperature class can be used in the presence of all gases, provided that its ignition temperature is above the temperature class rating of the particular device. For example, a T5 classified apparatus can be used with all gases, the ignition temperature of which is above 100 °C (212 °F).

Important: For all explosion protection methods, a temperature classification is required with regard to all surfaces that could come into contact with a potentially explosive atmosphere.

Ignition Protection Methods

In order to reduce the risk of explosion, elimination of one or more of the components of the ignition triangle is necessary (refer to "Ignition Triangle" section for a discussion). There are three basic methods of protection – explosion containment, segregation, and prevention.

- **Explosion containment:** The only method that allows the explosion to occur but confines it to a well-defined area, thus avoiding the propagation to the surrounding atmosphere. Flameproof and explosion-proof enclosures are based on this method.
- **Segregation:** A method that attempts to physically separate or isolate the electrical parts or hot surfaces from the explosive mixture. This method includes various techniques, such as pressurization, encapsulation, etc.
- **Prevention:** A method that limits the energy, both electrical and thermal, to safe levels under both normal operation and fault conditions. Intrinsic safety is the most representative technique of this method.

Selecting a protection method

First of all, the normal functioning of the apparatus must be considered. Secondly, eventual malfunctioning of the apparatus due to faulty components must be a consideration. Lastly, all those conditions that can accidentally occur, such as a short circuit, open circuit, grounding, and erroneous wiring of the connecting cables, must be evaluated.

The choice of a specific protection method depends on the degree of safety needed for the type of hazardous location considered in such a way as to have the lowest probable degree of an eventual simultaneous presence of an adequate energy source and a dangerous concentration level of an air/gas mixture.

None of the protection methods can provide absolute certainty of preventing an explosion. Statistically, the probabilities are so low that not even one incident of an explosion has been verified when a standardized protection method has been properly installed and maintained.

The first precaution to be used is to avoid placing electrical apparatus in hazardous locations. When designing a plant or factory, this factor needs to be considered. Only when there is no alternative should this application be allowed.

Other secondary, but important, factors for consideration are the size of the apparatus to be protected, the flexibility of the system, the possibility of performing maintenance, the installation cost, etc. Respective of these factors, intrinsic safety has many advantages; however, to better understand these advantages, it is necessary to know and understand the limitations of the other protection methods.

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The purpose of this section is to briefly present the different methods of protection. In Europe, CENELEC and IEC standards refer to protection methods with symbols, such as Ex d for the flame-proof method. These symbols are not used by the United States and Canada for Division rated products.

Using the symbol and labeling of the relevant apparatus, the protection method in use can be easily identified. The same applies to North America and Canada when the CEC zone method or NEC 505 (American conversion of the IEC recommendations for gases and vapors) are used.

Oil immersion	Ex o
Powder filling	Ex q
Encapsulation	Ex m
Pressurization	Ex p
Increased safety	Ex e
Flameproof	Ex d
Intrinsic safety	Ex i
Ignition protection n	Ex n
Intrinsically safe systems	Ex i
Apparatus with optical radiation	op

Table 11 Code designation of protection methods for hazardous gas areas according to IEC 60079-X and NEC 505

The same ignition protection classes exist in the North American zone methods as identified in the appropriate IEC 60079-X series standards.

Flameproof and Explosionproof Enclosure

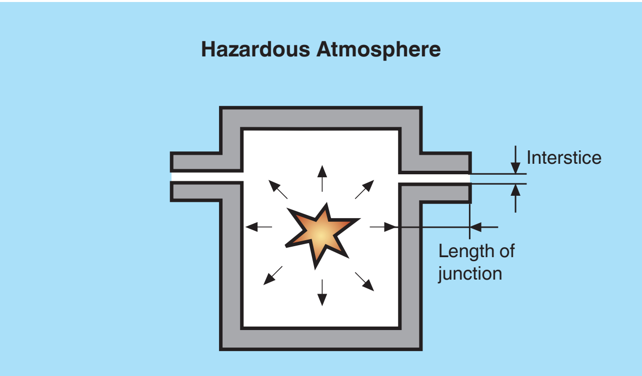

Figure 7 Schematic diagram of a flameproof enclosure (IEC 60079-1, EN 60079-1, FM 3615, UL 2279.P1)

This protection method is the only one based on the explosion-containment concept. In this case, the energy source is permitted to come in contact with the dangerous air/gas mixture. Consequently, the explosion is allowed to take place, but it must remain confined in an enclosure built to resist the excess pressure created by an internal explosion, thus impeding the propagation to the surrounding atmosphere.

The theory supporting this method is that the resultant gas jet coming from the enclosure is cooled rapidly through the enclosure's heat conduction and the expansion and dilution of the hot gas in the colder external atmosphere. This is only possible if the enclosure openings or interstices have sufficiently small dimensions.

Distinctions for Two Division Model

In North America, a flameproof enclosure (in accordance with IEC) is as a rule equated with the "flameproof" designation. In both considerations, the housing must be designed for a x1.5 explosion overpressure. The North American version "Explosion-proof" (XP) must withstand a maximum explosion overpressure of x4.

Furthermore, in North America the installation regulations (NEC 500) specify metal conduit to be used for the field wiring installation. It is also assumed here that the air-gas mixture can also be present within the conduit system. Therefore, the resulting explosion pressures must be taken into consideration. The conduit connections must be constructed according to specification and sealed (i. e. lead seals) with appropriate casting compound.

The housing is not constructed gas-tight. Of course, large openings are not permitted on the enclosure, but small ones are inevitable at any junction point. Some of these gaps may serve as pressure relief points. Escaping hot gases are cooled to the extent that they cannot ignite the potentially explosive atmosphere outside the housing. Ignition is prevented if the minimum temperature and minimum ignition energy of the surrounding potentially explosive atmosphere is not reached. For this reason, the maximum opening allowed for a particular type of joint depends on the nature of the explosive mixture and width of the adjoining surfaces (joint length).

The classification of a flameproof enclosure is based on the gas group and the maximum surface temperature which must be lower than the ignition temperature of the gas present.

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Installation and maintenance problems of explosion-proof enclosures

Often, explosion-proof enclosures have installation and maintenance problems that can be summarized as follows:

- A medium-weight enclosure is very heavy, and its installation creates mechanical and structural complications.
- Particularly corrosive atmospheric conditions (characteristic of chemical or petrochemical plants, or oil platforms), require the use of material such as stainless steel or bronze, resulting in dramatically higher costs.
- Cable entries require a particular arrangement (reductions, cable clamps, conduits, metal-clad cable, sealing) and, in some cases, such items may represent a cost higher than the enclosures themselves.
- In a particularly humid atmosphere, condensation may cause problems inside the enclosure or conduit pipe.
- The safety of an explosion-proof enclosure is based entirely on its mechanical integrity; therefore, periodic inspections are needed.
- Opening of the enclosure is not permitted while the apparatus is functioning; this may complicate maintenance and inspection operations. Usually, the process must shut down and the area inspected in order to perform routine maintenance.
- It is difficult to remove the lid (a special tool is needed or sometimes 30 to 40 bolts must be unscrewed). After removing the lid, it is important to ensure the integrity of the joint before restarting the system.
- Changes to the system are difficult to implement.

The degree of safety of an explosion-proof enclosure, over time, depends on the correct use and maintenance by the plant personnel. Because of this vulnerability, the flame-proof method is not always allowed, such as in the European Zone 0.

In the United States, not having a direct equivalent to Zone 0, there are particular restrictions in using explosion-proof enclosures in Division 1. Practically speaking, it is not allowed in any location that would be classified as Zone 0.

This protection method is one of the most widely used and is suitable for electrical apparatus located in hazardous locations where high levels of power are required, such as for motors, transformers, lamps, switches, solenoid valves, actuators, and for all parts that generate sparks. On the other hand, practical matters such as high maintenance and calibration costs make the use of this method less cost effective than that of intrinsic safety.

Purging or Pressurization Method

Purging or pressurization is a protection method based on the segregation concept. This method does not allow the dangerous air/gas mixture to penetrate the enclosure containing electrical parts that can generate sparks or dangerous temperatures. A protective gas – air or inert gas – is contained inside the enclosure with a pressure slightly greater than the one of the external atmosphere (refer to Figure 8).

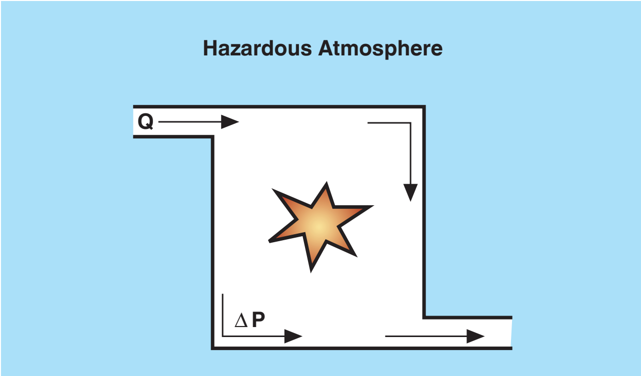

Figure 8 *Schematic diagram of a pressurizing system (IEC 60079-2, EN 60079-2, FM 3620 and NFPA 496)*

The internal overpressure remains constant with or without a continuous flow of the protective gas. The enclosure must have a certain degree of tightness; however, there are no particular mechanical requirements because the pressure supported is not very high.

To avoid pressure loss, the protective gas supply must be able to compensate, during operation, for enclosure leakage and access by personnel where allowed (the use of two interlocked doors is the classical solution).

Because it is possible for the explosive atmosphere to remain inside the enclosure after the pressurization system has been turned off, it is necessary to expel the remaining gas by circulating a certain quantity of protective gas before restarting the electrical equipment.

The classification of the electrical apparatus must be based on the maximum external surface temperature of the enclosure, or the maximum surface temperature of the internal circuits that are protected with another protection method and that remain powered even when the protective gas supply is interrupted.

The purging or pressurization technique is not dependent upon the classification of the gas. Rather, the enclosure is maintained at a pressure higher than the dangerous external atmosphere, preventing the flammable mixture from coming in contact with the electrical components and hot surfaces inside.

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Two Division Model

In the United States, the term "pressurization" is limited to Class II applications. This is the technique of supplying an enclosure with clean air or an inert gas, with or without continuous flow, at sufficient pressure to prevent the entrance of combustible dusts. Internationally, the term "pressurization" refers to a purging technique for Zones 1 and 2.

The two division model of the purging protection method is based on the reduction of the classification inside the enclosure to a lower level. The following three types of protection (X, Y, and Z) are identified in relation to the hazardous-location classification and the nature of the apparatus.

Types of protection in relation to classification and nature of apparatus

- Type X: reduces the inside of the enclosure from Division 1 to a non-hazardous state that requires an automatic shutdown of the system in case of pressure loss.
- Type Y: reduces the inside of the enclosure from Division 1 to Division 2.
- Type Z: reduces the inside of the enclosure from Division 1 to a non-hazardous state, requiring alarm signals only.

Three Zones Model

The European standard regarding this protection method, EN 60079-2, requires that particular safety systems function regardless of internal protective gas loss due to leakages, shutdowns, compressor breakdowns or operator errors.

Pressurization is allowed as a method of protection in Zones 1 and 2. In the case of pressure loss, an automatic shutdown of the power supply can occur even with a slight delay for Zone 1, while a visual or audible signal is sufficient for Zone 2.

The European and the American practices are quite similar. In fact, The European standards have been revised to include three new protection methods of px, py and pz. These methods are similar to the North American counterparts and show the level of harmonization taking place in the world. The safety devices (pressure sensors, flow meters, delay relays, etc.) needed to activate the alarm or the shutdown of the power supply must be either explosion-proof or intrinsically safe because, as a general rule, they are in contact with the explosive atmosphere both on the outside of the enclosure and on the inside during the expulsion phase or during pressure loss.

Sometimes the internal overpressure protection method is the only possible solution, i. e., when no other method of protection is applicable. For example, in the case of large electrical apparatus or control panels where the dimensions and high-energy levels make it impractical to use an explosion-proof enclosure or the application of the energy limitation method, the internal overpressure protection method is often the only answer.

The use of pressurization is limited to the protection of apparatus that do not contain the source of an inflammable mixture. For this type of apparatus, such as gas analyzers, the continuous-dilution technique must be used. This technique always keeps the protective gas – air or inert gas – in a quantity such that the flammable mixture concentration never exceeds 25 % of the lower explosive limit of the gas present.

Encapsulation

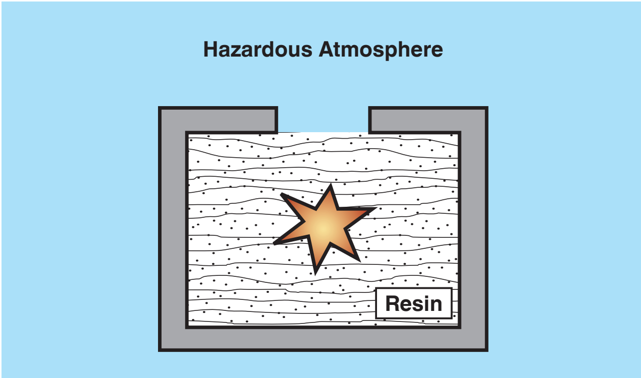

Figure 9 *Schematic diagram of the cast enclosure (IEC 60079-18, EN 60079-18, UL 60079-18, FM 3600)*

The encapsulation protection method is based on the segregation of those electrical parts that can cause the ignition of an explosive atmosphere in the presence of sparks or heating, by potting in resin that is resistant to the specific ambient conditions (refer to Figure 9).

Encapsulation ensures a good mechanical protection and is very effective in preventing contact with an explosive mixture. Generally, it is used to protect electrical circuits that do not contain moving parts, unless these parts, (e. g., reed relays) are already inside an enclosure that prevents the resin from entering. This technique is often used as a complement to other protection methods.

Oil-immersion Protection Method

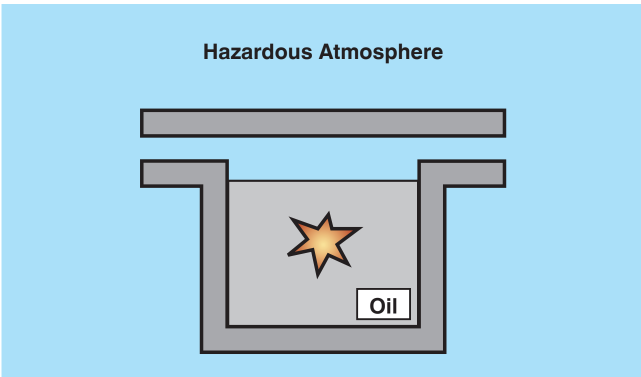

Figure 10 *Schematic diagram of the oil enclosure (IEC 60079-6, EN 60079-6, UL 60079-6, FM 3600)*

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According to this protection method, all electrical parts are submersed in either nonflammable or low-flammability oil, which prevents the external atmosphere from contacting the electrical components. The oil often serves also as a coolant (refer to UL 698 and IEC 60079-6).

The most common application is for static electrical equipment, such as transformers, or where there are moving parts, such as transmitters.

This method is not suitable for process instrumentation or for apparatus that require frequent maintenance or inspections.

Sand-filled (Powder-filled) Enclosure

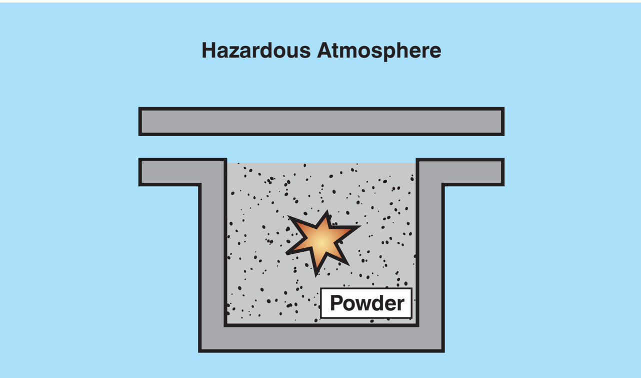

Figure 11 Schematic diagram of the sand enclosure (IEC 60079-5, EN 60079-5, UL 60079-5, FM 3600)

This protection method is based on spatial separation of the ignition source and the potentially explosive atmosphere. Electrical components which could ignite a potentially explosive atmosphere via sparks or heating are fixed in position within a housing and surrounded by a filling. The potentially explosive mixture may permeate the housing. A possible explosion of this mixture inside the housing would be extinguished by the filling before it can ignite the potentially explosive atmosphere surrounding the device. The filling must be accomplished in a manner so that there are no cavities in the filling material.

Normally the filling is quartz sand (glass beads). The filling is subject to special legal requirements, as is the design of the housing.

The free space inside the sand-filled electrical apparatus or Ex component must be completely occupied by filling material. The external surfaces of the housing may not reach the relevant minimum ignition temperature at any point.

The housing may not be opened and the filling must not escape from the housing, neither under normal operation, nor due to electric arcs or other processes within the sand enclosure.

Application: components giving rise to sparks or hot components, the function of which is not influenced by fine-grained filling material. Capacitors or transformers are typical applications, but also complex electronic components, such as computers and monitors which are used for controlling, operating and visualizing process data in hazardous areas (see Figure 11).

Increased Safety

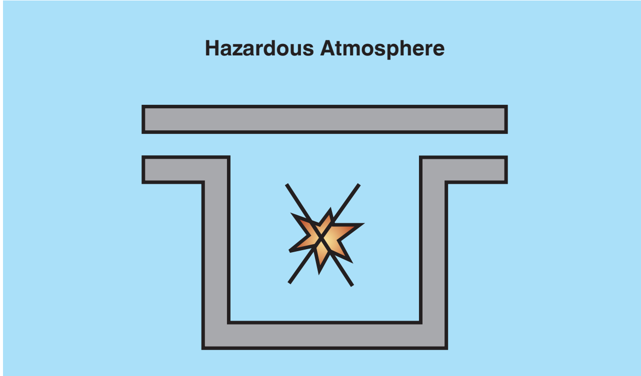

Figure 12 Schematic diagram of the increased safety ignition protection class (IEC 60079-7, EN 60079-7, UL 60079-7, FM 3600)

This protection method is based on the prevention concept. Measures must be applied to the electrical apparatus to prevent, with an elevated safety coefficient, the possibility of having excessive temperature or the generation of arcs or sparks inside and outside the apparatus during normal functioning (refer to Figure 11).

The increased safety ignition protection class is suitable for Zones 1 and 2. Under normal operation, an increased degree of safety is achieved by means of design parameters (increased air and creepage distances, degrees of protection to be observed, tensile strength of terminal connections and cable glands, minimum cross sections, mechanical strengths and isolation properties of the winding wire).

According to the standard, the prescribed means of construction must be made in such a way as to obtain an elevated safety coefficient during normal functioning. In the case of eventual allowed overloading, construction must comply to very specific standards regarding connections, wiring, components, distances in air and on surfaces, isolators, mechanical impact and vibration resistance, degree of protection of the enclosure, etc. Particular attention must be given to those parts of the apparatus that could be sensitive to temperature changes, such as motor windings.

In the event of an overload, cage motors, for example, can be shut down promptly before the motor windings reach an impermissibly high temperature and become an ignition source.

Application: junction boxes and connection boxes, connection spaces for heating, transformers, ballast resistors, squirrel-cage induction motors, in combination with other ignition protection methods.

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Intrinsic Safety

Intrinsic safety is based on the principle of preventing an effective source of ignition. The electrical energy is kept below the minimum ignition energy required for each hazardous area.

The intrinsic safety level of an electrical circuit is achieved by limiting current, voltage, power and temperature; therefore, intrinsic safety is limited to circuits that have relatively low levels of power. Of critical importance are the stored amounts of energy in circuits in the form of capacitance and inductance. These energy storage elements must be limited based on the voltage and current levels present in a particular circuit or make-break component.

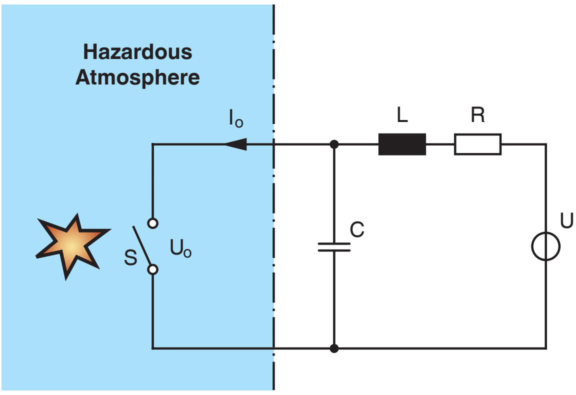

Figure 13 Schematic representation of an intrinsically safe circuit

In normal operation and in the event of a fault, no sparks or thermal effects may occur that could lead to the ignition of a potentially explosive atmosphere. Intrinsically safe circuits may therefore be connected and disconnected by experts during operation (even when live), as they are guaranteed to be safe in the event of a short circuit or disconnection. Intrinsic safety is the only ignition protection class that allows connectors to be opened and intrinsically safe apparatus to be removed and replaced by an equivalent device in a hazardous area. Because of the level of freedom this brings, intrinsic safety has become one of the most important methods of protection in the industrial automation industry.

Installation Costs

The standard relative to intrinsic safety allows the installation of apparatus in a similar way to the practice used for standard apparatus. This factor alone lowers the cost of installation.

Explosion-proof, flame-proof, and pressurized enclosures require special devices, such as metal-clad cables, conduits, cable clamps, lead seals, etc. Purging, or pressurization also requires a pipeline for the protective gas. These are the principle reasons for the higher installation cost when these protection methods are used rather than intrinsic safety.

Maintenance Costs

Relative to maintenance costs, intrinsic safety is the most advantageous because this method allows live maintenance with no need for plant shutdown. Intrinsic safety is also more reliable due to the use of infallible and de-rated components as prescribed by the standards.

Explosion-proof and flame-proof enclosures require that particular attention be given to the integrity of the coupling joints and cable entrance, which adds to the cost of maintenance over a period of time.

For pressurized enclosures, there is an added cost for the maintenance of the protective gas supply system and its relative piping.

Conclusion

From the comparison of the three most widely used protection methods, it is evident that intrinsic safety, where applicable, is preferred for safety and reliability reasons. Intrinsic safety is also the most economical for installation and maintenance.

The use of intrinsic safety provides the best mix of an affordable system and safety requirements.

Special Ignition Protection Classes

Ignition protection class n, for use on electrical apparatus in Division 2 and Zone 2 includes a number of various degrees of protection, some of which can be seen as simplifications of intrinsic safety and other ignition protection classes already presented.

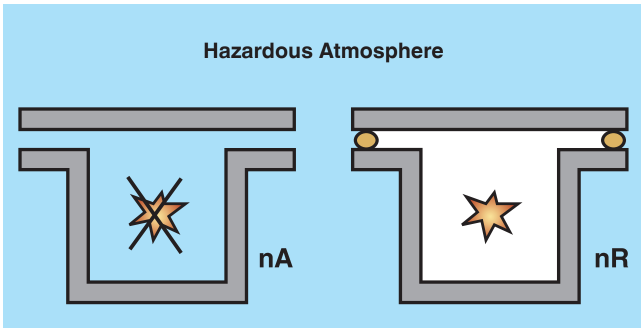

Figure 14 Schematic diagram of ignition protection class n (n = non-incendive) (IEC 60079-15, EN 60079-15, UL 60079-15, FM 3600)

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Two Division Model

The concept of non-incendive circuitry is defined by the National Electrical Code, NFPA 70, as a circuit in which any arc or thermal effect produced, under intended operating conditions of the equipment, is not capable, under specified test conditions, of igniting the flammable gas, vapor, or dust-air mixture. To better understand the entire non-incendive energy concept, refer to ANSI/ISA S12.12.01 for further detail.

The non-incendive technique, when applied to electrical apparatus, makes the apparatus incapable of igniting a surrounding explosive atmosphere during normal functioning.

Non-incendive devices are not approved for Division 1.

Three Zones Model

The European standard EN 60079-15 describes the requirements for equipment to be used in Zone 2. These include:

- Non-sparking electrical equipment
- Equipment with parts or circuits that require light arcs, sparks, or hot surfaces (and that could, therefore, be capable of igniting a potentially explosive atmosphere if they are unprotected).

Possible protective principles of ignition protection class n are summarized in the table below:

Equipment n	Examples of protection methods	Marking
Non-sparking (simple "increased safety")	Electro-motors (squirrel cage rotor), terminal box, fuses, lights, transformers, equipment with low power (C&I systems), plug-in devices, cells, batteries, etc.	Ex nA
With protected contacts	Simple "flameproof enclosure" or simple "cast enclosure"	Ex nC
Enclosed mechanism	Same	
Part not capable of igniting	Contact mechanism or housing designed so as to prevent ignition	
Hermetically sealed construction	Seal ensured by a melting process such as soft or hard soldering, welding, or melting glass into metal	
Sealed device	Designed so that it cannot be opened during normal operation	
Enclosed device	Completely embedded in an enclosing cast body	
Restricted breathing	Housing design limits penetration of gases and vapors. Only sparking equipment with an internal temperature ≤ 10 K compared to the ambient temperature of the housing can be installed.	Ex nR
Limited power (simple "intrinsic safety")	Limit power on circuits and components in accordance with the intrinsic safety concept	Ex nL

Table 12 Possible protection principles of ignition protection class n

Note:
nC, if molded, is now part of the protection method "encapsulation" mc (EN 60079-18).
nL is now part of the protection method "intrinsic safety" ic (EN 60079-11).

Mixed Protection Methods

In the process instrumentation field, the use of several protection methods applied to the same apparatus is a common practice. For example, circuits with intrinsically safe inputs can be mounted in pressurized or explosion-proof enclosures.

Generally, this mixed system does not present installation difficulty if each of the protection methods is appropriately used and is in compliance with the respective standards.

Summary of Protection Methods

This section has briefly presented the protection methods against fire and explosion. The concepts upon which these methods are based were introduced, and the general methods of construction and application were discussed.

The purpose of this section is not to exhaust the subject, but rather to offer an overview of the applicable protection methods for the electrical instrumentation used in that part of the plant classified as hazardous.

Intrinsic safety will be discussed in detail in the next section. For all other techniques, refer to the respective standards.

The following table presents a summary of the protection methods against explosion, stating the functioning principles from both the Two Division Model and Three Zones Model.

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General Principles	Three Zone Model	Zone	Two Division Model	Division	Basic Features	Defining Standard (IEC/EN)
Explosion Containment	Flameproof Ex d	1, 2	Explosion-proof	1, 2	Relatively simple to implement, however some mechanical requirements. Difficult/costly to maintain/test.	EN 60079-1 (IEC 60079-1)
Segregation	Enclosed switch contacts Ex nC	2	Hermetic seal	2	Protected contacts, usable for Zone 2/Division 2.	EN 60079-15 (IEC 60079-15)
	Pressurization Ex px, Ex py	1, 2	Purging	1, 2	Can be used for large housing or workspaces. Requires special monitoring equipment.	EN 60079-2 (IEC 60079-2)
	Pressurization Ex pz	2	Purging	2	Similar to Ex px and Ex py but can only be used for Zone 2/ Division 2.	EN 60079-2 (IEC 60079-2)
	Encapsulation Ex ma	0, 1, 2	Not recognized	–	Can be used for small components. Ensures good electrical and mechanical protection.	EN 60079-18 (IEC 60079-18)
	Encapsulation Ex mb	1, 2	Not recognized	–	Similar to Ex ma but can only be used for Zone 1 and Zone 2.	EN 60079-18 (IEC 60079-18)
	Encapsulation Ex mc	2	Not recognized	–	Similar to Ex ma but can only be used for Zone 2.	EN 60079-18 (IEC 60079-18)
	Oil immersion Ex o	1, 2	Oil immersion	1, 2	Can be used for transformers and circuit breakers.	EN 60079-6 (IEC 60079-6)
	Restricted breathing Ex nR	2	Not recognized	–	Can be used for housing used to prevent a gaseous atmosphere from entering.	EN 60079-15 (IEC 60079-15)
	Powder filling Ex q	1, 2	Not recognized	–	Can be used if there are no moving parts.	EN 60079-5 (IEC 60079-5)
	Increased safety Ex e	1, 2	Not recognized	–	Can be used for apparatus that does not spark in normal operation (connecting devices, terminals, bulb sockets, motors). Special requirements for construction.	EN 60079-7 (IEC 60079-7)
Prevention	Non-sparking Ex nA	2	Non-incendive equipment	2	Can be used for non-sparking devices with a low operating temperature.	EN 60079-15 (IEC 60079-15)
	Intrinsic safety Ex ia	0, 1, 2	Intrinsic safety	1, 2	Ideal for process instrumentation. Simple installation, maintenance and testing during operation. Limited to low power, safe even if two faults occur.	EN 60079-11 (IEC 60079-11)
	Intrinsic safety Ex ib	1, 2	Not recognized	–	Similar to Ex ia, safe for one fault	EN 60079-11 (IEC 60079-11)
	Intrinsic safety Ex ic	2	(Associated) non-incendive Field Wiring Apparatus	2	Similar to Ex ia, safe in normal operation	EN 60079-11 (IEC 60079-11)

Table 13 Summary of protection methods against explosion

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Labeling of Explosion Protection Methods

ATEX Labeling

With the introduction of ATEX requirements, a new labeling program came into force for the use of certain products in the EC.

The labeling requirements are aimed at uniformity. The CE conformity labeling on a product is an indication that all relevant directives (e. g. ATEX, low voltage directive 2006/95/EC, electromagnetic compatibility directive 2004/108/EC, machinery directive 2006/42/EC) have been adhered to and that the product for use corresponds to manufacturer's instructions.

For products used in hazardous areas, the following table is valid:

Device group	Device category	Type of atmosphere	Protection to be ensured	Hazardous area characteristics	Zone comparison
I (mining)	M1	–	Very high	Present continuously – equipment cannot be de-energized	–
	M2		High	Present continuously – equipment can be de-energized	–
II (all areas except mining)	1	G (gases, vapors, mists) D (dust)	Very high	Present continuously, for long periods or frequently	Zone 0 Zone 20
	2		High	Likely to occur in normal operation and for short periods of time	Zone 1 Zone 21
	3		Normal	Not likely to occur in normal operation or infrequently	Zone 2 Zone 22

Table 14 ATEX labeling

In the following example, the key elements of device labeling are listed:

⟨Ex⟩ II (1) G [Ex ia] IIC PTB 00 ATEX 2080
⟨Ex⟩ II (1) D [Ex ia] IIIC

	⟨Ex⟩	Symbol identifies the product for hazardous locations
⟨Ex⟩ ATEX portion	II	Device group – non-mining application
	1	Device category – Can be used in Zone 0 and/or 20 – (...) indicates only part of the device meets the requirements of the category.
	G	Atmosphere type – can be used in/for areas with flammable gas
	D	Atmosphere type – can be used in/for areas with flammable dust
CENELEC/IEC portion	[...]	Associated apparatus that supplies safety into the hazardous area.
	Ex	Product type – explosion protection
	ia	Protection type – intrinsic safety
	IIC	Equipment group – IIC (gas) is most hazardous area
	IIIC	Equipment group – IIIC (dust)
Certificate details	PTB	Certifying test agency
	00	Test year (2000)
	ATEX	Compliance with directive 94/9/EC
	2080	Registration number

Table 15 Device labeling

The Ex hexagon logo ⟨Ex⟩ indicates that this is a device for use in hazardous areas in the European market.

The EEx abbreviation stands for the CENELEC standard series EN 50***. Since December 2004, the Ex abbreviation has stood for CENELEC standard series EN 60079-**, which is based on harmonization with the IEC standard series of the same name.

Division Model Labeling

A label must be placed on the device that indicates the Approval Type, Class, Division and Group used. On devices certified according to the two division model, reference to a control drawing or installation document is normally included on the product label.

Furthermore, using the NEC 505 zone model, a similar IEC-based ignition protection class and marking (incorporating the AEx symbol) is permitted in USA. However, according to article 505 of the NEC, the installation methods and electrical connections employed for zones are similar to the those used in article 500 of the NEC (i. e. conduit must be used). The exception to this requirement is when intrinsic safety is implemented.

NEC 500	Class I, Division 1, Groups A, B, C, D, T6
NEC 505	Class I, Zone 1, AEx de IIC T6
IEC	Ex de IIC T6
ATEX	⟨Ex⟩ II 2 G EEx or Ex de IIC T6

Table 16 Differences in labeling for NEC 500, NEC 505, IEC and ATEX

Labeling of Associated Apparatus

Two Division Model

A label is placed on the device that indicates the approval type, class, division, and group used, and references a specific Control Drawing.

Example:

Associated apparatus for use in Class I, Division 2, Groups A,B,C,D hazardous locations provides intrinsically safe circuits for use in Class I, Division 1, Groups A,B,C,D hazardous locations when installed in accordance with Drawing No. ABC-1234.

Three Zones Model

Example 1: [Ex ia] IIC

(Associated electrical apparatus located in a non-hazardous location)

Example 2: Ex d [ia] IIC T4

(Associated electrical apparatus in an explosion-proof enclosure located in a hazardous location)

The marking between [ ] indicates that it is an associated electrical apparatus.

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The Philosophy of Intrinsic Safety

In the previous section, the different methods that are used to reduce the danger of explosion or fire were presented. The protection methods, based on the containment and segregation concepts, are methods that contain the explosion in order for the energy source – electrical or thermal – to avoid coming in contact with the potentially explosive mixture. In both cases, the use of appropriate enclosures and specific wiring and installation systems are required. The intrinsic safety method prevents the ignition of the explosive atmosphere, while simplifying the installation and use of the required apparatus that is connected to the electrical circuits directly located in a hazardous location.

The Intrinsically Safe Circuit

According to article 504 of the National Electrical Code, NFPA 70 and IEC/EN 60079-11, an intrinsically safe electrical circuit is defined as one in which no spark or thermal effect generated during normal functioning and/or during specific fault conditions is able to ignite a given explosive atmosphere.

An electrical circuit typically consists of a voltage U, resistance R, inductance L, capacitance C and switch S, connected as shown below.

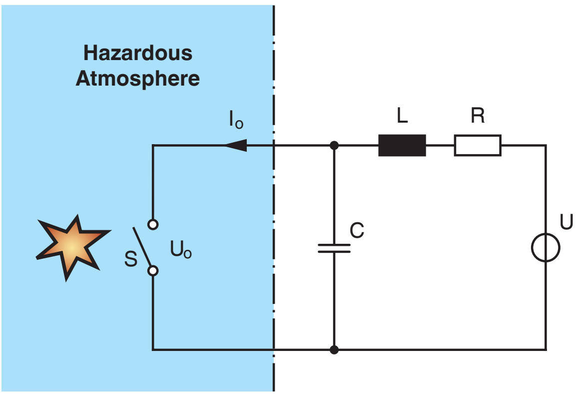

Figure 15 Schematic representation of an intrinsically safe circuit

In order to affirm that an electrical circuit is intrinsically safe, the parts of the circuit which are able to store energy, i. e., the inductor and the capacitor, must be considered. When the switch in the hazardous location is open, the capacitor accumulates energy that is discharged when the switch closes, thereby causing an electrical spark. In the same way, when the contact is closed, the inductor stores energy that is released in the form of an electrical arc when the switch opens. The energy that can be released by the circuit must be lower than the minimum ignition energy (MIE) of the air/gas mixture present in the hazardous location. Safety factors are then applied to ensure that the values allowed are well below that required for ignition.

A theoretical estimation of the energy inherent to an electrical circuit is not always possible, especially when the energy provided by the power source is higher, compared to the energy stored by the reactive components.

For this reason, the data normally used in considering intrinsic safety is presented in the form of the correlation between electrical parameters of the circuit, voltage and current, and the minimum ignition energy level of the hazardous atmosphere.

An electrical circuit, no matter how complex, is sequentially examined as resistive, inductive and capacitive. If the safety criteria are satisfied by the different types of circuits, the circuit can be considered intrinsically safe.

Resistive Circuits

A circuit is considered as resistive when the reactive part, inductance and capacitance, is zero or negligible.

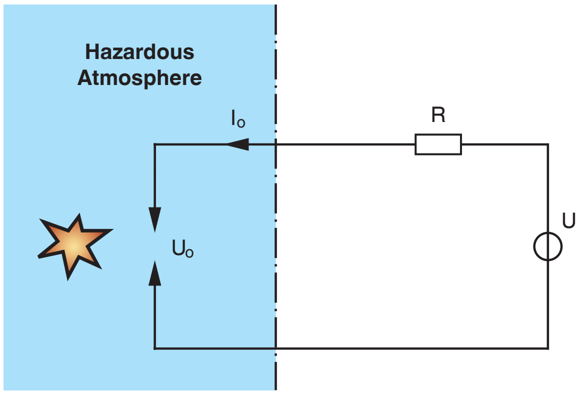

Figure 16 Schematic diagram of a resistive circuit

The energy released by this type of circuit depends essentially on the power supply source U and the current limitation due to the presence of resistor R.

The experimental tests on this type of circuit have demonstrated that the capacity for igniting an explosive atmosphere depends on the open-circuit voltage ($U_o = U$) and the short-circuit current ($I_o = U / R$).

The ignition curve for resistive circuits relative to the group of gases that are considered by the standards is shown in Figure 17.

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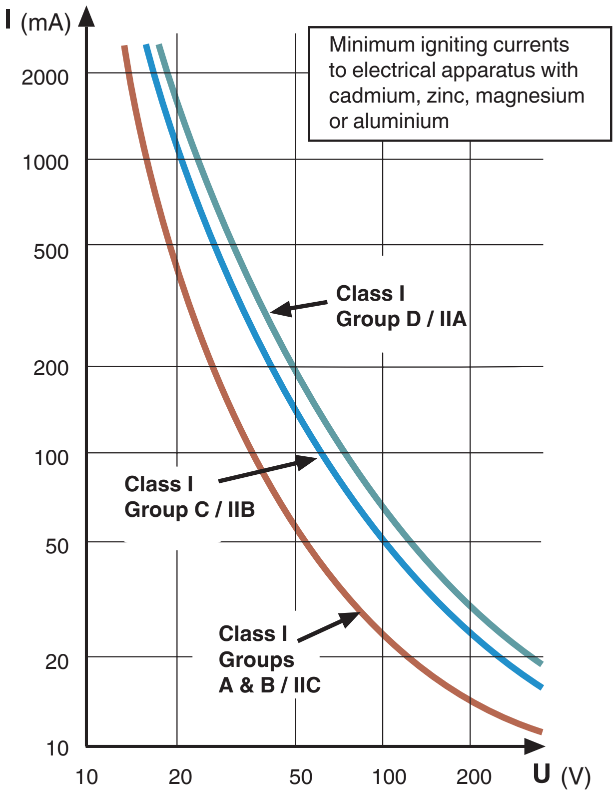

Figure 17 Ignition curve for a resistive circuit

By the trend of the curve, note that the lower the open-circuit voltage, the greater the amount of power that can be used safely. This characteristic allows process instrumentation that works with voltages on the order of 20 V to 30 V to be used efficiently in intrinsic safety applications.

For a more detailed ignition curve, refer to the appropriate standards.

Inductive Circuits

An electrical circuit is inductive when the reactive part, due to its inductance, is high with respect to the resistive part.

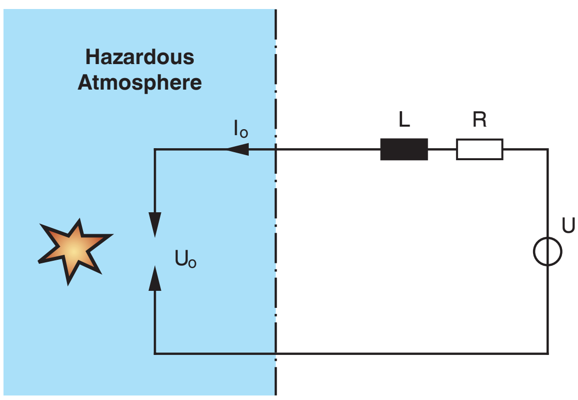

Figure 18 Schematic diagram of an inductive circuit

Closed electrical circuits

The maximum current that circulates in a closed circuit is:

$I_o = U / R$

The inductor L stores energy in the amount of:

$E = ½ \times L \times I_o^2$

Open electrical circuits

When the circuit is opened, a voltage ($U_{ind} = L\ di / dt$) is induced at the ends of the inductor that is added to voltage U. Therefore, the energy stored in the inductive magnetic fields, plus the energy coming from the power source, is released in the form of an electric arc at the point of the circuit's opening.

If the inductor's stored energy is the only cause of the spark, the minimum ignition current for a certain hazardous atmosphere is bound to the L value according to the following relationship:

$MIE = 1/2 \times L \times I_o^2 = \text{constant}$

Graphic representation on a logarithmic scale should present a rectilinear trend with an inclination of -2.

From the graph in Figure 19, you will note that the relationship can be verified except when the inductor value is lower than, or equal to, 1 mH.

This is due to the fact that, for high currents and low inductor values, the circuit becomes resistive. In this case, the power supply source becomes predominant as energy is released by the circuit.

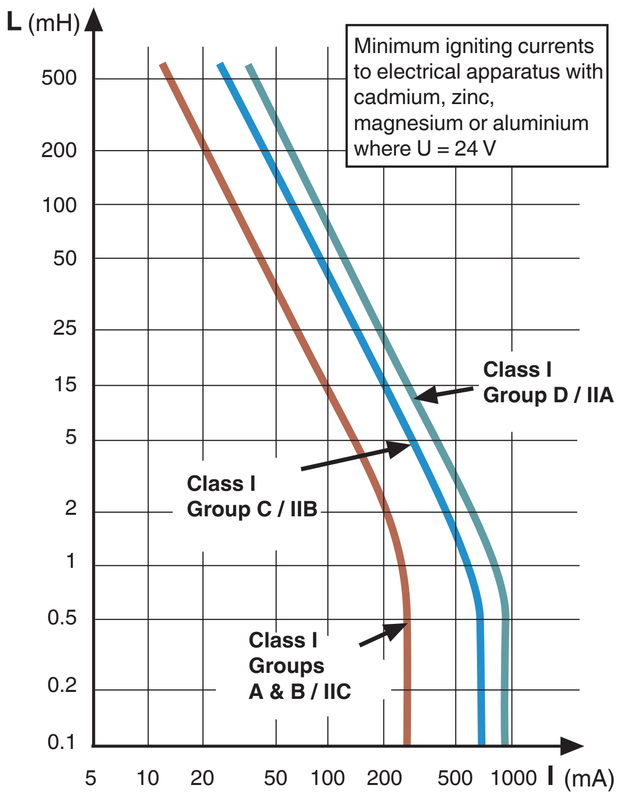

Figure 19 Ignition curve for an inductive circuit

Technology
Basic Principles
Ex Protection Intrinsic Safety
Functional Safety
Applications

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For a more detailed ignition curve, refer to the appropriate standards.

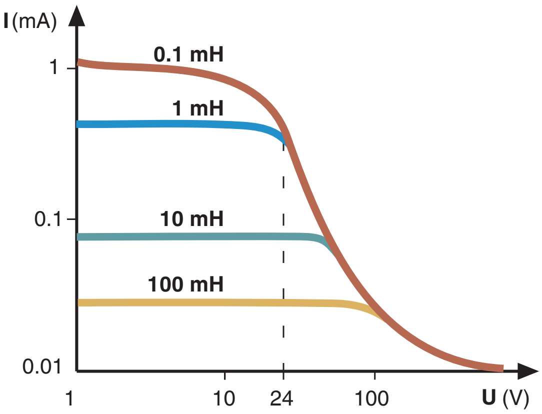

Figure 20 *Minimum ignition current for inductive circuits in relation to voltage U*

Capacitive Circuits

When a capacitive circuit (Figure 21) is open, the capacitor charges to a voltage U and accumulates an energy ($E = 1/2 \times C \times U^2$) that is released in the form of a spark at the point where the circuit closes. For an analogy with the inductive circuit with an inclination of -2 on the logarithmic scale, a relationship appears to exist between the capacitance value and the voltage source. However, experimental tests have demonstrated that this theoretical relationship does not exist and the ignition curves are as shown in Figure 22.

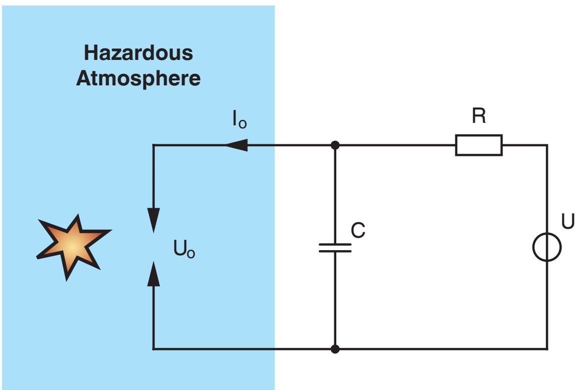

Figure 21 *Schematic diagram of a capacitive circuit*

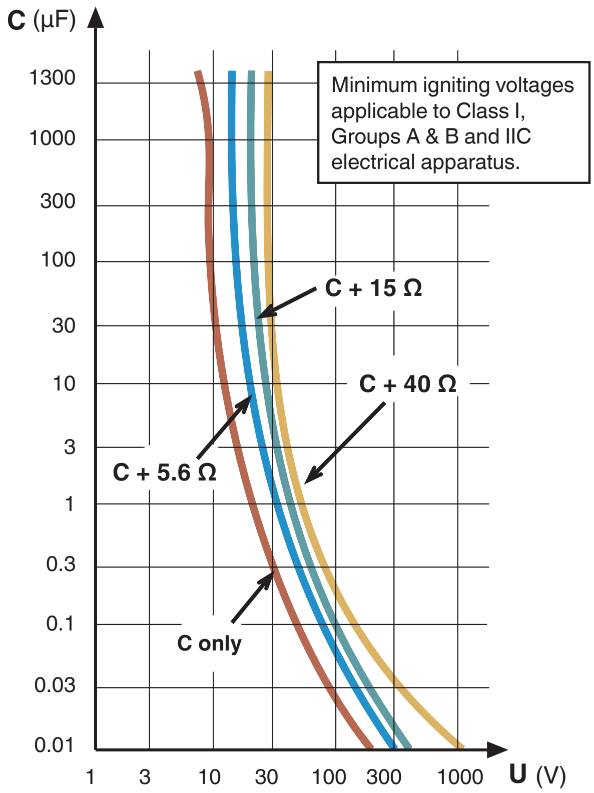

Figure 22 *Ignition curve for a capacitive circuit*

This discrepancy between the theoretical values and experimental data is due to the fact that the capacitor's discharge is not complete and instantaneous. Each resistor inserted in the capacitor's discharge circuit, besides increasing the discharge time constant, dissipates part of the accumulated energy, thus reducing the energy released at the point of contact.

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Intrinsically Safe Systems

Intrinsically safe apparatus never stand alone (unless they are battery operated). Generally, it is part of a system in which the certified components are used to guarantee the safety of the system.

The simplified schematic of an intrinsically safe system is shown in Figure 23 includes:

- Electrical apparatus (simple apparatus or intrinsic safe apparatus) located in a hazardous area
- Electrical apparatus located in a safe (non-hazardous) area
- The wiring between the two apparatus

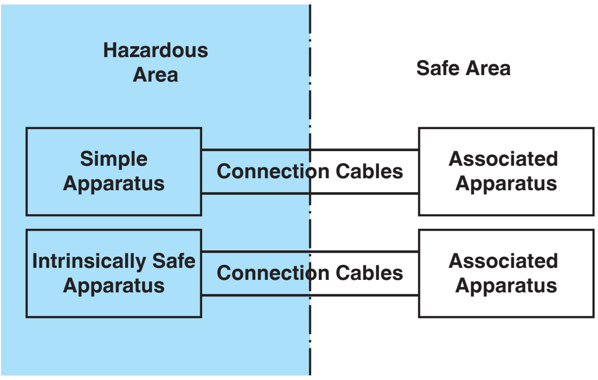

Figure 23 Simplified schematic of an intrinsically safe system

The analysis of an intrinsically safe system follows criteria that verify that the maximum energy, electrical and thermal, released in a hazardous location is lower than the ignition limit of the potentially explosive air/gas mixture, during normal or fault conditions.

Hazardous Area Apparatus

Apparatus that are certified for use in hazardous locations are of two types – simple apparatus and intrinsically safe apparatus.

Simple apparatus

According to IEC 600079-11 the following shall be considered to be simple apparatus:

1. Passive components, for example switches, junction boxes, resistors and simple semiconductor devices;
2. Sources of stored energy consisting of single components in simple circuits with well defined parameters, for example capacitors or inductors, whose values shall be considered when determining the overall safety of the system;
3. Sources of generated energy, for example thermocouples and photocells, which do not generate more than 1,5 V, 100 mA and 25 mW.

Intrinsically safe apparatus

The intrinsic safety of the apparatus must be guaranteed. This is accomplished by not permitting high energy levels, coming from connected apparatus or other circuits located in the same area, to be present in the hazardous location.

The certification exemption of simple apparatus cannot be applied to reactive circuits due to their capability of storing energy. Inductive components, relay coils or solenoid valves often can operate with energy levels much lower than the limits for intrinsic safety, but the energy released when the circuit is open can cause the ignition of the explosive atmosphere. In the same way, a capacitive circuit can cause ignition during discharge of the capacitor. Those types of apparatus must be equipped with components to reduce the released energy to safe levels.

There are many ways to make apparatus and circuits intrinsically safe. One such solution for making an inductive component safe is to parallel-connect a semiconductor diode to the coil so that released energy can be absorbed. For capacitive components, a resistor can be series-connected to reduce the discharged current to a safe level.

The standards permit the use of components such as diodes and resistors to be considered "infallible" where working conditions are concerned. Diodes must be duplicated and mounted so that a possible fault will not disconnect them from the coil. The resistor must be of metal film or wire-wound and of the necessary power rating. It must also be wired so that it will not short circuit during fault status.

These are just a few methods employed by designers to achieve the necessary protection for intrinsic safety apparatus.

Parameters of intrinsically safe apparatus

Electrical apparatus for hazardous locations must be approved as intrinsically safe. Normally, an intrinsically safe apparatus will have manufacturer's documentation, certificate, or control drawing that specifies parameters for the selection of the associated apparatus. U_i and I_i parameters are assigned to each input. The associated apparatus connected to each input must not have a maximum output voltage U_o greater than U_i. Similarly, the associated apparatus must not have a maximum output current I_o greater than I_i.

U_i	Maximum voltage applied to apparatus
I_i	Maximum current applied to apparatus
C_i	Internal unprotected capacitance
L_i	Internal unprotected inductance

Table 17

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Connection Cables

The length of cable connecting intrinsically safe equipment with associated equipment may be limited because of the energy-storing characteristics of the cable. The manufacture's documentation, certificate, or control drawing provides guidance on determining the maximum allowed capacitance and inductance.

The electrical parameters of an associated apparatus determine the maximum allowed inductance and capacitance values of the connected circuit; therefore, not only must the reactive part of the field devices be considered, but also the part related to the interconnecting cables. It is possible to limit or suppress the stored energy for field and non-hazardous location apparatus; however, because the total inductance and capacitance of the cable are distributed along its length, it is not possible to limit or suppress the stored energy for the connecting cable (refer to Figure 24).

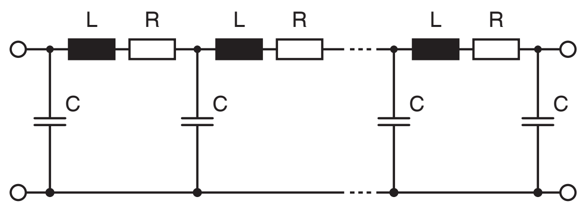

Figure 24 Equivalent schematic of a connecting cable

The capacitance, inductance, and resistance to length ratio parameters are usually supplied by the cable manufacturer and rarely cause a problem for the user. Particular attention must be given to the cable parameters because the manufacturer's data is not related to the possible fault situations covered by intrinsic safety. The fault combination that determines the worst condition must be verified.

For a 2-conductor cable, the manufacturer's data is sufficient. For shielded or multi-conductor cables, the analysis is more complex.

Safe Area Associated Apparatus

Associated electrical apparatus, which are located in a non-hazardous location, consists of electrical circuits related to intrinsic safety and can be designed to limit the energy toward the hazardous location to the required level.

Associated apparatus can be of the following three types:

- Apparatus receiving signals from the field
- Apparatus sending command signals to the field
- Intrinsically safe interfaces

Instrumentation devices that receive signals from a hazardous location do not supply power to the field devices during normal functioning. Intrinsic safety is accomplished by limiting the energy in the case of a fault.

Instruments that send signals are designed so that the dangerous energy level is never exceeded during normal operation or under fault conditions.

Intrinsically safe interfaces (e. g., Zener Barriers) prevent the transfer of dangerous energy coming from the uncertified instrumentation in non-hazardous locations.

Parameters of Associated Apparatus

Associated electrical apparatus must be certified as intrinsically safe, based on the maximum energy that can be transferred to the hazardous location, and have the following parameters:

U_o	Maximum open-circuit voltage
I_o	Maximum short-circuit current
C_o	Maximum allowed capacitance
L_o	Maximum allowed inductance

Table 18

These parameters are very important for the intrinsic safety of a system. If the parameters are respected, ignition of the explosive atmosphere will be prevented, during normal operation or under fault conditions (i. e., accidental short-circuiting, opening, or grounding of the connecting cable).

Protection Levels of Intrinsically Safety Systems

Zone Classification Protection Levels

Intrinsically safe electrical apparatus and the intrinsically safe part of the associated electrical apparatus are divided into three levels of protection – ia, ib, and ic.

- Level ia: An electrical apparatus belonging to level of protection ia must not be able to ignite an explosive atmosphere during normal functioning, during a single-fault condition, or during a combination of a two-fault condition with the following safety factors:
  - 1.5 during normal functioning,
  - 1.5 during normal functioning with one fault,
  - 1 with two faults
- Level ib: An electrical apparatus belonging to level of protection ib must not be able to ignite an explosive atmosphere during normal functioning or during a single-fault condition with the following safety factors:
  - 1.5 during normal functioning,
  - 1.5 during normal functioning with one fault
- Level ic: An electrical apparatus belonging to level of protection ic must not be able to ignite an explosive atmosphere during normal functioning.

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In conclusion, safety is guaranteed for the apparatus of level of protection ia during a two-fault condition; safety is guaranteed for the apparatus of level of protection ib during a single-fault condition. For both levels of protection, the safety factor during normal functioning with one fault is 1.5.

Levels ia, ib, and ic can be used for any group of gas; however, level of protection ia is the only category permitted for Zone 0. This is justified by the fact that, according to the safety concept expressed in section "Ignition Triangle", there must be at least two independent events, each one of low probability, before the ignition can occur.

For Zone 0, where danger is ever present, level ia allows up to two non-sequential events. For Zone 1, where danger is intermittent, the two events are the simultaneous presence of the dangerous gas and a single-fault condition in intrinsically safe apparatus. For Zone 2, the area is normally not hazardous.

It is evident that apparatus designed for Zone 0, level of protection ia, can be used in Zones 1 and 2 with a greater margin of safety.

Division Classification Protection Levels

In the United States, the competent authority for the classification of hazardous locations is the National Fire Protection Association (NFPA). The NFPA is responsible for the National Electrical Code, NFPA 70, and the American standard for intrinsic safety is ANSI/ISA-60079-11 Classification of Hazardous Locations.

Article 500 of the National Electrical Code stipulates the use of electrical apparatus in hazardous locations and defines the classification of the areas, the groups of potentially explosive material and surface temperatures.

ANSI/ISA-60079-11 is specifically related to intrinsic safety and is the authority on which the standards used by the testing labs are based (ANSI/UL 913, FM 3610). The requirements contained in ANSI/ISA-60079-11 are based on IEC 60079-11 with national deviations. This results in significant harmonization of requirements between North America and the IEC.

A hazardous location of Division 1 includes the corresponding Zone 0 and Zone 1. Therefore, only one intrinsic safety category is allowed with the following safety factors:

- 1.5 considering the most unfavorable condition of a single fault
- 1 considering the most unfavorable condition of two faults

The North American standard is equivalent to the European standard for category ia.

The certification of apparatus, as it relates to the present danger – gas, dust, fiber – and surface temperature, follows the same concept as the European classification. The differences lie with the denomination of the groups and the subclasses of temperature.

The ignition curve for the resistive, inductive, and capacitive circuits are identical to IEC 60079-11.

Safety Barriers for Protection of Intrinsically Safe Circuits

Safety barriers are electronic circuits to limit the energy to the field within the minimum ignition level of the explosive atmosphere. In order to interface electrical apparatus located in a hazardous location with electrical apparatus located in a non-hazardous location (associated apparatus), defined barriers must be used.

Barriers can be of the following two types:

- Not galvanically isolated **Zener Barriers**
- Galvanically **isolated barriers**

Zener Barriers

Intrinsic safety barriers of this type are uncomplicated from a circuital point of view (refer to Figure 25).

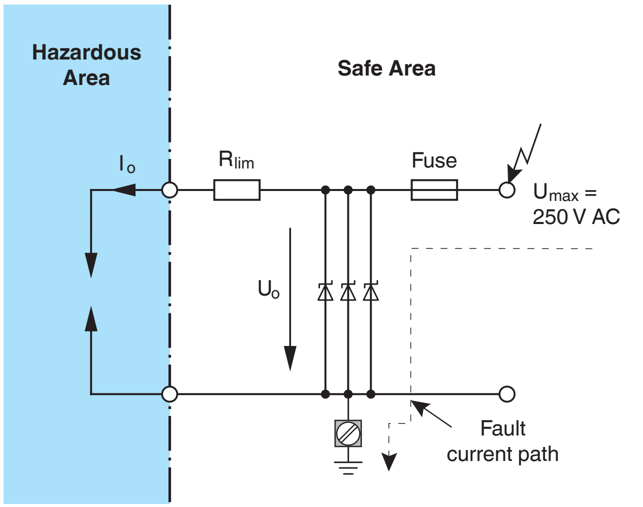

Figure 25 Schematic of a Zener Barrier

The functioning principle relating to this type of barriers is based on the following: If a dangerous voltage that comes from the safe area (250 V AC max.) is present, the zener diodes limits the voltage and shunt the fault current toward ground until the fuse breaks, thereby maintaining an open-circuit "safe" voltage (U_o) toward the hazardous location, while the maximum field short-circuit current is defined by

$I_o = U_o / R_{lim}$.

The safety parameters of Zener Barriers are defined in the following table:

U_o	Maximum open-circuit voltage
I_o	Maximum short-circuit current
C_o	Maximum allowed capacitance
L_o	Maximum allowed inductance

Table 19

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The efficiency of Zener Barriers in limiting the maximum energy to the hazardous location substantially depends on the integrity of the barrier ground connection. Installation rules require that the ground-connection resistance of the barrier must be lower than 1 Ω.

The main advantages of Zener Barriers are:

- Lower component costs
- Uncomplicated and reliable functioning
- More flexibility

The limitations of Zener Barriers are:

- The requirement of an equipotential ground system
- The existence of problems with current return caused by the absence of input/output isolation
- The reduction of the voltage available for the field apparatus caused by the limiting resistor, and the introduction of errors when the limiting resistor is connected to resistance temperature detectors
- The introduction of errors by the limiting zener due to the current leakage toward ground
- The requirement of active instrumentation for obtaining a signal, i. e., 4 mA to 20 mA, that is usable in non-hazardous locations when used with passive sensors, such as TCs, RTDs, etc.
- The possibility of permanent damage to the barrier in the case of a fault situation or an incorrect connection

Isolated Barriers

Galvanically isolated barriers are transmitter power supplies, signal converters or repeaters that transmit or receive signals from hazardous locations in an isolated manner (refer to Figure 26).

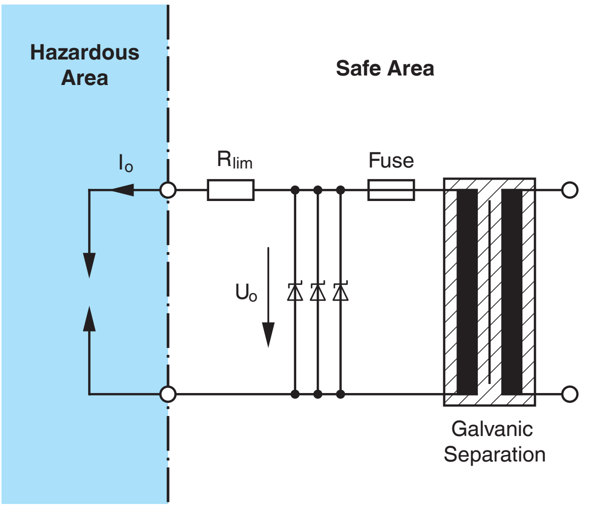

Figure 26 Schematic of a galvanically isolated barrier

The main difference between a passive Zener Barrier and a galvanically isolated barrier, lies in the safety components that are used to obtain the isolation between the non-hazardous location and the circuit related to intrinsic safety.

This configuration does not allow the dangerous voltage (250 V AC max) that may be present on the terminal blocks, which are located in a non-hazardous location, to be transferred to the energy-limiting circuit that must be able to tolerate, during a fault condition, the maximum voltage of the secondary side.

Since the entire circuit is floating in respect to ground, there is no possibility for the fault current, due to the 250 V AC, to pass through the energy-limiting circuit; therefore, it is not necessary to ground the energy-limiting circuit.

The safety parameters for isolated barriers (U_o, I_o, C_o, and L_o) are determined in a similar way to the safety parameters for zener barriers. This is due to the similarity of the intrinsically safe circuits toward the hazardous location.

The main advantages of galvanically isolated active barriers are:

- A grounded system is not required.
- Grounded sensors can be used.
- Galvanic isolation avoids the problems of the return currents and allows a high common-mode rejection.
- Better measurement accuracy is possible.
- Output signals can be directly used.
- Designed and optimized for specific application.

The limitations of galvanically isolated barriers are:

- Higher component costs, although installed costs are more comparable.

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Proof of Intrinsically Safe Systems

Systems with only one Associated Apparatus (Simple Proof)

In order to verify the intrinsic safety between the associated apparatus and the field device in the hazardous location, the safety parameters (i. e. entity parameters) must be matched. The voltage, current, power, capacitance, and inductance must be verified according to the following relationships:

Safety/entity parameters				
Intrinsically safe apparatus		Cable/leads		Associated apparatus
U_i			≥	U_o
I_i			≥	I_o
P_i			≥	P_o
L_i	+	L_c	≤	L_o
C_i	+	C_c	≤	C_o

Table 20 Electrical parameters of a simple intrinsically safe circuit

As an example, the test of a simple intrinsically safe circuit comprising a proximity switch and a switch amplifier should be carried out according to IEC/EN 60079-14, NEC NFPA 70 article 500 or CEC C22.1 as appropriate.

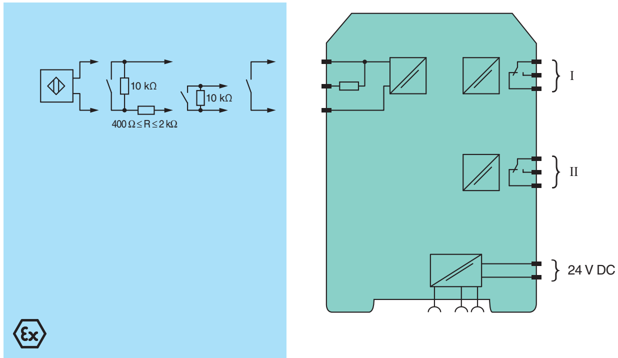

Figure 27 Intrinsically safe circuit to monitor position of a flap

Associated apparatus: Designation	Type	Manufacturer	Relevant Certificate	U_o [V]	I_o [mA]	P_o [mW]	L_o [mH]	C_o [nF]	Ex group
Switch amplifier	KFD2-SR2-Ex2.W	Pepperl+Fuchs GmbH	PTB 00 ATEX 2080	10.5	13	34	3	620	IIC

Serial no.	Intrinsically safe electrical apparatus: Designation	Type	Manufacturer	Relevant Certificate	U_i [V]	I_i [mA]	P_i [mW]	L_i [mH]	C_i [nF]	Ex group
1	Proximity switch	SJ3,5-N	Pepperl+Fuchs GmbH	PTB 99 ATEX 2219	16	25	64	1.25	50	IIC
2										
Cable inductance and capacitance			L_c = 700 µH/km C_c = 45.9 nF/km l = 600 m					0.42	27.54	
Total inductance and capacitance			L_i/C_i					1.67	77.54	
Conditions for intrinsic safety			U_o I_o P_o L_o C_o	≤ ≤ ≤ ≤ ≤	U_i I_i Pi $L_i + L_c$ $C_i + C_c$	10.5 V 13 mA 34 mW 3 mH 620 nF	≤ ≤ ≤ ≥ ≥	16 V 25 mA 64 mW 1.67 mH 77.54 nF		

Table 21 Proof of intrinsic safety of a simple intrinsically safe circuit (example)

Typically, if safety or entity parameters are not available, a system certificate issued by a certification authority will be necessary to guarantee the intrinsic safety of the equipment.

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Systems with Several Associated Apparatus (Interconnected)

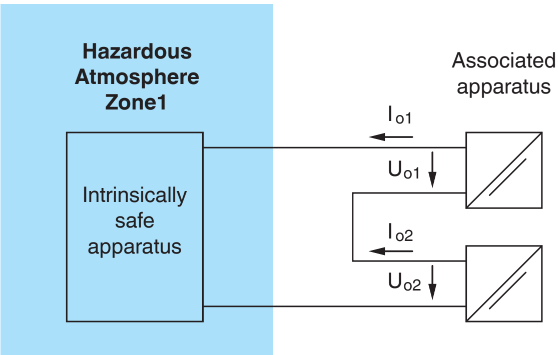
In the case of two or more associated apparatus in an intrinsically safe circuit, the following practical method can be used to determine the new maximum system voltages and currents under fault conditions in the intrinsically safe circuit using the values U_o, I_o of each item of associated apparatus taken from the documentation or from the marking plate Dependent on the interconnection of the intrinsically safe terminals of the associated apparatus, the values of U_o and Io should be determined, in the case of normal operation and also under fault conditions, taking into account

- the summation of voltages only,
- the summation of currents only, or
- the summation of both voltages and currents.

In the case of series connection of the associated apparatus with galvanic isolation between intrinsically safe and non-intrinsically safe circuits only the summation of voltages is possible, irrespective of the polarity of the circuits.

In the case of parallel connection of both poles of the sources only the summation of currents is necessary.

In all other cases, where any interconnection of the poles of the sources is possible series or parallel connections have to be taken into account, dependent on the fault under consideration. In this situation, both the summation of voltages and the summation of currents have to be considered separately.

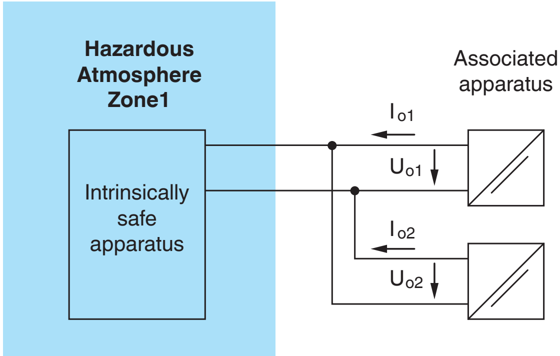


New maximum system values:

$U_o = \Sigma U_{oi} = U_{o1} + U_{o2}$

$I_o = \max. (I_{oi})$

Figure 28 Series connection – summation of voltage

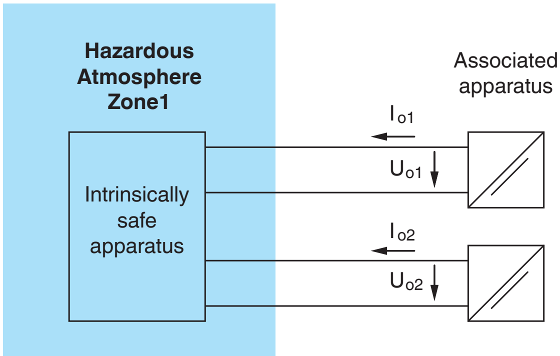


New maximum system values:

$U_o = \max. (U_{oi})$

$I_o = \Sigma I_{oi} = I_{o1} + I_{o2}$

Figure 29 Parallel connection – summation of current



New maximum system values:

$U_o = \Sigma U_{oi} = U_{o1} + U_{o2}$ or $U_o = \max. (U_{oi})$

$I_o = \max. (I_{oi})$ or $I_o = \Sigma I_{oi} = I_{o1} + I_{o2}$

Figure 30 Series and parallel connections – summation of voltage and current

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Installation of Intrinsically Safe and Associated Apparatus

Installation of intrinsically safe and associated apparatus must conform to IEC 60079-14, Article 504 of the NEC, section 18 of the CEC and other applicable standards. These standards require that intrinsically safe wiring be separated from non-intrinsically safe wiring, and that intrinsically safe wiring, terminals, and raceways be clearly labeled. Other considerations such as grounding and shielding requirements are also considered.

The installation of intrinsically safe and associated apparatus must be handled with particular care in order to prevent any intrusion in the intrinsically safe circuits from apparatus and conductors that are not intrinsically safe circuits, if these intrusions could reduce or eliminate the intrinsic safety of the system.

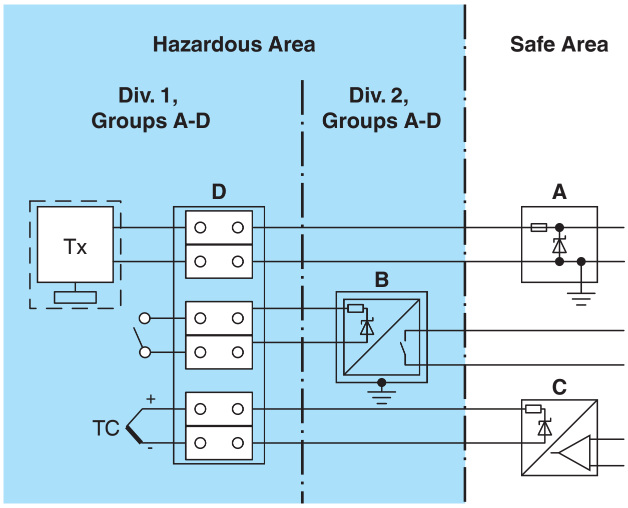
To achieve this, it is important to understand the concepts of segregation, separation, and clear identification of the intrinsically safe components. In particular:

1. The terminals of the intrinsically safe circuits must be placed at a distance of at least 50 mm (2 in) from the terminals of the non-intrinsically safe circuits, or adequate separators (e. g., grounded metal partitions) must be used.
2. The different types of intrinsically safe circuits do not have to be electrically connected, unless such connection has been specified in the control drawing or if the proof of intrinsic safety is verified.
3. When different types of intrinsically safe circuits end at the same marshaling terminal, it is advisable to maintain a distance between the relative terminals that is much greater than the 6 mm (0.24 in) required by the standard, unless it can be demonstrated that the interconnection between the different types of circuits will not introduce a dangerous energy situation.
4. The properties of intrinsically safe circuits are different if the circuits:
   - Operate at different voltages or polarities
   - Have different barrier grounding points
   - Are certified for different categories or for different gas groups

For the intrinsically safe circuit, installation must be performed so that the maximum allowed value for current and voltage can never be exceeded because of external electric or magnetic fields. For example, proper installation in this case requires the use of cables that are adequately shielded and are separated from the cables of other circuits.

The connection elements – terminal block housing, protective enclosures for cables, the external enclosures for single conductors, and the wiring between intrinsically safe apparatus and associated apparatus – must be clearly marked and easily identified. If a color is used for this purpose, the color must be light blue.

For devices such as terminal blocks and switches, additional certification or specific marking is not required.



A Zener Barrier
B Switch amplifier
C Converter
D Terminal block for IS circuits

Figure 31 Example of different types of intrinsically safe circuits

Protection Ratings for Enclosures

Indoor enclosures

Required by the standards for enclosures of intrinsically safe and associated apparatus, Type 1/IP20 is the minimum degree of protection for enclosures that are installed in indoor and/or protected areas. (refer to the "Additional Information" section for a detailed presentation of type and IP protection ratings).

Outdoor enclosures

For outdoor enclosures, a protection degree of Type 4 or 4X/IP54 is required. It is important to consider protection ratings of enclosures for intrinsically safe and associated apparatus in the context of the overall functionality and safety of the plant.

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Cable Capacitance and Inductance

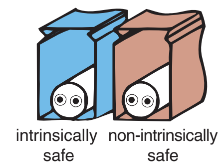
When designing and installing intrinsically safe systems, keep in mind that capacitance and inductance parameters of the connecting cables are important factors, even if they are not always determining factors.

The capacitance and inductance values of the cable (generally, given in pF/m and µH/m) should be easily available from the cable manufacturer. However, if there are difficulties in obtaining this data, the following values can be used (but only in an extreme situation), where the interconnection comprises two or three cores of a conventionally constructed cable (with or without shield): 200 pF/m (60 pF/ft) and either 1 µH/m (0.2 µH/ft).

As an alternative to the inductance, another characteristic of the cable, the inductance/resistance ratio (L/R), can be used and is normally given in µH/Ω. This parameter permits more flexibility in the cable installation process.

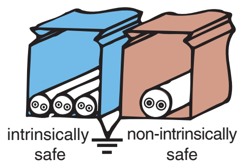
Refer to Figure 32 for examples of cable installation and to Figure 33 for examples of wiring in small enclosures containing associated apparatus.

A



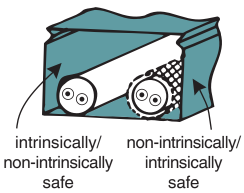
The cables of the intrinsically safe and non-intrinsically safe circuits are installed in two separate, isolated conduits.

B



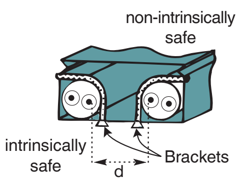
The cables of the intrinsically safe and non-intrinsically safe circuits are installed in two separate, metallic, grounded conduits.

C



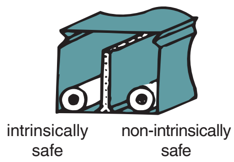
The cables of the intrinsically safe and non-intrinsically safe circuits are installed in the same conduit. One of the cables is protected by a grounded shield to divert fault current to ground.

D



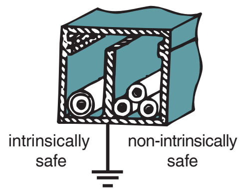
Installation as above, but the cables are separated by anchor brackets. The distance d must conform to the standards with a minimum of 50 mm.

E



Installation as above but the conduit must have an isolated divider.

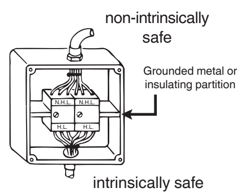
F



Installation as above but the conduit and divider must be made of metal and grounded.

Figure 32   Examples of cable installation

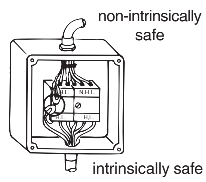
A



Correct:

When installing the wiring as shown, the minimum required distance between intrinsically safe and non-intrinsically safe conductors is guaranteed.

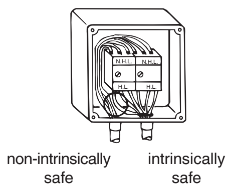
B



Incorrect:

Several conductors are of excessive length.

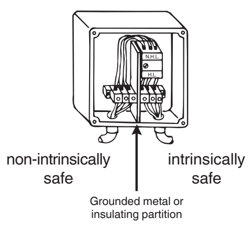
C



Incorrect:

A separation does not exist between intrinsically safe and non-intrinsically safe conductors.

D



Correct:

The maximum distance between the lid and the separator must be less than 1.5 mm; or the separator must guarantee a distance in air around the lid of at least 50 mm between the terminals of the intrinsically safe circuit and the non-intrinsically safe circuit.

Figure 33   Examples of wiring in small enclosures containing associated apparatus

Grounding of Intrinsically Safe Plants

Intrinsic safety standards require that certain points of the system must be grounded and others must be isolated from ground. Generally, the grounding of intrinsically safe circuits is required to prevent or even to reduce the probabilities that excessive energy levels can be generated in the hazardous location.

The isolation from ground of parts of the circuit is required to prevent the possibility of having two grounded points with a different potential and the possible circulation of a high current.

It is also a requirement of intrinsic safety that only one point can be grounded, while the rest of the circuit must be isolated from ground (500 V AC min).

The grounding of intrinsically safe circuits must be accomplished with a conductor that is isolated from any other plant grounds and connected to the reference ground system.

The NEC and CEC should be reference for North American installations while EN 60079-14 is used in Europe. Refer to the applicable standards for grounding practices in other countries.

Grounding of Zener Barriers

From an intrinsic safety point of view, the effective functioning of Zener Barriers is linked to their capability of diverting to ground the dangerous energy coming from the non-hazardous instrumentation devices on which they are connected.

For this reason, it is very important that the ground connection of the Zener Barrier is made to an equipotential ground system (refer to Figure 34).

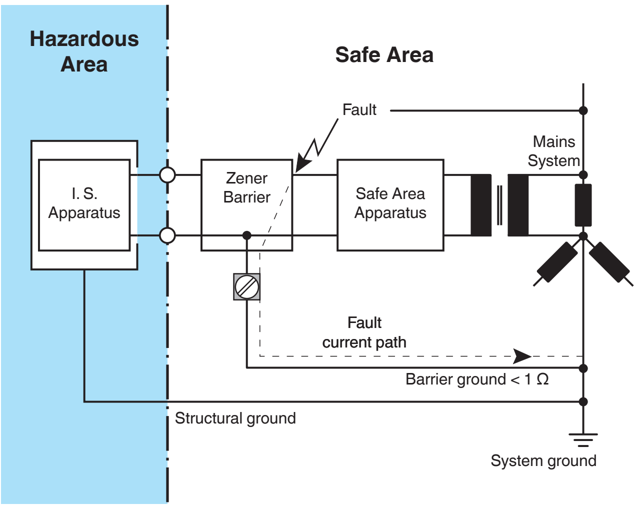


Figure 34 Schematic of a grounded Zener Barrier

The ground connector must be mechanically and electrically reliable and be able to reduce the fault current or the sum of the fault currents, if more barriers are connected to a single-ground bus.

The connecting cable used in grounding the barriers must be at least No. 12 AWG (**A**merican **W**ire **G**auge) or 2 x 1.5 mm^2 (Europe cross-sectional requirement).

The allowed resistance between the ground terminal of the most distant barrier and the isopotential ground point must be less than 1 Ω.

Barrier ground connections must be separated from any other plant grounds and must be connected to a ground system at only one point.

The required condition of the only ground point implies that a Zener Barrier cannot be used on interfacing sensors or hazardous location apparatus containing grounded or poorly isolated circuits (i. e., thermocouples with grounded junctions or non-isolateds transmitters).

Grounding of Shielded Cables

The use of shielded cables for connecting the hazardous location sensors or transmitters with the non-hazardous location control and measurement apparatus is widespread.

From a functional point of view, the shield's purpose is to create an equipotential zone around the conductor's capacitive coupling with that of other conductors. This is only true if the shield is connected to a grounded reference potential.

The shield should be grounded at only one point – preferably, at the system's ground point. If the shield is grounded at two non-equipotential points, the current could circulate in the shield, preventing functionality. Therefore, a shielded cable must be provided with an extra isolating coat above the shield to prevent accidental ground contacts.

For intrinsically safe apparatus, the shield acts as another conductor between the hazardous and non-hazardous locations and could become the fault current route if the cable is damaged. From this point of view, the principle of isolating the circuit in hazardous locations and grounding it in non-hazardous locations can also be applied to the shield.

For passive-barrier applications, the shield can be locally grounded if the galvanic isolation is not damaged by this connection. This means that the two shields at the two sides of the isolation device must not be interconnected.

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For applications where shielding is part of the segregation technique between different types of intrinsically safe circuits (i. e., multipolar cables), the reference ground connection of the shields must be the same as the ground connection of Zener Barriers (refer to Figure 35).

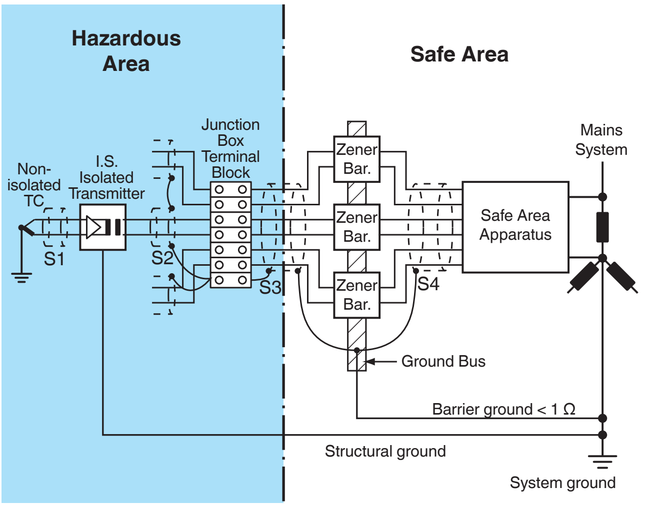

Figure 35 Example of shield ground connections

For functional reasons, the S1 shield is connected to the same grounding point as the measuring circuit. This must not be connected to the transmitter's metallic parts in order to prevent the second-circuit ground connection, which is not permitted by the intrinsic safety protection method.

Since the purpose of the field transmitter is to galvanically isolate the thermocouple's circuit from instrumentation in non-hazardous locations, there must be no connection between shields S1 and S2.

Shields S2 and S3 provide the shielding of the connection between the transmitter and the barrier. They are interconnected in an isolated point of the junction box terminal block.

S3 is also connected to the barrier's ground bus that, by means of a separate conductor, is connected to the reference ground point.

Shield S4 completes the shielding of the system and is not very important from a safety point of view. It is connected to the shield's reference point, which is represented by the ground bus.

For this type of connection, it is necessary that shield S2 be properly isolated from the transmitter's metallic structure; otherwise, a situation as shown in Figure 36 can occur.

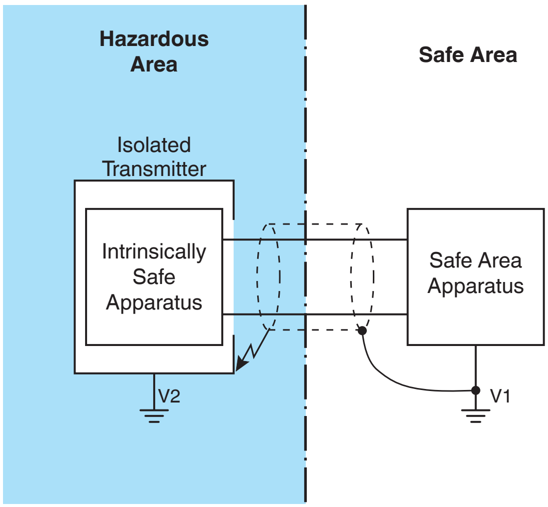

Figure 36 Possible dangerous situation for grounding of non-hazardous-location shields

When isolation no longer exists between the shield and the transmitter's enclosure, an excessive energy level could be present in a hazardous location if ground potential V1 is different from V2. Since the fault current is limited only by the resistance of the shield and the one existing between V1 and V2, the generated spark could ignite the surrounding potentially dangerous atmosphere.

This situation can be prevented by grounding the shield in the hazardous location; therefore, a spark could occur in the non-hazardous location without causing a fire or explosion.

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Legal Situation

In industrial countries explosion protection is regulated by law. Given any hazardous location installation, the plant operator is subject to the legal situation of the particular country. The following is a brief description of the North American situation followed by a more detailed situation for Europe.

Legal Situation in North America

The United States and Canada have a set of National Standards in force for equipment relating to hazardous locations. The Standards Council of Canada and the Occupational Health and Safety Administration in the US indicate that hazardous location equipment shall be certified by designated, third-party agencies (Nationally Recognized Test Laboratories in the US) to the appropriate standards of safety. Compliance to the standards are verified by the approval agencies. After successful completion of product evaluation, the testing agent will authorize the use of their mark on the product as an indication of meeting the necessary safety standard. Installation of the equipment in the particular state or providence of use is covered by the appropriate installation standard (i. e. NEC and CEC) and verified by the **A**uthority **H**aving **J**urisdiction (AHJ).

Legal Situation in Europe

The European Union has issued the ATEX directives (Atmosphere Explosive) which required the use of type-tested explosion-proof equipment.

ATEX consists of two parts: ATEX 95 (directive 94/9/EC), which concentrates on the duties of the manufacturer; and ATEX 137(directive 1999/92/EC), which focuses on the end user's obligations.

ATEX 95 applies to electrical as well as mechanical equipment and applies to gases, vapors, and dust atmospheres. Equipment manufacturers apply the harmonized explosion protection standards applicable in Europe and request an EC type test. Following successful testing, the testing institute issues a corresponding certificate (ATEX certificate) which is a prerequisite for bringing the equipment into circulation in the EC. Compliance with the ATEX directives means reinforced safety aspects – safer design, more demanding testing procedures, and specific quality assurance measures for the design as well as the manufacturing process.

With the signing of the Treaties of Rome (article 100: removal of technical barriers to trade), the foundation for harmonizing explosion protection on a European level was laid in 1957.

CENELEC (European Committee for Electrotechnical Standardization) emerged. With that, inside the EC and also beyond its borders (EFTA states and other countries), a unified legal basis for the manufacture and trade of electrical apparatus for use in hazardous areas was created. The installation conditions were subject to and are still widely subject to the legal and administrative regulations of the relevant countries using them.

CENELEC was originally composed of members of the **E**uropean **E**conomic **C**ommunity (EEC). Today, CENELEC extends to almost 30 countries and many partner members.

Furthermore, CENELEC has decided only to enact standards in parallel with the IEC. This means in practice that European standards in the area of electrical engineering will only be based on IEC standards as harmonized EN standards or be newly drafted.

For explosion protection of electrical equipment, these are mainly standards of series EN 60079 which also cover the requirements of dust explosion protection.

The internationalization will be supported further by the introduction of the so-called IECEx scheme. The aim of the IECEx scheme is world-wide recognition, based only on a certificate and the associated test. In the future, manufacturers will not require further approvals for the entire global market. There is great interest in the implementation of this idea worldwide. More and more countries (already 31 in 2010) have declared their intention to participate and have begun to prepare legislative adaptations.

In recent years, two EC directives have fundamentally changed the European Ex-landscape:

- Directive 94/9/EC of the European Parliament and Council of 23 March 1994 for harmonization of the statutory provisions of member states for devices and protection systems for intended use in hazardous areas (ATEX 95).
- Directive 1999/92/EC of the European Parliament and Council of 16 December 1999 regarding minimum provisions to improve health protection and safety of employees who may be endangered by potentially explosive atmospheres (ATEX 137).

The ATEX 95 is mainly directed towards the manufacturers of electrical and non-electrical components and systems for hazardous areas and must literally be implemented in national law, while the ATEX 137 mainly applies to the safe operation of these plants. The minimum requirements of ATEX 137 had to be implemented in line with national law and each member state could largely implement its own workplace protection independently.

The goal of the EC is easy to recognize: on the one hand, to create equal competition for all suppliers in the EC single market and on the other hand, to create equivalent safety standards for all operators of installations and equipment within the EC.

The directive 94/9/EC prescribes an EC-Type Examination with a corresponding verification certificate (Ex certificate of compliance) for electrical devices of categories 1 and 2. To obtain this certificate, the manufacturer submits all technical materials and possibly a prototype to a notified body. On passing the test, an EC-Type Examination Certificate is issued, which contains all binding information and parameters for use in hazardous areas. This is the basis for operation and connection of several electrical devices in Ex Zones 0 and 20, as well as 1 and 21.

For category 3 devices (operation in Zones 2 and 22) an EC declaration of conformity regarding the compliance with the directive is sufficient.

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The directive 1999/92/EC describes the "minimum requirements" for improving the health and safety of workers potentially at risk. It classifies the flammable atmosphere into zones and specifies which category of equipment is allowed for use in the zones.

The directive demands the analysis and description of the risks, the zone definitions and the required practices in relation to site safety. The effects of any explosion must be minimized in such a way that workers are not put at risk. Essentially, the employer is required to take all reasonable measures to prevent the formation of an explosive atmosphere in the workplace. Where this is not possible, measures must be taken to avoid the ignition of any potentially explosive atmosphere. In addition, the effects of any explosion must be minimized in such a way that workers are not put at risk.

The main obligations on employers

- Prepare an **E**xplosion **P**rotection **D**ocument (EPD)
- Classify the workplace into Zones where applicable
- Select ATEX 95 certified products (categories according to zone)
- Identify locations where explosive atmospheres may occur (using warning signs)
- Workers should be trained on hazardous area issues by the employer.
- Authorization should be given to each employee working in a hazardous area.
- When equipment is to be repaired, the end user has the responsibility to select a qualified repair shop.

Corresponding installations and equipment are classified as installations subject to monitoring in accordance with directive 1999/92/EC and may only be equipped with approved devices. In addition, installations must be tested before commissioning, following alterations and regularly by approved institutions, companies or by specially qualified personnel.

The responsibility for the plant safety is to the end user.

The safety of an Installation in a hazardous area is the result of cooperation between the equipment manufacturer, the installer and the end user. Under ATEX, the only parties responsible for preventing accidents due to explosive atmosphere are the equipment manufacturer and the end user. To use the equipment in a safe manner, the end user is obligated to follow the manufacturer's instructions regarding to installation, maintenance and repair for each piece of equipment.

The proof of intrinsic safety can be used to establish the safely limited energy values to ensure intrinsic safety. This proof is a component part of the documentation (a requirement of the European operating guidelines 1999/92 EC), which must be compiled before installation and kept up to date.

IEC/EN 60079-14 states that the requirements in the proof of intrinsic safety are adhered to if no system description exists for the overall intrinsically safe circuit. After establishing intrinsic safety the installer must then ensure that all required distances and separations between circuits are adhered to, especially with regards to the circuits being properly marked in accordance with IEC/EN 60079-14.

Obtaining proof of intrinsic safety is possible using several processes and depends on:

- the number of associated (supply) apparatus (one or more)
- shape of the output characteristic curve (linear or non-linear)
- type of reactances (lumped or distributed)

The following table provides an overview of the possible procedures for obtaining proof.

Number of pieces of associated apparatus	Characteristic curve shape	L_i, C_i both > 1 % L_o, C_o	Process
1	Linear	No	Simple proof
1	Linear	Yes	IEC/EN 60079-25 annex C or 50 % rule
1	Non-linear	Not relevant	IEC/EN 60079-25 annex C
> 1	All linear	No	Simple proof
> 1	All linear	Yes	IEC/EN 60079-25 annex C
> 1	> 1 non-linear	Not relevant	IEC/EN 60079-25 annex C

Table 22 Possible proof test procedures according to IEC/EN 60079-14 and IEC/EN 60079-25

The ignition limit curves can only be directly used to evaluate an intrinsically safe circuit and determine the maximum values for capacitance and inductance in the case of "simple proof" according to IEC/EN 60079-11 (EN 50020).

There are explosion limit curves for resistive, capacitive and inductive circuits.

Depending on which gas group an intrinsically safe circuit is being designed for, different curves are used to establish the minimum ignition energy for each gas group.

When both limits were pushed at the same time laboratory tests confirmed that ignition could occur.

In the example in Table 21 both the lumped inductances and capacitances are shown. This has already been factored into the certification of the associated apparatus through reduced L_o and C_o values. If these reduced values are not provided in the authorization then in the case of there being both lumped inductances and capacitances present the proof must be generated according to the IEC/EN 60079-25 annex C. In "simple" systems (only one source, output curve is linear) the "50 % process" from IEC/EN 60079-11 will suffice.

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Testing and Maintaining of Intrinsically Safe Systems

No method of protection is completely safe and human-error proof. Proper maintenance that includes a rigorous initial inspection, verification, and subsequent periodic inspections and repairs is extremely important for the safety and economical management of any instrumentation plant, and becomes fundamental in plants where the danger of fire or explosion exists.

To reduce the risk of catastrophic human errors, it is also important to permit only authorized and competent personnel to repair explosion-proof apparatus – as equipment must not be serviced under power. The following maintenance criteria are presented to give the reader a general understanding of what is involved in order to maintain an industrial facility relative to safety. This material is not intended to replace the applicable safety standards.

After the installation and completion of each plant, it is necessary to perform the following three types of inspection/maintenance activities:

- Initial inspection
- Programmed maintenance (periodic inspections and repairs)
- Apparatus failure and repairs

To maintain safety of electrical systems in hazardous areas regular maintenance is necessary.

Therefore the system operator is responsible for appropriate testing and maintenance cycles of their own system in accordance with the 1999/92/EC operator guidelines or other appropriate regulations.

For example, IEC/EN 60079-17 (testing and maintenance of electrical systems in hazardous areas) describes the procedure for electrical systems used in conjunction with explosion protection. The following applies in general:

Working on live electrical systems and apparatus in hazardous areas is strictly prohibited. Working on intrinsically safe systems is an exception to this rule.

Therefore special requirements exist for the intrinsic safety ignition protection class:

- Maintenance work on live intrinsically safe systems may be carried out under certain conditions.
- The ground connections of safety barriers may not be removed before the circuits in the hazardous area are disconnected.

Work in hazardous areas is to be limited to:

- disconnecting, removing, or changing parts
- adjusting all setting required for calibration
- removing or changing pluggable components
- using testing instruments as set out in the documentation
- After testing, the intrinsically safe system/apparatus must fulfill all requirements of the system documentation

The documentation must contain the following:

- proof of Intrinsic Safety
- manufacturer, type of apparatus and certification number, category, apparatus group, temperature class
- electrical parameters (inductance, capacitance, length, type and routing of cables, leads)
- special requirements according to the component data sheet
- The installation location of each component within the system

In addition the following should be tested:

- Easily identifiable marking of intrinsically safe circuits
- The conformity of the actual installation with the documentation
- Separation of components between intrinsically safe and non-intrinsically safe circuits
- Cables and leads and their shielding
- Continuity of grounding of non-galvanically isolated circuits, ground connections to ensure intrinsic safety
- Grounding or isolation of intrinsically safe circuits
- Adhering to specified minimum distances

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A new Dimension of Intrinsic Safety with DART

Introduction

Intrinsic safety is a worldwide-accepted type of ignition protection that offers many advantages over other types of ignition protection. It is based on the principle that the energy released within an electrical circuit through sparks, heat, or other normal and abnormal events is incapable of igniting a potentially explosive atmosphere.

Intrinsic safety is currently achieved by limiting the available power. This limitation of power – usually to less than 2 W – provides intrinsic safety (Ex i) and is therefore mainly employed in the area of control and instrumentation in the power supply to actuators and sensors with low connected loads.

A significantly higher direct power with the simultaneous safeguarding of all the positive characteristics of intrinsic safety offers the user a new and essentially wider scope of application. These aims are achieved through DART technology (**D**ynamic **A**rc **R**ecognition and **T**ermination). DART is a means of instantaneous tripping, which dynamically detects an undesired condition or a fault in the electrical system precisely as it occurs and instigates an immediate transition to a safe condition before any safety-critical parameters are exceeded. DART is based on the detection of fault conditions and the characteristic rate of change of current.

Through the use of DART, systems can be operated at drastically increased direct power output compared to present intrinsic safety solutions. More available direct power opens the door to the use of intrinsic safety in many applications relevant to the process industry. The following are some examples: analytic equipment, weighing equipment, lighting systems, valve control systems and fieldbus systems such as FOUNDATION Fieldbus H1 and PROFIBUS PA.

Basic Operating Principles

In the normal operating condition, the DART power supply feeds the full nominal power, which, depending on the application, can be greater by a factor of up to 25 (50 W) when compared to standards-related permissible values. At the very instant of the onset of a fault incident, such as the opening of the circuit, DART detects the resulting change in current and immediately switches off the power supply. In this way, the energy from the electrical system is effectively limited in just a few microseconds. Thus, a spark capable of causing an ignition is prevented.

This procedure is possible due to a very characteristic and therefore easily detectable change in current (di/dt) during the onset of a fault condition. The reaction of the power supply takes place very quickly – in approximately 1.4 µs. On such a fast reacting system, an additional factor to be considered is the propagation time on the cable. The energy released is determined by the power converted at the point of the fault integrated over the time up to the effective disconnection. The following physical parameters are principally responsible for this:

- The power – determined by the supply voltage and the load current
- The time – comprising the signal propagation delay in the cable and the reaction time of the power supply
- The energy stored in the connection cable
- The load behavior.

The energy liberated in the spark is determined by the power available, integrated over time. The relationships are explained below. Figure 37 shows the arrangement of the power supply, cable and devices in the hazardous area.

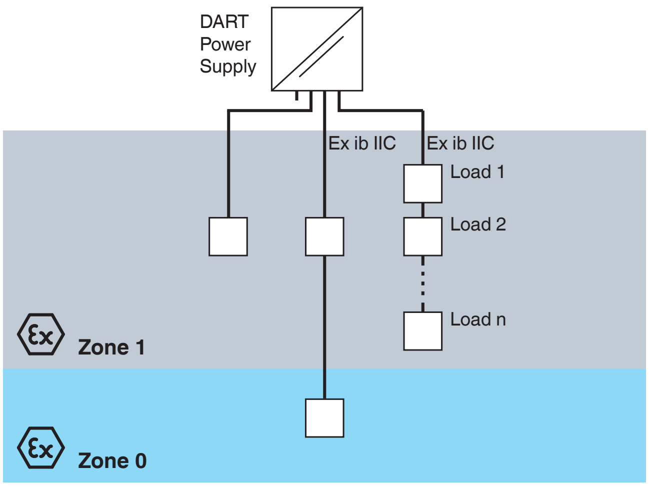

Figure 37 Arrangement of the power supply, cable and devices in the hazardous area

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Detecting The Ignition Of A Spark

The determination of the intrinsically safe ignition limit values is made with the spark test apparatus specified in the standard IEC/EN 60079-11 – in which these values are subjected to a specified ignition probability. It is important to distinguish make sparks and break sparks. Only break sparks are considered in this context as they represent the critical case.

A typical example of the behavior of the electrical parameters of a break spark is shown in Figure 38. A break spark commences with the voltage $U_F = 0$ V and usually ends on reaching the open circuit voltage at $U_F = U_o$, in which the steady increase of the spark voltage is directly associated with a reduction in the spark current I_F in a linear circuit. The period of time in between depends on the circuit and is referred to as the spark duration t_F.

Typical spark duration t_F: 5 µs < t_F < 2 ms.

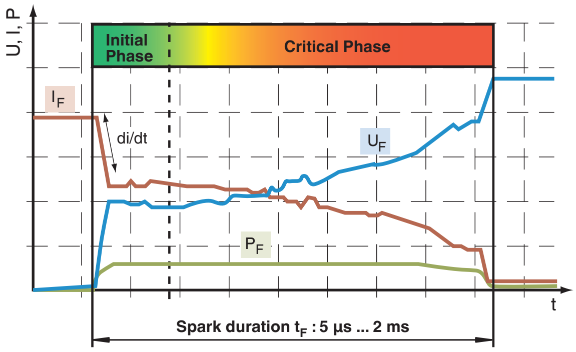

Figure 38 Variation with time of the spark current, voltage and power of a linear limited break spark (non-IS)

At the start of a break spark, the spark voltage U_F jumps within a very short time ($t \leq 1$ µs) from 0 V to $U_F \geq 10$ V. The voltage change is directly linked with a characteristic and easily evaluated sharp current change di/dt (see curve I_F). Directly after this change in current, the spark current and spark voltage remain relatively constant for approximately 1 to 5 µs. During this period there is definitively **no possibility of ignition** due to the extremely low available spark energy W_F and it is referred to as the "initial phase". The time following this initial phase persists up to the end of the spark duration t_F. This range is the "critical phase" during which **an ignition can occur**. During this period, the spark draws the necessary ignition energy from the system, i. e. from the source, the cable, and the loads.

From the knowledge of these variations, it can be shown that the rapid detection of sparks in combination with a means for the rapid disconnection of the source can be employed to reliably prevent the ignition of an explosive mixture. The task is principally to evaluate the current change (di/dt), while giving consideration to the characteristic safety values.

Figure 39 shows the time history of a spark interrupted by a DART power supply. The current change is clearly evident and is used to trigger the transition of the circuit into the safe condition. It is clear, that with DART a fault condition is not only already detected and evaluated within the "initial phase", but that it also leads to the disconnection of the power supply. The switch-off time available during this process depends on the system. A frequently used value, based on the physics of the spark is 5 µs.

Due to the very short rise times of current and voltage during the onset of a spark, the connecting cable between the power supply and the load acts as a wave guide even when the cable lengths are very short. The information that a spark is in existence propagates as a traveling wave or surge on the connecting cable. Thus, the power supply receives the information delayed – by up to one cable propagation delay period. The reaction of the power supply in turn becomes effective only after one cable propagation delay period and is based on the maximum cable length.

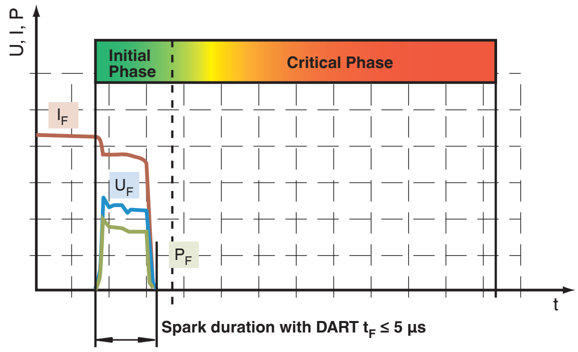

Figure 39 Time history of the spark current, voltage and power of a break spark with DART interruption

This delay is an important safety parameter. In a typical cable used for instrumentation, electric waves travel at approx. half the speed of light or 160,000 km/s. Available power is approximately inverse proportional to the cable length. Further influencing factors to be considered are the stored energy in the connection cable and in the load.

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Function of DART Components

A DART power system is comprised of three components – the power supply, the connecting cable/s, and one or more loads. A system consists of only one source, which can be provided in a redundant form for reasons of availability. The loads are connected to the power supply via a connecting cable with a defined surge impedance.

The Power Supply

The output voltage is galvanically isolated from the station supply and limited by multiple redundant circuits. The DART specific behavior is achieved through the functions represented in the block diagram in Figure 40.

Coordination of functions integrated in the DART power supply leads to the output characteristics, in which the output voltage U_{out} is represented against the output current I_{out} described below. In addition to the highest permitted safe values U_{lim} and I_{lim}, the characteristic is divided into the two operating ranges A and B:

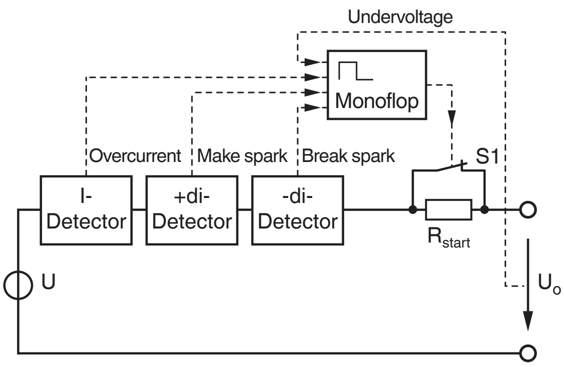

Figure 40 *Block diagram of power supply*

Safe Range A: Figure 41

This range, which is called the start-up and fold-back range, represents the characteristic curve of a linear voltage source with safe values. After switching on the source, switch S1 is open (point 1). A very low current of a few mA, the "trickle current" (point 2) begins to flow across the internal current limiting resistor R_{Start} and to the load resistance. The comparator circuit monitors the output voltage and in effect the combination of cable and load resistances to ensure no fault is present ($R_{Load} > R_{L1}$). When the output voltage reaches or exceeds a fixed threshold value U_{thre} (point 3) and after a necessary safety period of approx. 3 ms , the source switches to range B, the operating range. However, this is only possible if the current variation di/dt due to the load lies below the prescribed detection threshold during the switch-on phase.

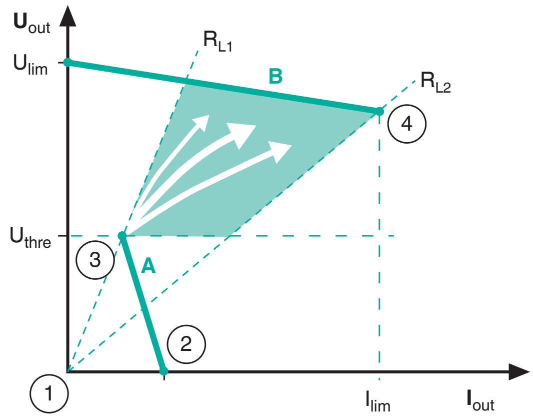

Figure 41 *Output characteristic of a DART source with a representation of the transition from the safe range A to the optimum operating range B (Schematic representation)*

Normal – Working Range B: Figure 42

Range B represents an almost ideal voltage source with an internal resistance $R_i \approx 0\ \Omega$. In the operating range, the source can provide the optimum power to the load, by which means the maximum power conversion is possible at point 4 with $R_{Load} = R_{L2}$. Any variations in the load condition – including that due to faults – are associated with an immediate current variation di/dt. If the prescribed maximum value of the current variation is exceeded, the source switches off and the operating point returns immediately from range B to the safe fold-back range A. This likewise takes place if the maximum permissible load current I_{lim} is exceeded. (see point 4).

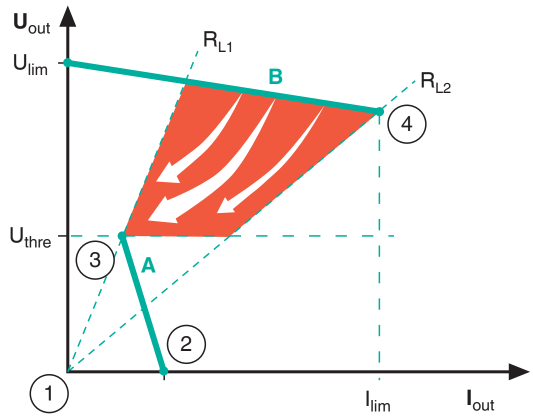

Figure 42 *Behavior of the DART source in the event of a fault (schematic representation)*

In summary, the dynamic control behavior of a DART source can be characterized as follows: a transition into the optimum operating range in the ms range and rapid turn-off to the safe fold-back range in the µs range in the event of faults.

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The Loads

The following prerequisites have been taken into account in the DART concept with regard to the loads:

The spectrum of loads that can be used should be as comprehensive as possible.

- It should be as simple as possible to integrate the loads into the system.
- It should be possible to operate already existing components / loads (including the customary field devices) with this technology in the same manner as is possible with previously customary technologies – e. g. FISCO (protection of stocks).
- In order to keep the safety considerations straightforward, only a line topology is envisioned.
- The loads must not have a negative influence either on the functional or the safety capability of the DART source or other loads (including the cable).

The following particularly applies to the loads: They must not restrict or absorb the propagation of information on the formation of sparks. In this context, the load behavior must be accepted as not being exactly defined. The following two examples illustrate safety-critical cases, which demand additional measures.

The Decoupling Module

A decoupling module ensures a well-defined electrical behavior both from a functional as well as a safety perspective. It permits operation of practically any load with DART. A decoupling module is integrated into the explosion-proof housing of the load and connected in series with it. The decoupling module essentially fulfills the following tasks:

- Soft start-up of the load with limited current rise (di/dt)
- Well-defined electrical behavior
- Optional disconnection in the case of faults through di/dt detection.

Summary And Outlook

Due to DART, very high intrinsically safe power is available for new applications in the process industry, depending on the length of cable employed. The maximum possible power output is strongly dependant on the delay times on the transfer cable. Solutions exist for two application areas: DART power for maximum power output and DART for fieldbus, optimized for fieldbus applications.

Output voltage U_{out}	Active power P_{out}	Cable length
DART power		
50 V DC	approx. 50 W	100 m
24 V DC	approx. 22 W	100 m
50 V DC	approx. 8 W	1000 m
DART for Fieldbus		
24 V DC	approx. 8 W	1000 m

Table 23 Maximum intrinsically safe output values of DART at typical cable length

Suitable test methods have been developed for an exact safety evaluation of the energy-limiting behavior of dynamically operating power supply concepts. Changes to the currently applicable standards have already been investigated. Further steps will follow.

DART enables the use of intrinsic safety in applications with power requirements, which today necessitate other, typically inflexible or expensive types of explosion protection. By means of DART operating processes will become simpler and complexity is reduced. Operating safety will be increased.

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Application Practice

Depending of the plant topology, there are different possibilities for interfacing field devices with the centralized engineering station. For conventional wiring, zener and isolated barriers with intrinsically safe wiring to the field loops protect your plant. With a Remote I/O-System or a fieldbus infrastructure, the field wiring and also the amount of connections to the engineering station can be reduced. In this case, other aspects of explosion protection have to be considered.

In the following section, different mounting options for barriers, Remote I/O-Systems, or fieldbus infrastructure components will be discussed.

In the field, all kinds of devices can be connected to the interfacing products:

Two-wire transmitters, four-wire transmitters, contacts, optocouplers, NAMUR initiators, temperature sensors, frequency gauges, relay outputs, solenoids, lamps, indicators, sounders, LEDs, proportional valves, positioners, I/P converters, etc.

The signal transfer from or to the field device can either be conventional with digital or analog signals or also with digital fieldbusses. The physics of explosion protection is the same. Therefore the field devices in the following drawings are shown as neutral blue boxes

Zener and Isolated Barriers Applications

Connecting IS Signals to Safe Area Mounted Devices

Isolated barriers and not-isolated Zener Barriers shown in Figure 43 are mounted in the safe area. They have an intrinsic safe wired connection (Ex i) to the field devices.

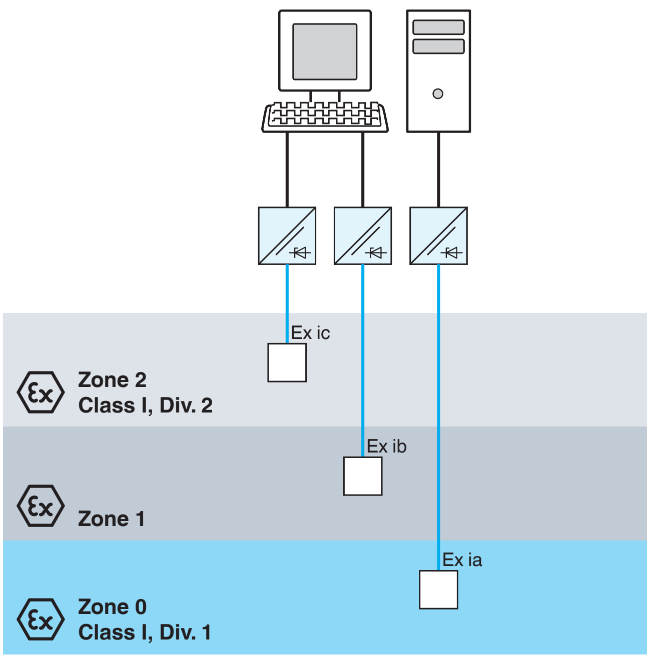

Figure 43 Connecting IS signals to safe area mounted devices

Connecting IS Signals to Zone 2/Class I, Division 2 Mounted Devices

Isolated and not isolated barriers can also be installed in Zone 2/Class I, Division 2. On the field side all above mentioned field devices can be installed in Zone 2 up to Zone 0, Class I, Division 1, with the only restriction mentioned in the previous chapters. The field loops are intrinsic safety.

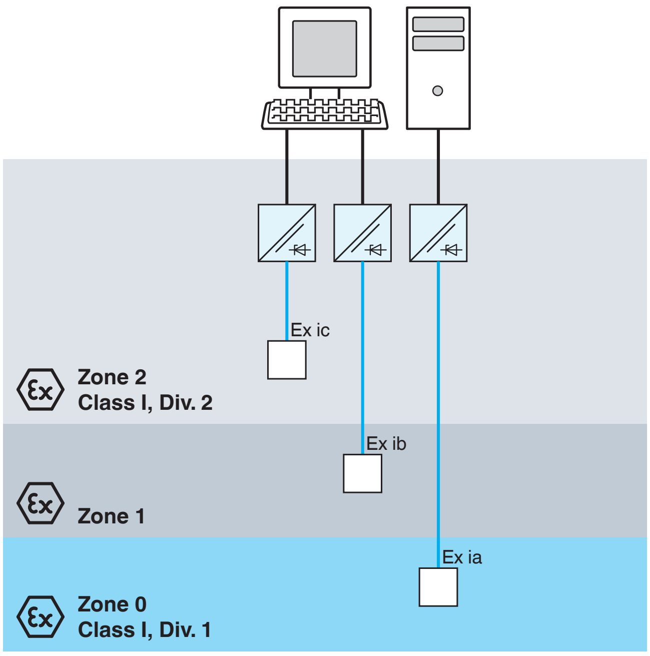

Figure 44 Connecting IS signals to Zone 2/Class I, Division 2 mounted devices

Remote I/O Applications

Connecting IS Signals to Safe Area Remote I/O

Standard RS 485 or Ethernet connect the control room with the field via Remote I/O. The Remote I/O employs various protection methods. IS modules can be exchanged under live operating conditions without a hot work permit. Inputs and outputs are galvanically isolated and intrinsically safe. The nA type increased safety I/O optional. Field loops undergo IS loop proofing as in traditional IS interfacing.

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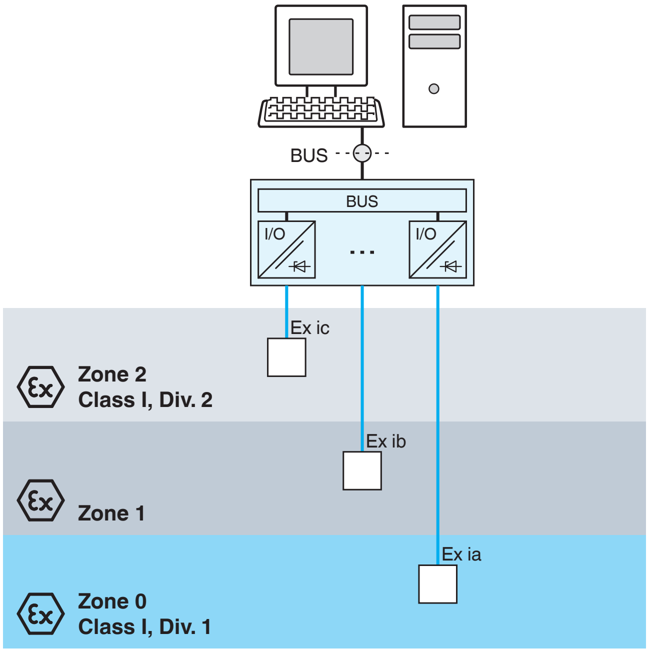

Figure 45 Connecting IS signals to safe area Remote I/O

Connecting IS Signals to Remote I/O in Zone 2/Class I, Division 2

Standard RS 485 or Ethernet connect the control room to the hazardous area. The Zone 2/Class I, Division 2 Remote I/O employs various protection methods. IS modules can be exchanged under live operating conditions without a hot work permit under normal operating conditions. Inputs and outputs are galvanically isolated and intrinsically safe. nA type increased safety I/O optional. Field loops undergo IS loop proofing as in traditional IS interfacing.

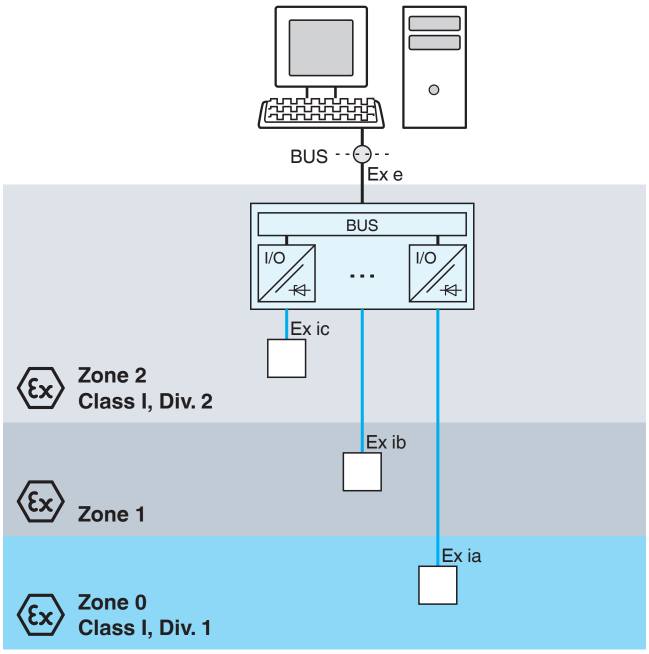

Figure 46 Connecting IS signals to Remote I/O in Zone 2/Class I, Division 2

Connecting IS Signals to Remote I/O in Zone 1

Standard RS 485 or Ethernet connect the control room to the hazardous area. The final link in Zone 1 must feature an increased safety cable and connections. The Zone 1 Remote I/O employs various protection methods. IS modules can be exchanged under live operating conditions without a hot work permit. They are encapsulated for hostile and hazardous conditions. Inputs and outputs are galvanically isolated and intrinsically safe. Increased safety I/O optional. Field loops undergo IS loop proofing as in traditional IS interfacing.

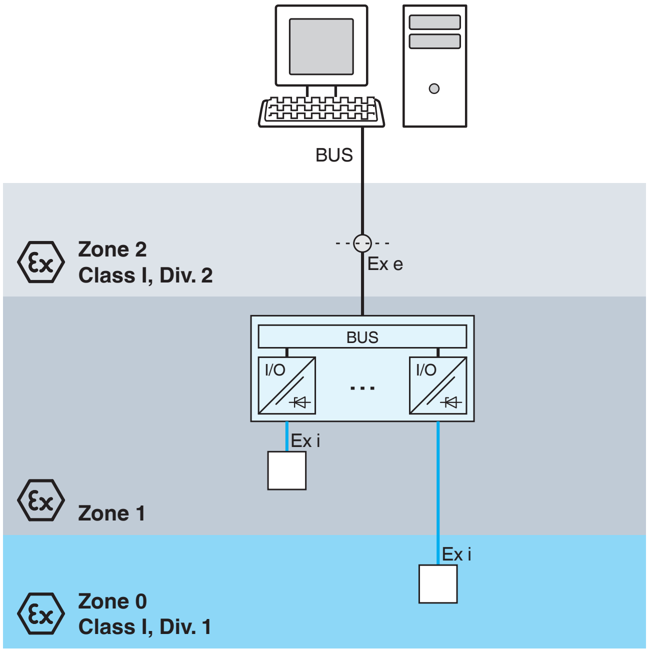

Figure 47 Connecting IS signals to Remote I/O in Zone 1

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Fieldbus Infrastructure Applications

Methods of Ignition Protection with Fieldbus

Fieldbus is a well accepted method to connect field instrumentation in process automation. Fieldbus systems accepted in process automation are defined in IEC 61158-2. They are: FOUNDATION Fieldbus H1 and PROFIBUS PA. They utilize the same physical layer for transmission of power and communication on a shielded twisted-pair cable. They are designed to meet the demanding criteria of hazardous area locations in process plants:

- Long cable distances of up to 1900 m
- Explosion protection
- Resistance to external influences, e. g. EMI

In fieldbus multiple devices are connected to a single electrical circuit, the segment. Users can choose from three basic methods of explosion protection based on requirements. Each method is described below and highlighted in it's benefits

Intrinsic Safety for the Entire Segment

Two methods, Entity and FISCO, are defined in IEC 60079. They are commonly accepted and can essentially be applied in any hazardous area location. This chapter describes the basic principles for applying and validating intrinsic safety with fieldbus. Regional requirements regarding installation methods apply.

The Entity Model

The Entity model as defined by IEC 60079-11 is a method of validating an installation of intrinsically safe and associated apparatus through the use of intrinsically safe parameters. In addition to the devices' parameters the cable capacitance and inductance is assumed as being concentrated and has to be considered as well. Simplifications for fieldbus were not considered within this specification and planners had no other option than to accept the complex and time consuming calculation efforts to validate an installation.

Applying the Entity model in practical fieldbus applications is rather rare, there are only few power supplies conforming to the Entity model available today. Typically they provide 10 V to 12 V and 70 mA to 100 mA which is just enough to operate 2 to 3 field devices per segment (gas group IIC). In the end Entity:

- Provides power for segments with up to 3 instruments
- Requires a calculation effort to validate intrinsic safety
- IIB solutions offer more power, however they are not suitable where as most applications require gas group IIC

The FISCO Model

Fast adoption of fieldbus technology in factory automation caused a desire to reevaluate the application of fieldbus in process automation as an alternative to 4 mA to 20 mA interface technology. Preliminary experiments conducted by the **P**hysikalisch **T**echnische **B**undesanstalt (PTB), Germany showed that long cable lengths connected to a power source did not significantly increase the incendivity of a spark. Under the premise to recheck the conservative approach of Entity with concentrated cable inductances and capacitances and with the objective to simplify system calculations and to allow more power in the field, PTB ascertained experimentally new IS parameters for fieldbus with the following objectives:

- Increase available power
- Standardize the installation parameters and limits
- Simplify system calculations and documentation

FISCO prescribes that only one power supply is permitted per fieldbus segment and that all other devices are power drains with measures in place preventing unintentional power feedback to the cable. For the first time a standard placed actual restrictions on cable and electric apparatus with regards to parasitic capacity and inductance. Instruments and power supplies require certification through a notified body. Cables are documented through a declaration by the manufacturer.

FISCO validation of intrinsic safety is limited to the documentation of FISCO compliance of all hardware involved. Later the FISCO report turned into the technical specification IEC TS60079-27 and adopted in the year 2005 as standard IEC 60079-27.

In spite of the improvements offered by FISCO a real breakthrough of intrinsically safe fieldbus failed to appear. This was due to the fact that the expected savings in installation cost and effort could not be realized, even if FISCO allows practically the operation of twice as many field instruments when compared to Entity. Further disadvantages moved to the foreground which haven't changed with the introduction of FISCO:

- No power supply redundancy, power supply as single point of failure
- Very little flexibility in segment design because mix of devices for safe and hazardous areas on one segment is not permitted.
- Operation of more field devices but still marginal compared to 32 possible devices as defined in the fieldbus standard IEC 61158-2.
- Need of special "add-on" devices for simultaneous use of FISCO and Entity field devices.

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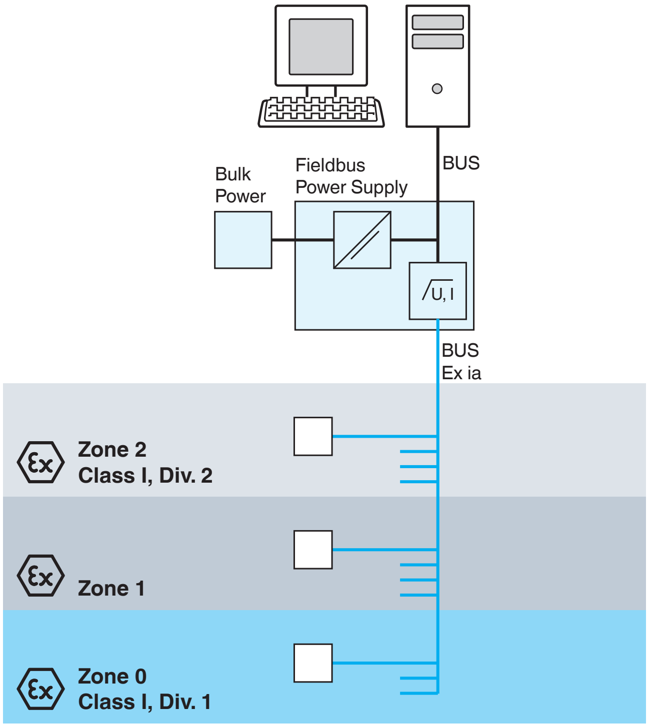

Figure 48 IS instrument connections with intrinsically safe fieldbus power supply

IS Signal Connections with the High-Power Trunk Concept

The **H**igh-**P**ower **T**runk **C**oncept (HPTC) removes the limitations with regards to segment length and number of devices. The principle idea of the HPTC is to deliver energy on the fieldbus trunk not limited for explosion protection close into the hazardous area. The trunk is installed utilizing increased safety methods (Ex e/Ex nA) and is therefore protected from mechanical damage and effects such as unintentional disconnect, damage or aggressive influences such as corrosion.

Within the hazardous area it is distributed via energy-limiting wiring interfaces to its final destination, the field instrument. Fieldbus coupler is the most generic name for a fieldbus wiring interface. A fieldbus coupler with energy limiting capabilities is installed near the instruments. From four to twelve instruments are connectable to outputs of the fieldbus coupler. The connection to the field instrument is called spur, as it is typically short – less than 120 m.

Compared to all other intrinsically safe installation methods standard power supplies can be applied for the HPTC, which are much simpler by design. The HPTC enables higher availability of the fieldbus segment as the power supplies may be operated in redundant configuration.

High-Power Trunk Concept for Instruments Ex ia in Zone 0 to 1/Div. 1 to 2

For Zone 1/0 (Div. 1) applications the fieldbus coupler, typically called FieldBarrier is installed near the instrument and provides four outputs certified Ex ia IIC with galvanic isolation to the trunk. Each FieldBarrier output acts as independent FISCO or Entity power supply. Up to four FieldBarriers may be operated on one segment, allowing up to 16 IS field devices and an overall maximum cable length of 1900 m.

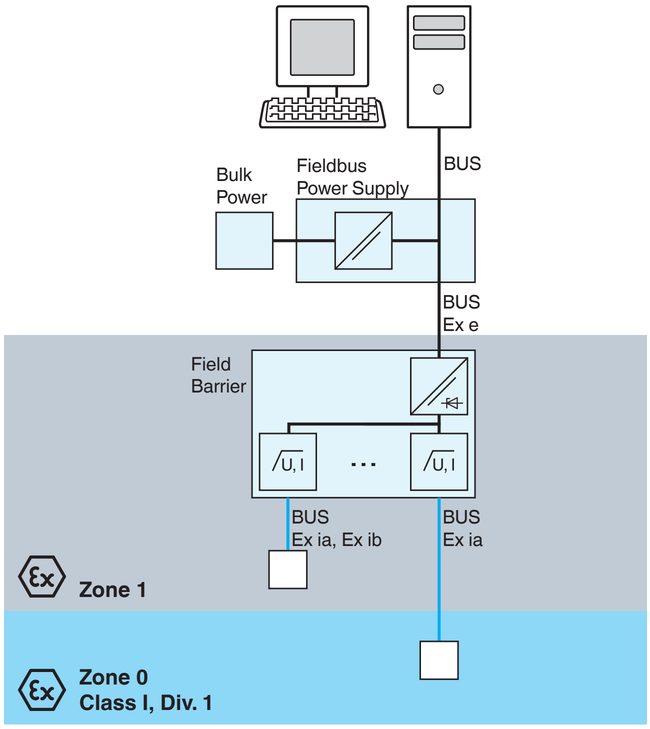

Figure 49 IS signal connections with High Power Trunk Concept using FieldBarriers in Zone 0 to 1/Div. 1 to 2

FieldBarriers provide:

- Galvanic isolation between the trunk and the segment
- Energy limitation of voltage and current for ignition protection Ex ia IIC

High-Power Trunk Concept for Instruments Ex ic in Zone 2

In 2006 the 5th edition of the international standard IEC 60079-11 was released introducing intrinsic safety protection Ex ic for live workable circuits in hazardous area Zone 2. The existing standard IEC 60079-15 edition 3, defining energy limited circuits Ex nL, allowing live work on electronic circuits, will loose its validity approx. in 2011.

Fundamentally, the way how fieldbus segments are designed remains the same. Due to the fact that ic is part of the intrinsically safe standard, additional constructural requirements to fieldbus equipment have to be considered. They are described in the application guideline "Using Pepperl+Fuchs fieldbus equipment in Zone 2 hazardous area Environments" available from Pepperl+Fuchs.

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High-Power Trunk Concept for Instruments Ex ic/Ex nL in Zone 2/Div. 2

For Zone 2/Div. 2 applications the fieldbus coupler is typically called Segment Protector. Because of higher permitted energy levels and reduced demands on electronic design for energy limiting ignition protection, the required voltage and current limitation is separated.

- Voltage limitation is located in the fieldbus power supplies.
- Current limitation is located in the Segment Protector.

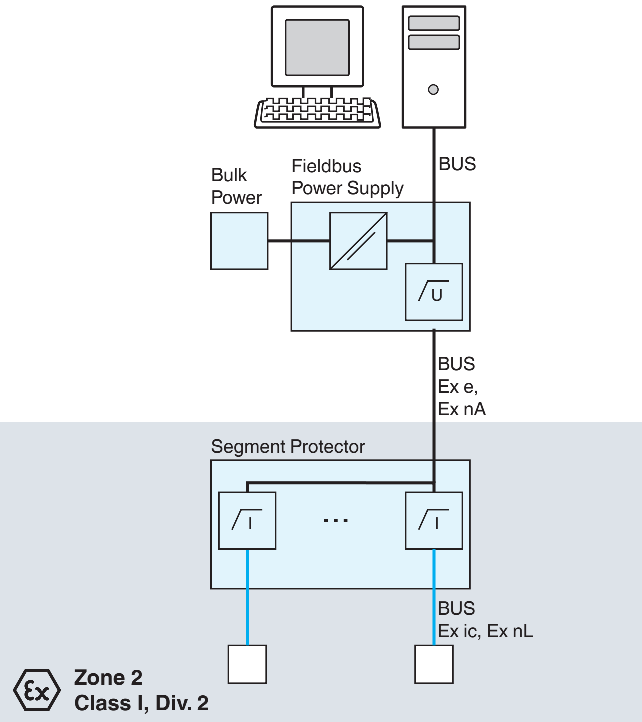

Figure 50 IS signal connections with High Power Trunk Concept using FieldBarriers in Zone 2/Div. 2

Only the proper combination of Fieldbus Power Supply and Segment Protector ensures proper ignition protection Ex ic or Ex nL at the spur. The trunk remains Ex nA: The High-Power Trunk. The following fieldbus designs are supported:

- No live maintenance, trunk and spurs rated "non-arcing, Ex nA"
- Live maintenance at the spur level (Ex nL), trunk rated "non-arcing, Ex nA"
- Live maintenance at the spur level (Entity Ex ic), trunk rated "non-arcing, Ex nA"
- Live maintenance at the spur level (FISCO Ex ic), trunk rated "non-arcing, Ex nA"

The Intrinsically Safe High-Power Trunk

DART technology enables significantly higher direct power while maintaining intrinsically safe ignition protection with all the positive aspects it offers. DART is a means of instantaneous tripping when a fault in the electrical system occurs and a way to instigate an immediate transition to a safe condition before any safety-critical parameters are exceeded. DART is based on the detection of the current's characteristic rate of change when a fault occurs. DART Fieldbus is the first implementation of DART enabling the intrinsically safe high-power trunk concept.

Trunk

DART provides ignition protection intrinsic safety to the trunk. As practically all sparks are temporary, such as a disconnect operation of a DART Segment Protector the DART Power Supply will attempt to switch back on after only a few milliseconds. During this very short interruption the DART Segment Protectors power the field instrumentation – the availability of communication and power supply is ensured.

Outputs

The DART Segment Protector provides intrinsically safe outputs Ex ib IIC. Any instrument conforming to the Entity concept can be connected. That is more than 98 % of instruments available today.

DART Fieldbus enables the following aspects and benefits:

- Live working on trunk and devices without hot work permit
- Redundancy of power supplies with load sharing
- Longer cable runs and more devices (up to 1000 m, up to 32 devices)
- Reduced requirements for cabinet space
- Protection from short-circuits at the spurs

More fundamental information and publications can be found on the website at: www.technology-dart.com

Benefits of the High-Power Trunk Concept

The introduction of the HPTC caused the break through and general acceptance of fieldbus in process automation. It is the enabling technology for fieldbus in hazardous areas, because it satisfies the need for long trunk cables while at the same time allowing a large number of devices per segment. The desired cost reduction in engineering, installation, check-out, and commissioning are achieved. With the HPTC the same topology can be used for all areas: non-hazardous, Zone 2, and intrinsically safe Zone 1, 0 applications. Attributes enabled by the HPTC are:

- Highest possible overall cable length and at the same time largest number of field devices per segment
- Live work on field devices allowed without hot work permit
- Significantly lower requirements for cabinet space compared to FISCO-compliant supplies
- Easiest validation of intrinsic safety once per spur with no calculation required
- Mix and match of FISCO and Entity compliant devices on one segment
- Redundancy of the power supplies
- Integrated physical layer diagnostics for long-term monitoring

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Additional Information

Bibliography

Bass, H.G., Intrinsic Safety, Quartermainte House, Ltd., Sunbury, Middlesex, UK, 1984.

Calder, W., Magison, E.C., Electrical Safety in Hazardous Locations, Instrument Society of America, North Carolina, USA, 1983.

Garside, R., Intrinsically Safe Instrumentation: a guide, Safety Technology, Ltd., Feltham, Middlesex, U.K., 1997.

Magison, E.C., Electrical Instruments in Hazardous Locations, 4th Ed., Instrument Society of America, North Carolina, USA, 1998.

Magison, E.C., Intrinsic Safety, Instrument Society of America, North Carolina, USA, 1984.

Redding, R.J., Intrinsic Safety, McGraw-Hill, Ltd., Berkshire, UK, 1971.

Dose, W. D., Manual Explosion Protection, Pepperl+Fuchs GmbH, Mannheim, 2007.

Reference Standards

United States

ANSI/NFPA 70	National Electrical Code, articles 500 to 505, Hazardous (Classified) Locations
ANSI/NFPA 496	Purged and Pressurized Enclosures for Electrical Equipment in Hazardous (Classified) Locations
ANSI/NFPA 497	Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
FM 3610	Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1 Hazardous Locations
FM 3615	Explosion-proof Electrical Equipment
ANSI/UL 698	Standard for Industrial Control Equipment for Use in Hazardous Locations, Class I, Groups A, B, C and D and Class II, Groups E, F and G
ANSI/UL 913	Standard for Intrinsically Safe Electrical Circuits and Equipment for Use in Hazardous Locations
UL60950-1	Information Technology Equipment – Safety – part 1: General Requirements
ANSI/ISA-60079-0 (12.00.01)-2009	Electrical Apparatus for Use in Class I, Zones 0, 1, and 2 Hazardous Locations: General Information
ANSI/ISA-60079-0 (12.00.01)-2009	General Requirements
ANSI/ISA-60079-11 (12.02.01)-2009	Electrical Apparatus for Use in Class I, Zones 0, 1, and 2 Hazardous Locations – Intrinsic Safety i
ISA-RP12.2.02-1996	Recommendations for the Preparation, Content, and Organization of Intrinsic Safety Control Drawings
ISA-RP12.4-1996	Pressurized Enclosures
ISA-12.04.01-2004 (IEC 60079-2 Mod)	Electrical Apparatus for Explosive Gas Atmospheres – part 2 Pressurized Enclosures p
ANSI/ISA-RP12.06.01-2003	Recommended Practice for Wiring Methods for Hazardous (Classified) Locations Instrumentation part 1: Intrinsic Safety
ANSI/ISA-12.12.01-2007	Non-incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
ANSI/ISA-60079-15 (12.12.02)-2009	Electrical Apparatus for Use in Class I, Zone 2 Hazardous (Classified) Locations – Type of Protection n
ANSI/ISA-61010-1 (82.02.01)-2004	Electrical Equipment for Laboratory Use

Canada

C22.1	Canadian Electrical Code
C22.2-30	Explosion-Proof Enclosures for Use in Class I Hazardous Locations
C22.2-157	Intrinsically Safe and Non-incendive Equipment for Use in Hazardous Locations
C22.2-213	Non-incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations

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International

IEC 60079-0	General Requirements
IEC 60079-1	Electrical Apparatus – Type of Protection d
IEC 60079-2	Electrical Apparatus – Type of Protection p
IEC 60079-4	Method of Test for Ignition Temperature
IEC 60079-5	Electrical Apparatus – Type of Protection q
IEC 60079-6	Electrical Apparatus – Type of Protection o
IEC 60079-7	Electrical Apparatus – Type of Protection e
IEC 60079-10	Classification of Hazardous Areas
IEC 60079-11	Electrical Apparatus – Type of Protection i
IEC 60079-14	Electrical Installations in Hazardous Areas (other than mines)
IEC 60079-15	Electrical Apparatus – Type of Protection n
IEC 60079-18	Electrical Apparatus – Type of Protection m
IEC 60079-25	Intrinsically Safe Systems
IEC 60529	Degrees of Protection Provided by Enclosures (IP Codes)
IEC 60950	Information Technology Equipment – Safety – part 1: General Requirements

Europe

EN 60079-0	General Requirements
EN 60079-1	Flameproof Enclosure d
EN 60079-2	Pressurized Apparatus p
EN 60079-5	Powder Filling q
EN 60079-6	Oil Immersion o
EN 60079-7	Increased Safety Protection Method e
EN 60079-11	Intrinsic Safety Protection Method i
EN 60079-25	Intrinsically Safe Systems i

Internet Resources

Instrumentation, Systems and Automation Association (ISA): www.isa.org

American National Standards Institute (ANSI): www.ansi.org

Environmental Protection Agency (EPA): www.epa.gov

Occupational Safety and Health Association (OSHA): www.osha.gov

Technischer Überwachungsverein (TÜV): www.tuvps.com

Factory Mutual (FM): www.fmapprovals.com

Underwriters Laboratory (UL): www.ul.com

Canadian Standards Association (CSA): www.csa-international.org

National Electrical Manufacturers Association (NEMA): www.nema.org

National Fire Protection Association (NFPA): www.nfpa.org

European Committee for Electromechanical Standardization (CENELEC): www.cenelec.org

International Electrotechnical Commission (IEC): www.iec.ch

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North American Enclosure Protection Ratings

Organizations such as NEMA, CSA, UL, IEC, and TÜV have developed rating systems for the identification of an enclosure's ability to withstand and repel the outside environment. NEMA, CSA, and UL are the systems most often used in North America.

The European rating system, developed by IEC and TÜV Rhineland, is very similar to the North American system for non-hazardous location enclosures. But because, historically, the European system has been more deeply rooted in the concept of intrinsic safety, IEC 60529 has no equivalents to the NEMA hazardous location enclosure types 7, 8, 9, and 10. The North American system also includes a 4X rating that indicates resistance to corrosion.

The following tables show the enclosure types for non-hazardous and hazardous locations according to NEMA standards and European IP rating systems.

Type	NEMA National Electrical Manufacturers Association (NEMA standard 250)
1	Intended for use primarily to provide a degree of protection against limited amounts of falling dirt.
2	Similar to Type 1 but with addition of drip shields used where condensation may be severe.
3	Intended for outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust, and damage from external ice formation.
3R	Intended for outdoor use primarily to provide a degree of protection against rain, sleet, and damage from external ice formation.
3S	Intended for outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust, and to provide for operation of external mechanisms when ice laden.
4	Intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water, and damage from external ice formation.
4X	Intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water, and damage from external ice formation.
6	Intended for indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during occasional temporary submersion at a limited depth, and damage from external ice formation.
6P	Intended for indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during prolonged submersion at a limited depth, and damage from external ice formation.
12	Intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping non-corrosive liquids.
12K	Type 12 with knockouts.
13	Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and non-corrosive coolant.

Table 24 Enclosure types for non-hazardous locations

Type	NEMA National Electrical Manufacturers Association (NEMA standard 250)
7	Intended for indoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the National Electrical Code.
8	Intended for indoor or outdoor use in locations classified as Class I, Groups A, B, C, or D, as defined in the National Electrical Code.
9	Intended for indoor use in locations classified as Class II, Groups E, F, or G, as defined in the National Electrical Code.
10	Constructed to meet the applicable requirements of the Mine Safety and Health Administration.

Table 25 Enclosure types for hazardous locations

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Enclosure Protection Degrees (European Rating System)

IEC Definitions

The IEC 60529 standard defines Ingress Protection as a two character code. The first character describes the degree of protection against access to hazardous parts and ingress of solid objects. The second character designates the Ingress Protection against water. Please refer to the appropriate sections of IEC 60529 for complete information regarding applications, features, and design tests.

Notes:

Wherever a code number is not required, the letter X must be used in its place.

Devices having a second character of 7 or 8 do not need to fulfil the requirements of the second characters 5 or 6, thus, if the device fulfils both degree 6 and 7 against water, a double description must be used (e. g. IPX6/IPX7).

The conditions of Pepperl+Fuchs GmbH for IPX8 are:

- 1 m water column above the test subject
- 24 h operation under water with cyclical damping and amplification under rated load
- cycle time 2 h
- water temperature = room temperature ± 5 °C (± 5 K)

IP	X Protection against access to hazardous parts and ingress of solid foreign objects (first character)		X Protection against ingress of liquids (second character)	
	0	• Non-protected	0	• Non-protected
	1	• Protected against ingress of objects equal to or greater than 50 mm • Protected against access with back of hand (50 mm)	1	• Protected against ingress of water dripping vertically
	2	• Protected against ingress of objects equal to or greater than 12.5 mm • Protected against access with jointed finger (12 x 80 mm)	2	• Protected against ingress of water dripping, enclosure tilted up to 15 °
	3	• Protected against ingress of objects equal to or greater than 2.5 mm • Protected against access with a tool (2.5 mm)	3	• Protected against ingress of spraying water, up to 60 ° from vertical
	4	• Protected against ingress of objects equal to or greater than 1 mm • Protected against access with a wire (1.0 mm)	4	• Protected against ingress of spraying water, any direction
	5	• Dust protected • Protected against access with a wire (1.0 mm)	4K	• Protected against splash water with increased pressure
	6	• Dust tight • Protected against access with a wire (1.0 mm)	5	• Protected against ingress of jetting water, any direction
			6	• Protected against ingress of powerful jetting water, any direction
			6K	• Protected against strong water jets
			7	• Protected against ingress of water during temporary immersion
			8	• Protected against ingress of water during continuous immersion
			9K	• Protected against water on high pressure cleaning or vapor stream cleaning

Table 26 Enclosure protection degree acc. to IEC/EN 60529

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Minimum Ignition Curves

The following graphs answer the question: What is a dangerous amount of electrical energy? These graphs are for circuits containing aluminum, cadmium, magnesium, or zinc – substances that produce a high temperature incendiary spark. It is important to keep in mind that these curves reflect the worst case scenario. When designing intrinsically safe electronic equipment today, most manufacturers start by specifying the equipment for the worst possible case.

The graphs chosen are those that are used most often by designers and manufacturers of electrical apparatus.

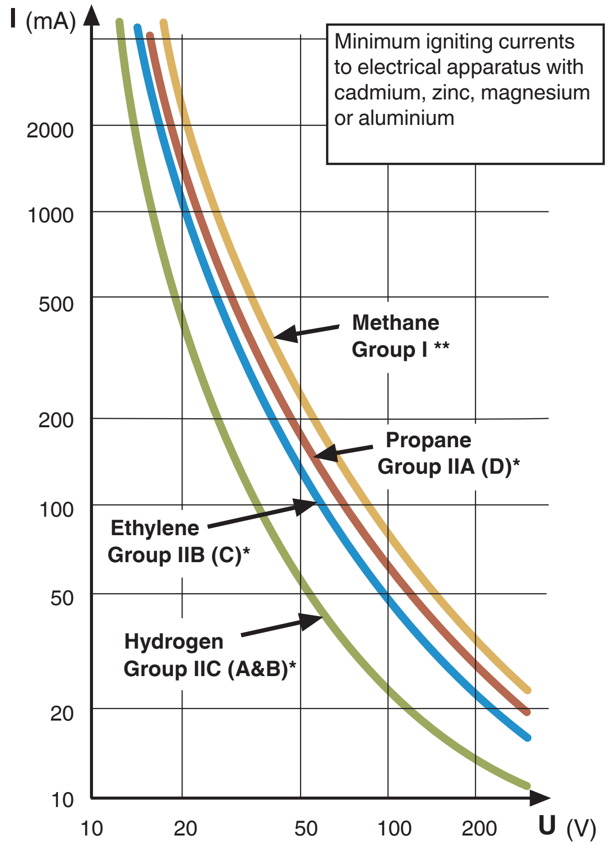

Figure 51 Minimum ignition curves for resistive circuits

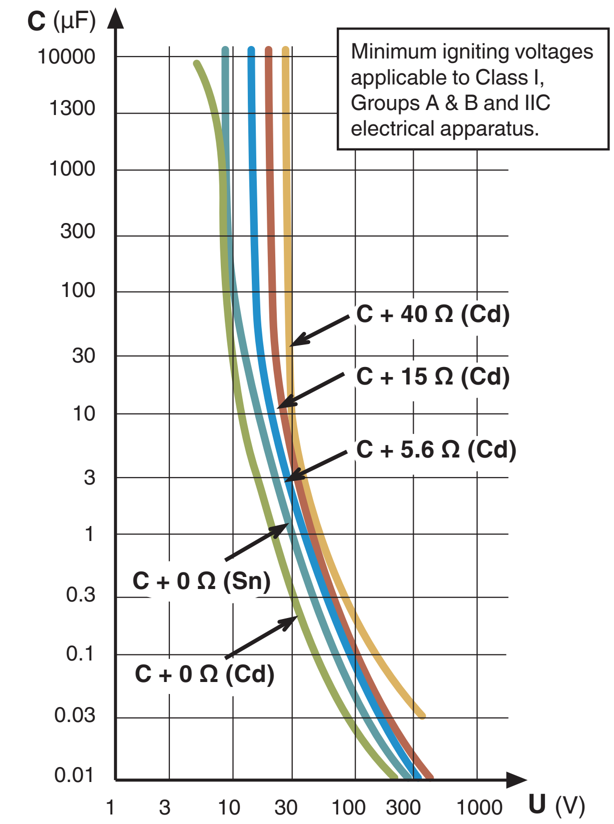

Figure 52 Minimum ignition curves for capacitive circuits group I

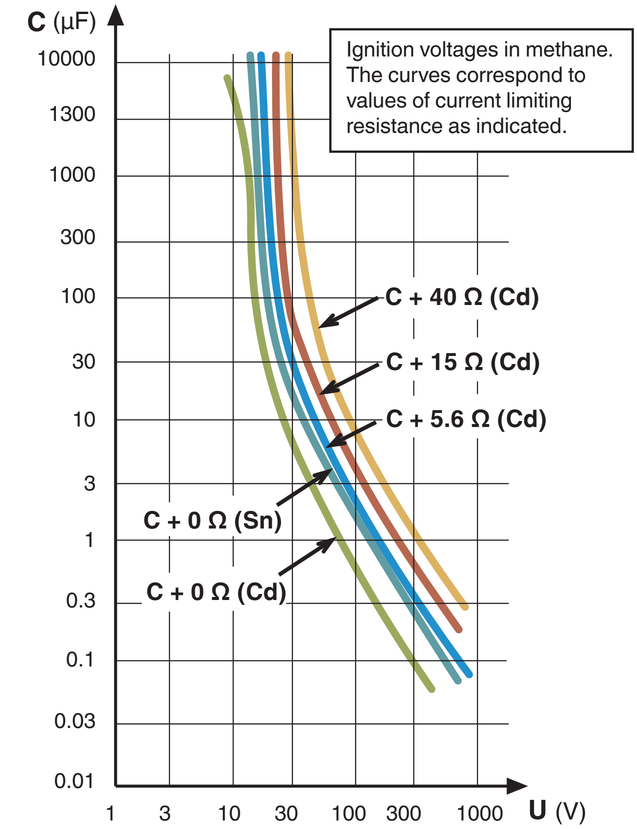

Figure 53 Minimum ignition curves for methane circuits

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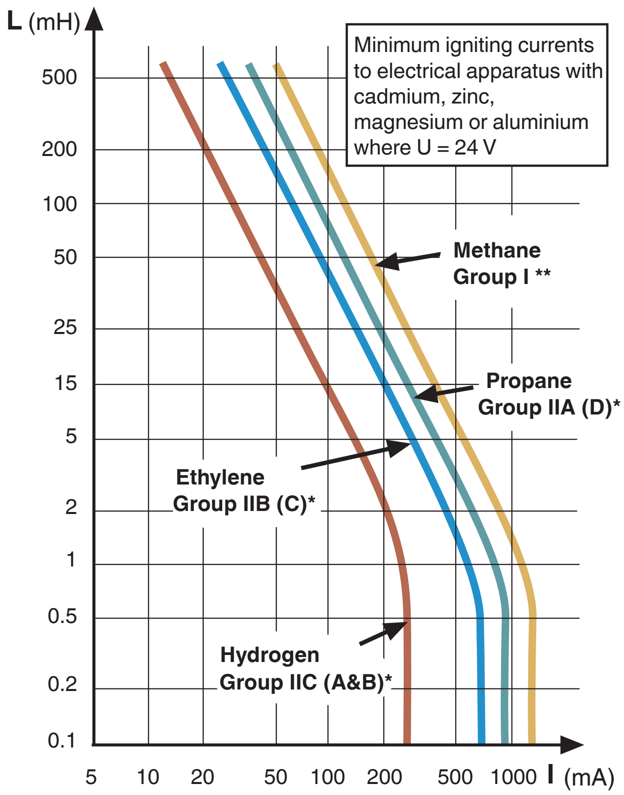

Figure 54 Minimum ignition curves for inductive circuits

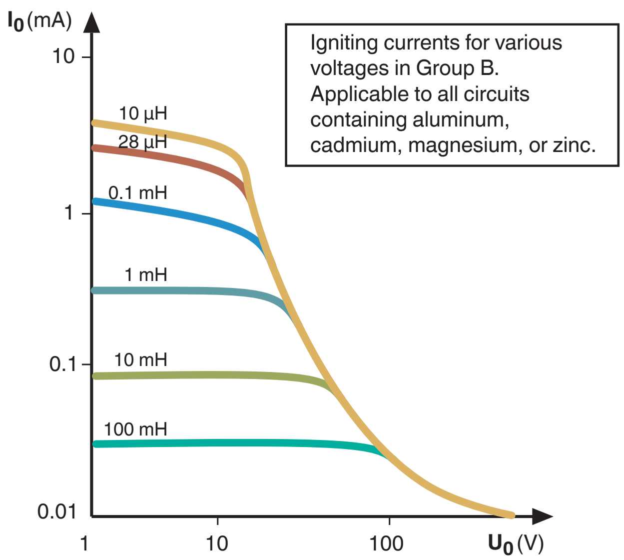

Figure 55 Certification curves showing relationship between inductance and minimum igniting current

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Functional Safety (SIL)

Risk

Risks in General

Risks are part of our daily lives and even the workplace is not free of danger. This makes it all the more important to detect risks to life and limb and wherever possible to exclude the dangers that can arise during production processes for example.

Risks are Subjective

A risk is the probability that a dangerous event will occur multiplied by the resulting consequences. These include consequences in the form of damage to health, as well as the physical damage caused by the incident and the associated costs.

It is impossible to provide absolute protection from risks. There will always be a residual risk that is evaluated on the basis of several factors:

- Country and region
- Social environment
- Legal position
- Incidental costs

The assessment of the residual risk is largely a question of subjective judgment.

Limiting Risks

Risks cannot be totally avoided, however it is possible to limit them efficiently. Under the controlled conditions of an industrial process in particular, a wide range of mechanical and electronic measures is available to reduce the probability of a hazardous incident, thus minimizing the residual risk to an acceptable extent.

To prevent negative impact on personnel, the environment and technical equipment, the first step is to determine the possible risks. Next, suitable protective measures need to be implemented. These measures can be very varied in nature.

- Structural measures
- Measures to spread risk
- Evacuation plans
- Safety-related controllers and protection devices

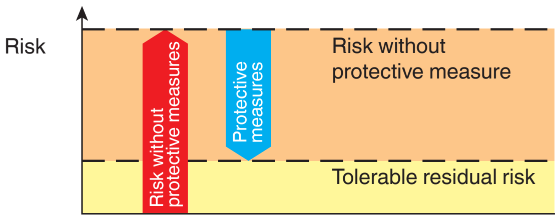

Figure 1 Presenting the risk reduction

Protective Measures on Different Levels

Measures to reduce the residual risk with a production system can be divided into different approaches, also referred to as production levels. These are hierarchical in structure and must each be considered in isolation.

The underlying principle is very simple: if one protective level fails, the next highest level is automatically activated to prevent, or at least limit, possible damage. The following level-based model shows the different types of protection measure and how they relate to each other:

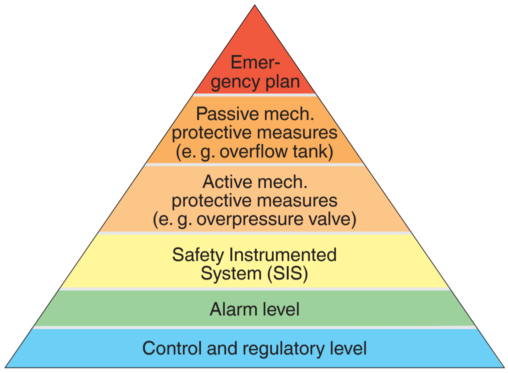

Figure 2 Protection levels on the system

The individual protection levels must operate absolutely independently of each other. Thus, for example, the controller and regulator technology on the lowest level cannot also be used for safety applications on a higher level. The reduction of the existing risk is the result of all measures on the various protection levels. The objective pursued here is to avoid possible damage insofar as possible and to reduce the unavoidable residual risk to an acceptable degree.

Risk Analysis

There are clear criteria for determining the risk associated with a processing system set down in IEC/EN 61511. The risk determined according to these criteria dictates the measures to be taken to reduce the risk. If this risk is limited with the help of installed automation technology, then the components used for this purpose must meet the criteria contained in IEC/EN 61508. Both standards divide the measures to reduce risks into four safety stages, which range from SIL1 for a low-level initial risk to SIL4 for a very high-level initial risk.

The following overview shows the link between the risk parameters and the **S**afety **I**ntegrity **L**evel (SIL) of the **S**afety **I**nstrumented **F**unctions (SIF).

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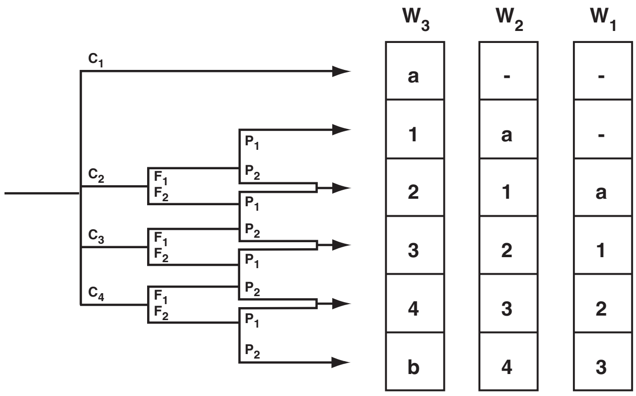
Consequence (severity)
C_1 minor injury or damage
C_2 serious injury or one death, temporary serious damage
C_3 several deaths, long-term damage
C_4 many dead, catastrophic effects

Frequency/exposure time
F_1 rare to quite often
F_2 frequent to continuous

Possibility of avoidance
P_1 avoidance possible
P_2 unavoidable, scarcely possible

Probability of occurrence
W_1 very low, rarely
W_2 low
W_3 high, frequent



1, 2, 3, 4 = Safety integrity level
- = Tolerable risk, no safety requirements
a = No special safety requirements
b = A single E/E/PE is not sufficient

Figure 3 Risk graph

Safety Integrity Level (SIL)

The various parts of a processing system are associated with different risks. However, as a risk increases, the need for the availability of the **S**afety **I**nstrumented **S**ystem (SIS) also increases.

The higher the safety integrity level the greater the risk reduction. This means that the SIL is a measure of the probability that the safety system can meet the required safety functions for a particular period. There are different ways to determine the required SIL or a risk reduction measure (protective function). Standards IEC 61508 and IEC 61511 (sector standard for the process industry derived from IEC 61508) list different methods to determine the SIL.

Low Demand and High Demand Mode

The process industry and production industry have different requirements in relation to the safety system because the applications in these industrial areas are very different. The key distinguishing feature is the demand rate in relation to the safety system. Here a distinction is made between high demand and low demand mode.

Low Demand Mode

Low demand is understood as a mode with a low demand rate for the safety system. This classification requires that the safety system should not be demanded more than once per year.

SIL	PFD	Max. accepted failure of the SIS
SIL1	$> 10^{-2}$ to $< 10^{-1}$	Max. one dangerous failure per 10 requests
SIL2	$> 10^{-3}$ to $< 10^{-2}$	Max. one dangerous failure per 100 requests
SIL3	$> 10^{-4}$ to $< 10^{-3}$	Max. one dangerous failure per 1,000 requests
SIL4	$> 10^{-5}$ to $< 10^{-4}$	Max. one dangerous failure per 10,000 requests

Table 1 Failure limit values for a safety function operated in the Low Demand Mode.

High Demand Mode

This is a mode with a high demand rate or with continuous demand on the safety system. In practice, this means that the security system operates continuously or is demanded more than once per year.

SIL	PFH	Max. accepted failure of the SIS
SIL1	$> 10^{-6} > 10^{-5}$	Max. one dangerous failure per 100,000 hours
SIL2	$> 10^{-7} > 10^{-6}$	Max. one dangerous failure per 1,000,000 hours
SIL3	$> 10^{-8} > 10^{-7}$	Max. one dangerous failure per 10,000,000 hours
SIL4	$> 10^{-9} > 10^{-8}$	Max. one dangerous failure per 100,000,000 hours

Table 2 Failure limit values for a safety function operated in the mode with high or continuous demand rate (High Demand)

High Demand Mode (or continuous mode) is mostly used in production technology. In this case it is often necessary to monitor work processes continuously in order to ensure the safety of personnel and of the environment.

Low Demand Mode (on demand mode) is used in the process industry. Emergency stop systems are a typical example of this, only becoming active when the process runs out of control. This normally occurs less than once per year. This is why high demand mode is meaningless for process instrumentation in most cases.

The following descriptions thus relate solely to low demand systems.

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PFD Value

Details of the SIL or the individual components are not sufficient for planning safety systems. While, in the past, the safety chain was able to reach the requirement grade (AK acc. to DIN 19250) of the weakest component, today the SIL calculations must be carried out on the basis of the probability of failure. PFD (= **P**robability of **F**ailure on **D**emand) is of central significance here. The PFD is the average probability that a safety system will not be available just at the moment when this safety function is required.

Components' PFDs are determined in a complex analytical process, known as the FMEA (**F**ailure on **M**ode and **E**ffect **A**nalysis) in which analysis takes place down to an individual component level to ascertain what happens when a particular failure occurs and to establish whether this can be detected.

In the low demand systems considered here, the dangerous, undetected failure λ_{du} plays a significant role. Such failures are detected during the course of a proof test and eliminated. Inversely, a change to the interval for testing changes the probability of failure when a demand is made. Every driver is familiar with this situation when he takes his car for its two-year road-worthiness test. Naturally, performing this test at annual or semi-annual intervals would increase the safety of the car, but this would also entail higher costs. Sometimes, however, reducing the test interval T_{proof} is the only way to achieve a required SIL. The PFD value is used for allocation to a SIL, among other things.

SFF and HFT

Two other parameters are used to define the safety integrity of the device: the proportion of non-dangerous failures (SFF, **S**afe **F**ailure **F**raction) and the hardware failure tolerance (HFT, **H**ardware **F**ailure **T**olerance).

The SFF value expresses the proportion of non-dangerous failures in relation to the totality of all possible failures. A non-dangerous failure is defined as a failure that is either detected and/or that transfers the system to a safe state.

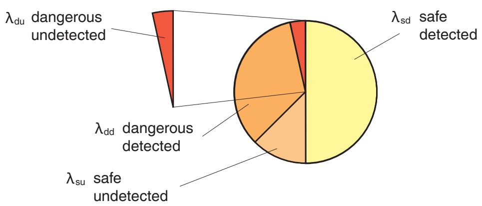

Figure 4 Proportion of non-dangerous failures (SFF)

Thus, for example, an SFF of 90 % indicates that only 10 % of the possible failures in a safety system would result in a dangerous state if they went undetected.

HFT describes the tolerance of a device or system in relation to hardware failures. Systems with no redundancy, in other words in which the safety function is no longer guaranteed if a single failure occurs, have a HFT = 0. With single redundancy the HFT = 1 and with double redundancy the HFT = 2.

The combination of the SFF and HFT parameters yields the SIL of a device. However, a distinction is made between simple devices (type A) in which all failures are known and describable and more complex devices (type B), in which not all failures are known and describable, as is the case with microprocessor systems or software solutions, for example.

Of the two different SILs yielded from the PFD and the combination of SFF and HFT, the lower value is assumed to be the SIL of the device or system.

Simple Devices

	HFT (Hardware Failure Tolerance)		
SFF (Safe Failure Fraction)	0	1	2
< 60 %	SIL1	SIL2	SIL3
60 % ... 90 %	SIL2	SIL3	SIL4
90 % ... 99 %	SIL3	SIL4	SIL4
> 99 %	SIL3	SIL4	SIL4

Table 3 The link between SFF and HFT in simple devices (type A)

Complex Devices

	HFT (Hardware Failure Tolerance)		
SFF (Safe Failure Fraction)	0	1	2
< 60 %	-	SIL1	SIL2
60 % ... 90 %	SIL1	SIL2	SIL3
90 % ... 99 %	SIL2	SIL3	SIL4
> 99 %	SIL3	SIL4	SIL4

Table 4 The link between SFF and HFT in more complex devices (type B)

Failure Types

In the case of a safety instrumented system (SIS), a distinction is made between systematic and random failures. In order to meet the required SIL criteria, both failure types must be analyzed separately.

Random Failures

Random failures are all failures that occur at random during operation and that are triggered by hardware defects. Such failures do not already exist at the time of delivery and may be the result of a short circuit, interruption, component movement, etc. Their probability and the associated failure rate can be calculated. The various hardware components of a SIS are analyzed separately and the PFD is calculated from the individual λ values; the PFD is in turn used to determine the SIL value.

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Systematic Failures

Unlike random failures, systematic failures already exist upon delivery and are characteristic of every individual device or system. They typically involve development errors, installation errors or errors during planning, for example software errors, incorrect dimensioning, incorrect configuration of the measuring instrument, etc.

The majority of systematic failures can be traced back to errors in the device software. The fundamental issue with systematic software errors is that programming errors can also lead to errors in the process. Systematic failures must, therefore be avoided when designing the SIS by taking particular steps. This is the purpose of a quality management system that constitutes a key component of EN 61508/61511. Thus, device manufacturers must provide details of SIL classification in relation to systematic failures. This information is generally contained in the declarations of conformity for the individual devices.

Depending on the SIL, the information is provided through certification by external, impartial organizations (TÜV, Exida). If the requirements for a particular SIL (e. g., SIL3) are to be met in relation to the systematic failure, the entire safety instrumented system (SIS) must be considered accordingly.

Common Cause Failures

So-called common cause failures are special systematic failures. This category includes all failures that apply simultaneously to all the components of a safety instrumented system (SIS) and are mostly caused by external influences, such as electromagnetic malfunctions (EMC), temperature, or mechanical stress. In order to cater for such failures, the standard places specific quality requirements on the development process, the change process and the hardware and software architecture of the device.

Depending on the measures implemented, you will get a larger or smaller percentage of common cause failures. This is specified as a beta factor.

Diverse Redundancy in the Case of Systematic Failures

It is also possible to use SIL2 components for SIL3 protective functions if measures have been taken that do not leave a systematic failure at SIL2 level. For example, if SIL2 pressure sensors are to be used in a SIL3 level safety instrumented system (SIS), it must be ensured that different device software is used. This can be achieved by using two different devices, for example. Diverse redundancy certainly exists if different technologies are used instead of different devices, for example with a pressure sensor and temperature sensor.

Error Distribution in the Safety Instrumented System (SIS)

A safety instrumented system (SIS) consists of several linked components all of which are part of the safety instrumented function (SIF). The PFD value derived from the SIL evaluation is distributed among all these relevant components, depending on the failure risk.

The sensors and actuators generally feature the highest risk of failure because they are installed in the field and are subject to chemical and physical stresses from external influences, such as process medium, pressure and temperature. Thus, 25 % of the entire PFD is set aside for sensors and 40 % for actuators. The fail-safe controller has a 15 % PFD share. The PFD value for the interface modules is assigned to the sensor or actuator circuit with 10 % each. However, the numeric values assumed here can vary depending on the application.

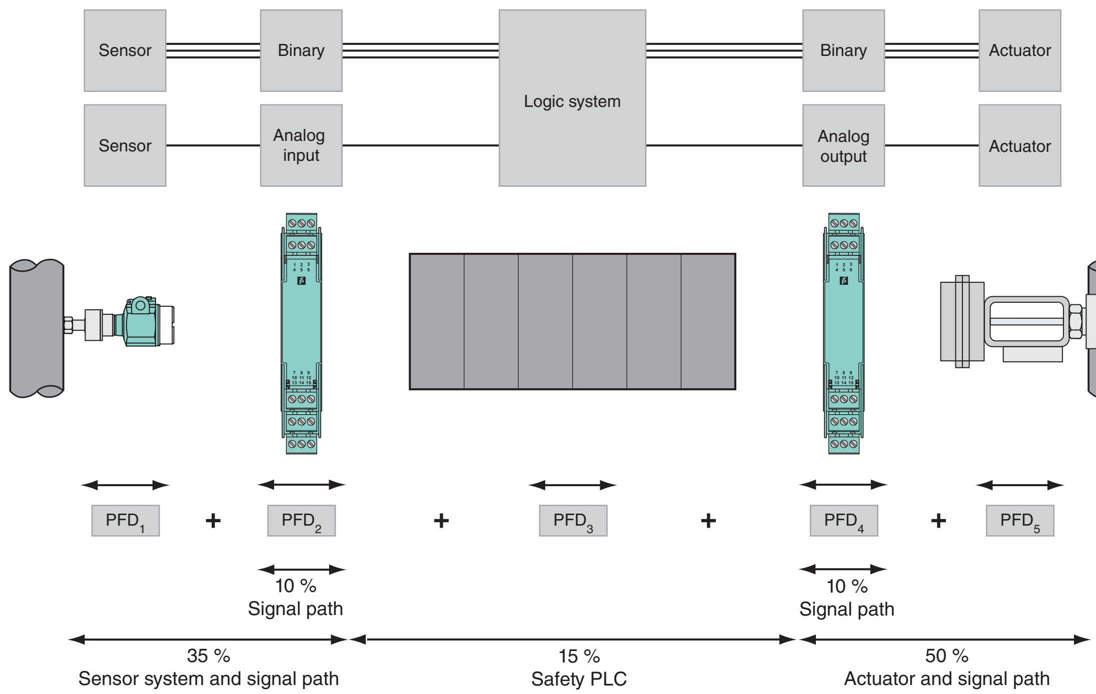

Figure 5 Error distribution in the safety instrumented system (SIS)

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Measures to increase the SIL of a Safety System

Reducing Test Intervals

In low demand safety systems, the test intervals T_{proof} are incorporated in the result in an almost linear pattern. Thus, reducing the testing intervals can increase the SIL. However, the increased frequency of testing also pushes up costs.

Configuring Redundancies

The redundancy used here can play a decisive role in improving the SIL. For example, we refer to 1oo2 (**1 o**ut **o**f **2**) or 2oo3 (**2 o**ut **of 3**) redundancies. If, for example, temperature is measured, a second, redundant measuring transmitter of the same type will reduce the likelihood of failure. However, this leads to the possibility that the two measuring transmitters will fail due to a common cause failure when they are under a shared load. This might be a systematic error in the measuring transmitter software that affects both devices at the same moment, for example when a certain measurement result occurs.

Redundant layout, 2-channel
with two identical devices

Figure 6 Configuring 2-channel redundancy

The most effective option is thus so-called diverse redundancies, which operate with different measuring devices and methods.

In such diverse redundancies, measuring transmitters from different manufacturers are used, possibly even with different measuring techniques. This reduces the probability of common cause failures. This also means that the beta factor is reduced.

Configure diverse redundancy

Two different devices
(this is to ensure that a systematic
fault cannot occur simultaneously)

Two different technologies

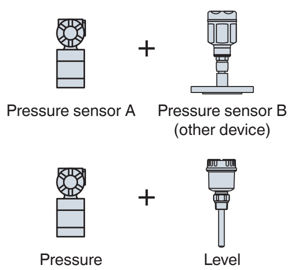

Figure 7 Configuring diverse redundancy

Questions about SIL

What is the Purpose of SIL Devices?

For manufacturers and users, the standard represents a common basis for monitoring the effectiveness of their development processes for example. For users, the decision in favor of devices with SIL certification from the manufacturer has the advantage that the relevant SIL will very probably be attained for their safety instrumented function (SIF). This makes it much easier for system operators to provide proof of risk reduction, as required by law in order to obtain permission to operate their systems.

It is not absolutely essential that products that already have SIL classification from the manufacturer should be used. However, this makes certification much easier because the risk of failure is already known for these products.

Is there any Advantage in having the highest possible SIL?

System operators are required to provide proof of the safety of their systems. The determination of the risk posed by a particular production system results in the demand for a particular SIL from a protective device. For cost reasons, system operators aim for the lowest possible SIL. However this not only yields a cost benefit, but also a much greater choice of devices. A high SIL is only necessary if it is unavoidable or if this would produce a cost benefit elsewhere, so that additional costs can be avoided (e. g., the avoidance of complex additional construction measures).

Which Devices are suitable for which SIL?

To achieve a particular SIL (SIL1 to SIL4), the entire safety instrumented system (SIS) must meet the requirements in relation to systematic failures (in particular in the area of software) and random failures (in the area of the hardware). This means that the result of the calculation of the entire safety instrumented system must meet the required SIL. In practice, this mainly depends on the conceptual design of the system or of a particular process circuit. Thus, it may be possible to use SIL2 devices in a safety instrumented system requiring SIL3 because it is often less expensive to use two SIL2 devices than a single SIL3 device.

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Is Redundancy still absolutely necessary with Devices with a higher SIL Classification?

Although it is theoretically possible to drop redundancy in this case, this is usually rejected by NAMUR*. This also makes sense in relation to field devices in particular because these usually come into direct contact with process media, resulting in risks that are difficult to calculate. In addition, just one device class is required that meets the requirements of SIL2.

These SIL2 devices are used both for protective devices and operational devices. SIL3 circuits should not be instrumented with a 1-channel with SIL3 devices, but rather with two SIL2 devices using 1oo2 redundancy. This permits uniform inventory management and limits the training required by service technicians to just a small number of devices.

SIL in Process Automation

Isolated Barriers and Zener Barriers

A variety of different solutions is possible in conjunction with intrinsically safe components and systems. The classic answer is direct point-to-point connections with Zener Barriers or isolated barriers. Zener Barriers act as simple, passive networks and are the simplest solution. However, circuits with Zener Barriers entail functional risks due to the longitudinal resistance and the ground connection of the equipotential bonding. That's why galvanic isolated barriers have been the preferred solution for some years now. The parameters required for planning purposes, such as PFD or testing intervals T_{proof} are documented in the relevant test reports or safety manuals.

However, the use of isolated barriers can cause a problem when configuring the safety chain. Because both the sensor circuit and actuator circuit contain another element, the PFD or the safety chain are incremented by these values. It is, therefore, advisable that an isolated barrier that can be used for safety circuits should take up a maximum of 10 % of the entire PFD value available for the required safety integrity level. Thus, for example, while a PFD value of 5×10^{-3} is sufficient for a SIL2, the corresponding isolating interface should "use" a maximum of 5×10^{-4}. If this is not possible or if there is no corresponding isolating interface available, the only alternative is redundancy as described above.

* NAMUR is an association that represents users of automation technology in the process industry.

SIL and HART Communication

Special HART management systems are available for evaluating the HART data; these enable the HART signals to be gathered, loaded and evaluated by means of a HART Multiplexer. Because the HART Multiplexer intervenes in the safety circuit and could falsify the relevant analog process signals, it must naturally also have a SIL evaluation. The SIL evaluation of the HART Multiplexers does not include the use of the HART information for checking the safety chain, but rather the certification that it has no safety-related influence on the analog signal.

Summary

The aim of every safety concept is to reduce the risk appropriately. The use of standard structures means that less planning and certification effort is required when implementing process control protection equipment. On the other hand, there is enough freedom to enable the optimum configuration of protection equipment in terms of function and cost using the benefits of the quantitative approach of IEC 61511. This concept has proven very effective in large chemicals businesses in recent years.

IEC 61511 has proven itself an excellent, practical tool. One of the main advantages for globally active businesses in particular lies in its worldwide applicability and the associated uniform evaluation benchmarks for process control protection equipment.

SIL levels 1 and 4 are not used in large chemical businesses. SIL4 is defined in IEC 61511-1 as the highest possible value that can be achieved using process control resources.

However, it should be pointed out at the same time that, with such a high value, the relevant process should be checked and/or mechanical protection equipment should be used before installing process control protection equipment.

For SIL3 circuits, IEC 61511 requires a hardware tolerance (HFT) of 1. This should prevent 1-channel protective circuits from being planned and implemented on the basis of dubious λ_{du} values, particularly at higher risks. This requirement largely corresponds to the previous national procedure for configuring low risk protective functions (< SIL3) with 1-channel and higher risk protection functions (SIL3) with multiple channels.

Because of the small proportion, representing less than 1 % of all process control functions, the demand for field devices for use in SIL3 protection circuits is low. Consequently, it could prove worthwhile developing special devices with SIL3 according to IEC 61508 for use in protection equipment, particularly for special applications. However, because of a lack of experience with non-safety applications, the additional storage capacity needed for spare devices and, not least, because of the necessarily high prices, such special devices are not necessarily the optimum solution.

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Pepperl+Fuchs and SIL

What are the Advantages of Pepperl+Fuchs Devices?

- Standard range devices
- No added cost for users
- No changes to approval values
- Uniform certificates of intrinsic safety
- Uniform device documentation
- Simple stores and spares inventory
- Excellent worldwide parts availability
- Easy planning and commissioning
- Tried-and-tested devices

Information on SIL Values

The SIL evaluations for Pepperl+Fuchs devices can be downloaded from the Internet free of charge either as a full version (15 to 20 pages), or as a management summary (2 pages) (www.pepperl-fuchs.com/selector/index.html).

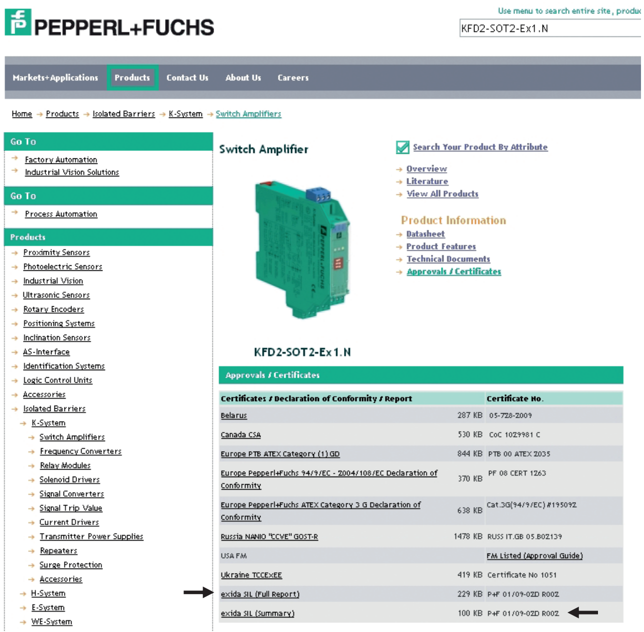

Figure 8 *All Pepperl+Fuchs devices with SIL evaluation are devices from the standard range.*

Technology
Basic Principles
Ex Protection Intrinsic Safety
Functional Safety
Applications

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Applications and Practical Solutions

Introduction

Intrinsically safe isolated barriers and signal conditioners for non-intrinsically safe applications form the core of the Pepperl+Fuchs product portfolio. We have the largest selection of products for the protection of electrical signals in hazardous (explosive) areas. To simplify the choice of the right intrinsic safe barrier for your application, this section contains an overview of common applications in hazardous areas using isolated barriers and non-Ex applications using signal conditioners.

By far the most widely used isolated modules are the flexible K-System modules which install on DIN mounting rail. However, our compact and highly flexible Termination Board style H-System solution offers exactly the same features. These product lines include more than 200 different functional options to satisfy the needs of modern manufacturing facilities and process automation requirements. The unique design permits simple additions to be made without requiring additional wiring and can be set up to handle various power supply concepts.

The K-System and H-System components meet the requirements of SIL according to IEC 61508, ensuring that international security standards for systems and processes can be met. The majority of these isolated modules can be used in SIL2 applications according to IEC 61508. In situations where they are installed in a redundant structure or appropriate safety sensors are used, they can also be employed in SIL3 applications.

Zener Barriers are currently the most economical solution for safety applications in hazardous areas. There are more than 75 versions of our Z-System and SB-System Zener Barriers available to support your intrinsically safe application. Some Zener Barriers have replaceable back-up fuses so that the barrier no longer has to be disconnected, detached or disposed of when a fault occurs. SB-System Zener Barriers are small devices that are mounted on a Termination Board. The barriers also feature replaceable back-up fuses for ease of integration and flexible configuring.

Representation of the Device Application

The field level is colored blue if field devices in both the hazardous area and the safe area can be connected to the isolated modules. In this case, the non-Ex applications are only listed in the table, they are not shown.

The field level will not be colored if only field devices in the safe area can be connected.

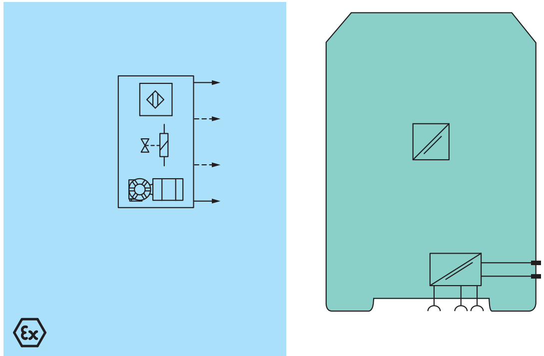

Figure 1

These examples are not comprehensive. Only some of the possible solutions are shown. The numerous other options include special features, voltage sources and channel configurations.

Refer to the fundamentals chapter of this technology section for more information about signal types. Details about the interface modules shown can be found in the appropriate data sheets.

Representation of the Device Variants

AC versions for a large number of the K-System devices are available. These can be ordered using model number KFA5-***-***.*.** (115 V AC), KFA6-***-***.*.** (230 V AC) or KFU8-***-***.*.** (AC/DC wide range power supply). Collective error message and Power Rail connection features are not available for these AC versions. These versions can be found in the selection tables, the function index and the type index.

Z-System Zener Barriers that are equipped with replaceable back-up fuses have an "F" at the end of the model number.

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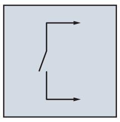
Digital Input Signals

Many applications use mechanical contacts, 3-wire sensors or NAMUR sensors to detect the position of moving parts, valve movements, counters and door positions. The special applications include locking relays for pumps and standstill monitoring. In addition, special isolated modules can be used to equip rotating machines, turbines and transmissions, which generally require frequency-based measurements. Conductive sensors are used to measure levels and to measure switching points after the electrodes have been triggered.

Solutions for Isolated Modules

The galvanically isolated modules illustrated below are fitted with an amplifier that transfers digital input signals from the field side to the control side. These input signals use a relay contact or transistor output to initiate a switching command on the output of the switch amplifier.

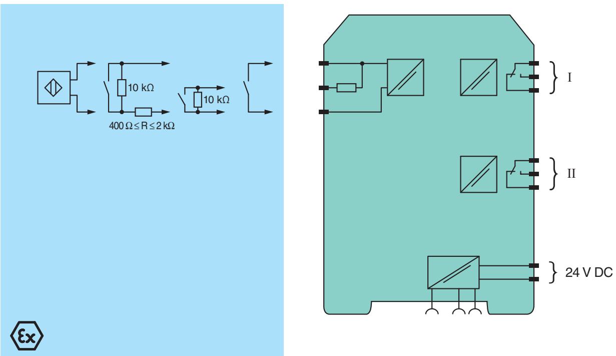
Switch Amplifier with Relay Output



Switch amplifiers evaluate the field signals from NAMUR sensors, 3-wire sensors or mechanical contacts. Relay contacts are located on the output side connected to the controller.

In the case of 1-channel switch amplifiers (as in Figure 2), a sensor signal is split between two outputs (known as signal splitting). The separate relay outputs can be used to initiate a wide range of control signals (e. g. for DCS, PLC or ESD).

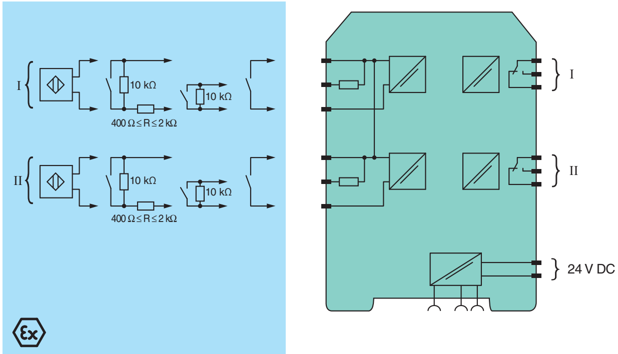
Depending on the type of housing style, the H-System and K-System will have change-over contacts or NO relay contacts.



K-System	KCD2-SR-1.LB
K-System	KCD2-SR-Ex1.LB
K-System	KFD2-SR2-Ex1.W.LB
H-System	HiC2821
H-System	HiD2821

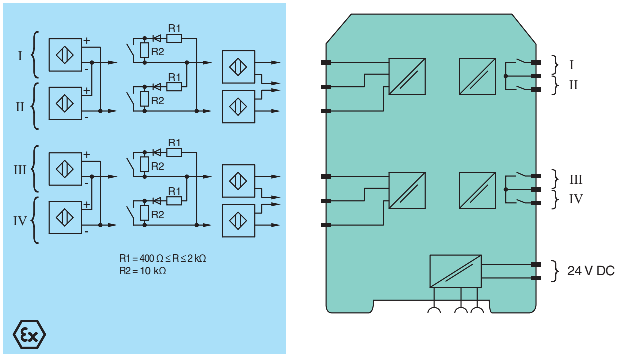
Figure 2

Multi-channel switch amplifiers are available for multi-channel, isolated signal transmissions (see Figure 3 and Figure 4). The KFD2-SRA-Ex4 and HiD2824 devices shown in Figure 4 are 4-channel isolated barriers that can be used in applications where space is limited. The K-System barrier employs a special 2:1 wiring technology that reduces the field wiring by up to 50 %. Most Pepperl+Fuchs NAMUR proximity sensors can be connected as shown in the block diagram. Additional wiring will be required, however, if switch contacts are used. The F-KD-Ex2/F-KDR-Ex2 terminal module can be used if the 2:1 wiring technology is activated in KFD2-SRA-Ex4. The H-System barriers do not have this feature.



K-System	KCD2-SR-2
K-System	KCD2-SR-Ex2
K-System	KFD2-SR2-Ex2.W
H-System	HiC2822
H-System	HiD2822

Figure 3



K-System	KFD2-SRA-Ex4
H-System	HiD2824

Figure 4

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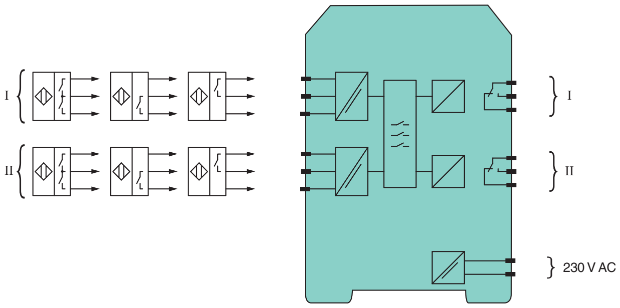
3-wire sensors are employed in non-intrinsically safe applications. Signal conditioners provide them with power. Figure 5 shows a 2-channel switch amplifier for supplying the 3-wire sensors. A 1-channel variant is also available that allows the ON characteristic of the relay to be delayed.

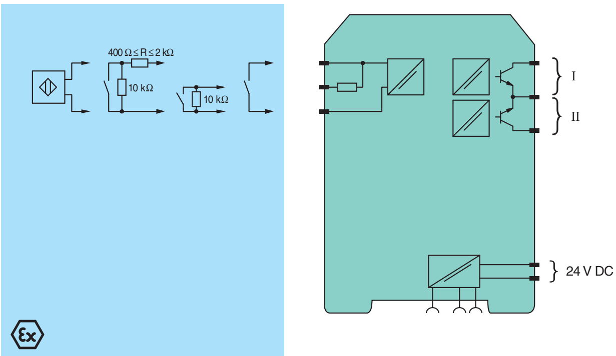


K-System	KFU8-SR-1.3L.V
K-System	KFA6-SR-2.3L

Figure 5

Switch Amplifier with Transistor Output

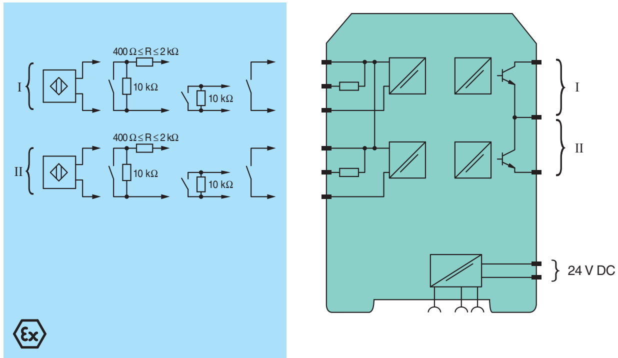
Switch amplifiers equipped with passive or active transistor outputs are available for applications using high-speed signals. Figure 6 shows a 1-channel isolated barrier whose input is split into two separate outputs. One of the outputs can be configured as a fault output if required.



K-System	KFD2-SOT2-Ex1.LB
H-System	HiC2821

Figure 6

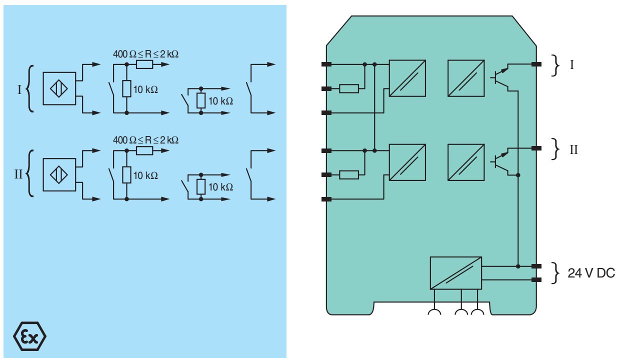
This figure shows how a switch amplifier can be connected when passive transistor outputs are required in a 2-channel barrier.



K-System	KFD2-SOT2-Ex2
H-System	HiC2842
H-System	HiD2842

Figure 7

If active transistor outputs are required, the KFD2-ST2-Ex2 isolated barrier, as illustrated in the configuration shown below, can be used. A separate, active transistor is provided for each channel.



K-System	KFD2-ST2-Ex2

Figure 8

Technology
Basic Principles
Ex Protection Intrinsic Safety
Functional Safety
Applications

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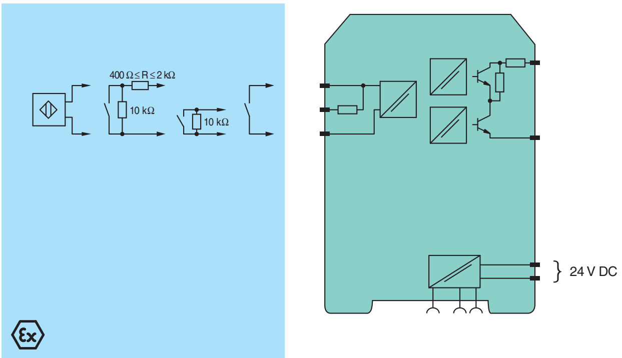
Switch Amplifier with Line Fault Transparency

Figure 9 illustrates how a digital input from a NAMUR proximity sensor or switch contact can be repeated or converted into a simulated NAMUR output in the safe area. This type of barrier is appropriate if the control system accepts NAMUR inputs or if analog I/O cards are used.



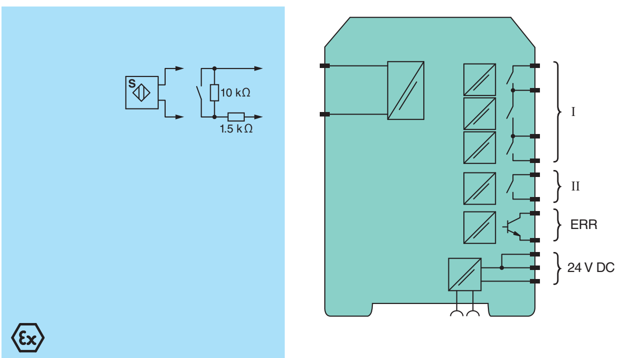
K-System	KFD2-SOT2-Ex1.N

Figure 9

Switch Amplifier for Safety Sensors

For applications requiring the highest level of safety, Pepperl+Fuchs offers a special range of switch amplifiers that can be used in conjunction with safety proximity sensors or switch contacts that have been certified for the application in question. Where proximity sensors are involved, NAMUR sensors from Pepperl+Fuchs with the designation SN or SN1 must be used. If a switch contact is used, resistors must be installed in series or in parallel to the contact. All the isolated barriers shown below provide a safety function for a particular set of output terminals.

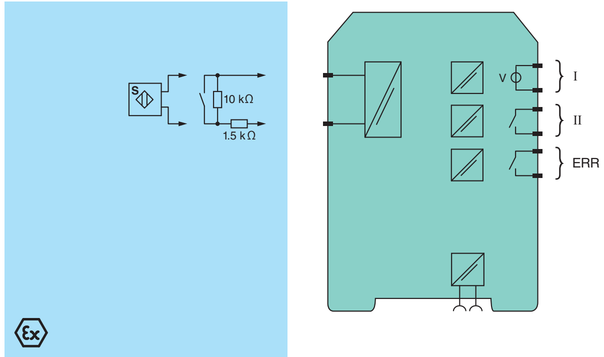
The KFD2-SH-Ex1 barrier in Figure 10 is used for applications that require a relay contact as a safety output. Three NO relay contacts are connected in series to ensure safe operation in connection with the control or ESD system.



K-System	KFD2-SH-Ex1

Figure 10

The following barrier configuration is used if a safe current output is required. The illustration shows a 24 V DC voltage source with a safety output, a separate NO relay contact and a fault signal output.

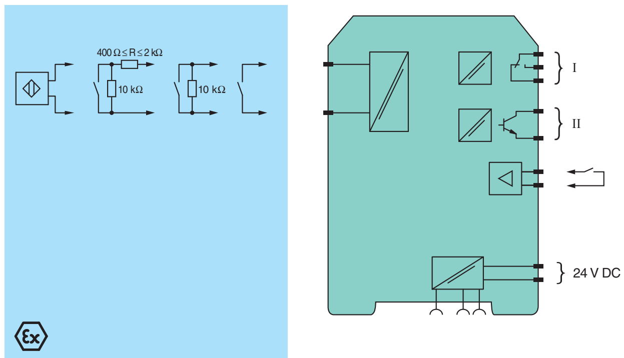


K-System	KFD2-SH-Ex1.T.OP
H-System	HiC2851

Figure 11

Switch Amplifier with Time Response

The galvanically isolated KFD2-DU-Ex1.D timer relay has a display to facilitate on-site programming and is typically used in applications where the signal processing requires On/Off delays.



K-System	KFD2-DU-Ex1.D

Figure 12

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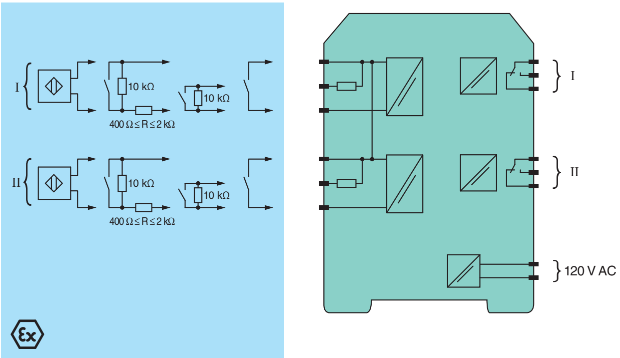
Switch Amplifier with Interval Function

The galvanically isolated switch amplifier shown in Figure 13 provides a latching function so it can be used as a two-stage controller. To preserve the stages of a process between two switching points, this barrier can be programmed to handle pump applications in both directions.

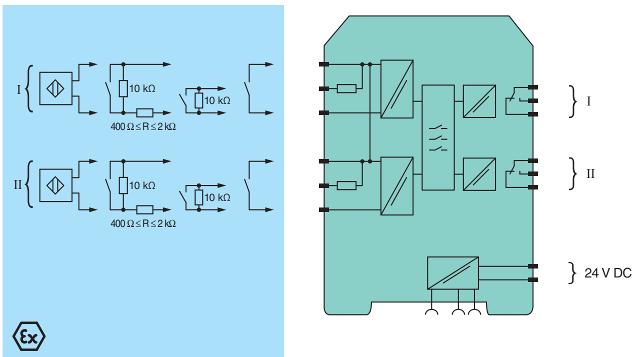


K-System	KFA5-SR2-Ex2.W.IR
K-System	KFA6-SR2-Ex2.W.IR

Figure 13

Standstill and Rotational Speed Monitoring

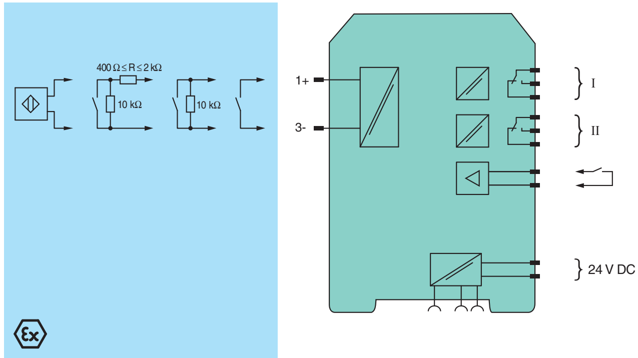
The isolated module shown in Figure 14 is utilized in applications that use standstill and rotational speed monitoring. The device has two inputs for either NAMUR sensors or mechanical contacts. The second input is used for either detecting the direction of rotation or, in the case of standstill monitoring, the start-up override.



K-System	KFD2-SR2-2.W.SM
K-System	KFD2-SR2-Ex2.W.SM

Figure 14

It is often necessary to determine whether a process is under or over speed. Rotational speed monitors with relay outputs and start-up override are available for this purpose.

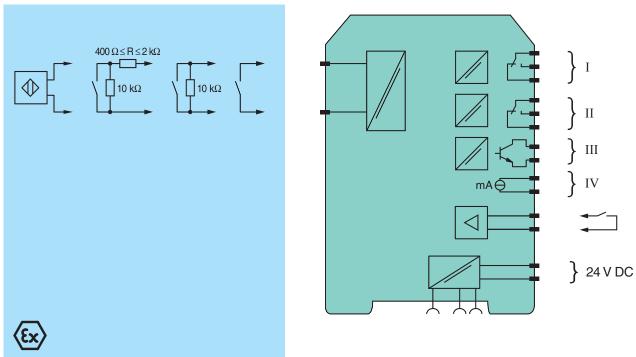


K-System	KFD2-DWB-1.D
K-System	KFD2-DWB-Ex1.D

Figure 15

Frequency Converter

This multifunctional device is configured locally using a display and operating panel. It converts the signals from a NAMUR sensor, 3-wire sensors or a mechanical contact into a 0/4 mA to 20 mA output signal or trip value. A pulse divider function is also included.



K-System	KFD2-UFC-1.D
K-System	KFD2-UFC-Ex1.D

Figure 16

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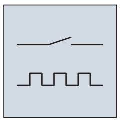
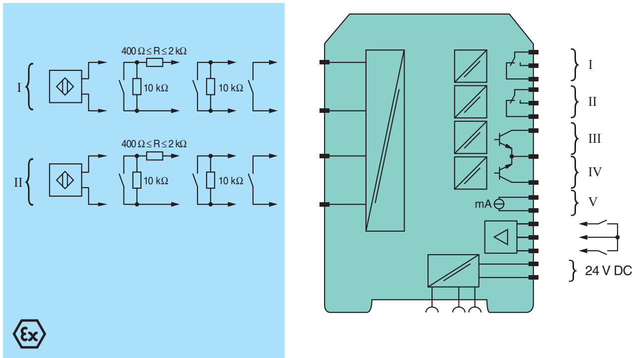
Direction of Rotation and Slip Monitoring



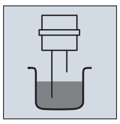
This device has a display and operating panel for local programming and is used when the direction of rotation needs to be recorded or slip/synchronization needs to be monitored. This device also has a frequency to 0/4 mA to 20 mA converter.



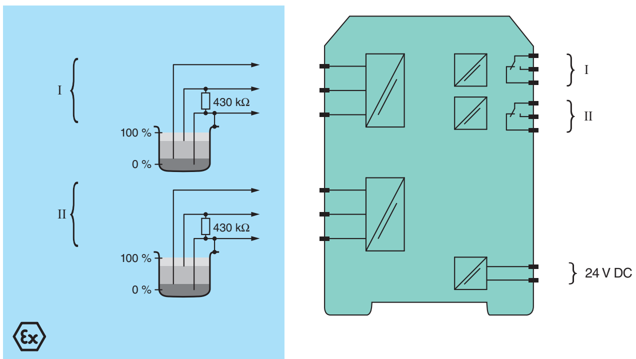
K-System	KFD2-UFT-2.D
K-System	KFD2-UFT-Ex2.D

Figure 17

Conductive Switch Amplifier



Up to three electrodes can be connected to this isolated module. A switching signal is emitted as soon as the electrodes are covered by the medium. Conductive switch amplifiers have one relay for min./max. controls or two relays for two switching points.

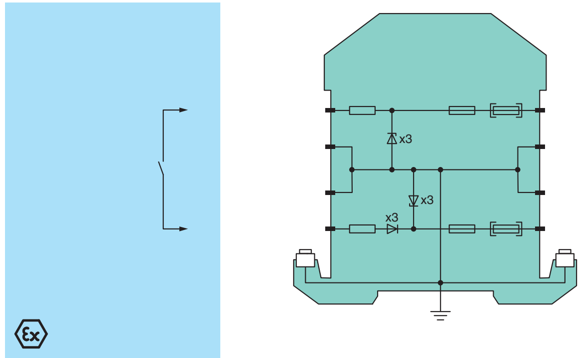


K-System	KFD2-ER-*.*.**
K-System	KFD2-ER-Ex1.W.LB

Figure 18

Solutions with Zener Barriers

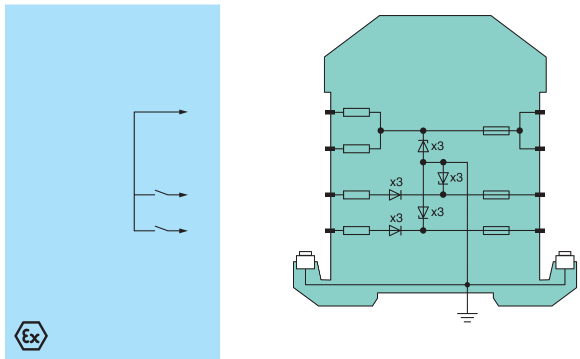
The following illustration shows a standard way of transmitting the switch status using Zener Barriers. Zener Barriers in what is effectively a non-grounded configuration enable both power supply terminals to be operated under load.



Z-System	Z787.*
SB-System	SB1787

Figure 19

This figure illustrates an alternative method of providing several channels in an effectively non-grounded configuration. The first channel of Zener Barrier Z789 is used for the field supply, while the channel with the diode return is isolated from ground.



Z-System	Z789

Figure 20

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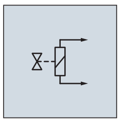
Digital Output Signals

Solenoids, LEDs and Alarms

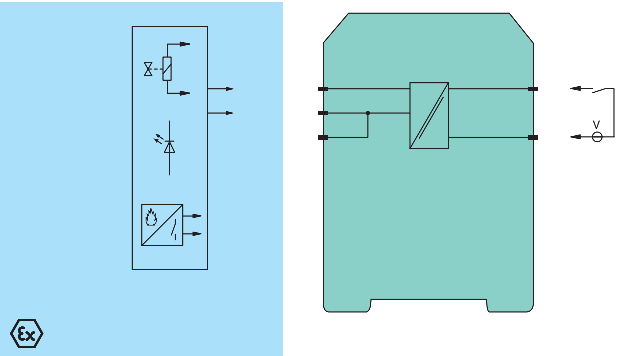


Many applications for automatic machines and processes encompass both basic On/Off functions and very complex processes. Solenoids are often used if the process involves linear or rotational movements. LEDs and alarms are used if simple identification or acoustic/optical signals are required.

Solutions for Isolated Modules

Loop Powered Solenoid Driver

The following solenoid driver modules provide the power required to supply digital output instruments, such as solenoids, displays and alarms. An external power supply is not required in this case, as the field device is supplied from the input signal. 2-channel solenoid drivers are also available.

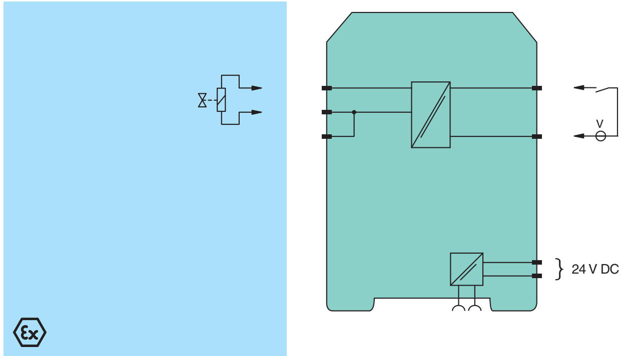


K-System	KCD0-SD-Ex1.1245
K-System	KFD0-SD2-Ex1.1045
K-System	KFD0-SD2-Ex2.1045
K-System	KFD0-SD2-Ex2.1245
H-System	HiC2871
H-System	HiD2871
H-System	HiD2872

Figure 21

Solenoid Driver with Logic Input

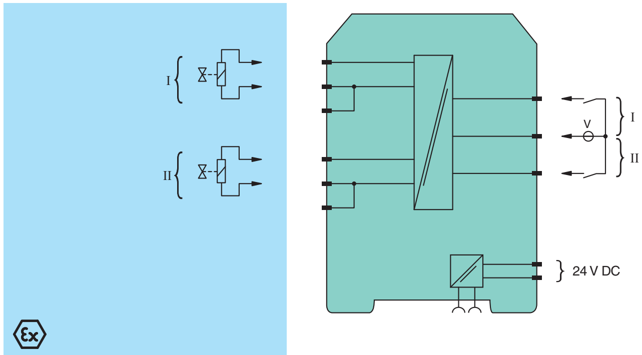
This 1-channel solenoid driver allows a load in a hazardous area to be supplied and can be activated and deactivated using a signal from a logical circuit. It also permits line fault detection and collective error messages. These barriers are suitable for SIL2 applications according to IEC 61508.



K-System	KFD2-SL2-Ex1
K-System	KFD2-SL2-Ex1.B
K-System	KFD2-SL2-Ex1.LK
H-System	HiD2871

Figure 22

This 2-channel solenoid driver allows a load in a hazardous area to be supplied and can be activated and deactivated with a signal from a logic circuit. It also permits line fault detection and collective error messages. These barriers are suitable for SIL2 applications according to IEC 61508.



K-System	KFD2-SL2-Ex2
K-System	KFD2-SL2-Ex2.B
H-System	HiD2872

Figure 23

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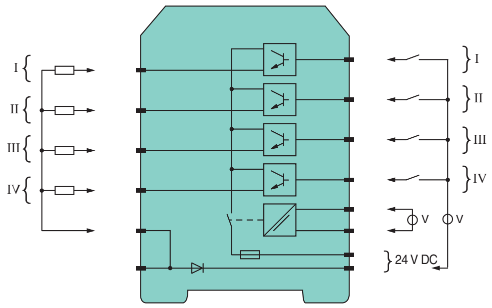
This 4-channel solenoid driver allows a load to be supplied and can be activated and deactivated with a signal from a logic circuit. The device also permits line fault detection and collective error messages. This signal conditioner is suitable for SIL2 applications according to IEC 61508.

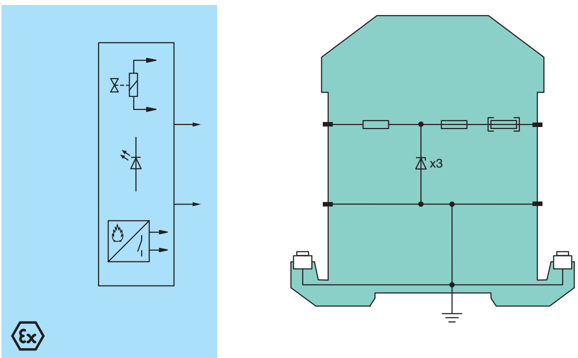


K-System	KFD2-SL-4

Figure 24

Solutions with Zener Barriers

The figure below shows the standard method of activating solenoids, displays and acoustic and optical alarms in hazardous areas. In this configuration, the control switch must be located in the supply line.



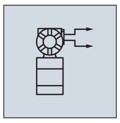
Z-System	Z728.*
SB-System	SB0728

Figure 25

Note: *The alternative use of Z779.* or SB0779 Zener Barriers with two channels lowers costs and reduces the space required for DIN mounting rails.*

Analog Input Signals

Transmitters

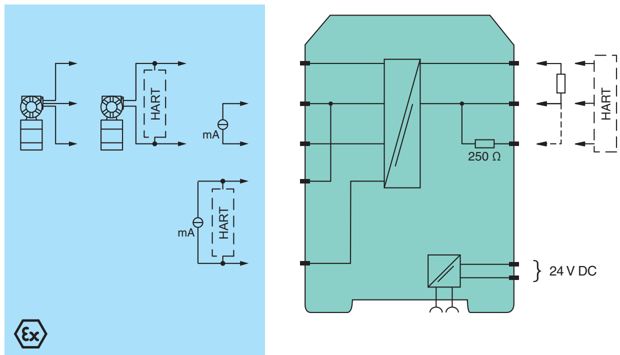


In the case of applications that require an electrical signal proportionate to a measured value (e. g. temperature, pressure or flow), a transmitter can supply the relevant 0/4 mA to 20 mA signals. These transmitters, known as SMART transmitters, can also utilize a superimposed signal to transmit other important process information

Solutions for Isolated Modules

Transmitter Power Supply

The following block diagrams show the SMART transmitter power supplies from Pepperl+Fuchs. This device group provides galvanic isolation and the SMART transmission between the field side and the control side, while at the same time supplying the power required by 2-wire SMART transmitters. Field devices from almost every manufacturer have been successfully tested with Pepperl+Fuchs isolated modules. Transmitters with an active current signal can also be connected. These devices have a transmission accuracy of ≤ 20 µA.



K-System	KCD2-STC-Ex1
K-System	KFD2-STC4-Ex1
K-System	KFD2-STC4-1

Figure 26

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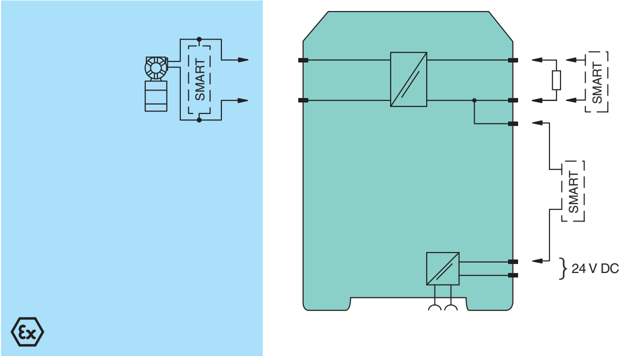
The KFD2-STC3-Ex1 connection configuration in Figure 27 shows a device for applications using high-speed SMART communications at up to 40 kHz.

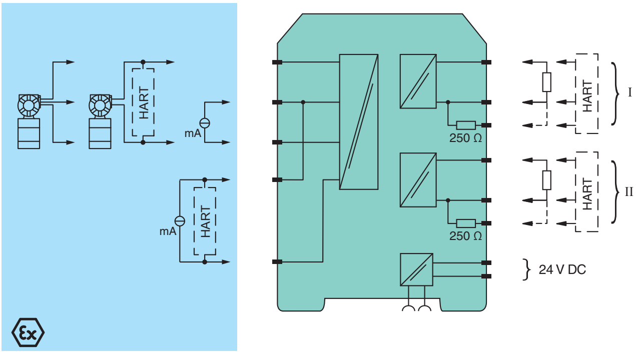


K-System	KFD2-STC3-Ex1

Figure 27

Transmitter Power Supply with two Outputs

This diagram shows a galvanically isolated transmitter power supply, as in Figure 26. In this case, however, the device has two separate outputs (signal splitting).

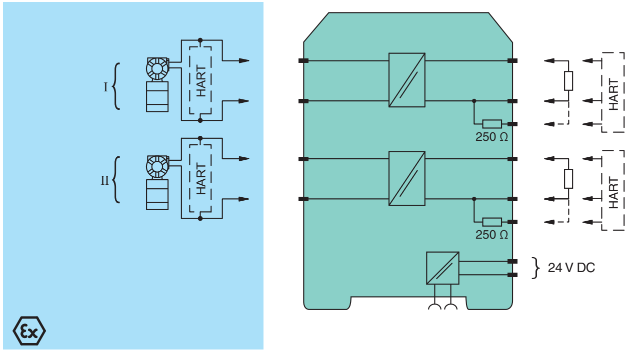


K-System	KFD2-STC4-1.2O
K-System	KFD2-STC4-Ex1.2O
H-System	HiD2030

Figure 28

2-Channel Transmitter Power Supply

This 2-channel transmitter power supply provides galvanic isolation between both channels. The device supplies power to a 2-wire transmitter and transfers the 4 mA to 20 mA analog signal to the controller.

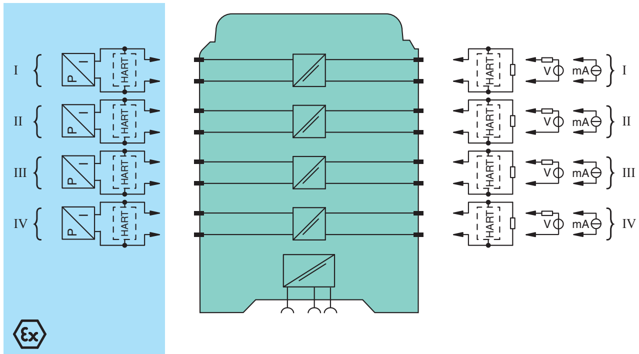


K-System	KFD2-STC4-2
K-System	KFD2-STC4-Ex2
H-System	HiD2030

Figure 29

4-Channel Transmitter Power Supply

This galvanically isolated 4-channel device supplies power to up to four 2-wire transmitters in the hazardous area and transmits the 4 mA to 20 mA analog signal to the safe area. Each of these 4 channels can also be used as an analog output.



H-System	HiD2024

Figure 30

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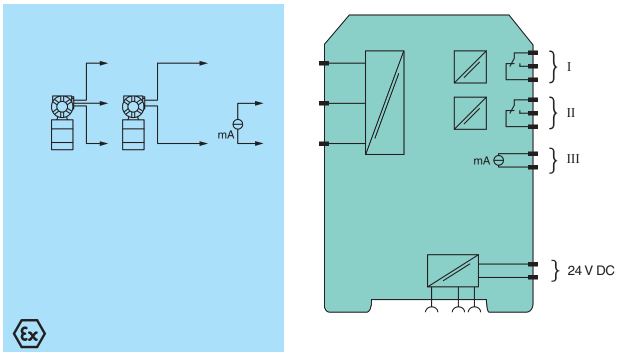
Transmitter Power Supply with Trip Values

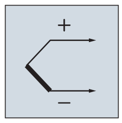
This device is a galvanically isolated transmitter power supply for a 2-wire or 3-wire transmitter or a 2-wire current source. It not only repeats the signal with 0/4 mA to 20 mA, but also offers two programmable relay outputs. Line fault detection and collective error messages are also available.



K-System	KFD2-CRG2-1.D
K-System	KFD2-CRG2-Ex1.D

Figure 31

Thermocouples

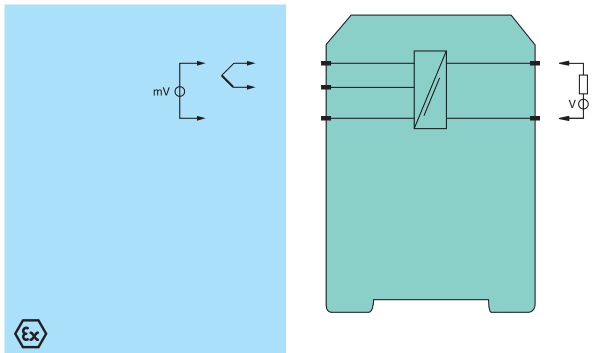


In certain applications, the temperature and resistance of thermocouples are recorded. These devices supply important feedback for turbine processes.

Solutions for Isolated Modules

Loop Powered Thermocouple Transmitter

The converter is galvanically isolated and offers a 4 mA to 20 mA output for several thermocouple inputs. This barrier also offers a lead breakage monitoring feature that can configured to fail high or fail low. The device also has potentiometers for setting the zero point and span.

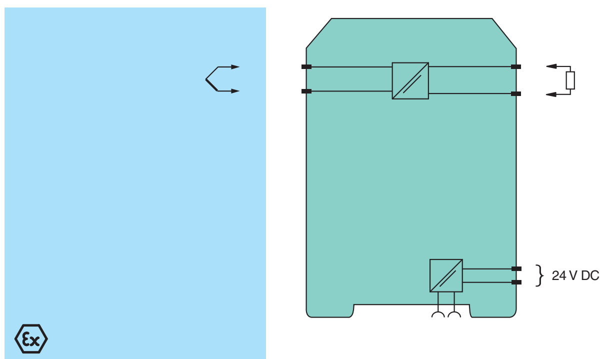


K-System	KFD0-TT-1
K-System	KFD0-TT-Ex1
H-System	HiD2061

Figure 32

Millivolt Repeater

This millivolt repeater can be used if an increased level of cross talk suppression or isolation is required between the thermocouple and the measuring instrument. This barrier repeats the mV signal generated by the thermocouple and, during a lead breakage, also outputs a +100 mV or -100 mV signal.



K-System	KFD2-VR2-Ex1.50M
H-System	HiC2065
H-System	HiC2068
H-System	HiC2095
H-System	HiD2096

Figure 33

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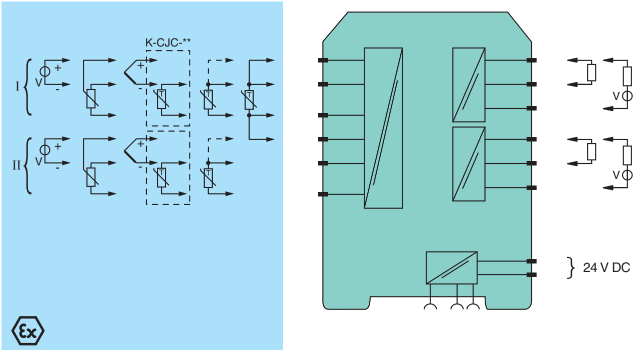
Universal Temperature Converter

Figure 34 shows a galvanically isolated universal temperature converter. This isolated module features high-level accuracy and temperature stability for the entire selected input range. A PC connection and software package from Pepperl+Fuchs allow the type of thermocouple and RTD sensor, conditions for lead breakage monitoring, measuring range, zero point, tag information and user-specific data to be configured.

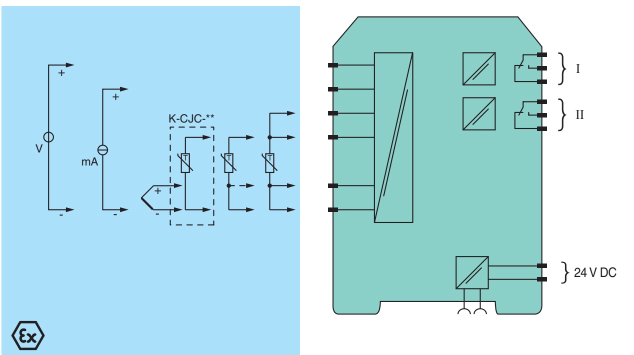


K-System	KFD2-UT2-*-*
K-System	KFD2-UT2-Ex*-*
H-System	HiD2081
H-System	HiD2082

Figure 34

Temperature Trip Amplifier

This galvanically isolated trip amplifier has two independent switching points for RTDs, thermocouples, voltage or current signals. A PC is used to configure the trip point, hysteresis and high/low alarm for this device. This isolated module not only offers the required isolation for intrinsic safety, but also a simple logic function for trip values.

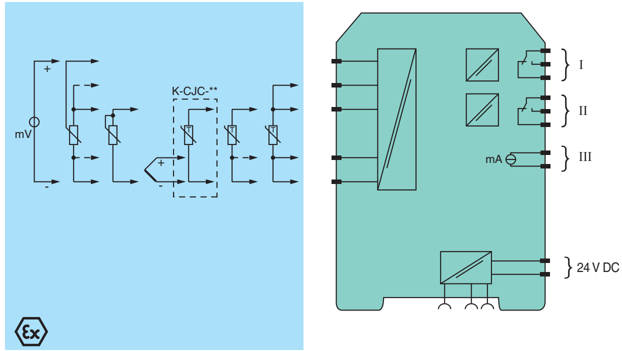


K-System	KFD2-GU-1
K-System	KFD2-GU-Ex1

Figure 35

Temperature Converter with Trip Values

In addition to the 0/4 mA to 20 mA analog output, the galvanically isolated temperature converter has two independent switching points for RTDs, thermocouples, voltage or potentiometer signals. This isolated module can be programmed using a PC or a keypad.

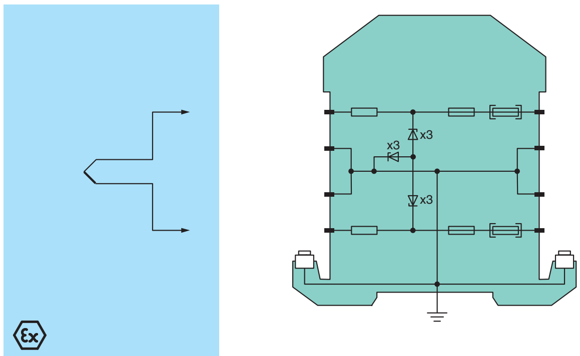


K-System	KFD2-GUT-1.D
K-System	KFD2-GUT-Ex1.D

Figure 36

Solutions with Zener Barriers

This is the most common method of connecting a thermocouple to a Zener Barrier. The 2-channel configuration has a symmetrical switching circuit with a maximum of 64 Ω per channel, permitting the use of every type of thermocouple.



Z-System	Z960.*
SB-System	SB0201

Figure 37

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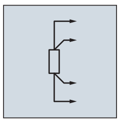
Resistance Temperature Detector (RTD)

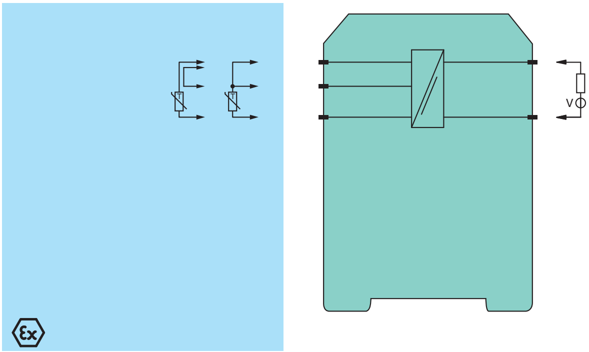


In certain applications, the temperature and resistance of resistance temperature detectors (RTD) are recorded. These devices supply important feedback for turbine processes.

Solutions for Isolated Modules

Loop powered RTD Converter

The converter is galvanically isolated and offers a 4 mA to 20 mA output for 2- or 3-wire RTDs. The device also has potentiometers for setting the zero point and span.

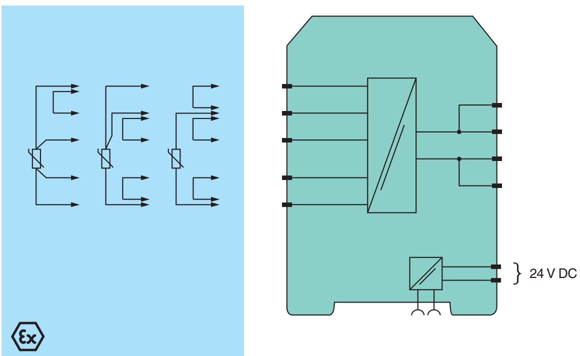


K-System	KFD0-TR-1
K-System	KFD0-TR-Ex1

Figure 38

Repeaters for Temperature Sensors

This device can be used if an increased level of cross talk suppression or isolation is required between the RTD and the measuring instrument. Depending on the degree of accuracy required, the repeater can be used in a 2-, 3- or 4-wire configuration. The device repeats the resistance measurement of the RTD in the safe area.

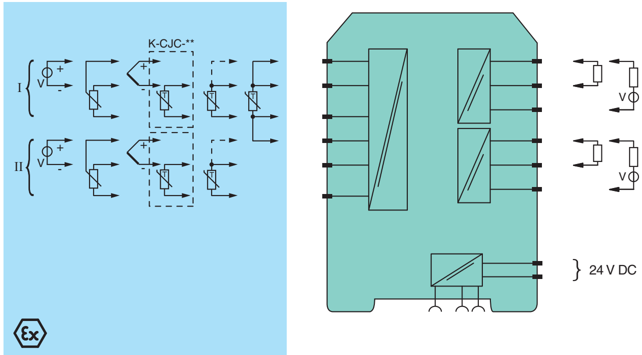


K-System	KFD2-RR-Ex1

Figure 39

Universal Temperature Converter

The figure shows a galvanically isolated 2-channel universal temperature converter. This isolated module features high-level accuracy and temperature stability for the entire selected input range. A standard PC connection and a software package from Pepperl+Fuchs allow the thermocouple and RTD sensor type, conditions for lead breakage monitoring, measuring range, zero point, tag information and user-specific data to be configured.

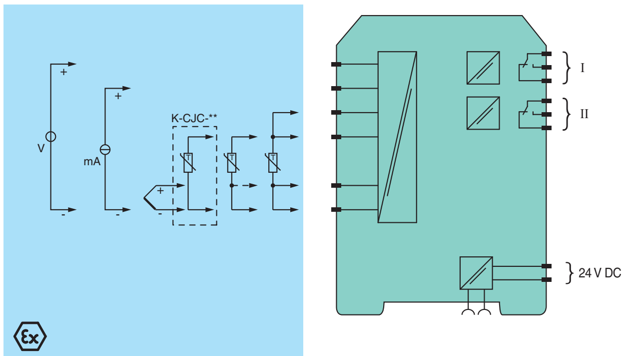


K-System	KFD2-UT2-1
K-System	KFD2-UT2-2
K-System	KFD2-UT2-Ex1
K-System	KFD2-UT2-Ex2
H-System	HiD2081
H-System	HiD2082

Figure 40

Trip Amplifier

This galvanically isolated trip amplifier has two independent switching points for RTDs, thermocouples, voltage or current signals. A PC can be used to configure the trip point, hysteresis and high/low alarm. The device not only offers the required isolation for intrinsic safety, it also has a simple logic function for trip values.



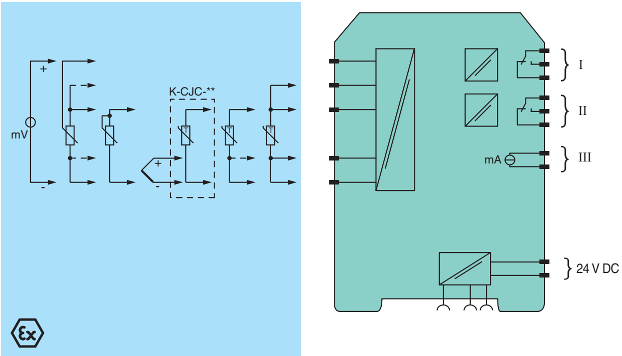
K-System	KFD2-GU-1
K-System	KFD2-GU-Ex1

Figure 41

Edition 908837 (US) / 208599 (EU) 11/2010

Temperature Converter with Trip Values

The galvanically isolated temperature converter has two independent switching points for RTDs, thermocouples, voltage or potentiometer signals. This isolated module can be programmed using a PC or a keypad.

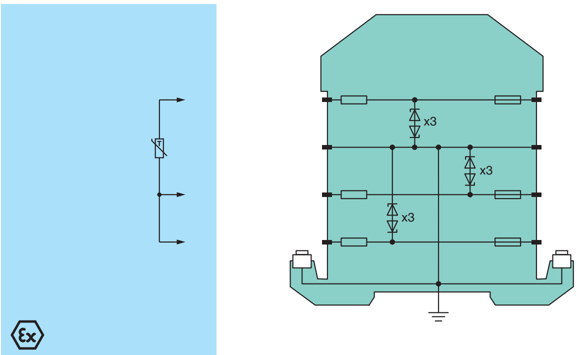


K-System	KFD2-GUT-1.D
K-System	KFD2-GUT-Ex1.D

Figure 42

Solutions with Zener Barriers

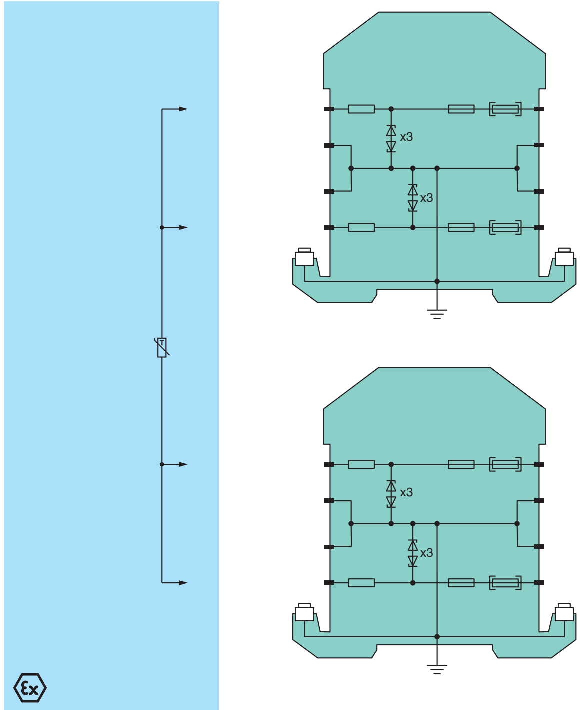
The block diagram shows a 3-wire RTD that is connected to a Z954 Zener Barrier. The 3-channel configuration means that the negative supply line is not connected directly to ground, thus providing what is effectively a non-grounded system. All three channels have their own series resistance, which, together with the measuring bridge, minimizes the number of faults.



Z-System	Z954

Figure 43

The greatest degree of accuracy is delivered by connecting 4-wire RTDs and Zener Barriers. This configuration means that the measuring circuit is not influenced by the series resistance of the barriers.

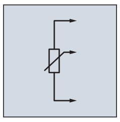


Z-System	Z961.*
SB-System	SB0016

Figure 44

Edition 908837 (US) / 208599 (EU) 11/2010

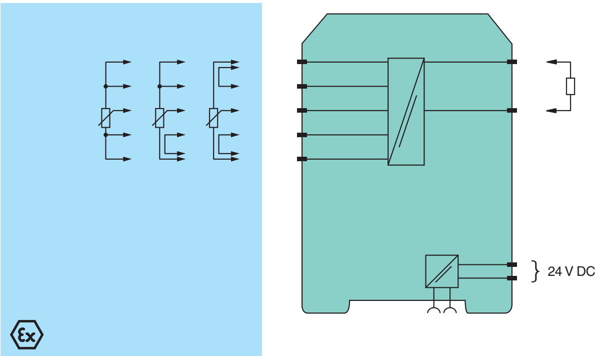
Potentiometer



In certain applications, the resistance of potentiometers is recorded. These devices supply important feedback for gantry crane processes.

Solutions for Isolated Modules

This converter has galvanic isolation between the input, output and supply to ensure optimum conversion accuracy and noise immunity. Depending on the degree of accuracy required, this isolated module can be configured for 3-, 4- or 5-wire potentiometers. The device can be ordered with the appropriate voltage or current outputs for your requirements.

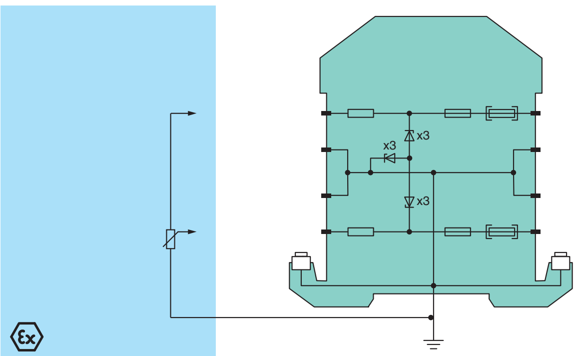


K-System	KFD2-PT2-Ex1
K-System	KFD2-GUT-1.D
K-System	KFD2-GUT-Ex1.D

Figure 45

Solutions with Zener Barriers

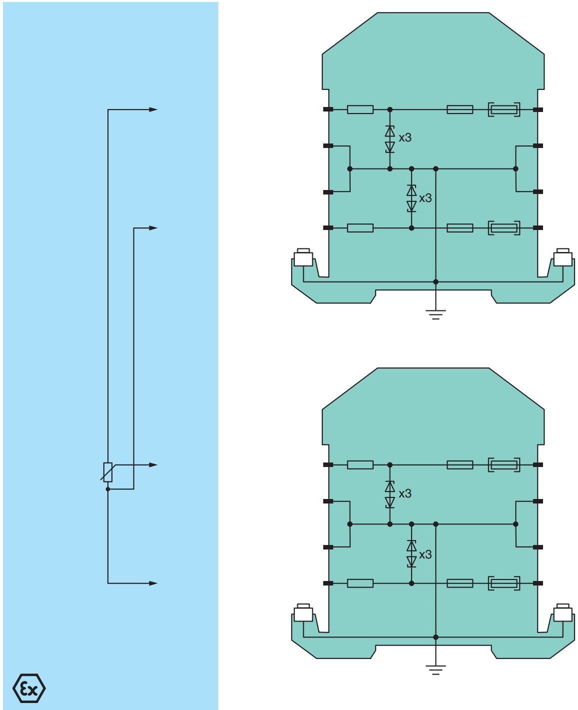
If the accuracy of the potentiometer signal is not critical, the Z960.* Zener Barrier has a 3-wire connection that connects the return line to the intrinsically safe ground. This connection can affect the measurement, as the resistance in the negative line has to be taken into account.



Z-System	Z960.*

Figure 46

A 4-wire connection is recommended if a higher degree of accuracy of the potentiometer voltage signal is required. In this case, neither the source nor the signal is connected to the intrinsically safe ground, and this results in greater accuracy.



Z-System	Z961.*
SB-System	SB0016

Figure 47

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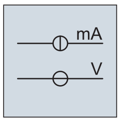
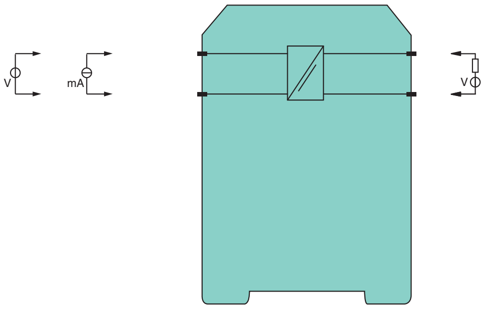
Current and Voltage



Signal converters are used to scale and amplify current or voltage signals and to convert them into standard signals. Galvanic isolation prevents interference and ensures reliable measured value acquisition.

Solutions for Isolated Modules

Signal converters are available for recording low voltages, e. g. from shunt measurements, which convert the measurement signal into a 0/4 mA to 20 mA or 0/2 V to 10 V standard signal.

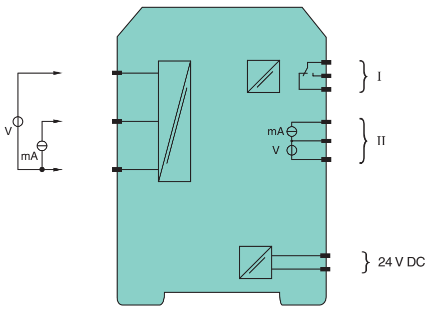


K-System	KFD0-CC-1
K-System	KFD0-CC-Ex1
K-System	KFD0-VC-1.10

Figure 48

Signal Converter with Trip Value

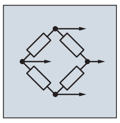
Signal conditioners with output relays are used to record trip values from current and voltage signals. In the case of devices with displays, the measured value can be displayed in a predefined unit. These settings are entered by means of keypad, DIP switches or potentiometers.



K-System	KFD2-GS-1.2W
K-System	KFD2-USC-1.D

Figure 49

Weighing

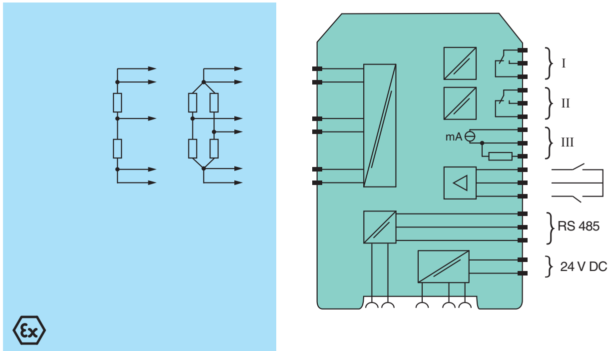


Electronic load cells are preferred for most applications in modern processing systems.

Solutions for Isolated Modules

Strain Gauge Converter

Figure 50 shows a converter for strain gauge bridges. The converter has a galvanic isolation between the input, output and supply to ensure optimum evaluation of the strain gauge. Depending on the accuracy required, the strain gauge can be configured with a 4- or 6-wire connection. The excitation voltage of the strain gauge, the mV signal range, the tare and the current range can be programmed via push buttons on the device.



K-System	KFD2-WAC2-1.D
K-System	KFD2-WAC2-Ex1.D

Figure 50

Edition 908837 (US) / 208599 (EU) 11/2010

Solutions with Zener Barriers

The Z966.* and SB0766 Zener Barriers supply a 350 Ω strain gauge with the required excitation voltage, while the Z964.* and SB2764 Zener Barriers provide the current source with a voltage input for greater accuracy. The mV signal is fed into the safe area via Z961.* or SB0016 Zener Barriers. If Zener Barriers are used, they are connected in what is effectively a non-grounded configuration to provide the best possible signal integrity.

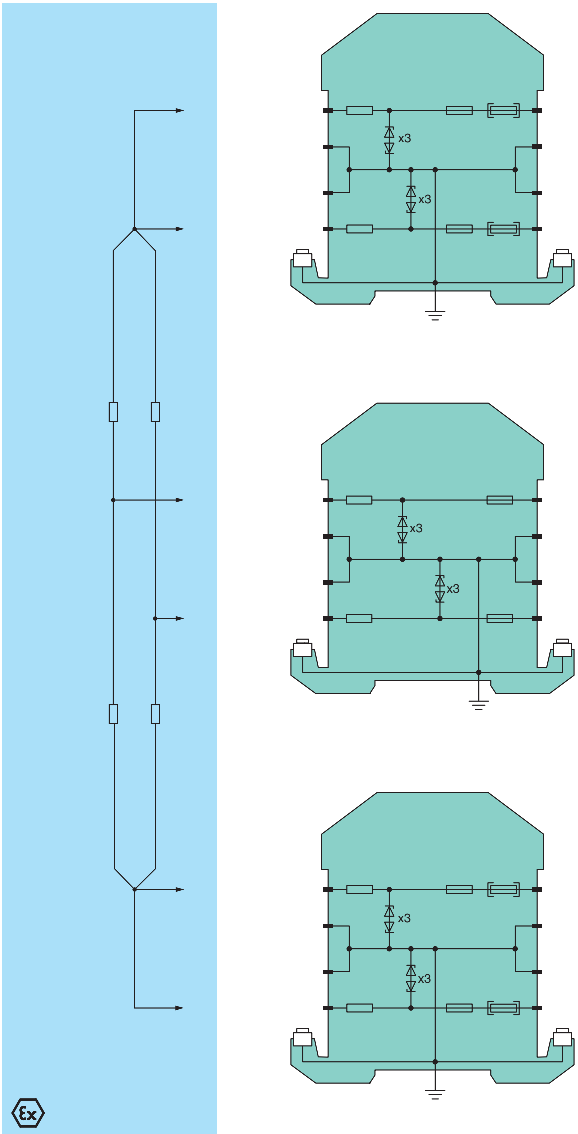
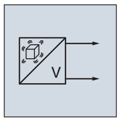


Figure 51

Vibration Monitoring

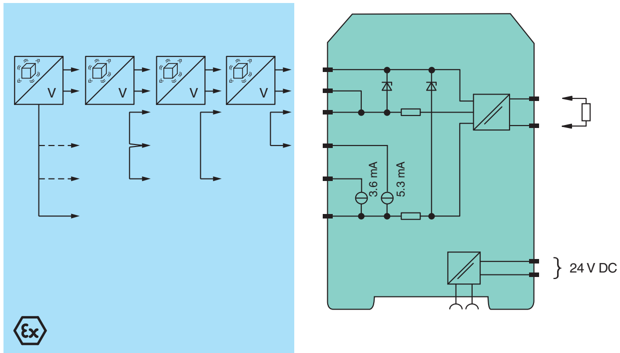


Vibration sensors monitor vibration. They are considered the most successful micro sensors ever developed. Vibration sensors are frequently employed for preventive maintenance or status monitoring purposes. They output a signal that corresponds to the level of vibration.

Solutions for Isolated Modules

Voltage Repeater

The galvanically isolated KFD2-VR4-Ex1.26 repeater has been specifically developed for use with vibration sensors. The repeater has a galvanic isolation between the input, output and supply to provide the vibration sensor with a stable power supply. A high-impedance amplifier modifies the measuring cell signal and repeats it on the safe side using a second amplifier with a low output impedance.

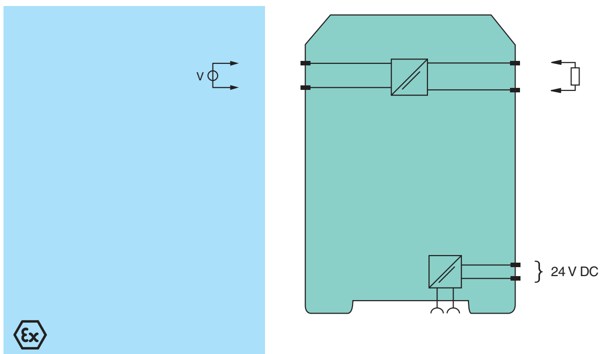


K-System	KFD2-VR4-Ex1.26

Figure 52

Voltage Repeater

In applications with frequency requirements in excess of 5 kHz, the KFD2-VR-Ex1.19-Y109129 repeater captures an active voltage pulse of up to ± 10 V. The voltage pulses can be transmitted at frequencies of up to 50 kHz.



K-System	KFD2-VR-Ex1.19-Y109129

Figure 53

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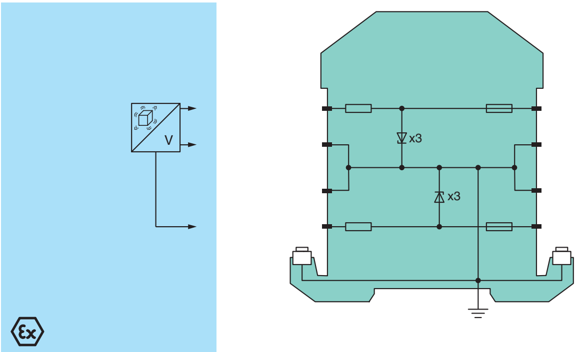
Solutions with Zener Barriers

Figure 54 shows an example of the connection of a Zener Barrier to a vibration monitoring in the hazardous area. The vibration monitoring outputs a voltage signal at frequencies of up to 4 kHz that is proportional to the vibration with respect to the positive supply. In this example, a barrier with negative polarity is therefore required. The positive side of the current source must be grounded.

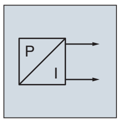


Z-System	Z896
SB-System	SB1796

Figure 54

Analog Output Signals

I/P Converters

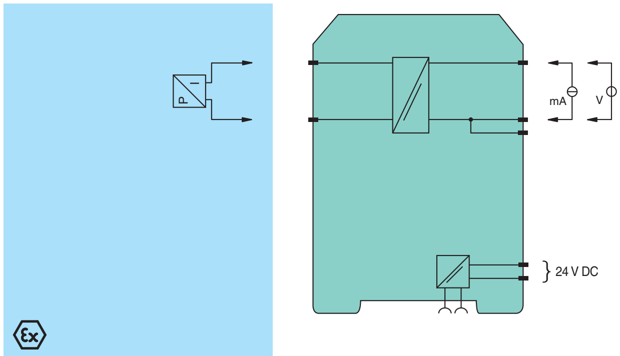


An I/P converter is generally used in applications that require a pneumatic output. This can be used to control actuators and valves for checking fluid pressure or flow in certain applications.

Solutions for Isolated Modules

Current Driver for Current/Voltage

The KFD2-CD-Ex1.32.* current driver offers a high degree of accuracy and temperature stability. If specified when ordering, the inputs and outputs of this galvanically isolated barrier can be configured to meet the needs of the particular application. It can be configured independently for voltage or current. The transmitter has a galvanic isolation between the input, output and supply to ensure a high degree of signal integrity. This barrier is suitable for SIL2 applications according to IEC 61508.



K-System	KFD2-CD-Ex1.32.*

Figure 55

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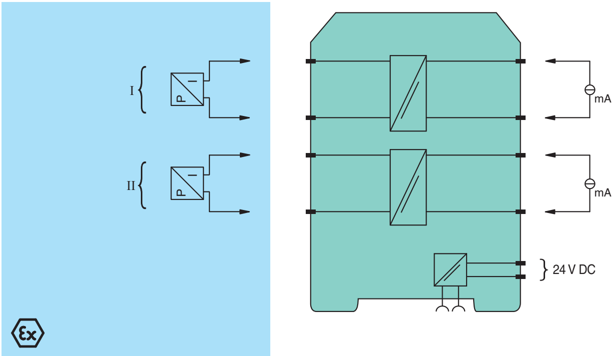
2-Channel Current Driver

This galvanically isolated current driver transmits a 4 mA to 20 mA signal to I/P converters, electric valves and actuators in the hazardous area. This barrier is suitable for SIL2 applications according to IEC 61508.

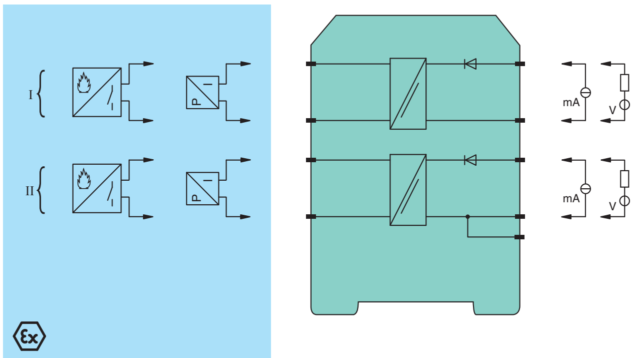


K-System	KFD2-CD2-Ex2
H-System	HiD2032

Figure 56

Current Driver

The loop powered current driver is galvanically isolated and is therefore easy to use. Although the device was originally developed for fire detection, where accuracy is not such an issue, it is generally precise enough for I/P converters. This isolated module is suitable for SIL2 applications according to IEC 61508.

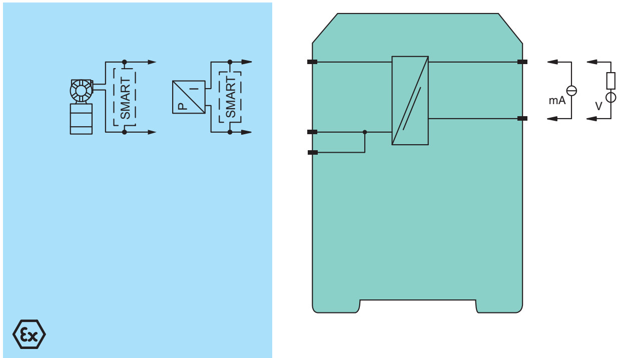


K-System	KFD0-CS-*.50
K-System	KFD0-CS-Ex2.51P

Figure 57

SMART Current Driver

The loop powered current driver in Figure 58 provides galvanic isolation. This barrier was developed for analog inputs and outputs and allows HART information to be transmitted in both directions. This barrier is suitable for SIL2 applications according to IEC 61508.

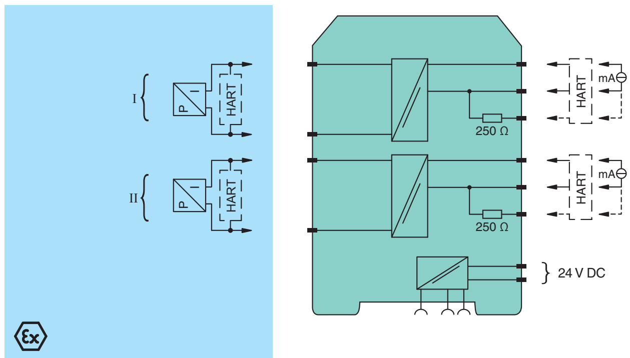


K-System	KFD0-SCS-Ex1.55

Figure 58

2-Channel SMART Current Driver

The SMART current driver has a galvanic isolation between the input, output and supply. The current driver can control the electrical values of I/P converters and actuators and allows HART information to be transmitted in both directions. It also enables line fault detection. This isolated module is suitable for SIL2 applications according to IEC 61508.



K-System	KCD2-SCD-1
K-System	KCD2-SCD-Ex1
K-System	KFD2-SCD2-*.LK
K-System	KFD2-SCD2-Ex*.LK
H-System	HiD2032

Figure 59

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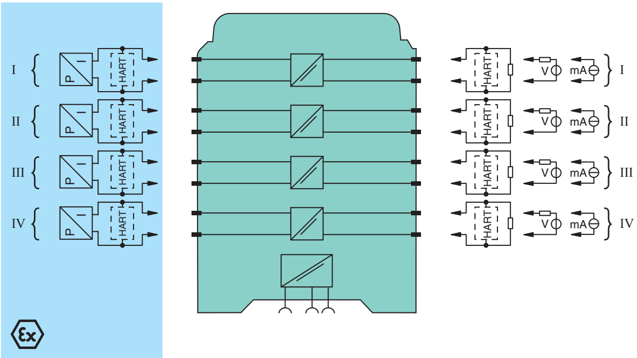
4-Channel Current Driver

This galvanically isolated 4-channel device can control the electrical values of I/P converters and actuators in the hazardous area and allows HART information to be transmitted in both directions. Each of these 4 channels can also be used as an analog input.

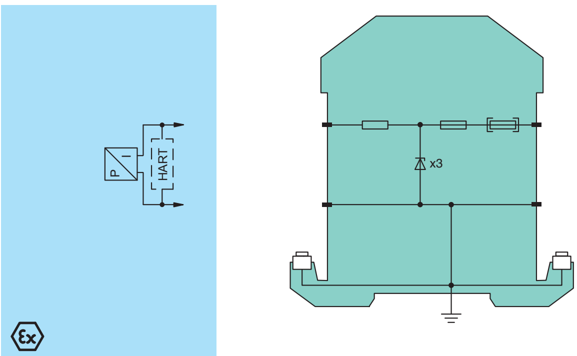


H-System	HiD2024

Figure 60

Solutions with Zener Barriers

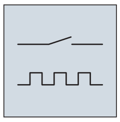
Connecting an I/P converter to a 1-channel Z728.* or SB0728 Zener Barrier is the most efficient method when the power supply in the controller either has to be isolated from other I/O channels or when its negative return is connected to ground.



Z-System	Z728.*
SB-System	SB0728

Figure 61

Counter/Serial Communication

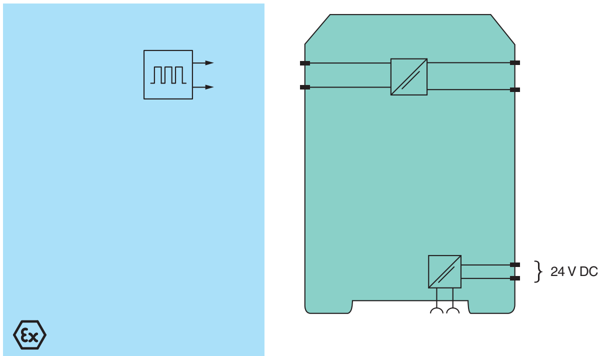


In the modern world of process automation, numerous applications, such as impulse sensors, special sensors, cameras, operator panels and other mobile devices, fill a particular area of the market. These applications have to be removed from or integrated into the hazardous area. Reliable communications must therefore be ensured at all levels.

Solutions for Isolated Modules

Millivolt Repeater

This millivolt repeater has a galvanic isolation between the input, output and supply to ensure optimum pulse repetition. If the active pulse signal has a magnitude of ± 500 mV, the barrier repeats the signal precisely up to 1.3 kHz.



K-System	KFD2-VR-Ex1.500M

Figure 62

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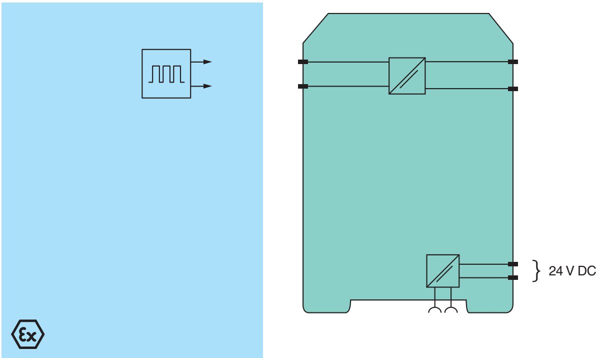
Voltage Repeater

The illustration below shows a galvanically isolated voltage repeater similar to the one in Figure 62. The active pulse signal can, however, have a magnitude of ± 10 V. The barrier also transmits the voltage pulse at a frequency of up to 1.2 kHz.



K-System	KFD2-VR-Ex1.19

Figure 63

RS 232 Repeater

This illustration shows a galvanically isolated RS 232 repeater for the transmission of data through the hazardous area. The signal is forwarded at a maximum data transmission rate of 20 kBit/s.

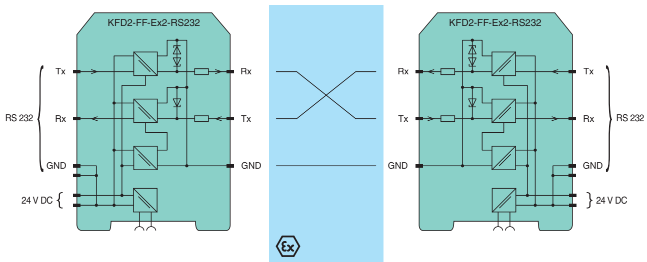
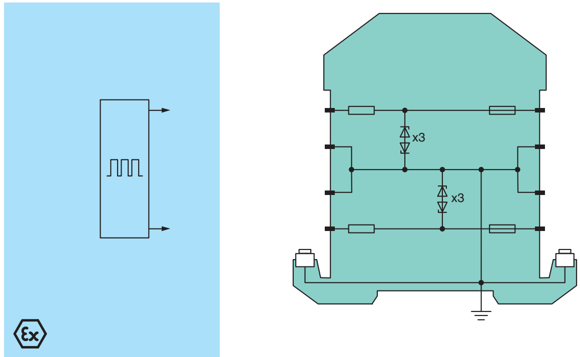


Figure 64

Solutions with Zener Barriers

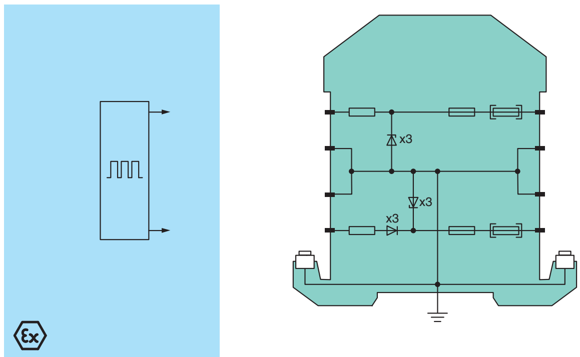
The figure shows an example of the connection of a Zener Barrier to an active impulse sensor in the hazardous area. The voltage pulse can be as high as 20 V, as the signal is isolated from ground due to the 2-channel design of the Zener Barrier.



Z-System	Z964

Figure 65

This configuration can be used if the passive impulse sensor needs a voltage source. The pulses are received in the safe area via a barrier channel with a diode return. The diodes can dampen the pulse height. The sensitivity of the receiving instrument must therefore be considered.



Z-System	Z787.*

Figure 66

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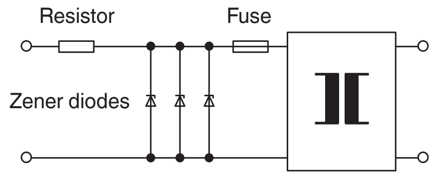
PEPPERL+FUCHS
PROTECTING YOUR PROCESS

Isolated barriers for intrinsic safety applications are used in factory and process control for the galvanic isolation of control and instrumentation signals, such as NAMUR sensors, 4 mA to 20 mA and 0 V to 10 V signals. These devices are also used to convert specialized measurement signals into standard control signals. Isolated barriers have intrinsically safe control circuits in order to operate and communicate with field devices in hazardous areas. In all cases, the respective statutory regulations and directives governing the application or intended use shall be observed.

Operating principle

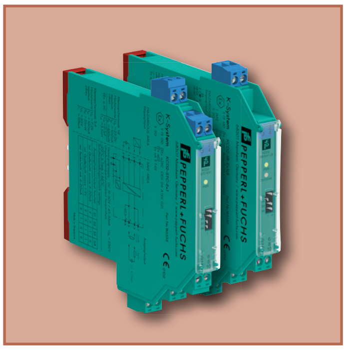
Isolated barriers are a combination of an intrinsic safety zener barrier and a galvanic isolation network. The energy limitation delivered to the field (voltage and current) is achieved through the zener barrier. In simple terms, a zener barrier contains a zener diode for voltage limitation and a resistor for current limitation. These components are protected with a fuse.



The galvanic isolation contained within the isolated barriers prevents noise, potential effects and transients from affecting the measurement signals. Although necessary for stand-alone, zener barriers, an isolated barrier does not require a connection to earth (ground).

K-System

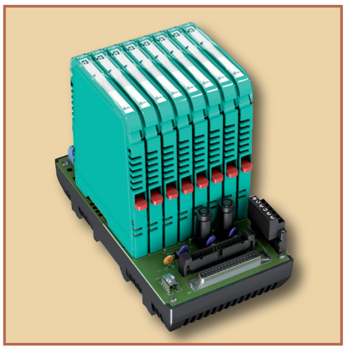
114



- DIN rail/Power Rail solutions
- 1-, 2- and 4-channel designs reduce DIN rail space
- SIL rated for safety instrumented systems
- Horizontal/vertical installation with no temperature degradation
- Removable terminals reduce the maintenance over the life cycle of the plant
- Integrated HART solutions for plant asset management
- 3-port galvanically isolated intrinsic safety barriers
- Line fault detection and local indication
- World-wide approvals

H-System

314



- Termination Board solutions feature custom system connectors
- High density modules reduce the number of cabinets and termination panels
- Plug-in I/O modules reduce maintenance over the life cycle of the plant
- SIL rated for safety instrumented systems
- Integrated HART solutions for plant asset management
- 3-port galvanically isolated intrinsic safety barriers
- Color-coded for visual identification
- World-wide approvals

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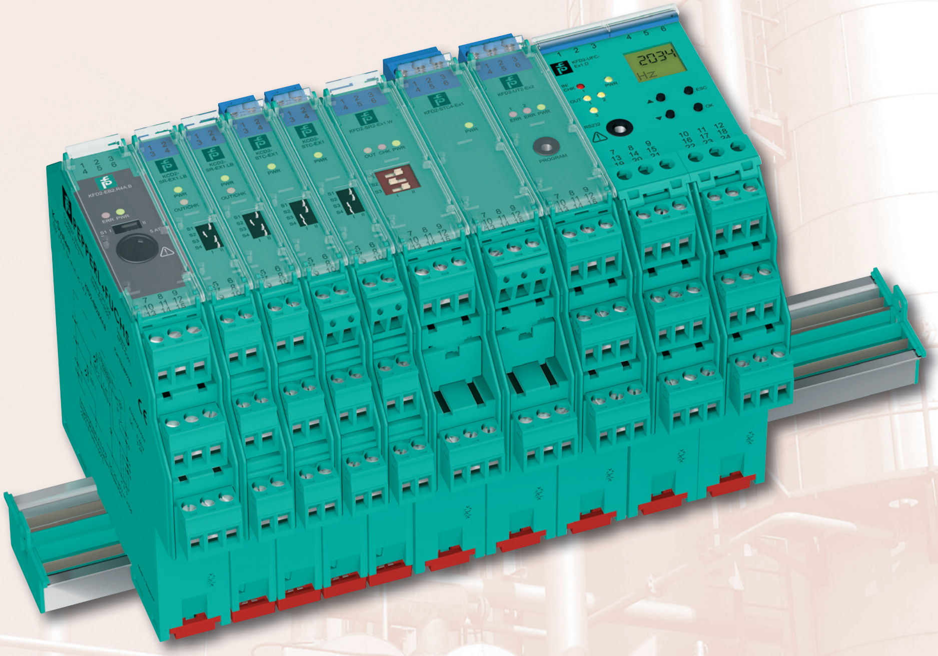
K-System



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Introduction

The K-System consists of wide range of isolated barriers suitable for mounting on 35 mm DIN rail. K-System is easy to specify, integrate and expand and has become synonymous with safety and reliability. Our extensive line of intrinsic safety isolators for hazardous location applications contains over 150 different models, each containing industry leading features and benefits.

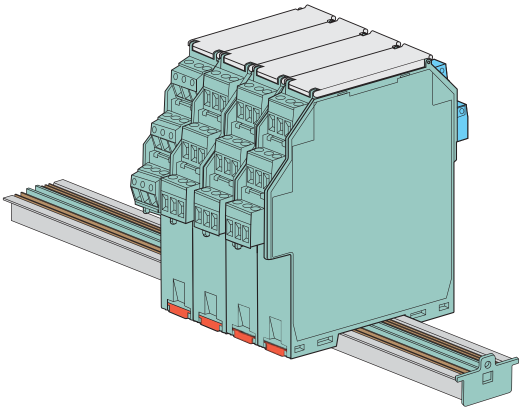

Figure 1 K-System on Power Rail

Housing types

Depending on the functionality and application, K-System has different housing widths. Whether it is the 12.5 mm KC modules or the well-proven 20 mm KF modules, the electrical and mechanical characteristics of the K-System are maintained. This collection of modules provides a wide range of interface barriers that can be combined on Power Rail.

KC module housing

Used for high signal integrity

- Compact housing, only 12.5 mm wide
- Single loop integrity
- Power loss only 0.8 W per device

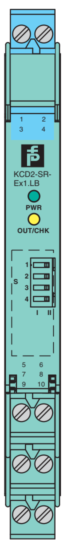

Figure 2 12.5 mm housing (KC module)

KF module housings

Used for high channel density

- Compact 20 mm housing
- Highest packing density on the market
- As low as 5 mm per channel

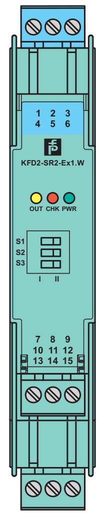

Figure 3 20 mm housing (KF module)

Used for applications with high functionality

- Logic controls determine and monitor speed, direction of rotation, slip, flow rates and time
- Analog controls monitor transmitter signals, strain gauges, temperature and load cells
- Configured using **PACT***ware*™ or by keypad
- Universal power supply

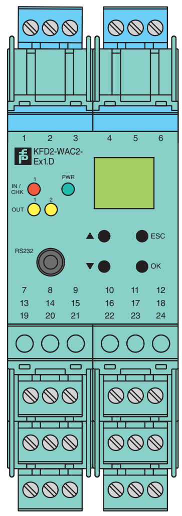

Figure 4 40 mm housing (KF module)

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Supply voltage

K-System isolated barriers are available with different supply voltages. The most widely used rating is 24 V DC; however, 115 V AC and 230 V AC are also available for applications when DC power is not available. The universal supply units carry the complete range from 20 V DC to 90 V DC and 48 V AC to 230 V AC on the same input terminals. The supported supply voltage for each barrier is identified on the side plate.

Mounting

The K-System is mounted on a 35 mm DIN rail acc. to EN 60715. To reduce wiring and installation costs, Power Rail is the optimum solution.

Low heat dissipation allows vertical or horizontal mounting.

Power Rail

The Power Rail is a plastic insert into a standard DIN rail and contains two leads that deliver power to the modules. Power is sent through the rail by a power feed module that delivers 24 V DC at 4 A. The module uses a 5 A fuse to protect the barriers. The Power Rail virtually eliminates the risk of wiring faults and facilitates easy expansion. Power Rail is available in two versions:

- UPR-03: 3-lead version supplies two leads for power and one lead for error signal
- UPR-05: 5-lead version supplies two leads for power, one lead for error signal and two leads for serial data exchange.

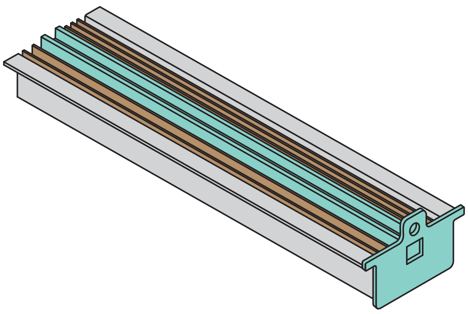

Figure 5 Universal Power Rail UPR-05

Mounting on Power Rail

As shown in the figure, the isolation modules are snapped onto the Universal Power Rail in a vertical downward movement.

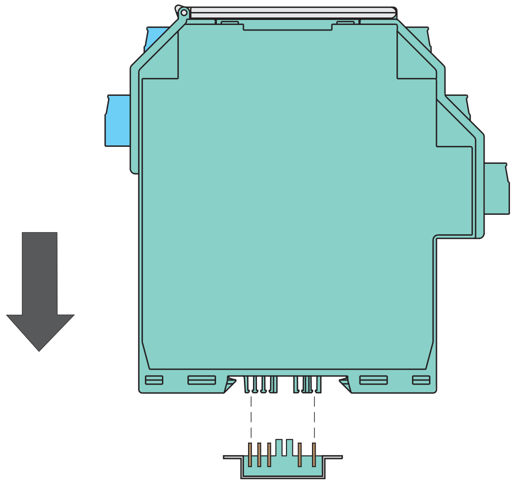

Figure 6 Proper K-System mounting

CORRECT: Device snapped on vertically.

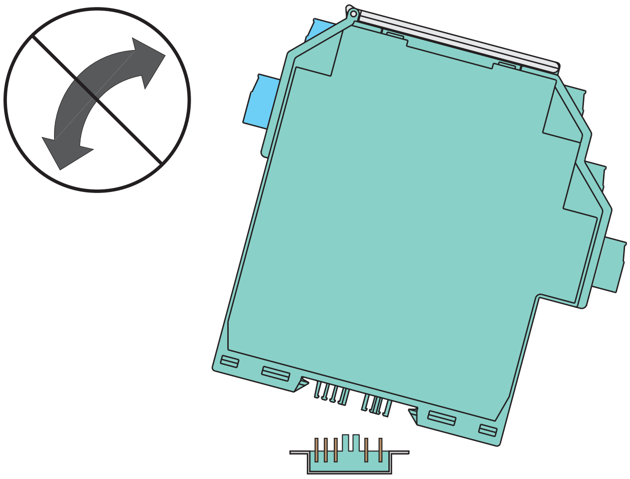

Figure 7 Improper K-System mounting

INCORRECT: Device snapped on from the side.

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

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Power connection to K-System

Conventional power supply without Power Rail

Conventional power supplies create complicated and expensive wiring systems. After all isolated barriers are connected, there is a significant amount of wiring and more wiring must be added for features such as lead breakage and short-circuit monitoring.

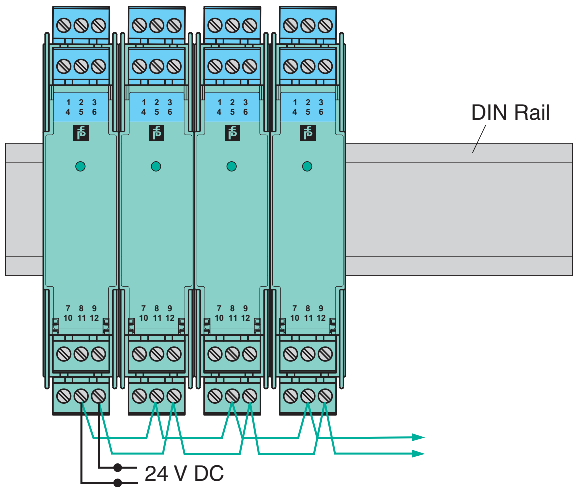

Figure 8 Conventional installation

Power supply with Power Rail

Supply with Power Feed Modules

The Pepperl+Fuchs Power Rail eliminates wiring hassles and reduces expense. The power feed module mounts on the Power Rail for easy and reliable distribution of power to all connected isolated modules. This method eliminates all of the parallel power wiring necessary on a conventional installation without Power Rail.

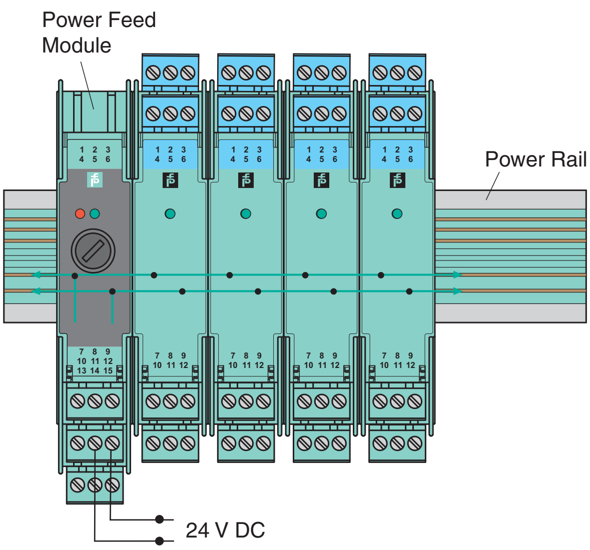

Figure 9 Power Rail installation

Redundant Supply with Power Feed Modules

Two power supplies or a redundant power supply with two power feed modules offers a high degree of safety and reliability.If a power supply is damaged or a fuse opens in a power feed module, the redundant supply continues to energize the isolator modules through their Power Rail connection.

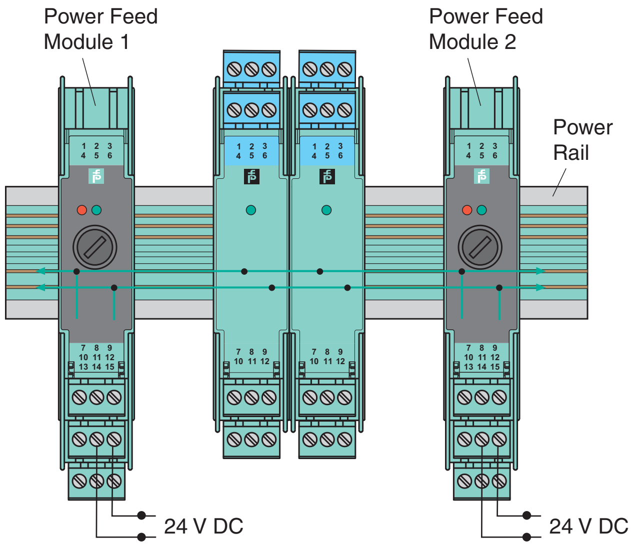

Figure 10 Redundant power connections

Direct Supply with Power Supplies

A complete power solution for a K-System installation is possible by using a 115/230 V AC to 24 V DC/4 A power supply with the KFA6-STR-1.24.4 or by using the KFA6-STR-1.24.500 that provides 24 V DC/500 mA. The power supplies snap-on the Power Rail to easily and efficiently distribute power to the isolated barriers.

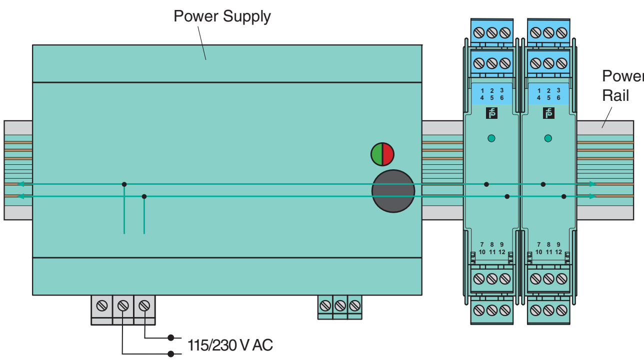

Figure 11 Integrated power supply (4 A)

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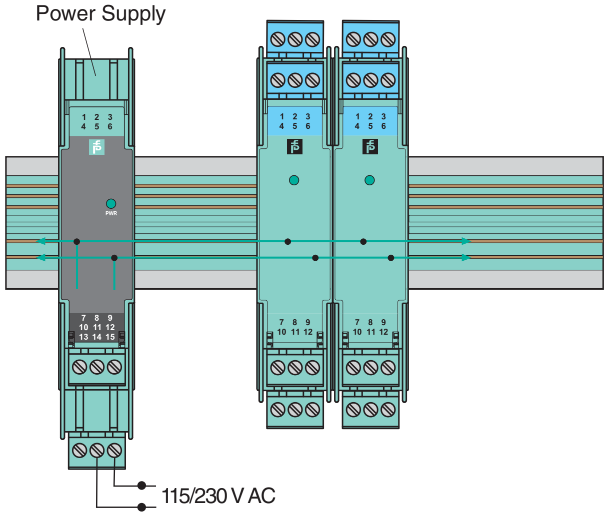

Figure 12   Integrated power supply (500 mA)

Collective error messaging

Collective error messaging enables lead breakage and short-circuit monitoring for isolator modules without additional wiring expenses. During a fault condition of the field circuit, an interrupt signal from an isolator module is transferred to the Power Rail. The power feed module evaluates the signal and transfers the interrupt signal to the control system via a relay contact.

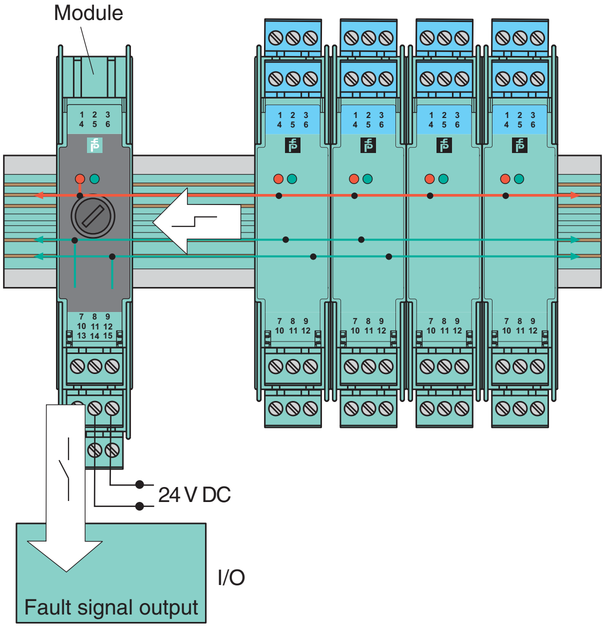

Figure 13   Collective error message via power feed module

Terminal blocks

Removable terminal blocks

The removable terminal blocks simplify control cabinet construction and allow the units to be replaced while they are energized. These screw-secured, cage clamp terminals allow space for the connection of leads with core cross-sections of up to 2.5 mm^2 (14 AWG). The connectors are coded with red pins so misconnection of a terminal block is eliminated. With the KF-CP coding pins (available separately), additional terminal block styles with test sockets or cage spring release can be easily coded and inserted into an isolated barrier

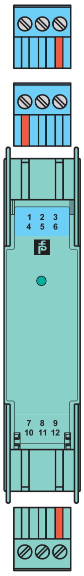

Figure 14   K-System removable terminal blocks

Terminal designation

Please reference appropriate model for terminal designation.

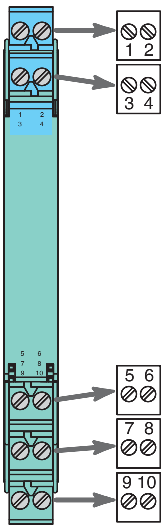

Figure 15   12.5 mm housing (KC module)

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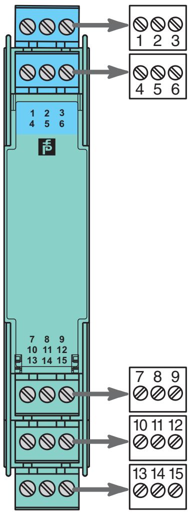

Figure 16 20 mm housing (KF module)

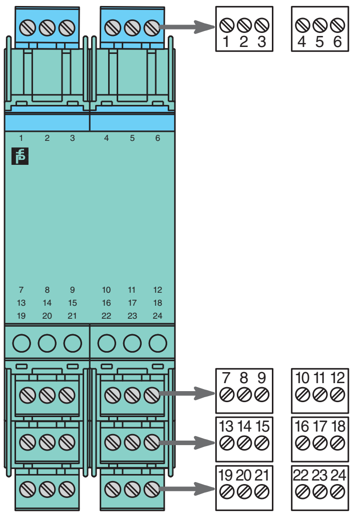

Figure 17 40 mm housing (KF module)

Color identification

The color identification of the devices has the following meaning:

- green indicates devices with DC power supply
- black indicates devices with AC power supply
- grey indicates devices with universal power supply of 20 V DC to 90 V DC or 48 V AC to 253 V AC

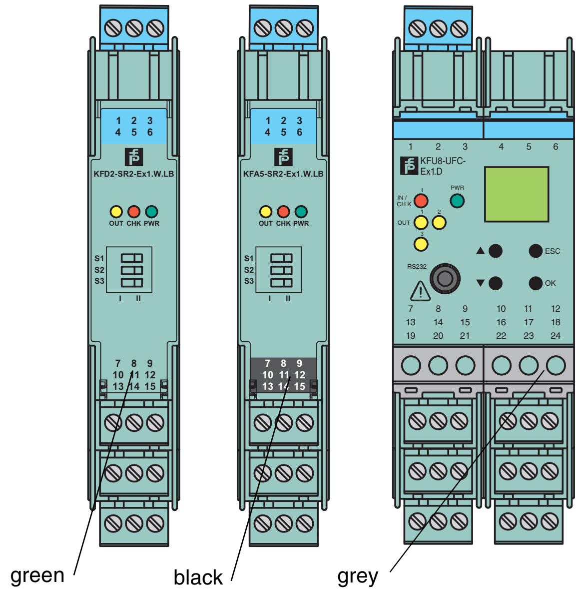

Figure 18 Color identification of devices

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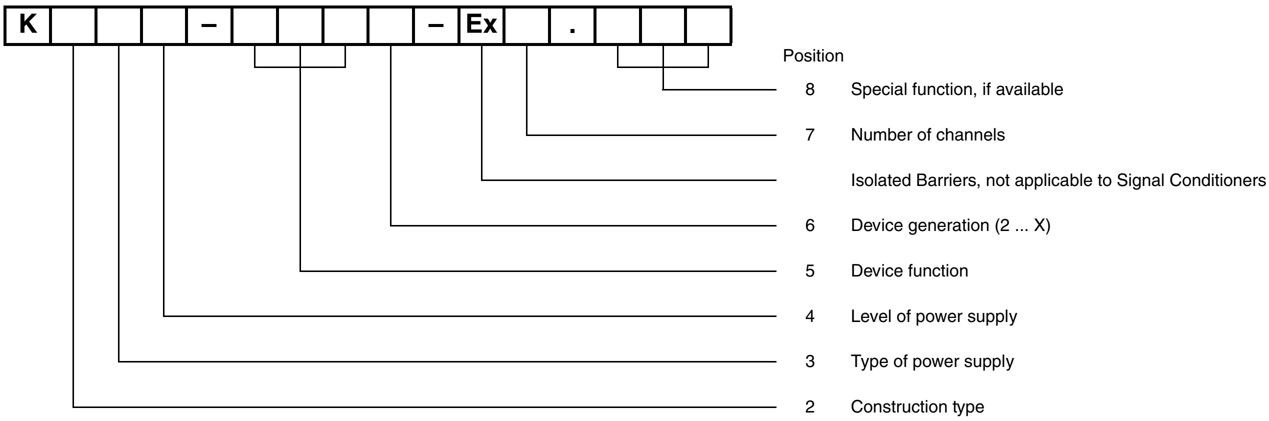
Model number description



Position 1	K	=	K-System
Position 2	C	=	Version with removable terminals, 12.5 mm width
	F	=	Version with removable terminals, 20 mm or 40 mm width
	H	=	Version without removable terminals, 20 mm or 40 mm width
Position 3	D	=	DC power supply
	A	=	AC power supply
	U	=	AC-/DC power supply
Position 4	0	=	without power supply
	2	=	24 V
	4	=	100 V
	5	=	115 V
	6	=	230 V
	8	=	20 V DC to 90 V DC, 48 V AC to 253 V AC
Position 5	CC	=	Converter for current/voltage
	CD	=	Current driver, active
	CR	=	Transmitter power supply device, current output
	CRG	=	Transmitter power supply device with limit value output
	CS	=	Current driver, passive
	DU	=	Switch amplifier, timer relay
	DWB	=	Rotational speed monitor, logic control unit
	EB	=	Power feed module
	ELD	=	Ground fault detection
	ER		Conductivity switch amplifier
	FF	=	RS 232 repeater
	GS	=	Trip amplifier for current/voltage
	GU	=	Universal trip amplifier
	GUT	=	Temperature converter with trip values
	HLC	=	HART Loop Converters
	HMM	=	HART Multiplexer Master
	HMS	=	HART Multiplexer Slave
	PT	=	Potentiometer converter
	RC	=	Converter for resistors
	RCI	=	Solenoid driver
	RO	=	Relay module
	RR	=	Repeater for resistance measuring sensor
	RSH	=	Relay module in safety application
	SCD	=	SMART current driver
	SCS	=	SMART current driver/repeater
	SD	=	Solenoid driver
	SH	=	Safety switch amplifier
	SL	=	Solenoid driver module with logic input
	SOT	=	Switch amplifier with passive, potential free transistor output
	SR	=	Switch amplifier with relay output
	SRA	=	Switch amplifier with relay output, 2:1 operation mode
	SRT	=	Switch amplifier with active transistor and relay output
	ST	=	Switch amplifier with active transistor output
	STC	=	SMART transmitter power supply with current output
	STR	=	Power supply
	STV	=	SMART transmitter power supply with voltage output
	TR	=	Converter for resistance measuring sensor
	TT	=	Converter for thermocouple/mV
	UFC	=	Universal frequency converter
	UFT	=	Frequency converter with direction and synchronization monitoring
	USC	=	Universal signal converter with trip values
	UT	=	Universal temperature converter
	VC	=	Converter for current/voltage
	VCR	=	Transmitter power supply, repeater for current/voltage
	VD	=	Solenoid driver
	VM	=	Solenoid driver
	VR	=	Voltage repeater
	WAC	=	Converter for strain gauges

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Safety information

The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

These devices are used in C&I technology for the galvanic isolation of C&I signals, such as 20 mA and 10 V unit signals, and also for the adaptation and/or standardization of signals. Devices which have intrinsically safe control circuits are used to operate field devices within hazardous areas.

The devices are not suitable for the isolation of signals in power engineering, unless this is specifically referred to in the respective data sheet.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Intrinsic safety circuits that were operated with circuits of other types of protection may not be used as intrinsically safe circuits afterwards.

Installation and commissioning

Commissioning and installation must be carried out by specially trained and qualified personnel only.

Installation of the interface devices in the safe area

The devices are constructed to satisfy the IP20 protection classification and must be protected from adverse environmental conditions such as water spray or dirt exceeding the pollution degree 2.

The devices must be installed outside the hazardous area!

Depending on the level of protection, the intrinsically safe circuits of the devices (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that the intrinsically safe circuits are safely separated from all non-intrinsically safe circuits.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of K-System devices (demonstration of intrinsic safety). EN 60079-14/ IEC 60079-14 or NEC and CEC electrical codes for US and Canada respectively must be observed (where appropriate). If available, also the product certification control drawing must be observed.

If more channels of one device are to be connected in parallel, it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety, the maximum values of the parallel connection are to be regarded.

The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Installation and commissioning of the interface devices within Zone 2/Div. 2 of the hazardous area

Only devices with the corresponding manufacturer's Declaration of Conformity or separate certificate of conformity can be installed in Zone 2/Div. 2.

The individual data sheets indicate whether these conditions are met.

For US and Canada installations, in Zone 2/Div. 2 follow the NEC and CEC wiring methods. The enclosure must be able to accept Zone 2/Div. 2 wiring methods. The referenced product certification control drawing must be observed.

For all other applications, the devices should be installed in a switch or junction box that:

- meets at least IP54 in accordance to EN 60529.
- meets to the requirements of resistance to light and resistance to impact according to EN 60079-0/ IEC 60079-0.
- meets to the requirements of thermal endurance according to EN 60079-15/IEC 60079-15.
- must not cause ignition danger by electrostatic charge during intended use, maintenance and cleaning.

Depending on the level of protection, the intrinsically safe circuits of the devices (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that the intrinsically safe circuits are safely separated from all non-intrinsically safe circuits.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of K-System devices (demonstration of intrinsic safety). EN 60079-14/ IEC 60079-14 or NEC and CEC electrical codes for US and Canada respectively must be observed (where appropriate). If available, also the product certification control drawing must be observed.

If more channels of one device are to be connected in parallel, it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety, the maximum values of the parallel connection are to be regarded.

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The EC-Type Examination Certificates, standard certificates/approvals or the manufacturer's Declaration of Conformity should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are not allowed.

Isolation coordinates for devices with Ex-certificate according to EN 50020 and EN 60079-11

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Isolation coordinates for installations for galvanic isolation according to EN 50178 and EN 61140

The devices of the K-System are electronic equipment for use in secluded electrical operating sites where only skilled personnel or electrically instructed personnel will have admission or access.

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Connect only power supplies to power feed modules, which provide protection against direct contact (e. g. SELV or PELV).

For additional details, see data sheets.

Technical data

Electrical data

Safe area signals and control circuit

- 0/4 mA to 20 mA signal level acc. to NE43
- Current output HART compatible
- Current input HART compatible
- Digital output: active or, passive electronic output 100 mA/30 V, short circuit protected
- Relay output 2 A, minimum load 1 mA/24 V
- Logic level 24 V acc. to IEC 60946
- Functional isolation or safe isolation acc. to EN 50178 and NAMUR NE23

For additional details, see data sheets.

Ex-signals and field circuit

- Transmitter power supply up to 17 V DC
- Current input HART compatible
- Pt100, in 2-, 3-, (4-)wire technology
- Resistor 0 Ω to 400 Ω with freely definable characteristic
- Potentiometer
- Thermocouples of all types, internal cold junction, external reference
- Current output HART compatible
- Digital input NAMUR EN 60947-5-6
- Digital output for Ex-i valves, short circuit protected

For additional details, see data sheets.

Mechanical data

Mounting

- Snap-on 35 mm standard DIN rail acc. to EN 60715. Can be mounted horizontally or vertically, side by side.
- Panel mount: The lugs on the base of the modules must be extended and used for mounting purposes with 3 mm screws.
- K-MS mounting base for screw attachment

Housing material

Polycarbonate (PC)

Dimensions

Housing drawings please refer to appendix.

Protection degree

IP20 acc. to EN 60529

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Connection

- KH*-modules:
  self-opening connection terminals for max. core diameter of 1 x 2.5 mm^2 (14 AWG)
- KF*-and KC*-modules:
  removable connector with integrated self opening device terminals for leads of up to a max. of 1 x 2.5 mm^2 (14 AWG)

Fire protection class

Housing: V2 according to UL 94 standard. (Unless stated otherwise all details relate to the reference conditions.)

Labeling

place for labeling on the front side, label:

- KC-modules (12.5 mm): 22 mm x 9 mm
- KF-modules (20 mm): 22 mm x 16.5mm
- KF-modules (40 mm): 18 mm x 8 mm

Ambient conditions

Ambient temperature

-20 °C to 60 °C (-4 °F to 140 °F)

Exceptions see data sheets.

Storage temperature

-40 °C to 90 °C (-40 °F to 194 °F)

Reference conditions for adjustment

20 °C (68 °F)

Relative humidity

max. 95 % without moisture condensation

Vibration resistance

acc. to EN 60068-2-6, 10 Hz to 150 Hz, 1 g, high crossover frequency

Shock resistance

acc. to EN 60068-2-27, 15 g, 11 ms, half-sine

Conformity with standards and directives

General

- Isolator modules with explosion protection, mostly with Ex ia IIC/Class I Div. 1, international approvals
- EMC acc. to NAMUR NE21 and EN 61326
- LEDs acc. to NAMUR NE44
- Software acc. to NAMUR NE53
- Switch-on pulse suppression
- Devices K*D2:
  - Supply voltage 20 V DC to 30 V DC via Power Rail or supply terminals
  - Fault signals via Power Rail
- Devices K*A and K*U:
  - Supply voltage 115 V/230 V AC ±10 %
- Safety devices acc. to VDE 0660 T.209, AK acc. to DIN 19250

Digital inputs/outputs in accordance with NAMUR

The standards references for this interface have changed many times:

German standard (old): **DIN 19234**: Electrical distance sensors – DC interface for distance sensors and switch amplifiers; 1990-06

European standard (old): **EN 50227**: Low voltage switch gear and control gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 1996-10

German version (old): **DIN EN 50227**: Low voltage switch gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 1997, German nomenclature VDE 0660, part 212

Current designation: DIN EN 60947-5-6: Low voltage switch gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 2000, German nomenclature: VDE 0660 part 212

Current IEC designation: IEC 60947-5-6: Low voltage switch gear and control gear – part 5-6: Control circuit devices and switching elements – DC interface for proximity sensors and switching amplifiers (NAMUR), 1999

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Switch Amplifiers

Model Number	Channels	Function: Timer	Function: Interval	Input (Field): NAMUR Sensor/ Dry Contact	Input (Field): Line Fault Detection	Output (Control System): Relay	Output (Control System): Transistor (Active/Passive)	Output (Control System): Error Message Output	Output (Control System): Active Signal Output	Supply: 24 V DC	Supply: 115 V AC/ 230 V AC	SIL	Zone 2/Division 2 Mounting	Page
KCD2-SR-Ex1.LB	1			■	■	2		■		■		2	■	127
KFD2-SR2-Ex1.W	1			■	■	1				■		2	■	128
KFA5-SR2-Ex1.W	1			■	■	1					■	2		129
KFA6-SR2-Ex1.W	1			■	■	1					■	2		130
KFD2-SR2-Ex1.W.LB	1			■	■	2		■		■		2	■	131
KFA5-SR2-Ex1.W.LB	1			■	■	2		■			■	2		132
KFA6-SR2-Ex1.W.LB	1			■	■	2		■			■	2		133
KCD2-SR-Ex2	2			■	■	2				■		2	■	134
KFD2-SR2-Ex2.W	2			■	■	2				■		2	■	135
KFA5-SR2-Ex2.W	2			■	■	2					■	2		136
KFA6-SR2-Ex2.W	2			■	■	2					■	2		137
KFA5-SR2-Ex2.W.IR	2		■	■	■	2					■			138
KFA6-SR2-Ex2.W.IR	2		■	■	■	2					■			139
KFD2-SR2-Ex2.2S	2			■	■	2x2				■		2	■	140
KFD2-SRA-Ex4	4			■	■	4				■				141
KFD2-SR-Ex1.4S.LK	1	■		■	■	4+1		■		■				142
KFD2-ST2-Ex1.LB	1			■	■		2	■		■		2	■	143
KFD2-ST2-Ex2	2			■	■		2			■		2	■	144
KFD2-SOT2-Ex1.LB	1			■	■		2	■		■		2	■	145
KFD2-SOT2-Ex1.LB.IO	1			■	■		2	■		■		2	■	146
KFD2-SOT2-Ex1.N	1			■	■		NAMUR			■		2	■	147
KFD2-SOT2-Ex2	2			■	■		2			■		2	■	148
KFA5-SOT2-Ex2	2			■	■		2				■	2		149
KFA6-SOT2-Ex2	2			■	■		2				■	2		150
KFD2-SOT2-Ex2.IO	2			■	■		2			■		2	■	151
KFD2-SH-Ex1	1			SN*	■	1		■		■		3	■	152
KFD2-SH-Ex1.T.OP	1			SN*	■		1	■	■	■		3	■	153
KHA6-SH-Ex1	1			SN*	■	1		■			■	3		154
KFD2-DU-Ex1.D	1	■		■	■	1	1			■			■	155
KFA5-DU-Ex1.D	1	■		■	■	1	1				■			156
KFA6-DU-Ex1.D	1	■		■	■	1	1				■			157

* Pepperl+Fuchs Safety Sensors

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Frequency Converters

Model Number	Functions			Input (Field)		Output (Control System)				Supply				Page
	Speed Monitor	Frequency Conversion	Special Functions	NAMUR Sensor/ Dry Contact	Line Fault Detection	Relay	Transistor (Passive)	Error Message Output	0/4 mA ... 20 mA	24 V DC	115 V AC/ 230 V AC	SIL	Zone 2/Division 2 Mounting	
KFD2-SR2-Ex2.W.SM	■		■	■	■	2				■		2	■	158
KFD2-DWB-Ex1.D	■			■	■	2		■		■		2	■	159
KFA5-DWB-Ex1.D	■			■	■	2		■			■	2		160
KFA6-DWB-Ex1.D	■			■	■	2		■			■	2		161
KFD2-UFC-Ex1.D	■	■	■	■	■	2	1	■	1	■		2	■	162
KFU8-UFC-Ex1.D	■	■	■	■	■	2	1	■	1	■	■	2		163
KFD2-UFT-Ex2.D	■	■	■	■	■	2	2	■	1	■			■	164
KFU8-UFT-Ex2.D	■	■	■	■	■	2	2	■	1	■	■			165

Conductivity Switch Amplifiers

Model Number			Input (Field)		Output (Control System)		Supply				Page
	Channels	Function Measurement of Conductivity	Line Fault Detection	Resistance	Relay	Error Message Output	24 V DC	115 V AC/ 230 V AC	SIL	Zone 2/Division 2 Mounting	
KFD2-ER-Ex1.W.LB	1	■	■	■	2	■	■				166
KFA5-ER-Ex1.W.LB	1	■	■	■	2	■		■			167
KFA6-ER-Ex1.W.LB	1	■	■	■	2	■		■			168

Ground Fault Detections and Interface Modules

Model Number	Description	Page
KFD2-ELD-Ex16	Ground Fault Detection, 16-channel, digital and analog inputs	169
KFD2-FF-Ex2.RS232	RS 232 Repeater, bi-directional	170

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Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 500 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal or error message; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 30 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 119 mm (0.5 x 4.5 x 4.7 in), housing type A2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0092
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ⓔx I (M1) [Ex ia] I
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4 X
FM approval	
Control drawing	16-533FM-12 (cFMus)
UL approval	
Control drawing	16-533FM-12 (cULus)
IECEx approval	IECEx BAS 06.0025
Approved for	[Ex ia] IIC, [Ex ia] I

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Housing width 12.5 mm**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

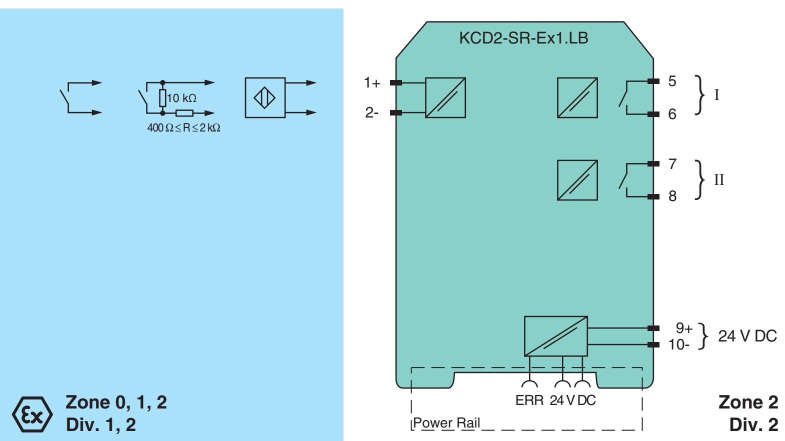
The proximity sensor or switch controls a form A normally open relay contact for the safe area load. The normal output state can be reversed using switch S1. Switch S2 allows output II to be switched between a signal output and an error message output. Switch S3 enables or disables line fault detection of the field circuit.

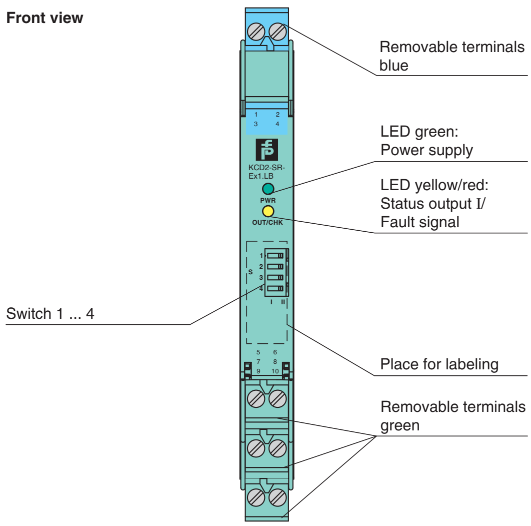
During an error condition, relays revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Due to its compact housing design and low heat dissipation, this device is useful for detecting positions, end stops, and switching states in space-critical applications.

Diagrams





K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

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KFD2-SR2-Ex1.W

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The barrier output changes state when the input signal changes state. The normal output state can be reversed using switch S1. Switch S3 is used to enable or disable line fault detection of the field circuit.

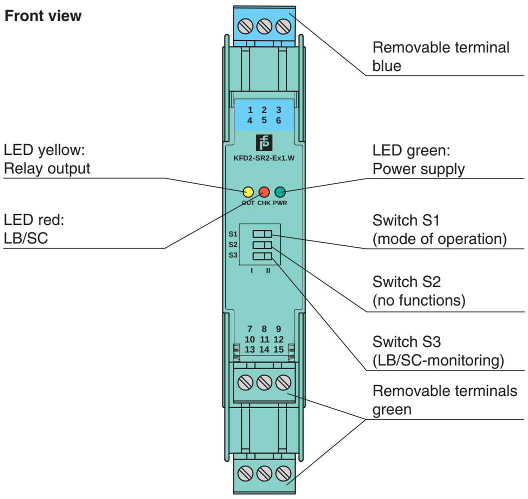
During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault according to NAMUR NE44.

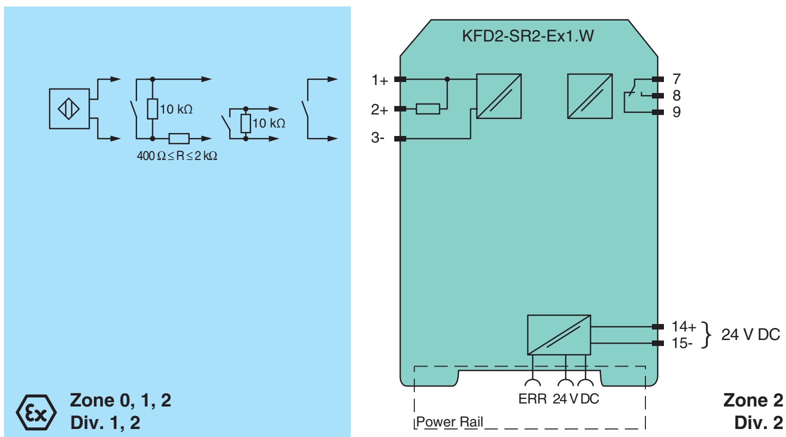
A unique collective error messaging feature is available when used with the Power Rail system.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	< 0.9 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output	signal; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2080
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection	Ⓔx II (3)G [Ex ic] IIC; [Ex nL] IIC
Statement of conformity	TÜV 99 ATEX 1493 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Diagrams





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Technical data

Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	1 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output	signal; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2081
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Features

- **1-channel isolated barrier**
- **115 V AC supply**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

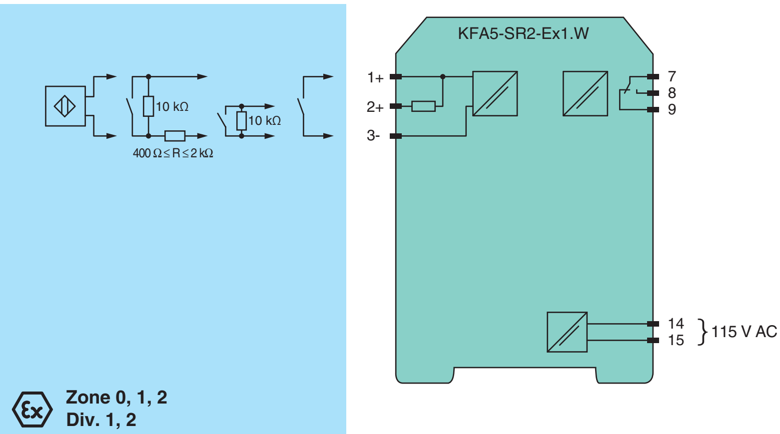
Function

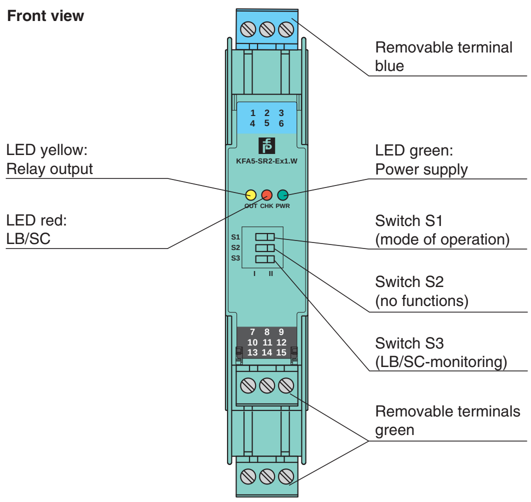
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The barrier output changes state when the input signal changes state. The normal output state can be reversed using switch S1. Switch S3 is used to enable or disable line fault detection of the field circuit.

During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault according to NAMUR NE44.

Diagrams





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Features

- **1-channel isolated barrier**
- **230 V AC supply**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

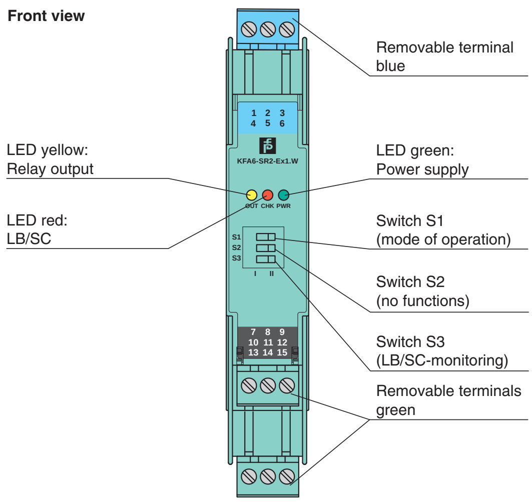
The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The barrier output changes state when the input signal changes state. The normal output state can be reversed using switch S1. Switch S3 is used to enable or disable line fault detection of the field circuit.

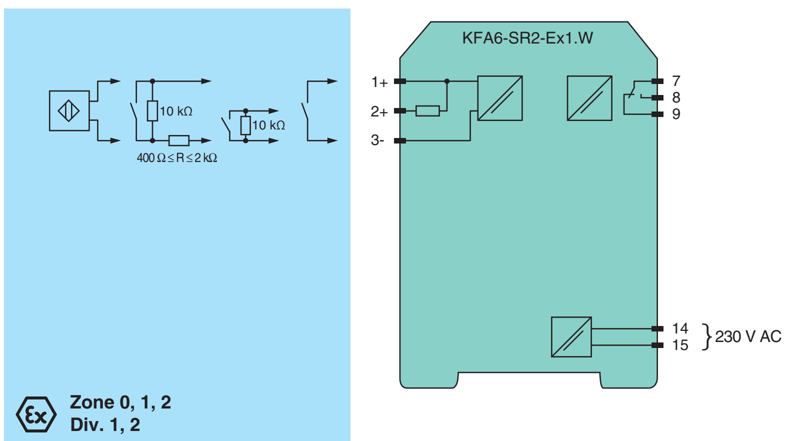
During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault according to NAMUR NE44.

Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	≤ 1 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output	signal; relay
Contact loading	253 V AC/2 A/cos Φ > 0.7; 126.5 V AC/4 A/cos Φ > 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2081
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	< 1.3 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal or error message; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2080
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection	Ⓔx II (3)G [Ex ic] IIC; [Ex nL] IIC
Statement of conformity	TÜV 99 ATEX 1493 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

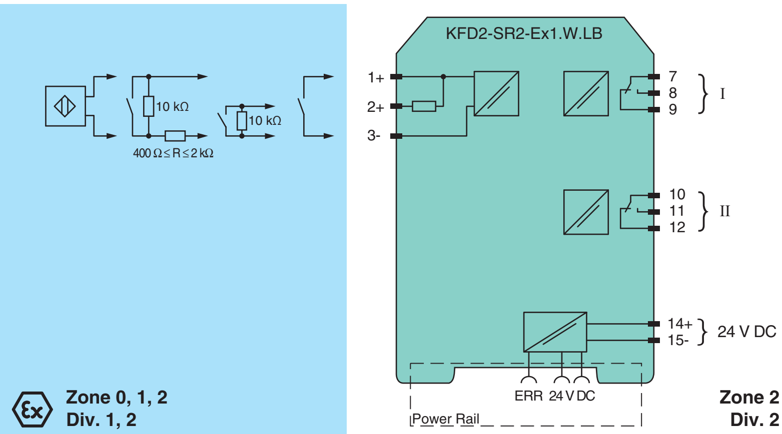
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

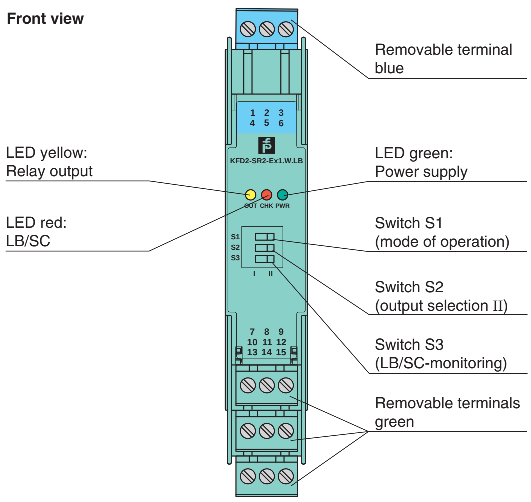
The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The normal output state can be reversed using switch S1. Switch S2 allows output II to be switched between a signal output or an error message output. Switch S3 is used to enable or disable line fault detection of the field circuit.

During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





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Features

- **1-channel isolated barrier**
- **115 V AC supply**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

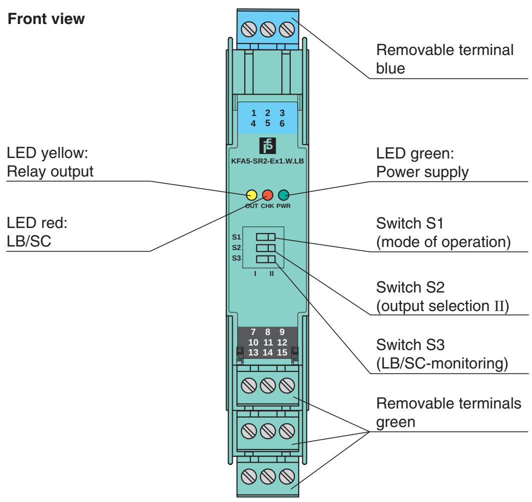
The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The normal output state can be reversed using switch S1. Switch S2 allows output II to be switched between a signal output or an error message output. Switch S3 is used to enable or disable line fault detection of the field circuit.

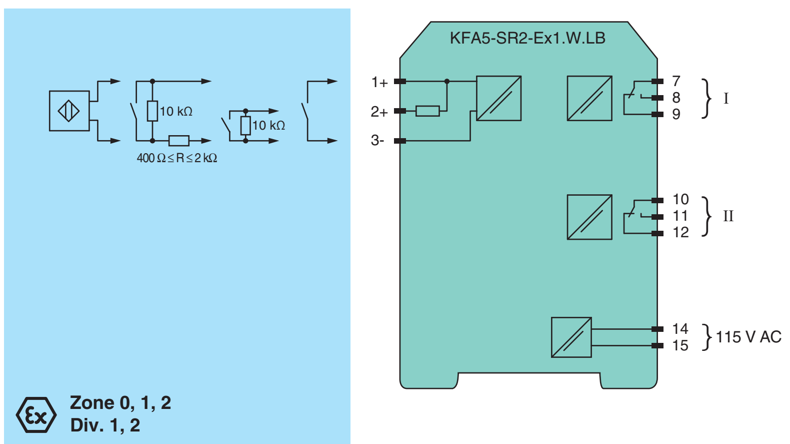
During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

Technical data

Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	≤ 1.3 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal or error message; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2081
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Diagrams





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Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	≤ 1.3 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal or error message; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2081
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Features

- **1-channel isolated barrier**
- **230 V AC supply**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

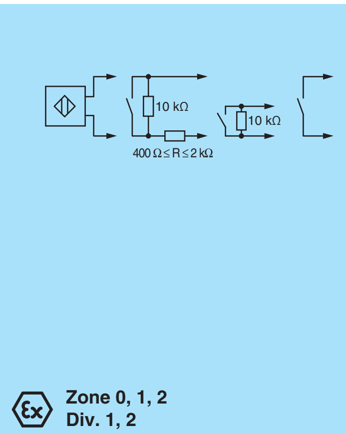
Function

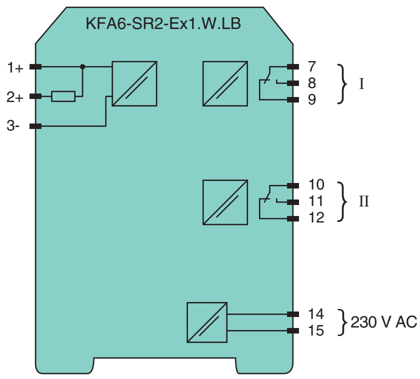
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The normal output state can be reversed using switch S1.
Switch S2 allows output II to be switched between a signal output or an error message output. Switch S3 is used to enable or disable line fault detection of the field circuit.

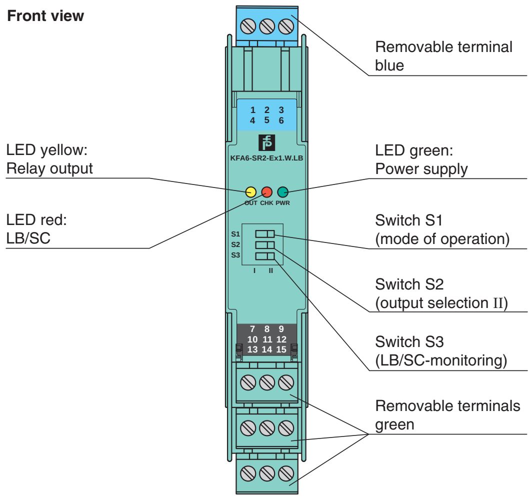
During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

Diagrams





Front view



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Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Housing width 12.5 mm**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls a form A normally open relay contact for the safe area load. The normal output state can be reversed using switches S1 and S2. Switch S3 is used to enable or disable line fault detection of the field circuit.

During an error condition, relays revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

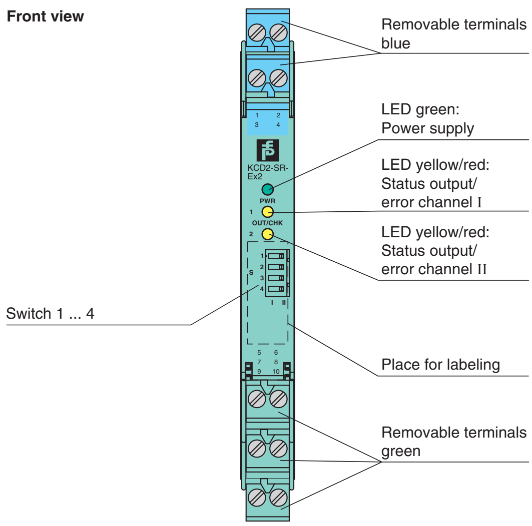
A unique collective error messaging feature is available when used with the Power Rail system.

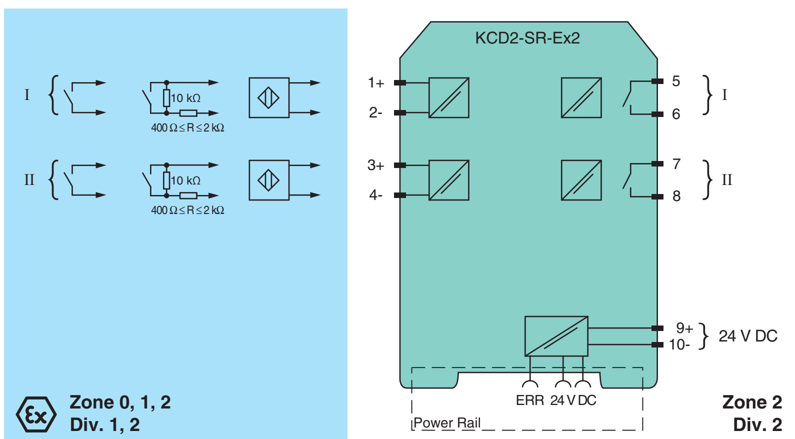
Due to its compact housing design and low heat dissipation, this device is useful for detecting positions, end stops, and switching states in space-critical applications.

Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 600 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 30 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 119 mm (0.5 x 4.5 x 4.7 in), housing type A2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0092
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ⓔx I (M1) [Ex ia] I
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4 X
FM approval	
Control drawing	16-533FM-12 (cFMus)
UL approval	
Control drawing	16-533FM-12 (cULus)
IECEx approval	IECEx BAS 06.0025
Approved for	[Ex ia] IIC, [Ex ia] I

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	< 1.3 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I, II	signal; relay
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2080
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection	Ex II (3)G [Ex ic] IIC; [Ex nL] IIC
Statement of conformity	TÜV 99 ATEX 1493 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

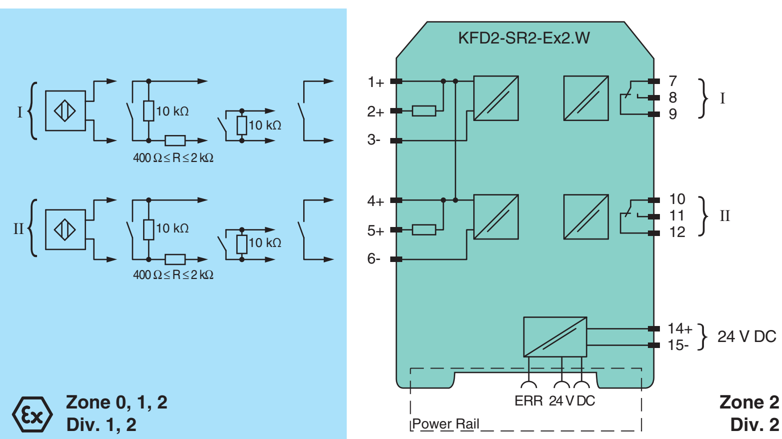
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

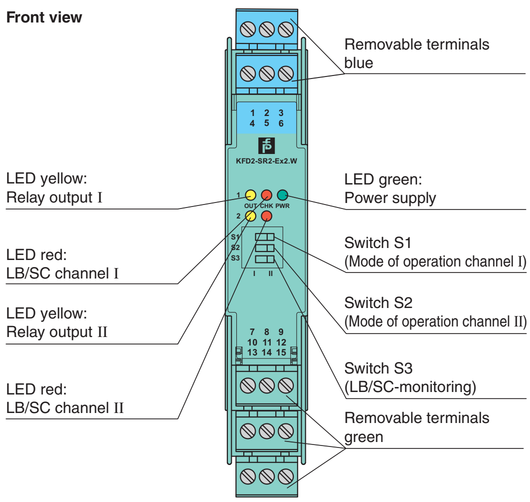
The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The normal output state can be reversed using switches S1 and S2. Switch S3 is used to enable or disable line fault detection of the field circuit.

During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **115 V AC supply**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The normal output state can be reversed using switches S1 and S2. Switch S3 is used to enable or disable line fault detection of the field circuit.

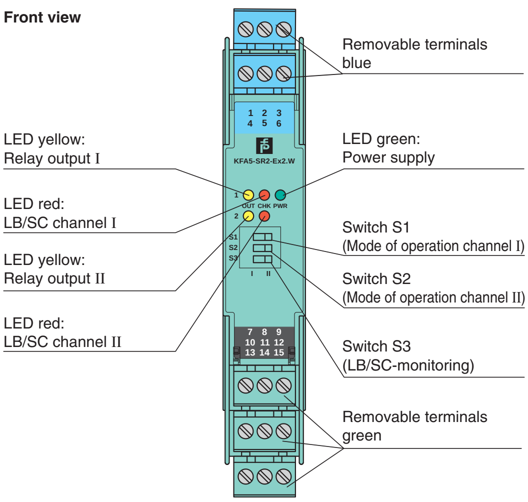
During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

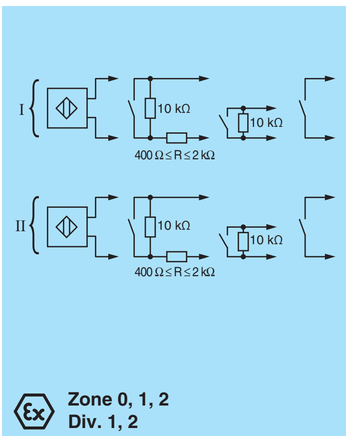
Technical data

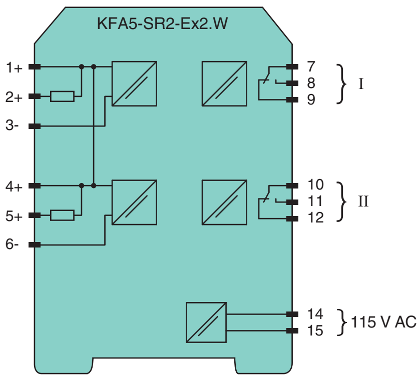
Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	≤ 1.3 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I, II	signal; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2081
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Diagrams

Front view







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Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	≤ 1.3 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I, II	signal; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2081
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Features

- **2-channel isolated barrier**
- **230 V AC supply**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

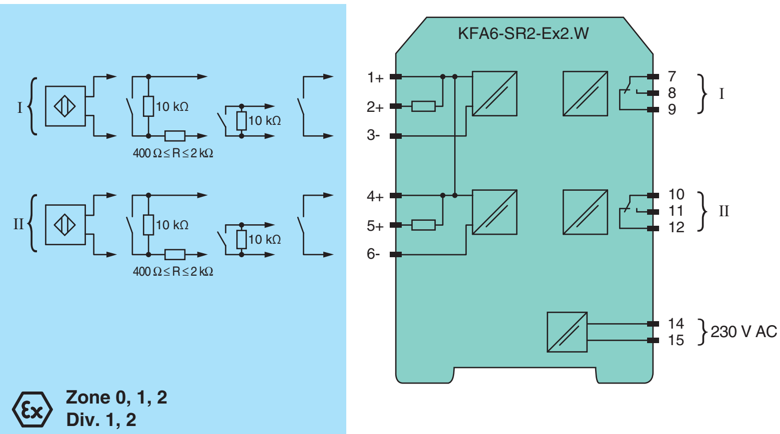
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls a form C changeover relay contact for the safe area load. The normal output state can be reversed using switches S1 and S2. Switch S3 is used to enable or disable line fault detection of the field circuit.

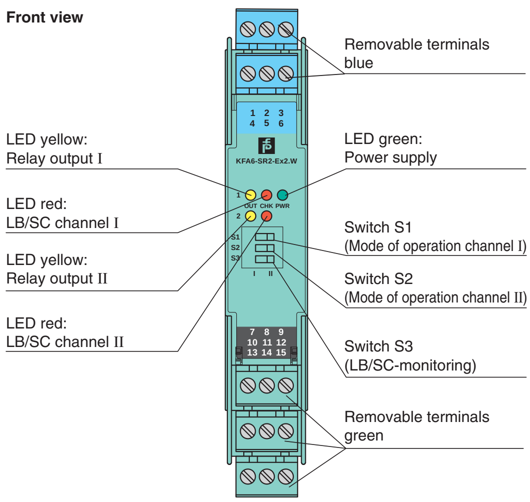
During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **115 V AC supply**
- **Dry contact or NAMUR inputs**
- **Latching relay output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**

Function

This isolated barrier is used for intrinsic safety applications. It has a latching relay (bistable operation) for level control, pump up/pump down, or other switch/logic applications. The device is set by an active signal on input I and is reset by an active signal on input II. The mode of operation of inputs I and II can be programmed.

Switch S3 is used to enable or disable line fault detection of the field circuit. During an error condition or loss of power, the form C changeover relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44. When the wiring fault is corrected, the relay will revert to the state prior to the fault.

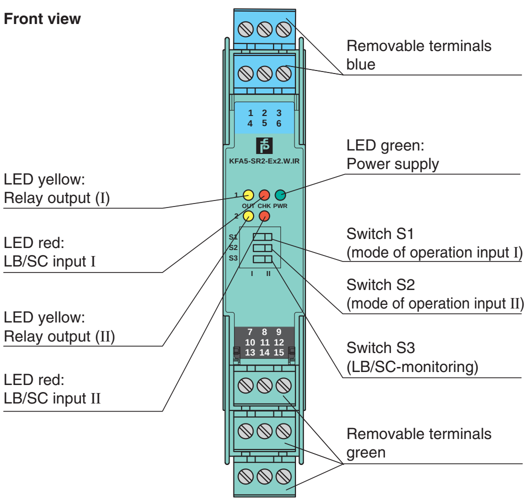
If the device is re-energized after power loss, the relays return to a factory-configured state.

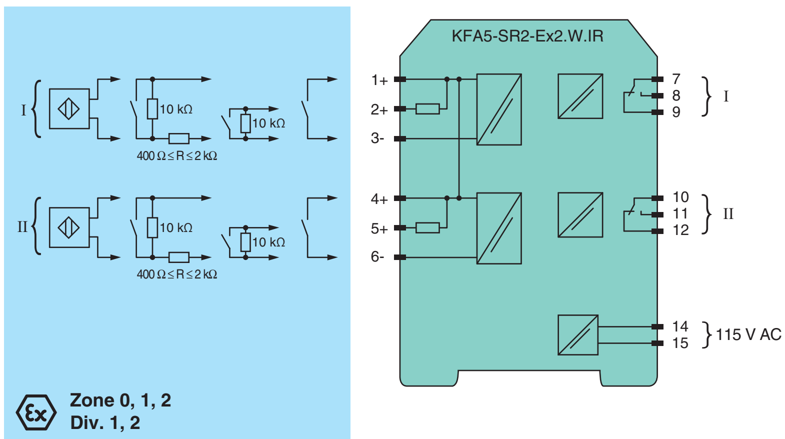
Technical data

Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	≤ 1.5 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 10 ms/≥ 10 ms
Output	
Output I, II	signal; relay
Contact loading	253 V AC/2 A/cos Φ > 0.7; 126.5 V AC/4 A/cos Φ > 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2081
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Diagrams

Front view





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Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	≤ 1.5 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 10 ms/≥ 10 ms
Output	
Output I, II	signal; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2081
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Features

- **2-channel isolated barrier**
- **230 V AC supply**
- **Dry contact or NAMUR inputs**
- **Latching relay output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**

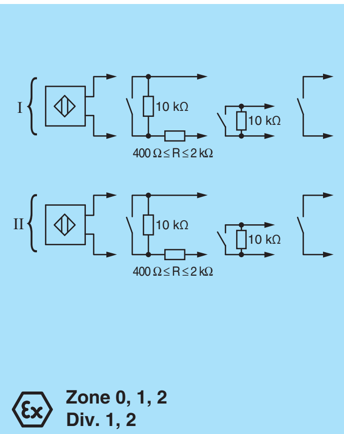
Function

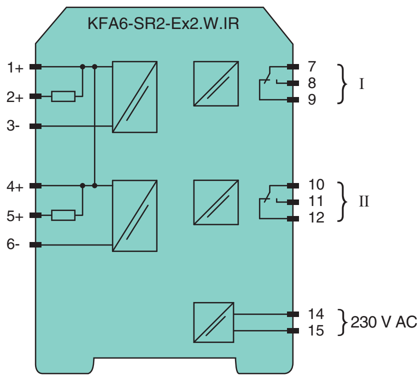
This isolated barrier is used for intrinsic safety applications. It has a latching relay (bistable operation) for level control, pump up/pump down, or other switch/logic applications. The device is set by an active signal on input I and is reset by an active signal on input II. The mode of operation of inputs I and II can be programmed.

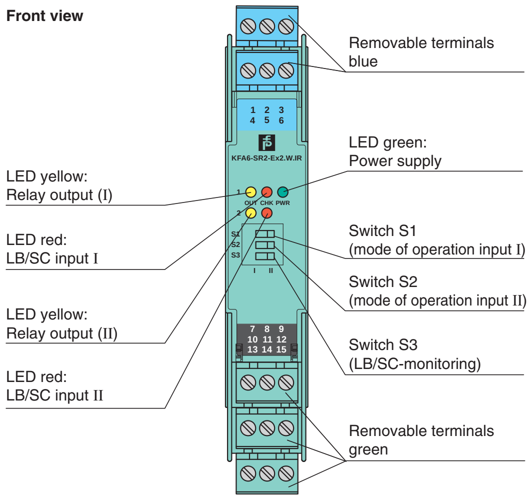
Switch S3 is used to enable or disable line fault detection of the field circuit. During an error condition or loss of power, the form C changeover relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44. When the wiring fault is corrected, the relay will revert to the state prior to the fault.

If the device is re-energized after power loss, the relays return to a factory-configured state.

Diagrams







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Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **2 x 2 relay contact outputs with AND logic**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

Each sensor or switch controls two form A normally open relay contacts for the safe area load. The normal output state can be reversed using switches S1 and S2. Switch S3 is used to enable or disable line fault detection of the field circuit.

During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

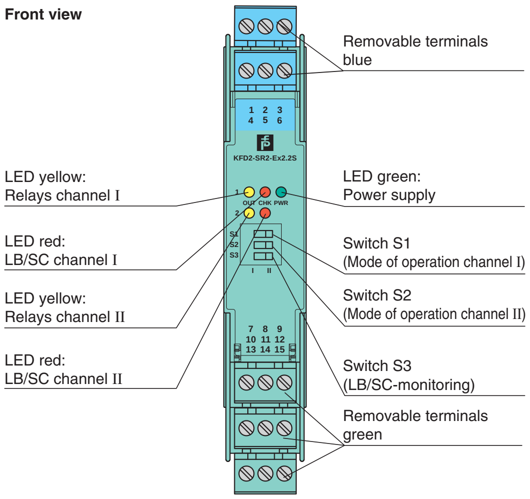
A unique collective error messaging feature is available when used with the Power Rail system.

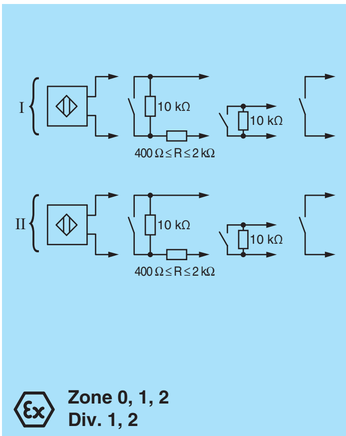
Technical data

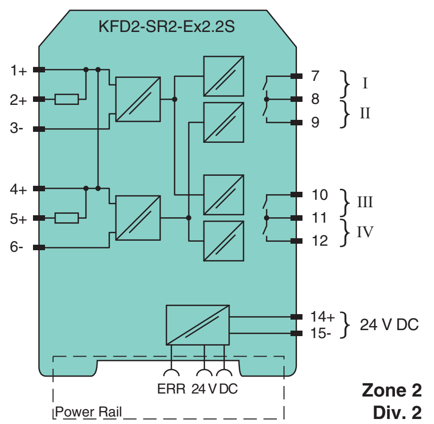
Supply	
Rated voltage	20 ... 30 V DC
Power consumption	< 1.3 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Collective error message	Power Rail
Output I, II, III, IV	channel 1, 2; relay
Contact loading	50 V AC/1 A/cos Φ> 0.7; 40 V DC/1 A resistive load
Minimum switch current	1 mA/24 V DC
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^8 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2083
Group, category, type of protection	⟨Ex⟩ II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1493 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Diagrams

Front view







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Technical data

Supply	
Rated voltage	19 ... 30 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Pulse/Pause ratio	≥ 35 ms/≥ 35 ms (non-AC operation) ≥ 70 ms/≥ 70 ms (AC operation)
Lead monitoring	breakage I ≤ 0.15 mA, short-circuit I > 6 mA
Output	
Collective error message	Power Rail
Output I up to IV	Signal I ... Signal IV; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 30 ms/approx. 30 ms
Mechanical life	5 x 10^6 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz (non-AC operation) ≤ 3 Hz (AC operation)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	ZELM 99 ATEX 0009
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC [circuit(s) in zone 0/1/2]
UL approval	
Control drawing	116-0145

Features

- **4-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **50 % less wiring, 2:1 technology**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**

Function

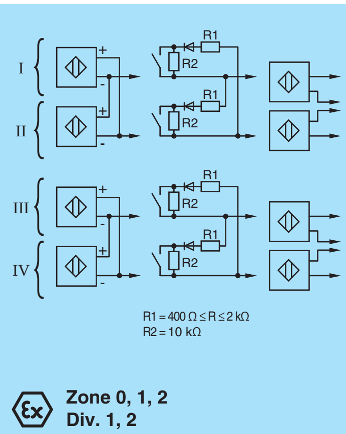
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

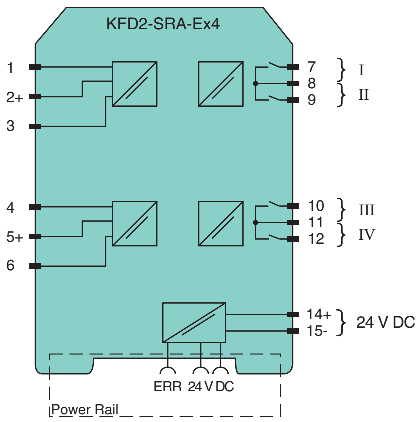
Each sensor or switch controls one form A normally open relay contact for the safe area load. A special 2:1 wire-saving technology is available on this isolator, reducing field wiring by 50 %.

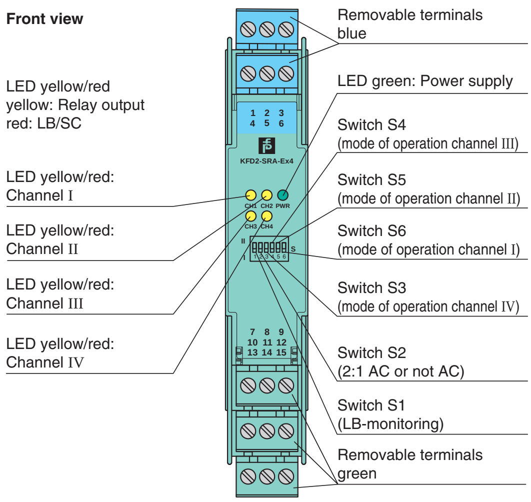
Switch S1 is used to enable or disable line fault detection of the field circuit. The 2:1 mode is selected with switch S2 while the remaining switches, S3 ... S6, are used for reversing the normal output state of the relays.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams







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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Adjustable pulse extension**
- **4 relay contact outputs**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**

Function

This isolated barrier is used for intrinsic safety applications. It extends the pulse duration of a digital signal (NAMUR sensors/mechanical contacts) from a hazardous area.

The proximity sensor or switch controls 4 form A normally open relay contact for the safe area load. The pulse duration on the output contacts can be adjusted from 50 ms to 1 s with a potentiometer. The pulse duration is designed to retrigger if another input pulse is detected.

A separate form A normally open relay contact is also available as a fault output. The normal output state can be reversed with switch S1a. Switch S1b enables or disables line fault detection of the field circuit.

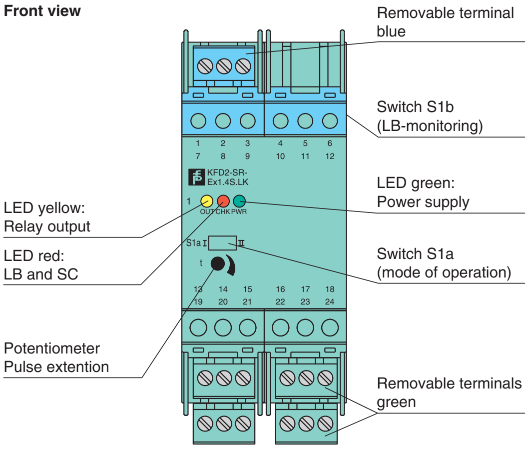
During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

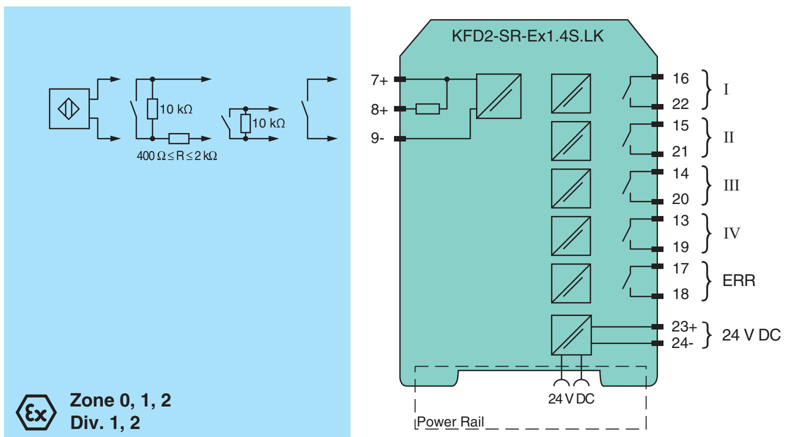
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Pulse/Pause ratio	≥ 0.1 ms/≥ 0.1 ms
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Fault signal	relay
Output I up to IV	signal; relay
Contact loading	50 V AC/1 A/cos Φ > 0.7; 40 V DC/1 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	5 x 10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	40 x 107 x 115 mm (1.6 x 4.2 x 4.5 in), housing type C1
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2082
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Collective error message	Power Rail
Signal level	1-signal: (L+) - 3.5 V (100 mA, short-circuit proof) 0-signal: switched off (off-state current ≤ 10 µA)
Output I	signal; electronic output, active
Output II	signal or error message; electronic output, active
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2035
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Active transistor output**
- **Active fault output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

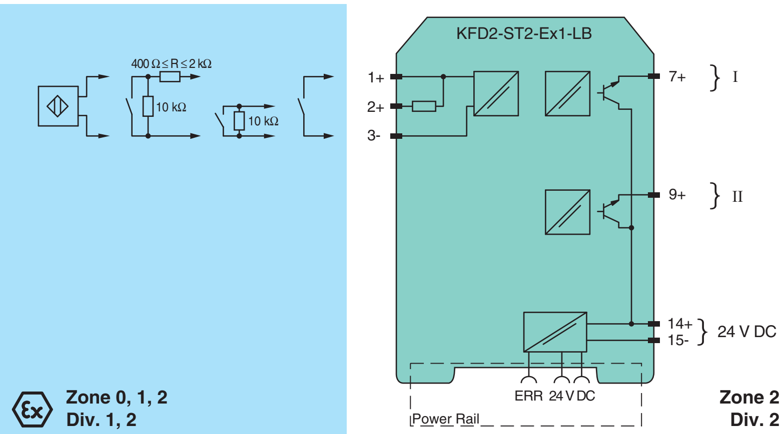
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls an active transistor output per channel for the safe area load. The normal output state is reversed using switch S1. Switch S2 allows output II to be switched between a signal output and an error message output. Switch S3 enables or disables line fault detection of the field circuit.

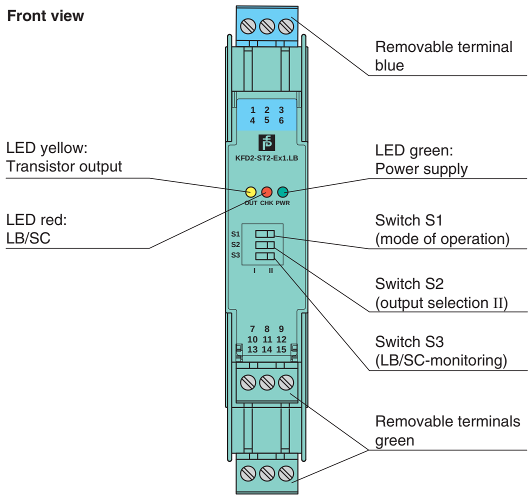
During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams



Front view



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Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Active transistor output**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

Each proximity sensor or switch controls an active transistor output per channel for the safe area load. The barrier output changes state when the input signal changes state.

The normal output state can be reversed using switch S1. Switch S2 allows output 2 to be switched between a signal output or an error message output. Switch S3 enables or disables line fault detection of the field circuit.

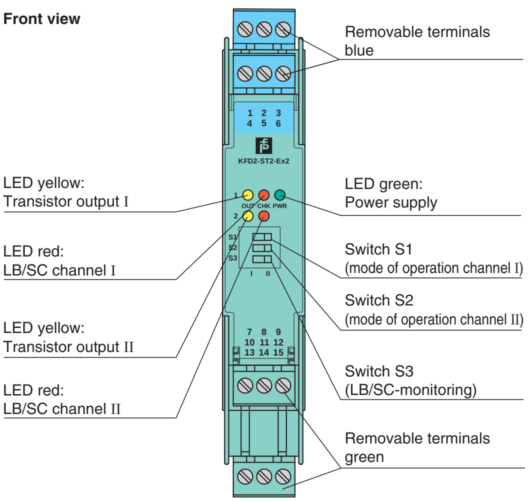
During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

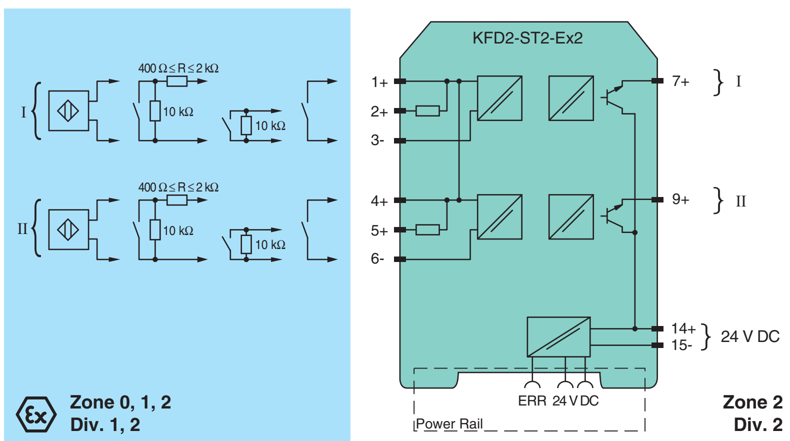
A unique collective error messaging feature is available when used with the Power Rail system.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Collective error message	Power Rail
Signal level	1-signal: (L+) - 3.5 V (100 mA, short-circuit proof) 0-signal: switched off (off-state current ≤ 10 µA)
Output I, II	signal; electronic output, active
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2035
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Collective error message	Power Rail
Signal level	1-signal: switching voltage - 2.5 V max. at 10 mA switching current or 3 V max. at 100 mA switching current 0-signal: switched off (off-state current ≤ 10 µA)
Output I	signal, passive electronic output
Output II	signal or error message; passive transistor output
Switching voltage	≤ 40 V
Switching current	≤ 100 mA, short-circuit proof
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2035
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ⓔx I (M1) [EEx ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Passive transistor output, non-polarized**
- **Passive fault output, non-polarized**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

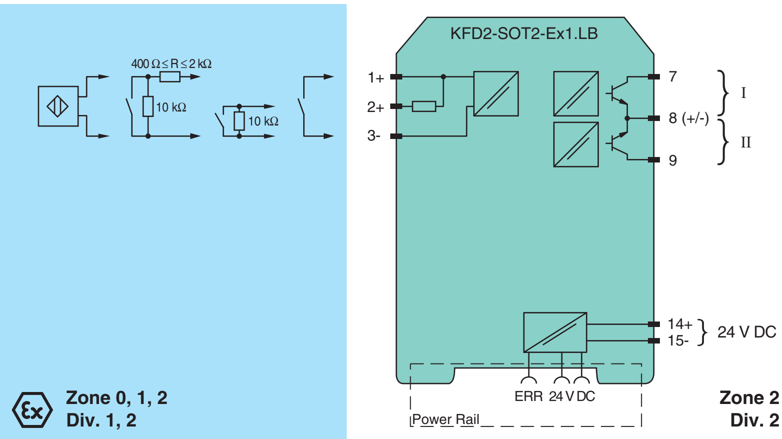
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

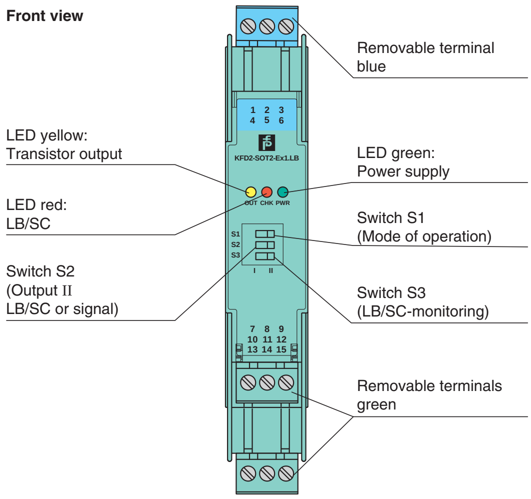
The proximity sensor or switch controls two passive transistors for the safe area load. The normal output state can be reversed using switch S1. Switch S2 allows output II to be switched between a signal output or an error message output. Switch S3 enables or disables line fault detection of the field circuit.

During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Isolated passive transistor output, non-polarized**
- **Isolated passive fault output, non-polarized**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls two passive transistors for the safe area load. Both transistor outputs are isolated from each other and isolated from the power supply. The normal output state can be reversed using switch S1. Switch S2 allows output II to be switched between a signal output and an error message output. Switch S3 enables or disables line fault detection of the field circuit.

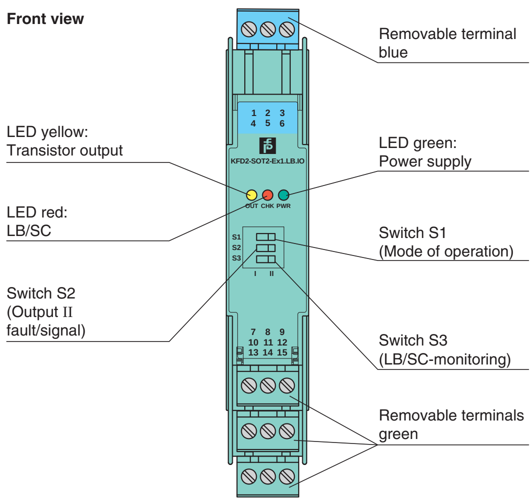
During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

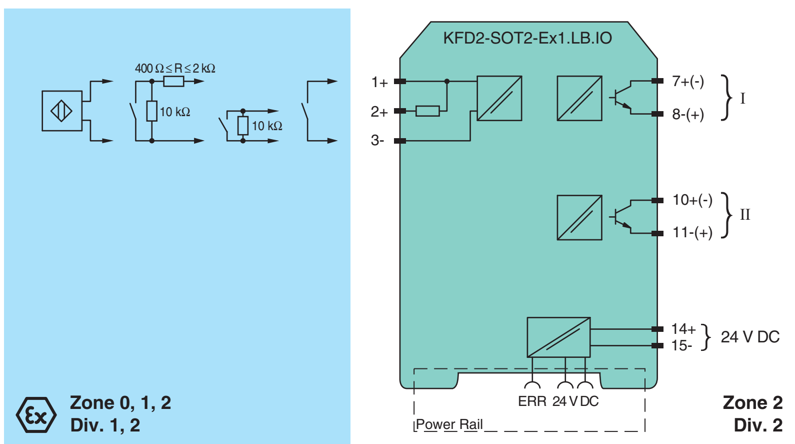
A unique collective error messaging feature is available when used with the Power Rail system.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Collective error message	Power Rail
Signal level	1-signal: switching voltage - 2.5 V max. at 10 mA switching current or 3 V max. at 100 mA switching current 0-signal: switched off (off-state current ≤ 10 µA)
Output I	signal, passive electronic output
Output II	signal or error message; passive transistor output
Switching voltage	≤ 40 V
Switching current	≤ 100 mA, short-circuit proof
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2035
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ex I (M1) [EEx ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Rated voltage	typ. 8 V max. 20 V DC
Output	signal, passive electronic output
Impedance	1-signal: 1.6 kΩ ± 5 % 0-signal: 12 kΩ ± 5 %
Collective error message	Power Rail
Fault signal	< 10 µA
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2035
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **NAMUR rated output**
- **Line fault transparency**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

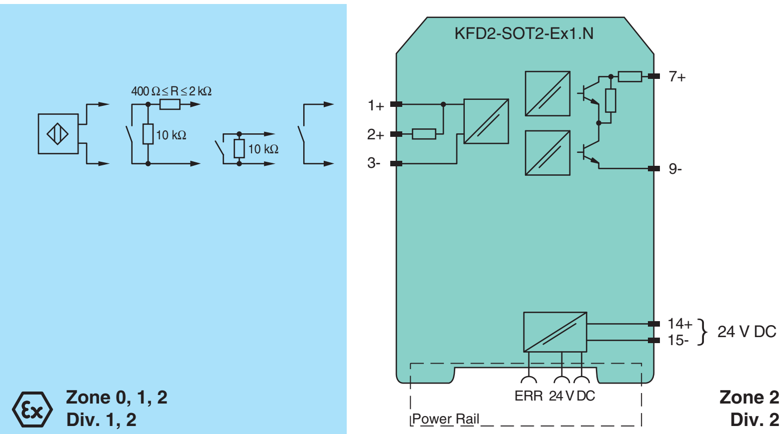
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

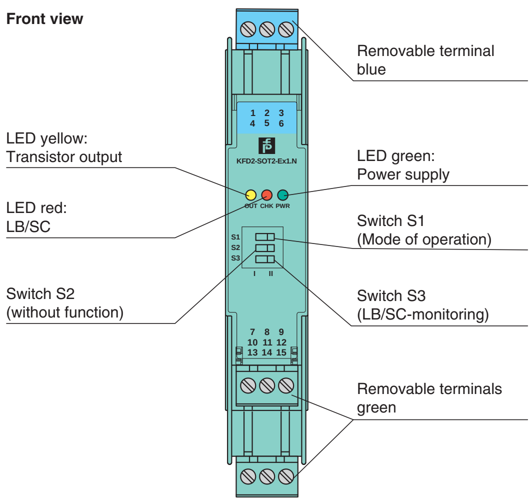
The switch output is designed according to NAMUR and transfers in addition to the switch signal the fault message in case of lead breakage or short circuit in the input circuit. During the error condition, the output changes to a high-impedance state. This can be evaluated by the downstream unit. Thus any additional wiring is omited for the channel-wise line fault detection in the control system.

LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





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Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Passive transistor output, non-polarized**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

Each proximity sensor or switch controls a passive transistor output for the safe area load. The normal output state can be reversed using switch S1 for channel I and switch S2 for channel II. Switch S3 enables or disables line fault detection of the field circuit.

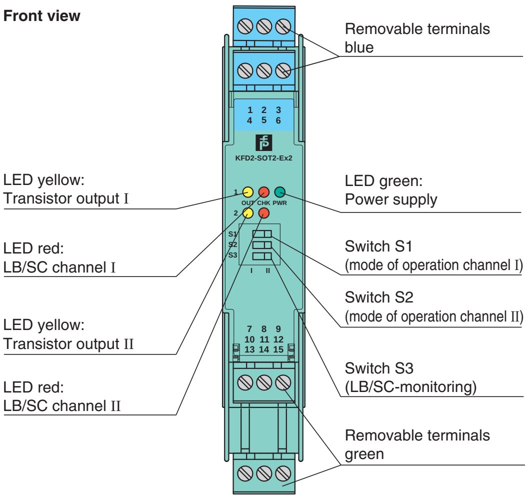
During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

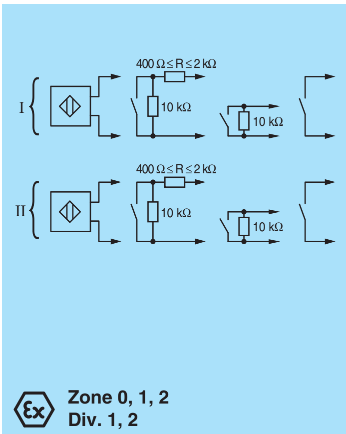
A unique collective error messaging feature is available when used with the Power Rail system.

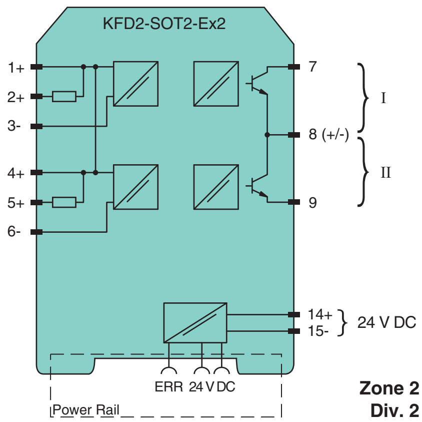
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Collective error message	Power Rail
Signal level	1-signal: switching voltage - 2.5 V max. at 10 mA switching current or 3 V max. at 100 mA switching current 0-signal: switched off (off-state current ≤ 10 µA)
Output I, II	signal; electronic output, passive
Switching voltage	≤ 40 V
Switching current	≤ 100 mA, short-circuit proof
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2035
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ⓔx I (M1) [EEx ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Diagrams







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Technical data

Supply	
Rated voltage	103.5 ... 126.5 V AC
Power consumption	≤ 1.5 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Signal level	1-signal: switching voltage - 2.5 V max. at 10 mA switching current or 3 V max. at 100 mA switching current 0-signal: switched off (off-state current ≤ 10 µA)
Output I, II	signal; electronic output, passive
Switching voltage	≤ 40 V
Switching current	≤ 100 mA, short-circuit proof
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 98 ATEX 2164
Group, category, type of protection	Ex II (1) G [Ex ia] IIC Ex II (1) D [Ex iaD]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Features

- **2-channel isolated barrier**
- **115 V AC supply**
- **Dry contact or NAMUR inputs**
- **Passive transistor output, non-polarized**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

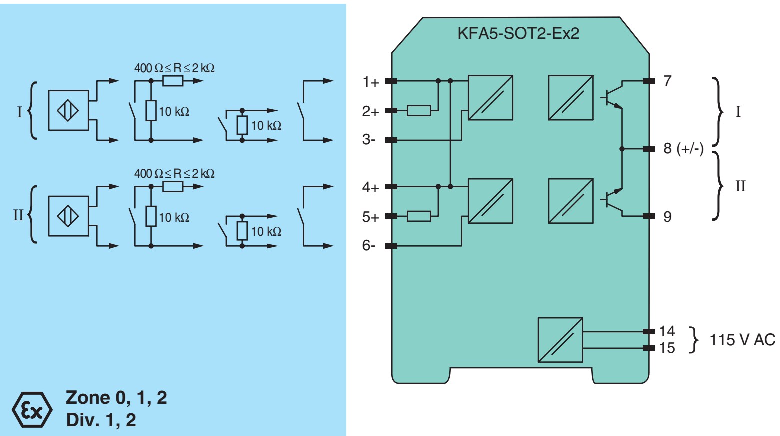
Function

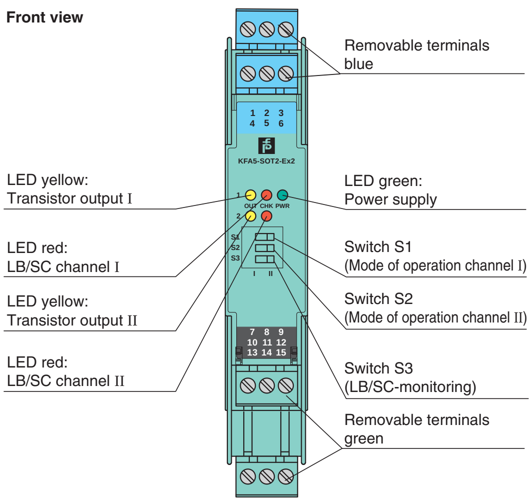
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

Each proximity sensor or switch controls a passive transistor output for the safe area load. The normal output state can be reversed using switch S1 for channel I and switch S2 for channel II. Switch S3 enables or disables line fault detection of the field circuit.

During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

Diagrams





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Features

- **2-channel isolated barrier**
- **230 V AC supply**
- **Dry contact or NAMUR inputs**
- **Passive transistor output, non-polarized**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

Each proximity sensor or switch controls a passive transistor output for the safe area load. The normal output state can be reversed using switch S1 for channel I and switch S2 for channel II. Switch S3 enables or disables line fault detection of the field circuit.

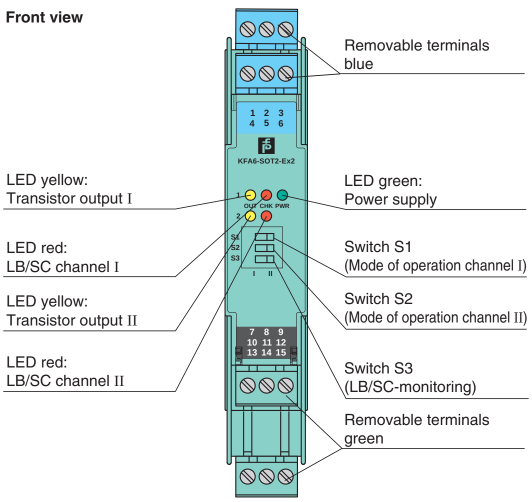
During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

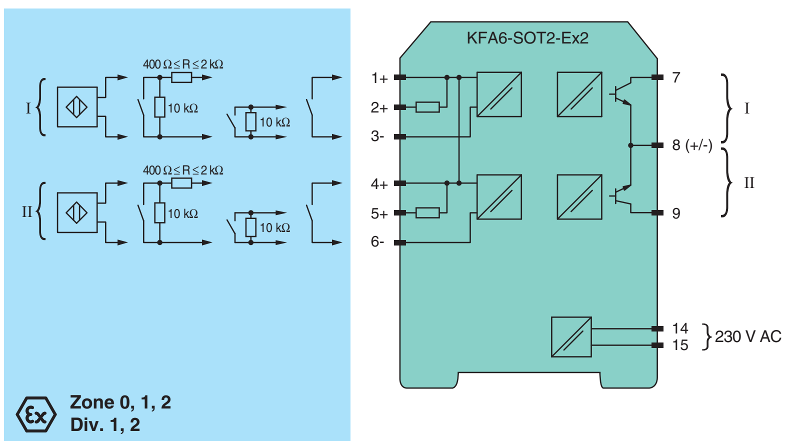
Technical data

Supply	
Rated voltage	207 ... 253 V AC
Power consumption	≤ 1.5 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Signal level	1-signal: switching voltage - 2.5 V max. at 10 mA switching current or 3 V max. at 100 mA switching current 0-signal: switched off (off-state current ≤ 10 µA)
Output I, II	signal; electronic output, passive
Switching voltage	≤ 40 V
Switching current	≤ 100 mA, short-circuit proof
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 98 ATEX 2164
Group, category, type of protection	Ⓔx II (1) G [Ex ia] IIC Ⓔx II (1) D [Ex iaD]
FM approval	
Control drawing	116-0035
UL approval	
Control drawing	116-0145
CSA approval	
Control drawing	116-0047

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Collective error message	Power Rail
Signal level	1-signal: switching voltage - 2.5 V max. at 10 mA switching current or 3 V max. at 100 mA switching current 0-signal: switched off (off-state current ≤ 10 µA)
Output I, II	signal; electronic output, passive
Switching voltage	≤ 40 V
Switching current	≤ 100 mA, short-circuit proof
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2035
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ex I (M1) [EEx ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Isolated passive transistor output, non-polarized**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

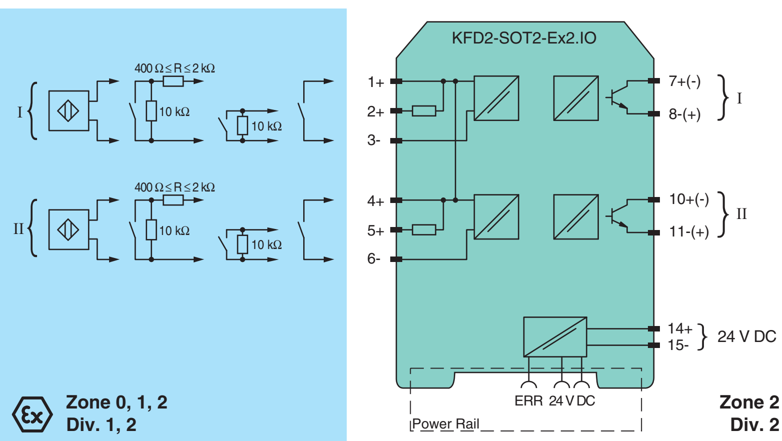
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

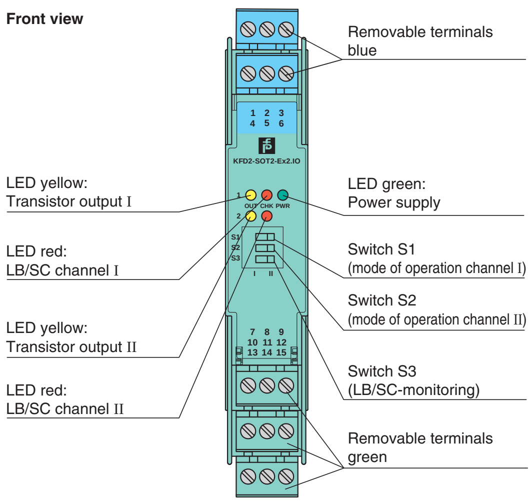
Each proximity sensor or switch controls a passive transistor output for the safe area load. Both transistor outputs are isolated from each other and isolated from the power supply. The normal output state can be reversed using switch S1 for channel I and switch S2 for channel II. Switch S3 enables or disables line fault detection of the field circuit.

During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





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KFD2-SH-Ex1

Switch Amplifier

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input for dry contacts or SN/S1N sensors**
- **Relay contact output**
- **Error message output**
- **For usage in accordance with ISO 13849-1**
- **Line fault detection (LFD)**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (SN/S1N proximity sensors and approved mechanical contacts) from a hazardous area to a safe area. It has additional protective circuitry to maintain a reliable safety function.

The proximity sensor or switch controls 1 safety output with 3 form A normally open relay contacts (one is in series to the 2 output relay contacts for the safety function), 1 standard output with 1 form A normally open relay contact, and 1 error message output with a passive transistor. Lead breakage (LB) and short circuit (SC) conditions are continuously monitored.

During an error condition, fault output energizes and outputs I and II de-energize.

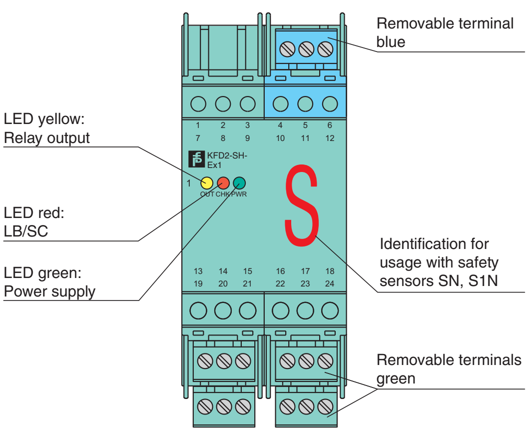
For safety applications, terminals 13 and 14 (output I) must be used.

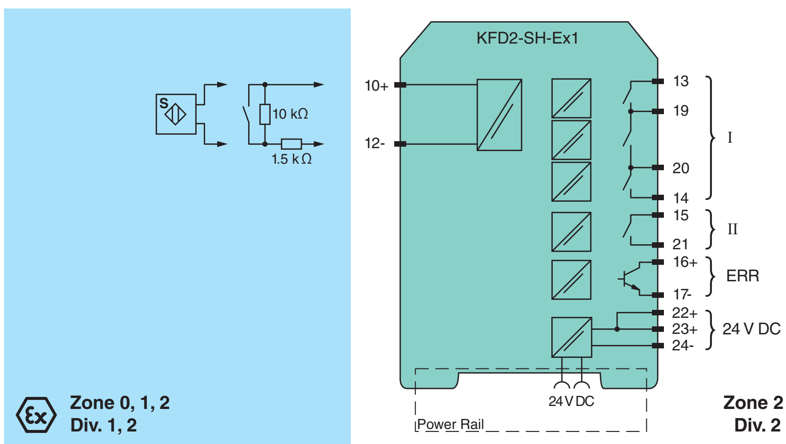
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.3 W
Input	
Open circuit voltage/short-circuit current	approx. 8.4 V DC/approx. 11.7 mA
Lead resistance	≤ 50 Ω, in hazardous area cable capacitances and inductivities are to be taken into account
Switching point	
Relay de-energized	I < 2.1 mA and I > 5.9 mA
Relay energized	2.8 mA < I < 5.3 mA
Response delay	≤ 1 ms
Output	
Output I	signal, safety oriented; relay
Output I, II	
Contact loading	50 V AC/1 A/cos Φ > 0.7; 24 V DC/1 A resistive load
Mechanical life	50 x 10^6 switching cycles
Output II	signal, not safety oriented; relay
Output III	fault signal, not safety oriented; electronic output, passive
Rated voltage	10 ... 30 V DC
Signal level	1-signal: (L+) -2.5 V (7 mA, short-circuit proof)/ 0-signal: blocked output (leakage current ≤ 10 mA)
Transfer characteristics	
Switching frequency	5 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 280 g
Dimensions	40 x 107 x 115 mm (1.6 x 4.2 x 4.5 in), housing type C1
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2042
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1493 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0158

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	≤ 1.7 W
Input	
Open circuit voltage/short-circuit current	approx. 8.4 V DC/approx. 11.7 mA
Lead resistance	≤ 50 Ω, cable capacitances and inductances must be observed in hazardous areas
Switching point	
Relay de-energized	I < 2.1 mA and I > 5.9 mA, output switched off
Relay energized	2.8 mA < I < 5.3 mA, output switched on
Response delay	≤ 1 ms
Output	
Output I	safety oriented; electronic output, active
Rated voltage	24 V DC (≥ 20 V DC)
Current	> 15 mA (short-circuit current ≤ 25 mA)
Output II	not safety oriented; relay
Output II and III	
Contact loading	50 V AC/DC, 250 mA
Mechanical life	≤ 20 x 10^6 switching cycles
Output III	not safety oriented, fault signal; relay
Transfer characteristics	
Switching frequency	
Output I	≤ 50 Hz
Output II	≤ 5 Hz
Output III	≤ 5 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2041
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1493 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0158

Features

- 1-channel isolated barrier
- 24 V DC supply (Power Rail)
- Input for dry contacts or SN/S1N sensors
- Active signal output
- Relay contact output
- Error message output
- For usage in accordance with ISO 13849-1
- Line fault detection (LFD)
- Up to SIL3 acc. to IEC 61508

Function

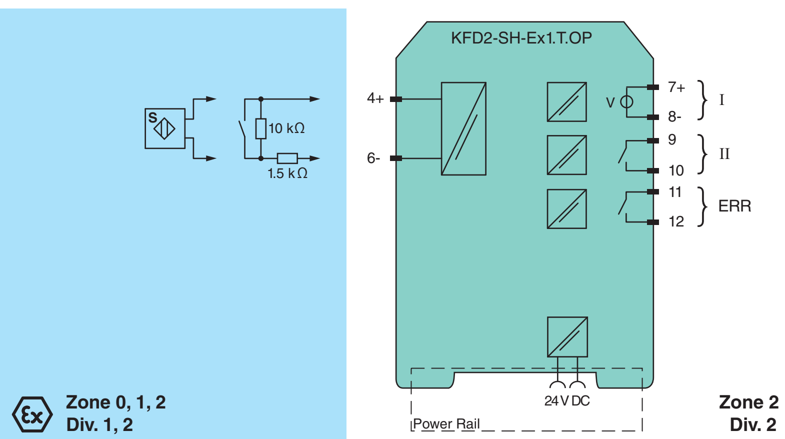
This isolated barrier is used for intrinsic safety applications. It transfers digital signals (SN/S1N proximity sensors and approved mechanical contacts) from a hazardous area to a safe area. It has an additional protective circuitry to maintain a reliable safety function.

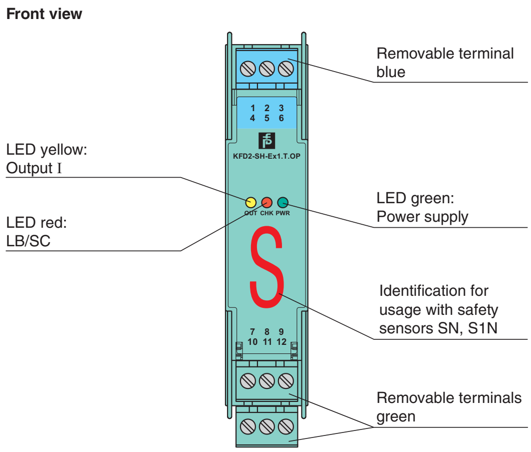
The proximity sensor or switch controls a safety-related electronic output (output I) and a relay output (output II) with a form A normally open relay contact. Lead breakage (LB) and short circuit (SC) conditions are continuously monitored.

During an error condition, fault output energizes and outputs I and II de-energize.

For safety applications, terminals 7 and 8 (output I) must be used.

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **115/230 V AC supply**
- **Input for dry contacts or SN/S1N sensors**
- **Relay contact output**
- **Error message output**
- **For usage in accordance with ISO 13849-1**
- **Line fault detection (LFD)**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (SN/S1N proximity sensors and approved mechanical contacts) from a hazardous area to a safe area. It has additional protective circuitry to maintain a reliable safety function.

The proximity sensor or switch controls 1 safety output with 3 form A normally open relay contacts (one is in series to the 2 output relay contacts for the safety function), 1 standard output with 1 form A normally open relay contact, and 1 error message output with a passive transistor. Lead breakage (LB) and short circuit (SC) conditions are continuously monitored.

During an error condition, fault output energizes and outputs I and II de-energize.

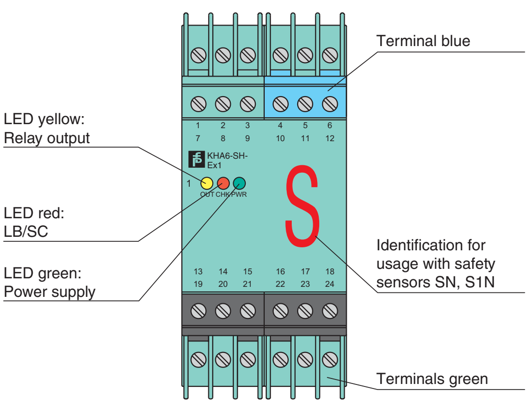
For safety applications, terminals 13 and 14 (output I) must be used.

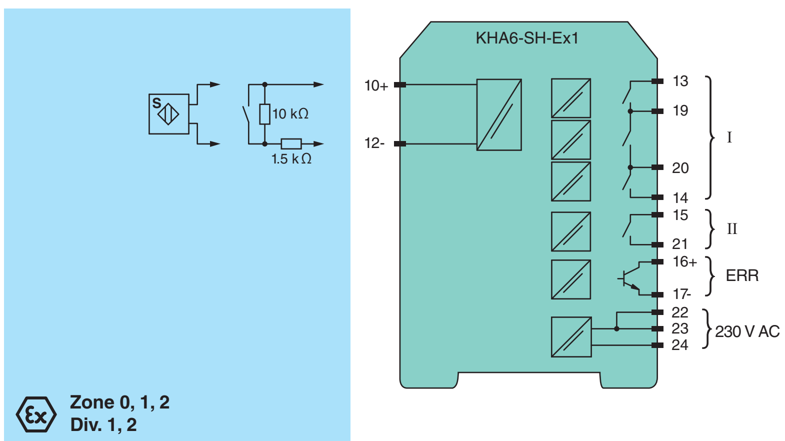
Technical data

Supply	
Rated voltage	85 ... 253 V AC, 45 ... 65 Hz
Power consumption	≤ 2.3 W
Input	
Open circuit voltage/short-circuit current	approx. 8.4 V DC/approx. 11.7 mA
Lead resistance	≤ 50 Ω, in hazardous area cable capacitances and inductivities are to be taken into account
Switching point	
Relay de-energized	I < 2.1 mA and I > 5.9 mA
Relay energized	2.8 mA < I < 5.3 mA
Response delay	≤ 1 ms
Output	
Output I	signal, safety oriented; relay
Output I, II	
Contact loading	253 V AC/1 A/cos Φ ≥ 0.7; 24 V AC/1 A resistive load
Mechanical life	50 x 10^6 switching cycles
Output II	signal, not safety oriented; relay
Output III	fault signal, not safety oriented; electronic output, passive
Rated voltage	10 ... 30 V DC
Signal level	1-signal: (L+) -2.5 V (7 mA, short-circuit proof)/ 0-signal: blocked output (leakage current ≤ 10 mA)
Transfer characteristics	
Switching frequency	5 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 280 g
Dimensions	40 x 93 x 115 mm (1.6 x 3.7 x 4.5 in), housing type E
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2043
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	1.8 W
Input	
Input I	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	8.2 V/10 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Pulse duration	≥ 75 µs/1 ms see instruction manuals; the maximum input frequency has to be observed.
Input frequency	0 ... 80 Hz, pulse divider 0 ... 1 kHz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input II	reset
Active/Passive	I > 4 mA/I < 1.5 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Pulse duration	≥ 10 ms
Output	
Output I	signal; relay
Contact loading	253 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output II	signal; electronic unit, isolated
Contact loading	40 V/50 mA
Energized/De-energized delay	after rising input flank 3 ms; after falling input flank 2 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1408
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 02 ATEX 1885 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4
FM approval	
Control drawing	16-538FM-12

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Relay and transistor output**
- **Adjustable output timer functions from 10 ms ... 60 min**
- **Input frequency up to 80 Hz; pulse divider up to 1 kHz**
- **Reset function**
- **Configurable by keypad**
- **Line fault detection (LFD)**

Function

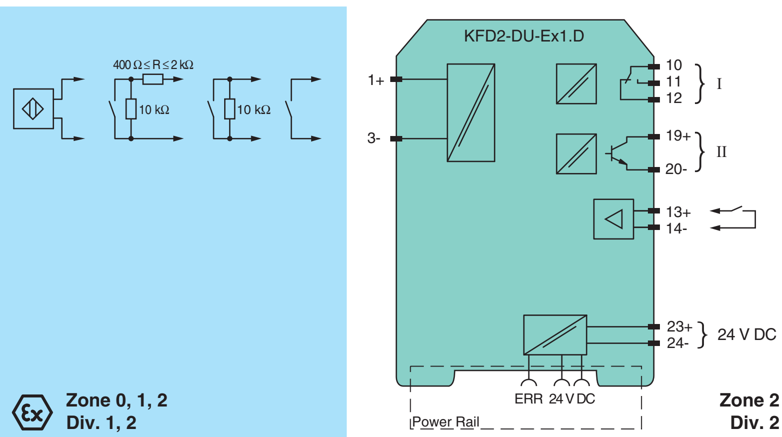
This isolated barrier is used for intrinsic safety applications. It is a highly configurable timer that accepts a digital signal (NAMUR sensor/mechanical contact) from a hazardous area and is commonly used in applications requiring on-delay, off-delay, one-shot, or pulse lengthening.

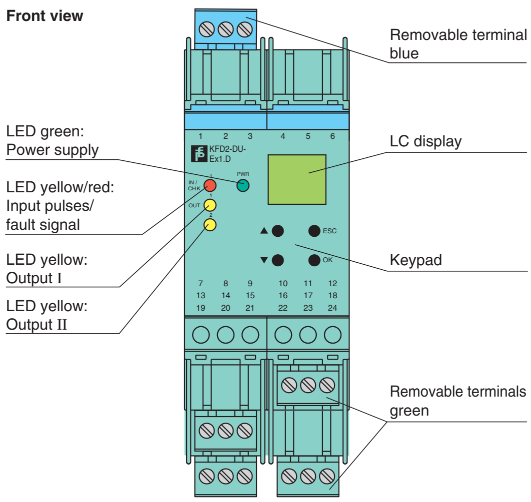
The output relay switch duration is easily adjusted, and a pulse divider function allows step-down ratios from 1:1 to 9999:1. A reset can be activated via dry contact switch and used to terminate a particular time function.

The unit is easily programmed by the use of a keypad located on the front of the unit. Line fault detection of the field circuit is indicated by a red LED and through the collective error output via Power Rail.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **115 V AC supply**
- **Dry contact or NAMUR inputs**
- **Relay and transistor output**
- **Adjustable output timer functions from 10 ms ... 60 min**
- **Input frequency up to 80 Hz; pulse divider up to 1 kHz**
- **Reset function**
- **Configurable by keypad**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It is a highly configurable timer that accepts a digital signal (NAMUR sensor/mechanical contact) from a hazardous area and is commonly used in applications requiring on-delay, off-delay, one-shot, or pulse lengthening.

The output relay switch duration is easily adjusted, and a pulse divider function allows step-down ratios from 1:1 to 9999:1.

A reset can be activated via dry contact switch and used to terminate a particular time function.

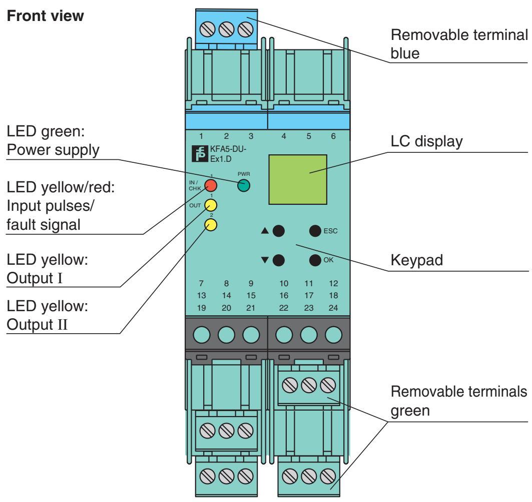
The unit is easily programmed by the use of a keypad located on the front of the unit. Line fault detection of the field circuit is indicated by a red LED.

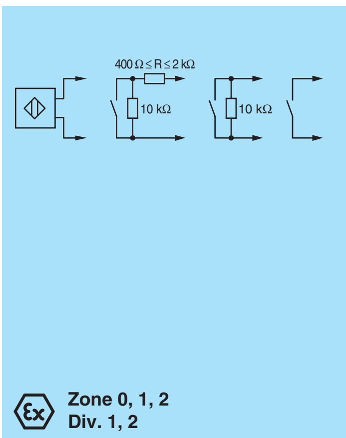
For additional information, refer to the manual and www.pepperl-fuchs.com.

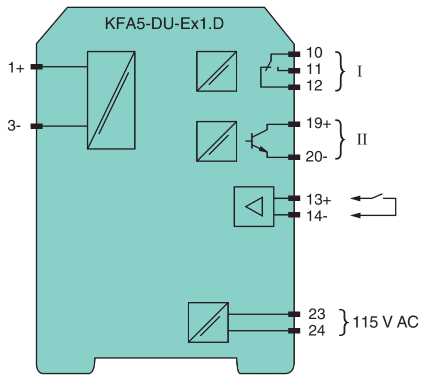
Technical data

Supply	
Rated voltage	115 V AC ± 10 %
Power consumption	4 VA
Input	
Input I	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	8.2 V/10 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Pulse duration	≥ 75 µs/1 ms see instruction manuals; the maximum input frequency has to be observed.
Input frequency	0 ... 80 Hz, pulse divider 0 ... 1 kHz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input II	reset
Active/Passive	I > 3 mA/I < 1.5 mA
Open circuit voltage/short-circuit current	12 V/3.5 mA
Pulse duration	≥ 10 ms
Output	
Output I	signal; relay
Contact loading	253 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output II	signal; electronic unit, isolated
Contact loading	40 V/50 mA
Energized/De-energized delay	after rising input flank 3 ms; after falling input flank 2 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1408
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
FM approval	
Control drawing	16-538FM-12

Diagrams







Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	230 V AC ± 10 %
Power consumption	4 VA
Input	
Input I	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	8.2 V/10 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Pulse duration	≥ 75 µs/1 ms see instruction manuals; the maximum input frequency has to be observed.
Input frequency	0 ... 80 Hz, pulse divider 0 ... 1 kHz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input II	reset
Active/Passive	I > 3 mA/I < 1.5 mA
Open circuit voltage/short-circuit current	12 V/3.5 mA
Pulse duration	≥ 10 ms
Output	
Output I	signal; relay
Contact loading	253 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output II	signal; electronic unit, isolated
Contact loading	40 V/50 mA
Energized/De-energized delay	after rising input flank 3 ms; after falling input flank 2 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1408
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
FM approval	
Control drawing	16-538FM-12

Features

- **1-channel isolated barrier**
- **230 V AC supply**
- **Dry contact or NAMUR inputs**
- **Relay and transistor output**
- **Adjustable output timer functions from 10 ms ... 60 min**
- **Input frequency up to 80 Hz; pulse divider up to 1 kHz**
- **Reset function**
- **Configurable by keypad**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It is a highly configurable timer that accepts a digital signal (NAMUR sensor/mechanical contact) from a hazardous area and is commonly used in applications requiring on-delay, off-delay, one-shot, or pulse lengthening.

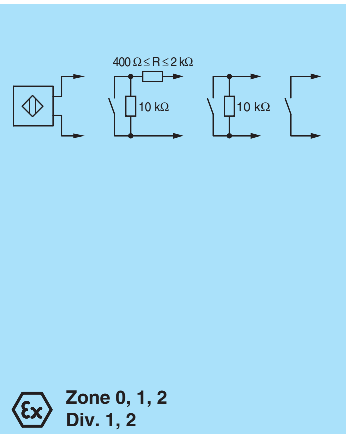
The output relay switch duration is easily adjusted, and a pulse divider function allows step-down ratios from 1:1 to 9999:1.

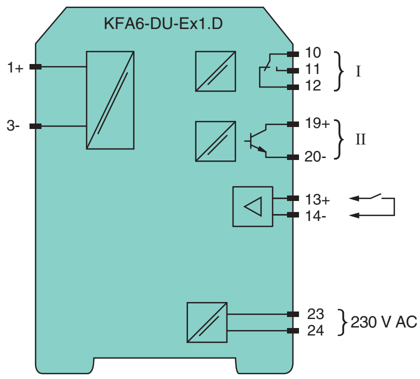
A reset can be activated via dry contact switch and used to terminate a particular time function.

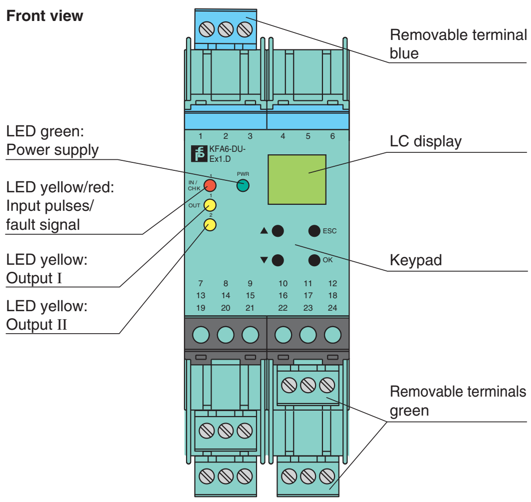
The unit is easily programmed by the use of a keypad located on the front of the unit. Line fault detection of the field circuit is indicated by a red LED.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams







Edition 908837 (US) / 208599 (EU) 11/2010

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **PNP/push-pull, dry contacts or NAMUR inputs**
- **Selectable frequency trip values**
- **2 relay contact outputs**
- **Start-up override**
- **Selectable mode of operation**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is a zero speed/standstill monitor that accepts input frequency pulses and triggers an output when the frequency drops below a selected value.

Two startup override values are available. This unit can also be used to determine rotation direction.

During an error condition, relays revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

The available diagnostic LEDs show rotation detection, limit trip indicator, power on, and hardware error indication.

The unit is easily programmed via switches mounted on the front of the unit.

A unique collective error messaging feature is available when used with the Power Rail system.

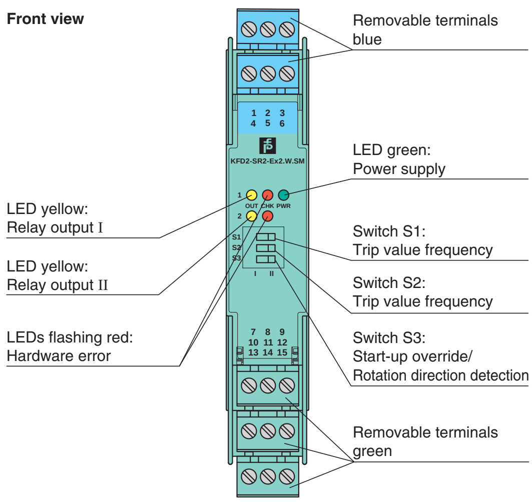
For additional information, refer to www.pepperl-fuchs.com.

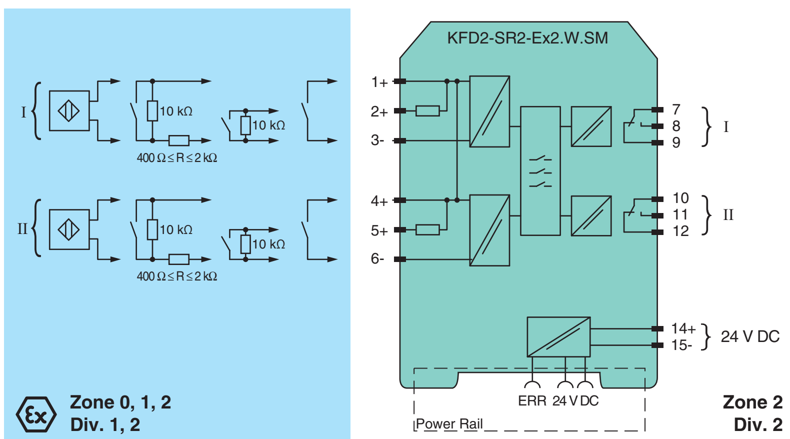
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	≤ 1.5 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Control input	sensor power supply approx. 8.2 V, impedance 1.2 kΩ
Pulse duration	> 200 µs for standstill monitoring, > 250 µs for rotation direction detecion
Output	
Relay	2 changeover contacts
Contact loading	253 V AC/2 A/cos Φ > 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	5 x 10^6 switching cycles
Trip value f_{max}	for standstill monitoring: 0.1 Hz; 0.5 Hz; 2 Hz; 10 Hz adjustable via DIP switch (S1 and S2)
Transfer characteristics	
Accuracy	± 5 %
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2080
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection	Ⓔx II (3)G (EEx nL) IIC X [circuit(s) in zone 2]
Statement of conformity	TÜV 99 ATEX 1493 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0035
CSA approval	
Control drawing	116-0047

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 1.8 W/1.8 W
Input	
Input I	acc. to EN 60947-5-6 (NAMUR)
Pulse duration	> 50 µs
Input frequency	0.001 ... 5000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Collective error message	Power Rail
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Transfer characteristics	
Input I	
Measurement range	0.001 ... 5000 Hz
Output I, II	
Response delay	≤ 200 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1408
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 02 ATEX 1885 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
FM approval	
Control drawing	16-538FM-12

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 5 kHz**
- **2 relay contact outputs**
- **Start-up override**
- **Configurable by keypad**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It monitors for an overspeed or underspeed condition of a digital signal (NAMUR sensor/mechanical contact) from a hazardous area by comparing the input frequency to the user programmed reference frequency.

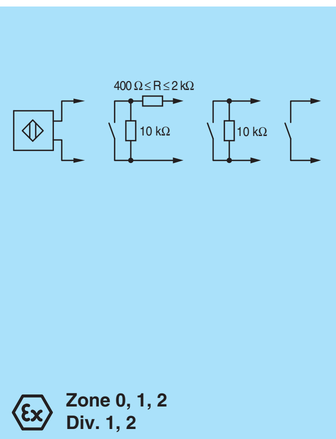
An overspeed or underspeed condition is signaled via the relay outputs. Line fault detection of the field circuit is indicated by a red LED, Power Rail and/or relay. The start-up override feature sets relay outputs to default conditions programmed by the user for up to 1,000 seconds.

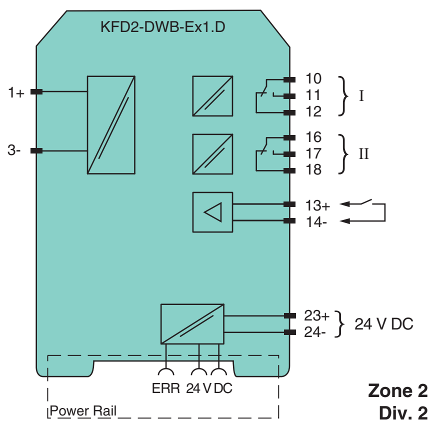
The unit is easily programmed by the use of a keypad located on the front of the unit.

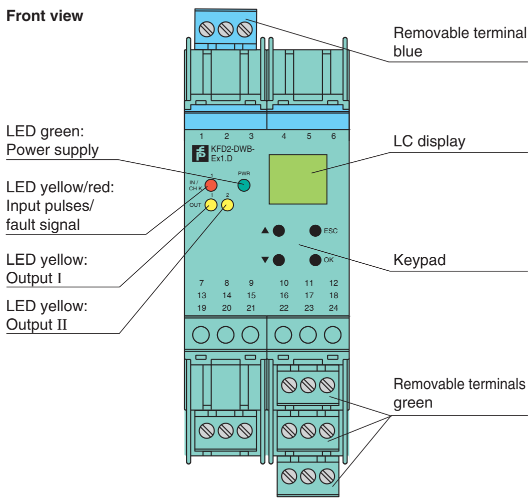
A unique collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams







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Features

- **1-channel isolated barrier**
- **115 V AC supply**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 5 kHz**
- **2 relay contact outputs**
- **Start-up override**
- **Configurable by keypad**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It monitors for an overspeed or underspeed condition of a discrete signal (NAMUR sensor/mechanical contact) from a hazardous area by comparing the input frequency to the user programmed reference frequency.

An overspeed or underspeed condition is signaled via the relay outputs. Line fault detection of the field circuit is indicated by a red LED and/or relay. The start-up override feature sets relay outputs to default conditions programmed by the user for up to 1,000 seconds.

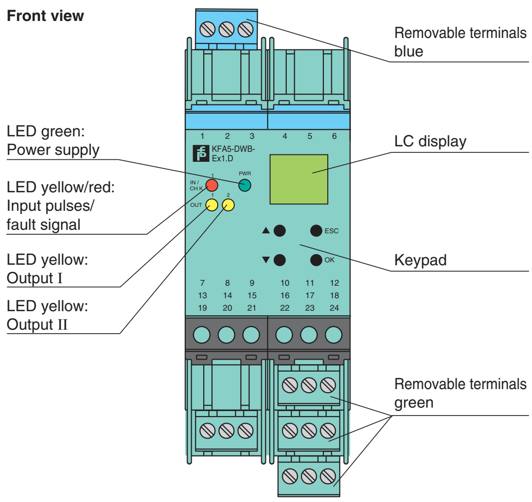
The unit is easily programmed by the use of a keypad located on the front of the unit.

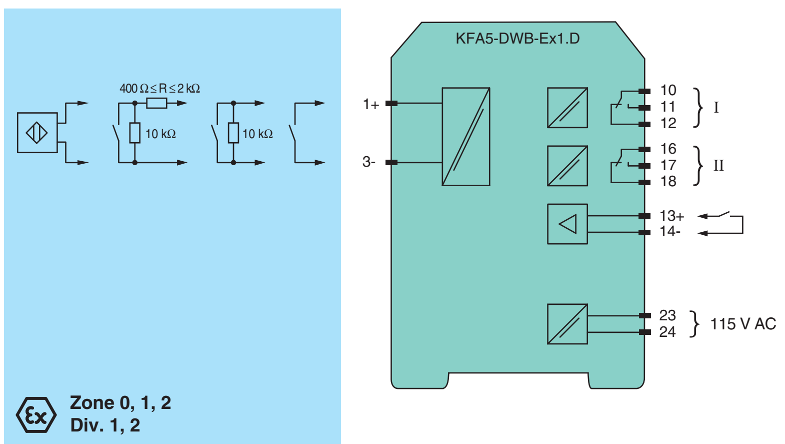
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	115 V AC +/- 10 %
Power loss/power consumption	≤ 2 VA/2 VA
Input	
Input I	acc. to EN 60947-5-6 (NAMUR)
Pulse duration	> 50 µs
Input frequency	0.001 ... 5000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Transfer characteristics	
Input I	
Measurement range	0.001 ... 5000 Hz
Output I, II	
Response delay	≤ 200 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1408
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
FM approval	
Control drawing	16-538FM-12

Diagrams





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Technical data

Supply	
Rated voltage	230 V AC ± 10 %
Power loss/power consumption	≤ 2 VA/2 VA
Input	
Input I	acc. to EN 60947-5-6 (NAMUR)
Pulse duration	> 50 µs
Input frequency	0.001 ... 5000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Transfer characteristics	
Input I	
Measurement range	0.001 ... 5000 Hz
Output I, II	
Response delay	≤ 200 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1408
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
FM approval	
Control drawing	16-538FM-12

Features

- **1-channel isolated barrier**
- **230 V AC supply**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 5 kHz**
- **2 relay contact outputs**
- **Start-up override**
- **Configurable by keypad**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

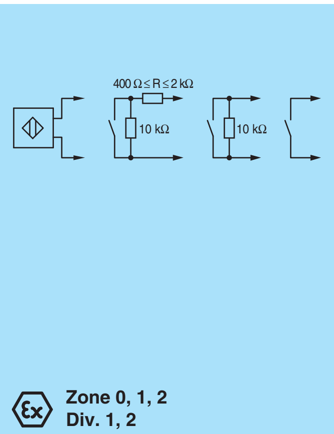
This isolated barrier is used for intrinsic safety applications. It monitors for an overspeed or underspeed condition of a discrete signal (NAMUR sensor/mechanical contact) from a hazardous area by comparing the input frequency to the user programmed reference frequency.

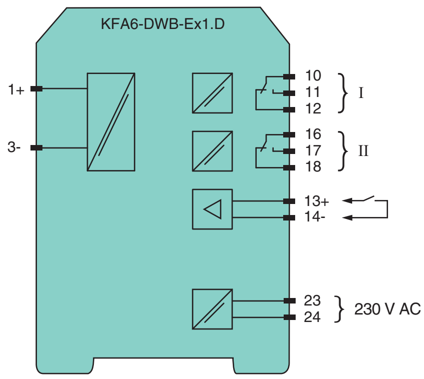
An overspeed or underspeed condition is signaled via the relay outputs. Line fault detection of the field circuit is indicated by a red LED and/or relay. The start-up override feature sets relay outputs to default conditions programmed by the user for up to 1,000 seconds.

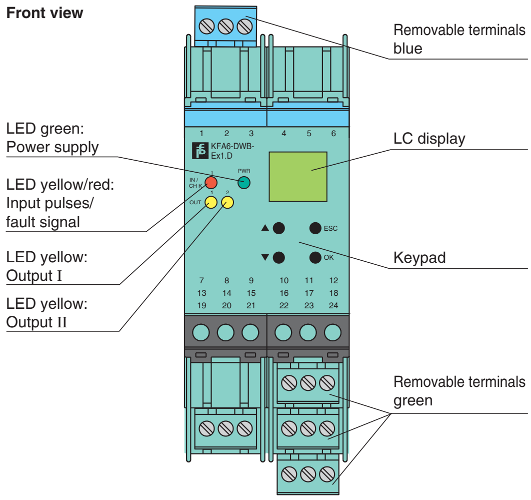
The unit is easily programmed by the use of a keypad located on the front of the unit.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams







Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 5 kHz**
- **Current output 0/4 mA ... 20 mA**
- **Relay and transistor output**
- **Start-up override**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is a universal frequency converter that changes a digital input (NAMUR sensor/mechanical contact) into a proportional free adjustable 0/4 mA ... 20 mA analog output and functions as a switch amplifier and a trip alarm.

Also the functions of the switch outputs (2 relay outputs and 1 potential free transistor output) are easily adjustable [trip value display (min/max alarm), serially switched output, pulse divider output, error signal output].

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

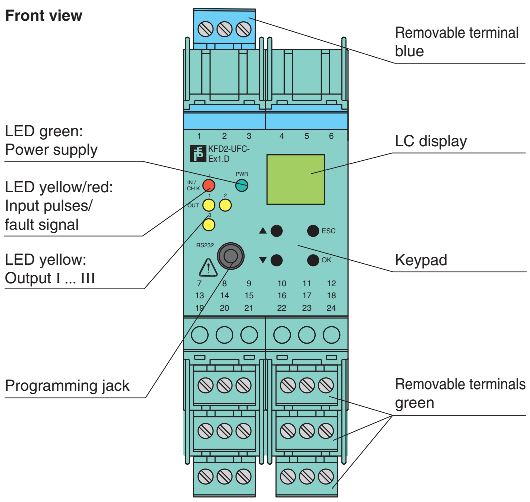
Line fault detection of the field circuit is indicated by a red LED and through the collective error output via Power Rail.

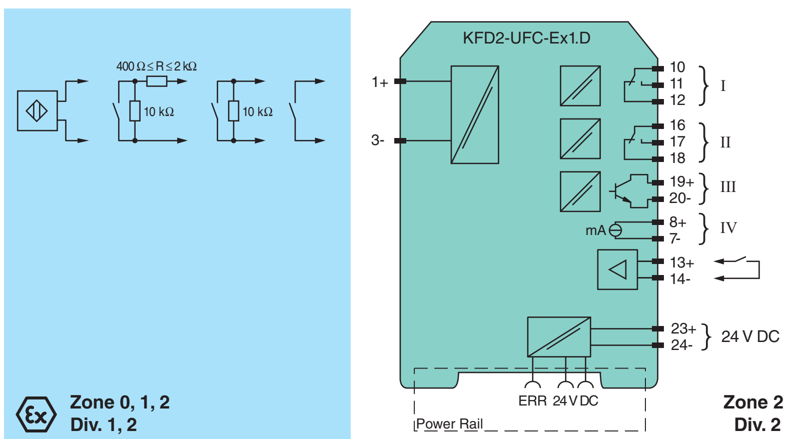
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 2 W/2.2 W
Input	
Input I	acc. to EN 60947-5-6 (NAMUR)
Pulse duration	> 50 µs
Input frequency	0.001 ... 5000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Output	
Collective error message	Power Rail
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	electronic output, passive
Contact loading	40 V DC
Output IV	analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale ≥ 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1471
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 02 ATEX 1885 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4
FM approval	
Control drawing	16-538FM-12

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC 50 ... 60 Hz
Power loss/power consumption	≤ 2 W; 2.5 VA/2.2 W; 3 VA
Input	
Input I	acc. to EN 60947-5-6 (NAMUR)
Pulse duration	> 50 µs
Input frequency	0.001 ... 5000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Output	
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	electronic output, passive
Contact loading	40 V DC
Output IV	analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale ≥ 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1471
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
FM approval	
Control drawing	16-538FM-12

Features

- **1-channel isolated barrier**
- **AC/DC wide range supply**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 5 kHz**
- **Current output 0/4 mA ... 20 mA**
- **Relay and transistor output**
- **Start-up override**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is a universal frequency converter that changes a digital input (NAMUR sensor/mechanical contact) into a proportional free adjustable 0/4 mA ... 20 mA analog output and functions as a switch amplifier and a trip alarm.

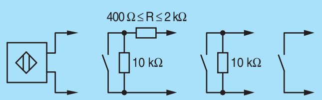
Also the functions of the switch outputs (2 relay outputs and 1 potential free transistor output) are easily adjustable [trip value display (min/max alarm), serially switched output, pulse divider output, error signal output].

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

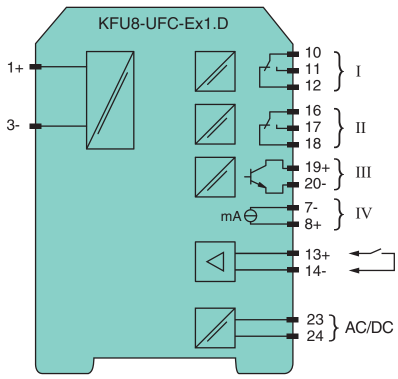
Line fault detection of the field circuit is indicated by a red LED.

For additional information, refer to the manual and www.pepperl-fuchs.com.

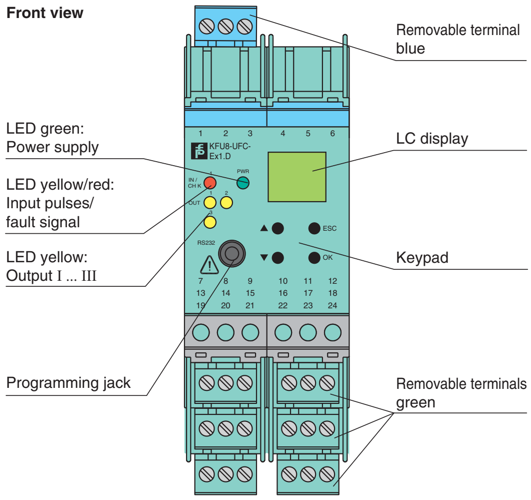
Diagrams



Zone 0, 1, 2
Div. 1, 2



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

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KFD2-UFT-Ex2.D Frequency Converter with Direction and Synchronization Monitor

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 1 kHz**
- **Current output 0/4 mA ... 20 mA**
- **Relay and transistor output**
- **Start-up override**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It analyzes 2 digital signals (NAMUR sensor/mechanical contact) from a hazardous area and functions as a rotation direction indicator, slip monitor, frequency monitor or synchronization monitor.

Each proximity sensor or switch controls a passive transistor output. The 2 relay outputs indicate if the input signal is above or below the trip value or the rotational direction.

The analog output can be programmed to be proportional to the input frequency or slip differential.

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

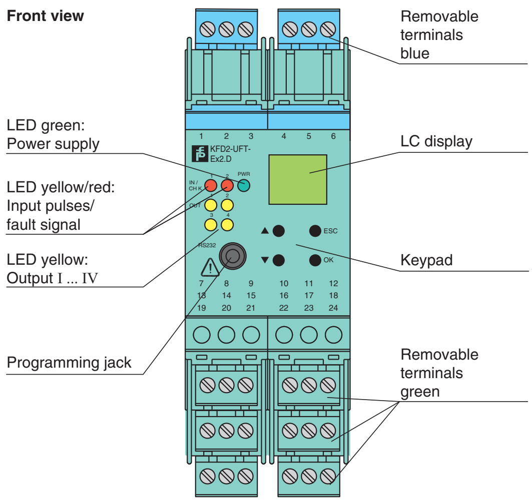
Line fault detection of the field current is indicated by a red LED and through the collective error output via Power Rail.

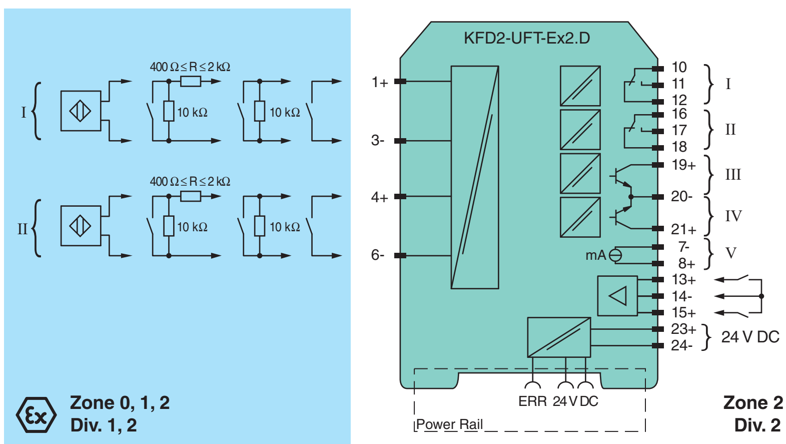
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	2.5 W
Input	
Input I, II	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	8.2 V/10 mA
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input III, IV	
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Collective error message	Power Rail
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III and IV	signal; electronic output, passive
Contact loading	40 V DC
Output V	analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	max. 24 V DC
Load	max. 650 Ω
Programming interface	
Interface	RS 232
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1471
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 02 ATEX 1885 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4
FM approval	
Control drawing	16-538FM-12

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC 50 ... 60 Hz
Power consumption	2.5 W/5 VA
Input	
Input I, II	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	8.2 V/10 mA
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input III, IV	
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III and IV	signal; electronic output, passive
Contact loading	40 V DC
Output V	analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	max. 24 V DC
Load	max. 650 Ω
Programming interface	
Interface	RS 232
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1471
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
FM approval	
Control drawing	16-538FM-12

Features

- **2-channel isolated barrier**
- **AC/DC wide range supply**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 1 kHz**
- **Current output 0/4 mA ... 20 mA**
- **Relay and transistor output**
- **Start-up override**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It analyzes 2 digital signals (NAMUR sensor/mechanical contact) from a hazardous area and functions as a rotation direction indicator, slip monitor, frequency monitor or synchronization monitor.

Each proximity sensor or switch controls a passive transistor output. The 2 relay outputs indicate if the input signal is above or below the trip value or the rotational direction.

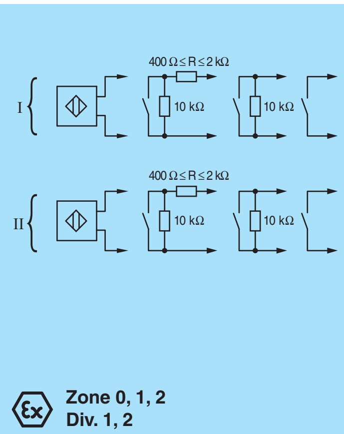
The analog output can be programmed to be proportional to the input frequency or slip differential.

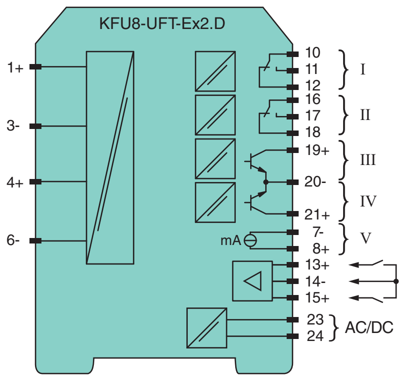
The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

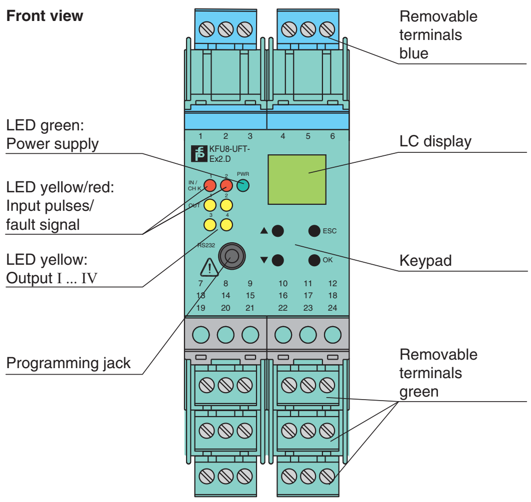
Line fault detection of the field current is indicated by a red LED.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams







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KFD2-ER-Ex1.W.LB

Conductivity Switch Amplifier

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It provides the AC measuring voltage for the level sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

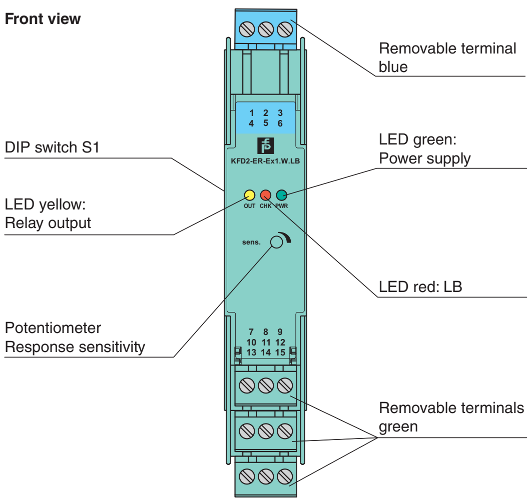
It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

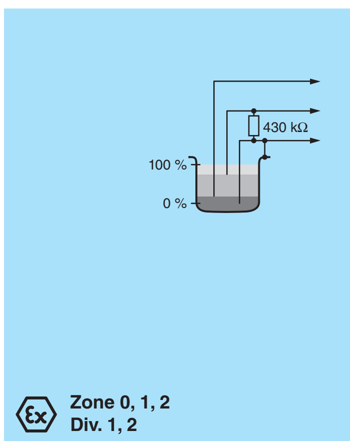
This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. If LB monitoring is selected, output II serves as the fault signal output; otherwise, it will follow the function of output I.

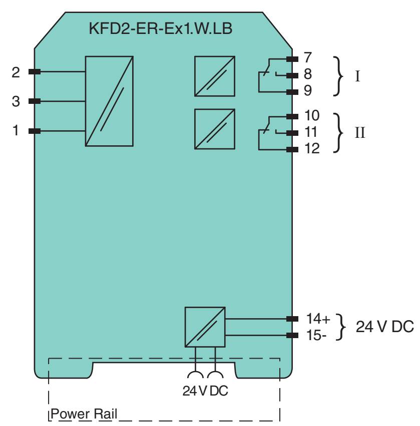
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	signal; relay
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	DMT 00 ATEX E 033
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]

Diagrams







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Singapore: +65 6779 9091 pa-info@sg.pepperl-fuchs.com

Technical data

Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	< 1.2 W
Input	
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	signal; relay
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	DMT 00 ATEX E 032
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]

Features

- **1-channel isolated barrier**
- **115 V AC supply**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It provides the AC measuring voltage for the level sensing electrodes.

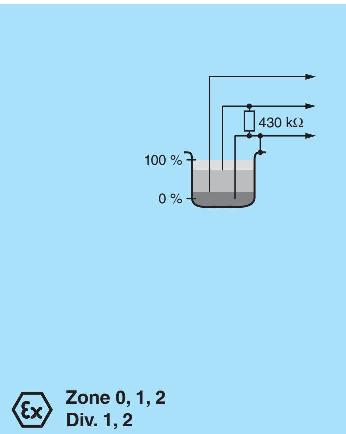
Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

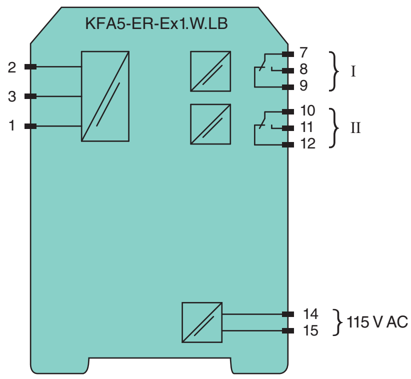
The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

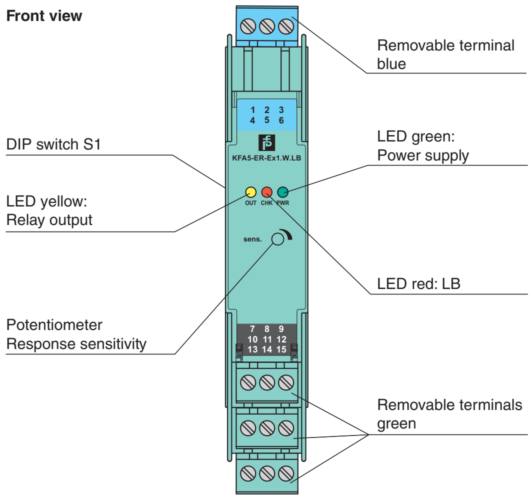
It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. If LB monitoring is selected, output II serves as the fault signal output; otherwise, it will follow the function of output I.

Diagrams







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Features

- **1-channel isolated barrier**
- **230 V AC supply**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It provides the AC measuring voltage for the level sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

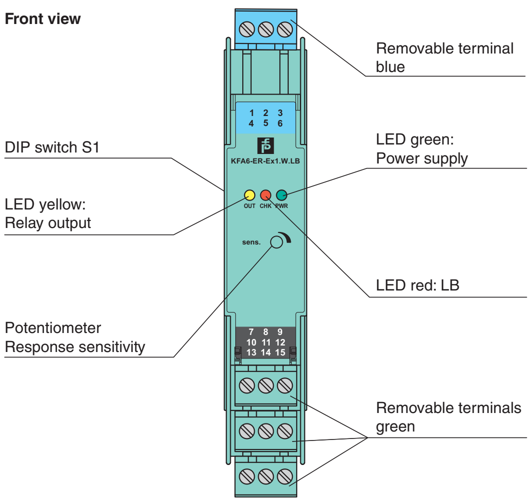
It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

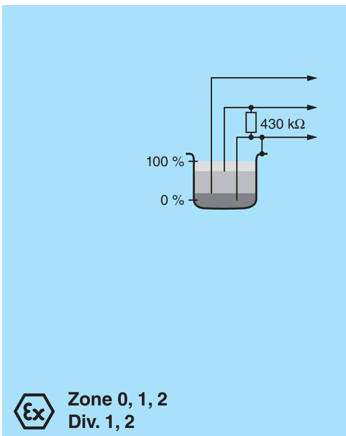
This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. If LB monitoring is selected, output II serves as the fault signal output; otherwise, it will follow the function of output I.

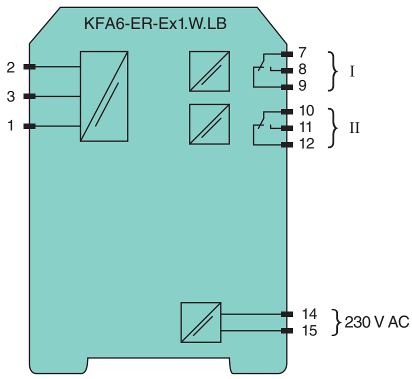
Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	< 1.2 W
Input	
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	signal; relay
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	DMT 00 ATEX E 032
Group, category, type of protection	⟨Ex⟩ II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]

Diagrams







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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Input	
Ground connection	terminal 17
Rated values	5 V_{pp}, 0.1 mA; rectangular
Function	Test input: 24 V DC/5 mA; non-polarized
Output	
Output	signal; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Mechanical life	10^7 switching cycles
Transfer characteristics	
Response delay	≤ 50 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 260 g
Dimensions	60 x 119 x 115 mm (2.4 x 4.7 x 4.5 in), housing type D2
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	TÜV 00 ATEX 1585
Group, category, type of protection	Ⓔx II (1) G [Ex ia] IIC Ⓔx II (1) D [Ex iaD]

Features

- **16-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Analog or digtial field device inputs**
- **Monitors leakage current**
- **Fault relay contact output**
- **LED status indication**
- **Test circuit for validation**
- **Parallel connection for easy integration**

Function

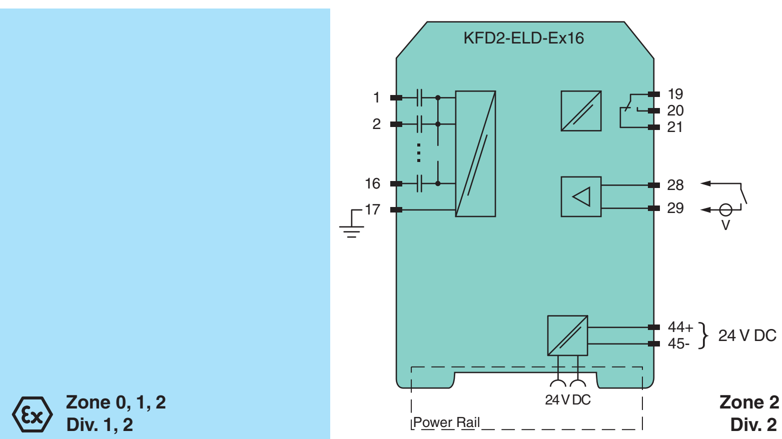
This isolated barrier is used for intrinsic safety applications. It detects ground faults on field lines.

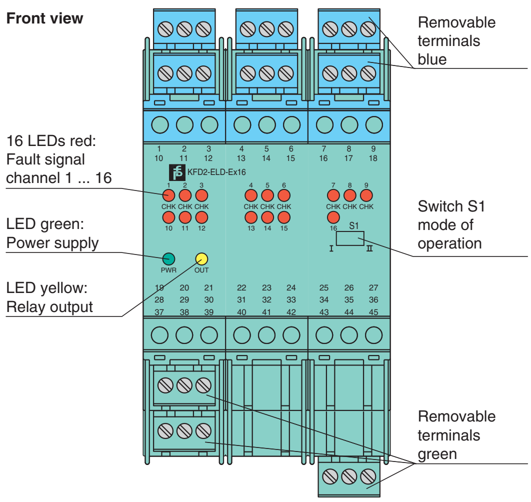
This 16-channel unit continuously monitors isolated intrinsically safe circuits and warns if their resistance to ground falls below 10 kΩ .

During an alarm condition, the appropriate channel LED is illuminated and the form C changeover relay contact is initiated (S1 = position II). The function of this relay can be reversed with the mode of operation switch (S1 = position II).

A self-test feature is also available on this device. When triggered manually by the user or remotely by the control system, the barrier reacts in the same manner as a real alarm condition.

Diagrams





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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **RS 232 input/output**

Function

This isolated barrier is used for intrinsic safety applications. It is a repeater for the bi-directional transfer of RS 232 signals.

The input and output circuits are intrinsically safe and designed to transmit and receive RS 232 signals between the safe area and the hazardous area.

This barrier accepts input signals in the ±3 V ... ±15 V range providing a nominal ±10 V output that is independent of the input voltage.

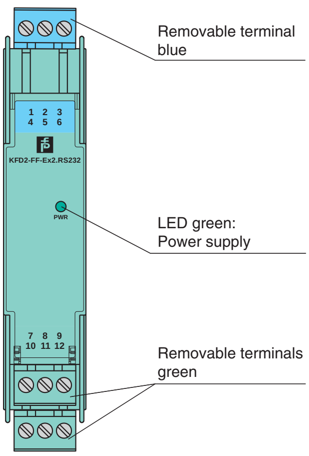
The maximum rate of data exchange is 20 kBits per second.

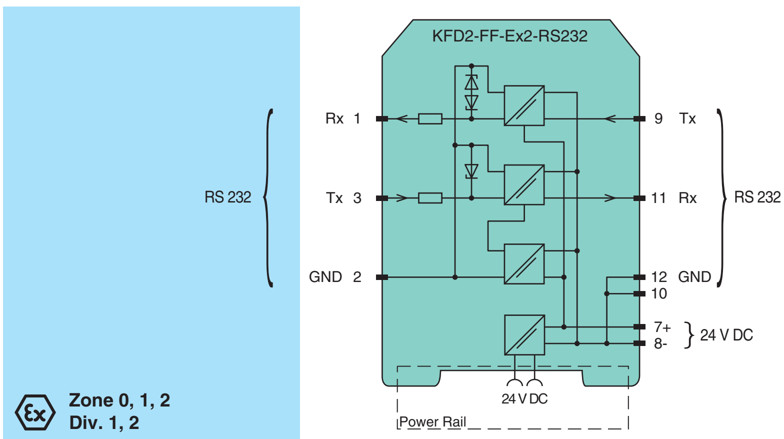
Technical data

Supply	
Rated voltage	15 ... 35 V DC
Power consumption	approx. 1.5 W
Field circuit	
Interface	RS 232
Input	
Input signal	logic 0: +3 ... +15 V logic 1: -3 ... -15 V
Output	
Output signal	logic 0: +9 ... +12 V logic 1: -9 ... -12 V
Safe area	
Interface	RS 232
Input	
Input signal	logic 0: +3 ... +15 V logic 1: -3 ... -15 V
Output	
Output signal	logic 0: +9 ... +12 V logic 1: -9 ... -12 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 171 for entity parameters
EC-Type Examination Certificate	BAS 02 ATEX 0116
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC T4 (-40 °C ≤ T_{amb} ≤ 60 °C)
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view





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ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
KCD2-SR-Ex1.LB	1, 2	10.5	17.1	45
KCD2-SR-Ex2	1, 2; 3, 4	10.5	17.1	45
KFA5-DU-Ex1.D	1, 3	10.1	13.5	34
KFA5-DWB-Ex1.D	1, 3	10.1	13.5	34
KFA5-ER-Ex1.W.LB	1, 2, 3	10	2.5	6
KFA5-SOT2-Ex2	1, 2, 3; 4, 5, 6	10.5	13	34
KFA5-SR2-Ex1.W	1, 2, 3	10.6	19.1	51
KFA5-SR2-Ex1.W.LB	1, 2, 3	10.6	19.1	51
KFA5-SR2-Ex2.W	1, 2, 3; 4, 5, 6	10.6	19.1	51
KFA5-SR2-Ex2.W.IR	1, 2, 3; 4, 5, 6	10.6	19.1	51
KFA6-DU-Ex1.D	1, 3	10.1	13.5	34
KFA6-DWB-Ex1.D	1, 3	10.1	13.5	34
KFA6-ER-Ex1.W.LB	1, 2, 3	10	2.5	6
KFA6-SOT2-Ex2	1, 2, 3; 4, 5, 6	10.5	13	34
KFA6-SR2-Ex1.W	1, 2, 3	10.6	19.1	51
KFA6-SR2-Ex1.W.LB	1, 2, 3	10.6	19.1	51
KFA6-SR2-Ex2.W	1, 2, 3; 4, 5, 6	10.6	19.1	51
KFA6-SR2-Ex2.W.IR	1, 2, 3; 4, 5, 6	10.6	19.1	51
KFD2-DU-Ex1.D	1, 3	10.1	13.5	34
KFD2-DWB-Ex1.D	1, 3	10.1	13.5	34
KFD2-ELD-Ex16	1 ... 16	7.2	1.7	3
KFD2-ER-Ex1.W.LB	1, 2, 3	10	2.5	6
KFD2-FF-Ex2.RS232	1, 2	14.5	48	180
	2, 3	5.4	27	40
	1, 2, 3	19.9	75	200
KFD2-SH-Ex1	10, 12	9.56	16.8	41
KFD2-SH-Ex1.T.OP	4, 6	9.56	16.8	41
KFD2-SOT2-Ex1.LB	1, 2, 3	10.5	13	34
KFD2-SOT2-Ex1.LB.IO	1, 2, 3	10.5	13	34
KFD2-SOT2-Ex1.N	1, 2, 3	10.5	13	34
KFD2-SOT2-Ex2	1, 2, 3; 4, 5, 6	10.5	13	34
KFD2-SOT2-Ex2.IO	1, 2, 3; 4, 5, 6	10.5	13	34
KFD2-SR2-Ex1.W	1, 2, 3	10.5	13	34
KFD2-SR2-Ex1.W.LB	1, 2, 3	10.5	13	34
KFD2-SR2-Ex2.2S	1, 2, 3; 4, 5, 6	10.5	13	34
KFD2-SR2-Ex2.W	1, 2, 3; 4, 5, 6	10.5	13	34
KFD2-SR2-Ex2.W.SM	1, 2, 3; 4, 5, 6	10.5	13	34
KFD2-SRA-Ex4	1, 2, 3, 4, 5, 6	10	14	35
KFD2-SR-Ex1.4S.LK	7, 8, 9	12.7	20	62
KFD2-ST2-Ex1.LB	1, 2, 3	10.5	13	34
KFD2-ST2-Ex2	1, 2, 3; 4, 5, 6	10.5	13	34
KFD2-UFC-Ex1.D	1, 3	10.1	13.5	34
KFD2-UFT-Ex2.D	1, 3; 4, 6	10.1	13.5	34
KFU8-UFC-Ex1.D	1, 3	10.1	13.5	34
KFU8-UFT-Ex2.D	1, 3; 4, 6	10.1	13.5	34
KHA6-SH-Ex1	10, 12	9.56	16.8	41

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CSA Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)
KFA5-SOT2-Ex2	1, 3, 2, 3; 4, 6, 5, 6	10.5	13.0
KFA5-SR2-Ex1.W	1, 3; 2, 3	12.9	19.8
KFA5-SR2-Ex1.W.LB	1, 3; 2, 3	12.9	19.8
KFA5-SR2-Ex2.W	1, 3, 2, 3; 4, 6, 5, 6	12.9	19.8
KFA5-SR2-Ex2.W.IR	1, 3, 2, 3; 4, 6, 5, 6	12.9	19.8
KFA6-SOT2-Ex2	1, 3, 2, 3; 4, 6, 5, 6	12.9	19.8
KFA6-SR2-Ex1.W	1, 3; 2, 3	12.9	19.8
KFA6-SR2-Ex1.W.LB	1, 3; 2, 3	12.9	19.8
KFA6-SR2-Ex2.W	1, 3, 2, 3; 4, 6, 5, 6	12.9	19.8
KFA6-SR2-Ex2.W.IR	1, 3, 2, 3; 4, 6, 5, 6	12.9	19.8
KFD2-SOT2-Ex1.LB	1, 3; 2, 3	10.5	13.0
KFD2-SOT2-Ex1.LB.IO	1, 3; 2, 3	10.5	13.0
KFD2-SOT2-Ex1.N	1, 3; 2, 3	10.5	13.0
KFD2-SOT2-Ex2	1, 3, 2, 3; 4, 6, 5, 6	10.5	13.0
KFD2-SOT2-Ex2.IO	1, 3, 2, 3; 4, 6, 5, 6	10.5	13.0
KFD2-SR2-Ex1.W	1, 3; 2, 3	12.9	19.8
KFD2-SR2-Ex1.W.LB	1, 3; 2, 3	12.9	19.8
KFD2-SR2-Ex2.2S	1, 3, 2, 3; 4, 6, 5, 6	12.9	19.8
KFD2-SR2-Ex2.W	1, 3, 2, 3; 4, 6, 5, 6	12.9	19.8
KFD2-SR2-Ex2.W.SM	1, 3, 2, 3; 4, 6, 5, 6	12.9	19.8
KFD2-SR-Ex1.4S.LK	7, 9; 8, 9	12.9	19.8
KFD2-ST2-Ex1.LB	1, 3; 2, 3	10.5	13.0
KFD2-ST2-Ex2	1, 3, 2, 3; 4, 6, 5, 6	10.5	13.0

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FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
KCD2-SR-Ex1.LB	1, 2	10.5	17.1	–	–
KCD2-SR-Ex2	1, 2; 3, 4	10.5	17.1	–	–
KFA5-DU-Ex1.D	1, 3	10.1	13.5	–	–
KFA5-DWB-Ex1.D	1, 3	10.1	13.5	–	–
KFA5-SOT2-Ex2	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFA5-SR2-Ex1.W	1, 3; 2, 3	12.9	19.8	–	–
KFA5-SR2-Ex1.W.LB	1, 3; 2, 3	12.9	19.8	–	–
KFA5-SR2-Ex2.W	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFA5-SR2-Ex2.W.IR	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFA6-DU-Ex1.D	1, 3	10.1	13.5	–	–
KFA6-DWB-Ex1.D	1, 3	10.1	13.5	–	–
KFA6-SOT2-Ex2	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFA6-SR2-Ex1.W	1, 3; 2, 3	12.9	19.8	–	–
KFA6-SR2-Ex1.W.LB	1, 3; 2, 3	12.9	19.8	–	–
KFA6-SR2-Ex2.W	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFA6-SR2-Ex2.W.IR	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFD2-DU-Ex1.D	1, 3	10.1	13.5	–	–
KFD2-DWB-Ex1.D	1, 3	10.1	13.5	–	–
KFD2-SH-Ex1	10, 12	9.78	15.7	–	–
KFD2-SH-Ex1.T.OP	4, 6	9.78	17.2	–	–
KFD2-SOT2-Ex1.LB	1, 3; 2, 3	12.9	19.8	–	–
KFD2-SOT2-Ex1.LB.IO	1, 3; 2, 3	12.9	19.8	–	–
KFD2-SOT2-Ex1.N	1, 3; 2, 3	12.9	19.8	–	–
KFD2-SOT2-Ex2	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFD2-SOT2-Ex2.IO	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFD2-SR2-Ex1.W	1, 3; 2, 3	12.9	19.8	–	–
KFD2-SR2-Ex1.W.LB	1, 3; 2, 3	12.9	19.8	–	–
KFD2-SR2-Ex2.2S	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFD2-SR2-Ex2.W	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFD2-SR2-Ex2.W.SM	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFD2-SR-Ex1.4S.LK	7, 9; 8, 9	12.9	19.8	–	–
KFD2-ST2-Ex1.LB	1, 3; 2, 3	12.9	19.8	–	–
KFD2-ST2-Ex2	1, 3; 2, 3; 4, 6; 5, 6	12.9	19.8	–	–
KFD2-UFC-Ex1.D	1, 3	10.1	13.5	–	–
KFD2-UFT-Ex2.D	1, 3; 4, 6	10.1	13.5	–	–
	1, 4 to 3, 6	–	–	10.1	27
KFU8-UFC-Ex1.D	1, 3	10.1	13.5	–	–
KFU8-UFT-Ex2.D	1, 3; 4, 6	10.1	13.5	–	–
	1, 4 to 3, 6	–	–	10.1	27

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UL Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
KCD2-SR-Ex1.LB	1, 2	10.5	17.1	–	–
KCD2-SR-Ex2	1, 2; 3, 4	10.5	17.1	–	–
KFA5-SOT2-Ex2	1, 3; 4, 6	10.6	19.5	–	–
KFA5-SR2-Ex1.W	1, 3; 4, 6	10.6	19.5	–	–
KFA5-SR2-Ex1.W.LB	1, 3; 4, 6	10.6	19.5	–	–
KFA5-SR2-Ex2.W	1, 3; 4, 6	10.6	19.5	–	–
KFA5-SR2-Ex2.W.IR	1, 3; 4, 6	10.6	19.5	–	–
KFA6-SOT2-Ex2	1, 3; 4, 6	10.6	19.5	–	–
KFA6-SR2-Ex1.W	1, 3; 4, 6	10.6	19.5	–	–
KFA6-SR2-Ex1.W.LB	1, 3; 4, 6	10.6	19.5	–	–
KFA6-SR2-Ex2.W	1, 3; 4, 6	10.6	19.5	–	–
KFA6-SR2-Ex2.W.IR	1, 3; 4, 6	10.6	19.5	–	–
KFD2-FF-Ex2.RS232	1, 2, 3	–	–	19.9	75
KFD2-SRA-Ex4	1, 3; 4, 6	10.6	19.5	–	–

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Solenoid Drivers

Model Number	Channels	Input (Control System)			Relay Output (Control System)	Output (Field)		Supply		SIL	Zone 2/Division 2 Mounting	Page
		Loop Powered	Logic Input	OR Function		Voltage (V)	Max. Current (mA)	24 V DC	Loop Powered			
KFD0-SD2-Ex1.1045	1	■				10	45		■	3		176
KFD0-SD2-Ex2.1045	2	■				10	45		■	3		177
KCD0-SD-Ex1.1245	1	■				12	45		■	3	■	178
KFD0-SD2-Ex2.1245	2	■				12	45		■	3		179
KFD0-SD2-Ex1.1065	1	■				9.8	65		■	3		180
KFD0-SD2-Ex1.1180	1	■				11	80		■	3		181
KFD0-SD2-Ex1.10100	1	■				10	100		■	3		182
KFD2-SL2-Ex1	1		■			11.7	45	■		2	■	183
KFD2-SL2-Ex1.B	1		■			11.7	45	■		2	■	184
KFD2-SL2-Ex1.LK	1		■		■	11.2	45	■		2	■	185
KFD2-SL2-Ex1.LK.1045	1		■		■	10	45	■		2	■	186
KFD2-SL2-Ex1.LK.1270	1		■		■	12.5	70	■		2		187
KFD2-SL2-Ex2	2		■			11.7	45	■		2	■	188
KFD2-SL2-Ex2.B	2		■			11.7	45	■		2	■	189
KFD2-RCI-Ex1	1		■			13.5	20.4	■		3	■	190
KFD2-VM-Ex1.35.L	1		■	■		15.3	17	■				191

Relay Outputs

Model Number	Channels	Input (Control System)		Output (Field)	Supply		SIL	Zone 2/Division 2 Mounting	Page
		Loop Powered	Logic Input	Relay	24 V DC	Loop Powered			
KFD0-RO-Ex2	2		■	2		■		■	192

Interface Modules

Model Number	Description	Page
KFD2-FF-Ex2.RS232	RS 232 Repeater, bi-directional	193

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KFD0-SD2-Ex1.1045

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current limit 45 mA at 10 V DC**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is loop powered, so the available energy at the output is received from the input signal. The output signal has a resistive characteristic. As a result the output voltage and current are dependent on the load and the input voltage.

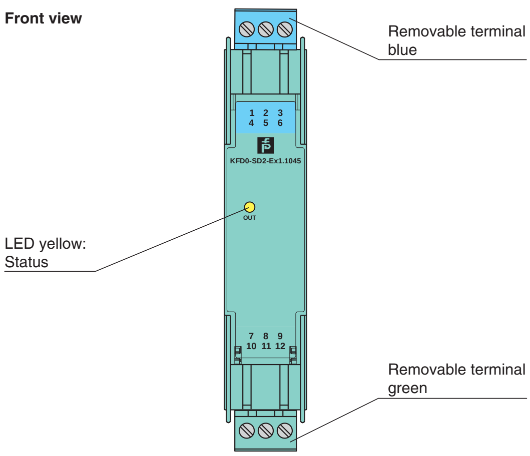
At full load, 10 V at 45 mA is available for the hazardous area application.

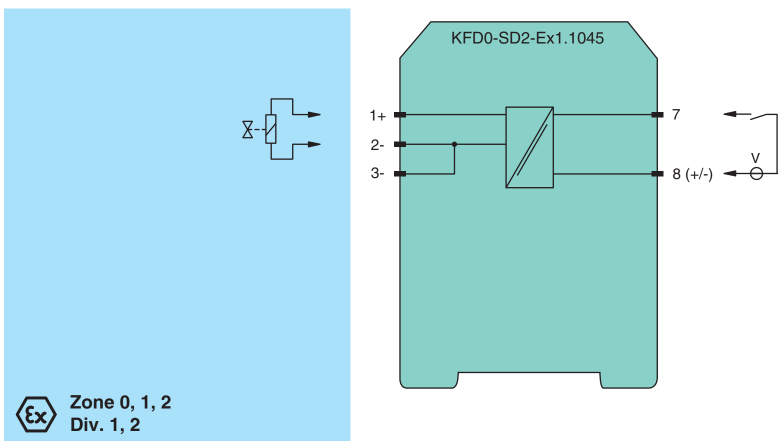
Technical data

Supply	
Rated voltage	loop powered
Power loss	< 1.05 W (≤ 30 V)
Input	
Rated voltage U_i	20 ... 35 V DC
Current	72 mA at 20 V input voltage, load = 220 Ω 50 mA at 35 V input voltage, load = 220 Ω
Output	
Internal resistor	≤ 282 Ω
Limit	current I_E: ≥ 45 mA voltage U_E: ≥ 10 V
Open loop voltage	≥ 22.7 V
Output rated operating current	45 mA
Output signal	these values are valid for the rated operational voltage 20 ... 35 V DC
Energized/De-energized delay	single operation: 300 µs/50 µs; periodical: 5 µs/50 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0252
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ex I (M1) [Ex ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	266-031FM-12 (cFMus)
UL approval	
Control drawing	116-0316 (cULus)
IECEx approval	IECEx BAS 06.0058

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	loop powered
Power loss	< 1.05 W (≤ 30 V) per channel
Input	
Rated voltage U_i	20 ... 35 V DC
Current	72 mA at 20 V input voltage, load = 220 Ω 50 mA at 35 V input voltage, load = 220 Ω
Output	
Internal resistor	≤ 282 Ω
Limit	current I_E: ≥ 45 mA voltage U_E: ≥ 10 V
Open loop voltage	≥ 22.7 V
Output rated operating current	45 mA
Output signal	these values are valid for the rated operational voltage 20 ... 35 V DC
Energized/De-energized delay	single operation: 300 µs/50 µs; periodical: 5 µs/50 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0252
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ⓔx I (M1) [Ex ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	266-031FM-12 (cFMus)
UL approval	
Control drawing	116-0316 (cULus)
IECEx approval	IECEx BAS 06.0058

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current limit 45 mA at 10 V DC**
- **Up to SIL3 acc. to IEC 61508**

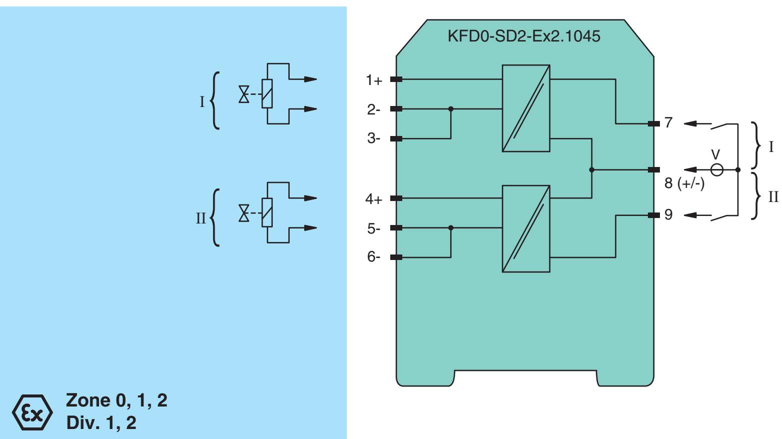
Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

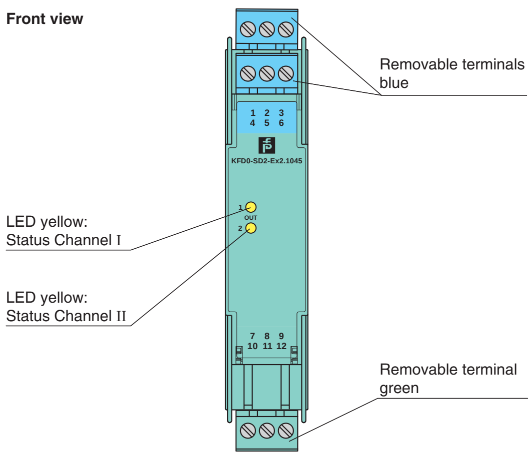
It is loop powered, so the available energy at the output is received from the input signal. The output signal has a resistive characteristic. As a result the output voltage and current are dependent on the load and the input voltage.

At full load, 10 V at 45 mA is available for the hazardous area application.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current limit 45 mA at 12 V DC**
- **Housing width 12.5 mm**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is loop powered, so the available energy at the output is received from the input signal. The output signal has a resistive characteristic. As a result the output voltage and current are dependent on the load and the input voltage.

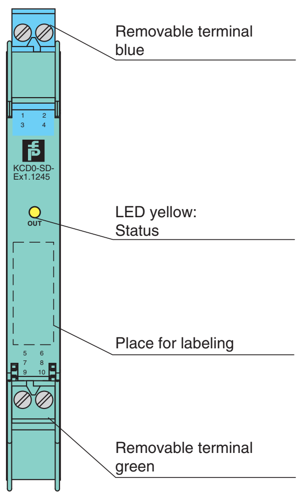
At full load, 12 V at 45 mA is available for the hazardous area application.

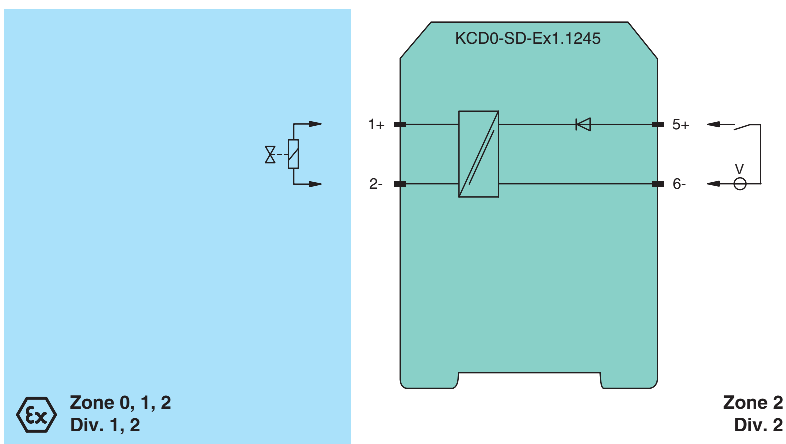
Technical data

Supply	
Power loss	< 1 W
Input	
Rated voltage U_i	19 ... 30 V DC
Current	72 mA at 19 V input voltage and 265 Ω output load 50 mA at 30 V input voltage and 265 Ω output load
Output	
Internal resistor	≤ 238 Ω
Limit	current I_E: ≥ 45 mA voltage U_E: ≥ 12 V
Open loop voltage	≥ 22.7 V
Output rated operating current	45 mA
Output signal	These values are valid for the rated operational voltage 19 ... 30 V DC.
Energized/De-energized delay	single operation: 300 µs/50 µs; periodical: 5 µs/50 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 119 mm (0.5 x 4.5 x 4.7 in), housing type A2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0170
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ex I (M1) [Ex ia] I
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X
FM approval	
Control drawing	16-533FM-12 (cFMus)
UL approval	
Control drawing	16-533UL-12 (cULus)
IECEx approval	IECEx BAS 06.0032
Approved for	[Ex ia] IIC, [Ex ia] I

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Power loss	< 1 W (≤ 30 V) per channel
Input	
Rated voltage U_i	20 ... 35 V DC
Current	72 mA at 20 V input voltage, load = 265 Ω 50 mA at 35 V input voltage, load = 265 Ω
Output	
Internal resistor	≤ 238 Ω
Limit	current I_E: ≥ 45 mA voltage U_E: ≥ 12 V
Open loop voltage	≥ 22.7 V
Output rated operating current	45 mA
Output signal	these values are valid for the rated operational voltage 20 ... 35 V DC
Energized/De-energized delay	single operation: 300 µs/50 µs; periodical: 5 µs/50 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0252
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ⓔx I (M1) [Ex ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	266-031FM-12 (cFMus)
UL approval	
Control drawing	116-0316 (cULus)
IECEx approval	IECEx BAS 06.0058

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current limit 45 mA at 12 V DC**
- **Up to SIL3 acc. to IEC 61508**

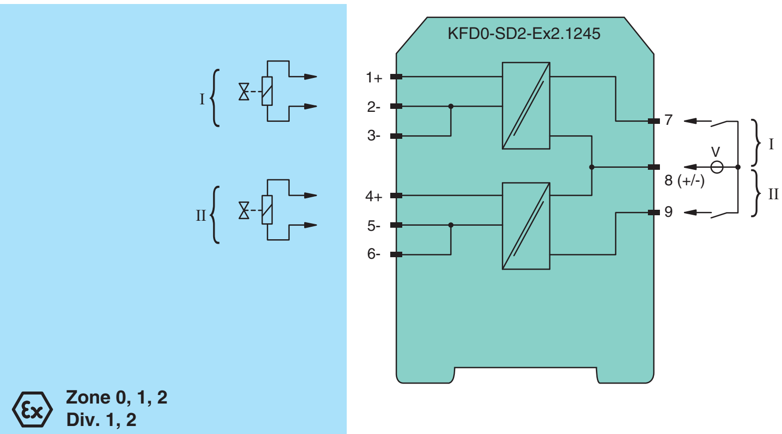
Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

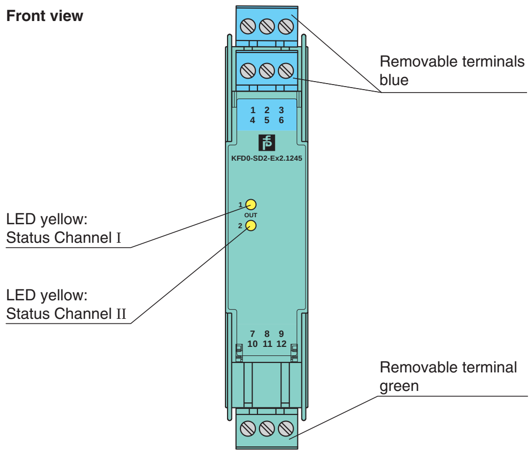
It is loop powered, so the available energy at the output is received from the input signal. The output signal has a resistive characteristic. As a result the output voltage and current are dependent on the load and the input voltage.

At full load, 12 V at 45 mA is available for the hazardous area application.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current limit 65 mA at 9.8 V DC**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is loop powered, so the available energy at the output is received from the input signal. The output signal has a resistive characteristic. As a result the output voltage and current are dependent on the load and the input voltage.

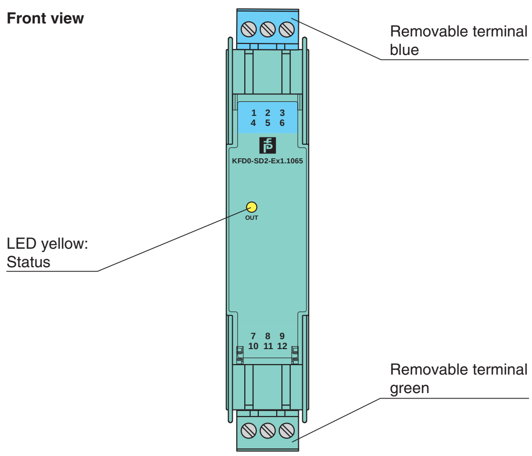
At full load, 9.8 V at 65 mA is available for the hazardous area application.

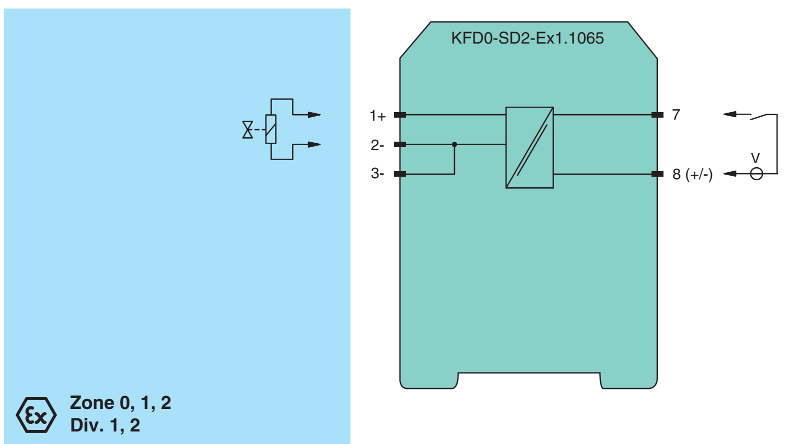
Technical data

Supply	
Rated voltage	loop powered
Power loss	< 1 W (≤30 V)
Input	
Rated voltage U_i	20 ... 35 V DC
Current	72 mA at 20 V input voltage, load = 150 Ω 50 mA at 35 V input voltage, load = 150 Ω
Output	
Internal resistor	≤ 90 Ω
Limit	current I_E: ≥ 65 mA voltage U_E: ≥ 9.8 V
Open loop voltage	≥ 15.4 V
Output rated operating current	65 mA
Output signal	these values are valid for the rated operational voltage 20 ... 35 V DC
Energized/De-energized delay	single operation: 300 µs/50 µs; periodical: 5 µs/50 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0252
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ex I (M1) [Ex ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	266-031FM-12 (cFMus)
UL approval	
Control drawing	116-0316 (cULus)
IECEx approval	IECEx BAS 06.0058

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Power loss	< 1 W (≤ 30 V)
Input	
Rated voltage U_i	20 ... 35 V DC
Current	140 mA at 20 V input voltage, load = 140 Ω 100 mA at 35 V input voltage, load = 140 Ω
Output	
Internal resistor	≤ 150 Ω
Limit	current I_E: ≥ 80 mA voltage U_E: ≥ 11 V
Open loop voltage	≥ 22.7 V
Output rated operating current	80 mA
Output signal	these values are valid for the rated operational voltage 20 ... 35 V DC
Energized/De-energized delay	single operation: 300 µs/50 µs; periodical: 5 µs/50 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0252
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIB, [Ex ia D] [circuit(s) in zone 0/1/2/20/21/22] Ⓔx I (M1) [Ex ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	266-031FM-12 (cFMus)
UL approval	
Control drawing	116-0316 (cULus)
IECEx approval	IECEx BAS 06.0058

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current limit 80 mA at 11 V DC**
- **Up to SIL3 acc. to IEC 61508**

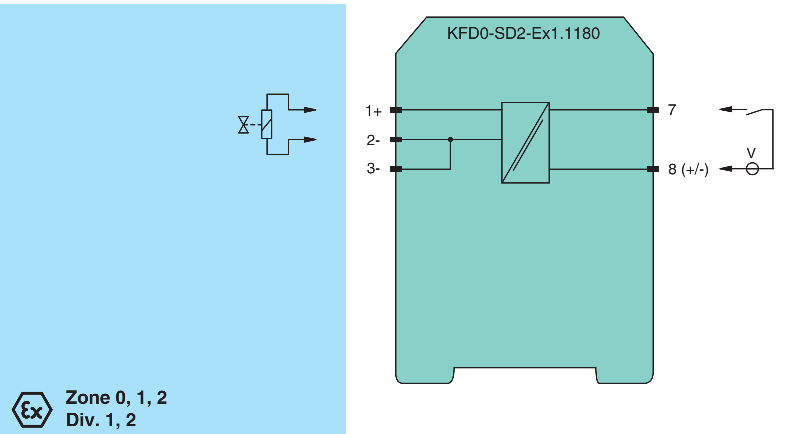
Function

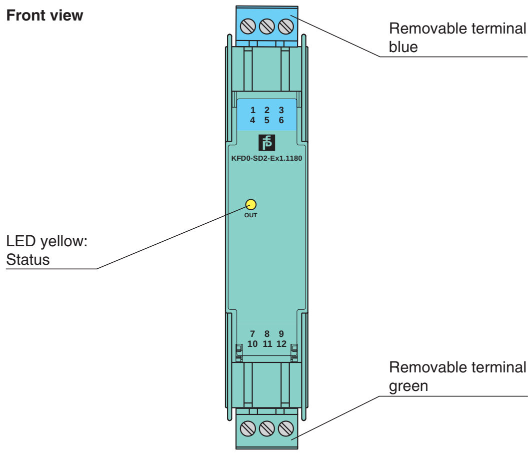
This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is loop powered, so the available energy at the output is received from the input signal. The output signal has a resistive characteristic. As a result the output voltage and current are dependent on the load and the input voltage.

At full load, 11 V at 80 mA is available for the hazardous area application.

Diagrams





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KFD0-SD2-Ex1.10100

Solenoid Driver

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current limit 100 mA at 10 V DC**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is loop powered, so the available energy at the output is received from the input signal. The output signal has a resistive characteristic. As a result the output voltage and current are dependent on the load and the input voltage.

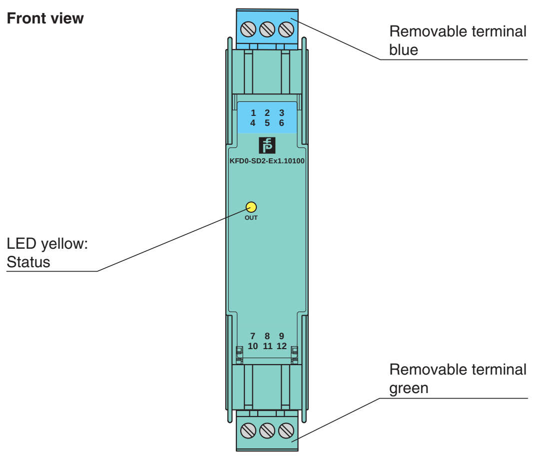
At full load, 10 V at 100 mA is available for the hazardous area application.

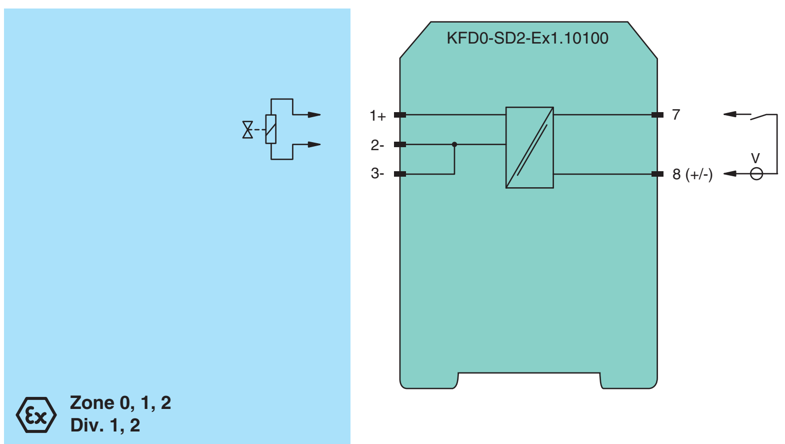
Technical data

Supply	
Rated voltage	loop powered
Power loss	< 1.2 W ($U_i \leq 30$ V)
Input	
Rated voltage U_i	20 ... 35 V DC
Current	150 mA at 20 V input voltage, load = 100 Ω 100 mA at 35 V input voltage, load = 100 Ω
Output	
Internal resistor	≤ 68 Ω
Limit	current I_E: ≥ 100 mA voltage U_E: ≥ 10 V
Open loop voltage	≥ 16.2 V
Output rated operating current	100 mA
Output signal	these values are valid for the rated operational voltage 20 ... 35 V DC
Energized/De-energized delay	single operation: 300 µs/50 µs; periodical: 5 µs/50 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0252
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ⓔx I (M1) [Ex ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	266-031FM-12 (cFMus)
UL approval	
Control drawing	116-0316 (cULus)
IECEx approval	IECEx BAS 06.0058

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	≤ 1.7 W at 45 mA output current
Input	
Input current	approx. 3 mA at 24 V DC
Signal level	1-signal: 16 ... 30 V DC 0-signal: 0 ... 5 V DC
Output	
Internal resistor	272 Ω
Limit	current I_E: 45 mA voltage U_E: 11.7 V
Open loop voltage	≥ 24 V
Output rated operating current	45 mA
Output signal	these values are valid for rated operational voltages from 20 ... 30 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	ZELM 00 ATEX 0024
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	TÜV 02 ATEX 1820 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	16-548FM-12
IECEx approval	IECEx TUN 04.0001
Approved for	[Ex ia] IIC, [Ex iaD]

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 45 mA at 11.7 V DC**
- **Logic input, non-polarized**
- **Lead monitoring**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms.

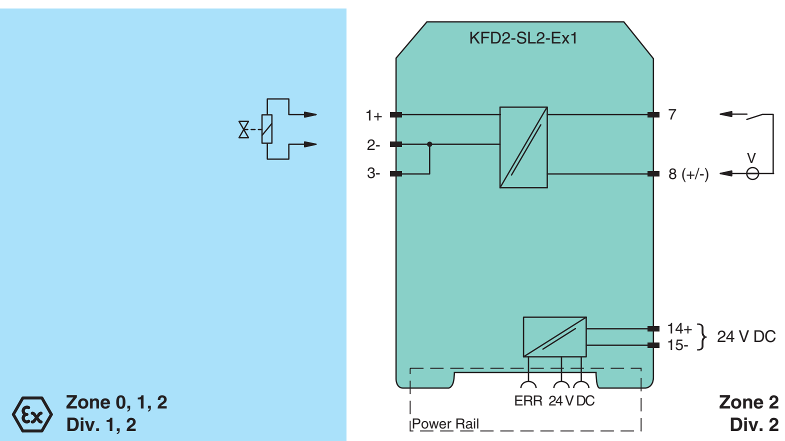
It is controlled by means of a logic circuit. Voltage signals in a range of 16 V DC ... 30 V DC are accepted as 1-signal. The 0-signal must be within a range of 0 V DC ... 5 V DC. The current consumption of the logic inputs is about 3 mA each.

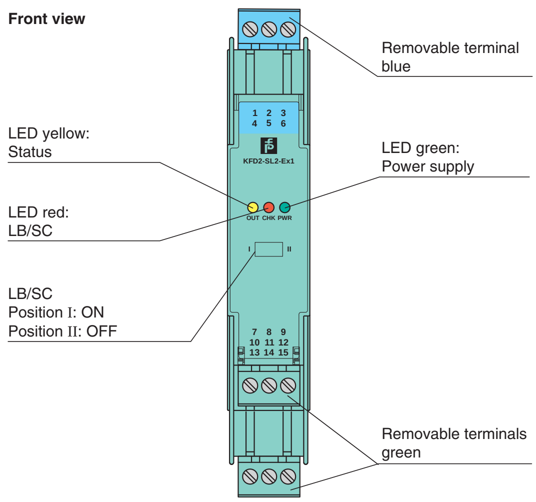
At full load, 11.7 V at 45 mA is available for the hazardous area load.

Line fault detection of the field circuit is indicated by a red LED. The error signal switches on if the field impedance is > 10 kΩ for lead breakage or < 50 Ω for short circuits.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 45 mA at 11.7 V DC**
- **Logic input, non-polarized**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms.

It is controlled by means of a logic circuit. Voltage signals in a range of 16 V DC ... 30 V DC are accepted as 1-signal. The 0-signal must be within a range of 0 V DC ... 5 V DC. The current consumption of the logic inputs is about 3 mA each.

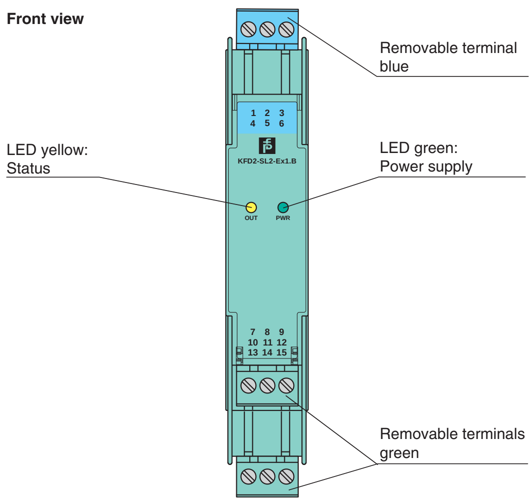
At full load, 11.7 V at 45 mA is available for the hazardous area load.

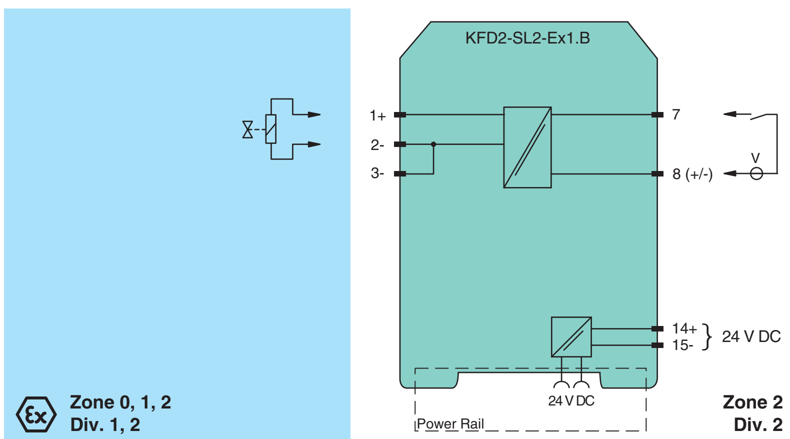
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	≤ 1.7 W at 45 mA output current
Input	
Input current	approx. 3 mA at 24 V DC
Signal level	1-signal: 16 ... 30 V DC 0-signal: 0 ... 5 V DC
Output	
Internal resistor	272 Ω
Limit	current I_E: 45 mA voltage U_E: 11.7 V
Open loop voltage	≥ 24 V
Output rated operating current	45 mA
Output signal	these values are valid for rated operational voltages from 20 ... 30 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	ZELM 00 ATEX 0024
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	TÜV 02 ATEX 1820 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	16-548FM-12
IECEx approval	IECEx TUN 04.0001
Approved for	[Ex ia] IIC, [Ex iaD]

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 1.9 W at 45 mA output current
Input	
Input current	approx. 3 mA
Signal level	1-signal: 16 ... 30 V DC 0-signal: 0 ... 5 V DC
Output	
Output I	
Internal resistor	270 Ω
Limit	current I_E: 45 mA voltage U_E: 11.2 V
Open loop voltage	≥ 23.5 V
Output rated operating current	45 mA
Output signal	These values are valid for the rated operational voltage 19 ... 30 V DC.
Output II	
Contact loading	terminals 10, 11, 12, 253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Lead monitoring	relay; signal at short-circuit R_B < 50 Ω, lead breakage R_B > 10 kΩ
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	ZELM 99 ATEX 0015
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC, [Ex iaD] [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1820 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 45 mA at 11.2 V DC**
- **Logic input, non-polarized**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms.

It is controlled by means of a logic circuit. Voltage signals in a range of 16 V DC ... 30 V DC are accepted as 1-signal. The 0-signal must be within a range of 0 V DC ... 5 V DC. The current consumption of the logic inputs is about 3 mA each.

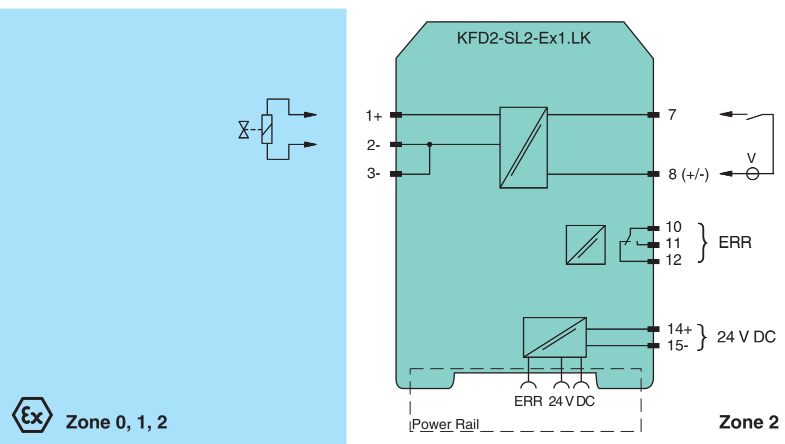
At full load, 11.2 V at 45 mA is available for the hazardous area load.

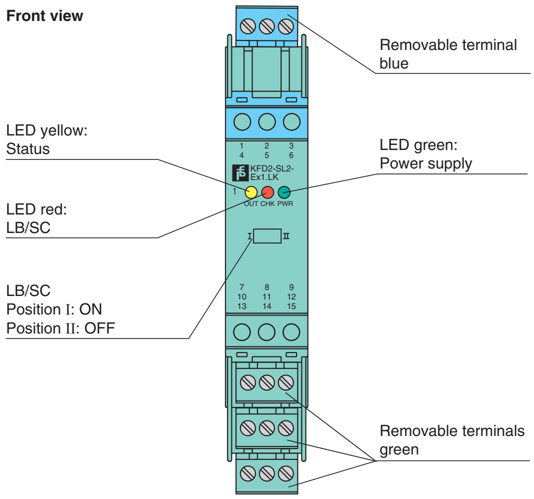
Line fault detection of the field circuit is indicated by a red LED, and initiation of a form C changeover relay contact.

During an error condition, the relay reverts to its de-energized state. The error signal switches on if the field impedance is > 10 kΩ for lead breakage or < 50 Ω for short circuits.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





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KFD2-SL2-Ex1.LK.1045

Solenoid Driver

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 45 mA at 10 V DC**
- **Logic input, non-polarized**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms.

It is controlled by means of a logic circuit. Voltage signals in a range of 16 V DC ... 30 V DC are accepted as 1-signal. The 0-signal must be within a range of 0 V DC ... 5 V DC. The current consumption of the logic inputs is about 3 mA each.

At full load, 10 V at 45 mA is available for the hazardous area load.

Line fault detection of the field circuit is indicated by a red LED, and initiation of a form C changeover relay contact.

During an error condition, the relay reverts to its de-energized state. The error signal switches on if the field impedance is > 10 kΩ for lead breakage or < 50 Ω for short circuits.

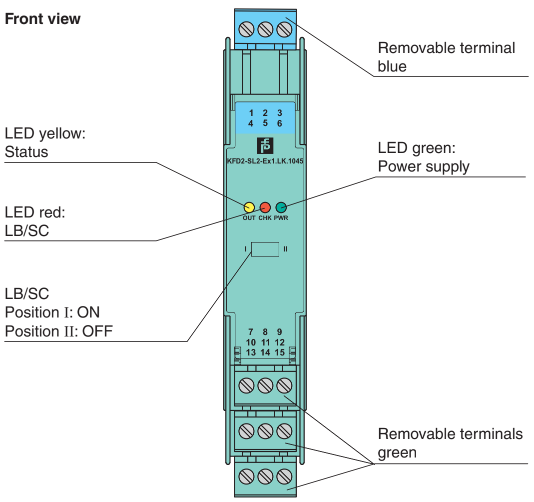
A unique collective error messaging feature is available when used with the Power Rail system.

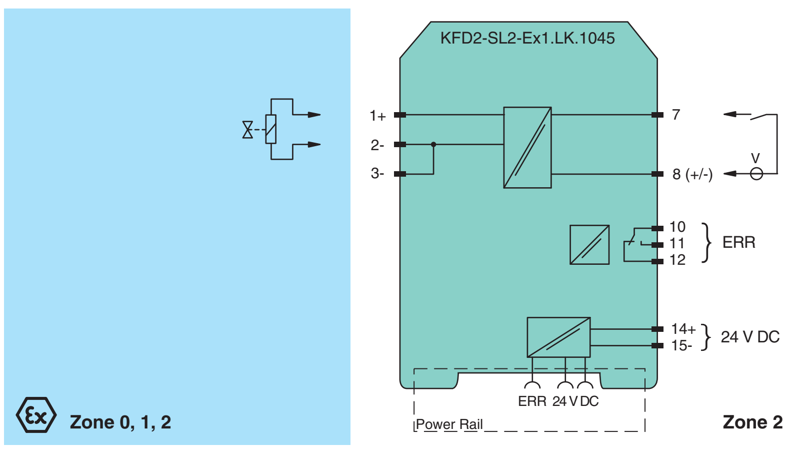
Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 1.9 W at 45 mA output current
Input	
Input current	approx. 3 mA
Signal level	1-signal: 16 ... 30 V DC 0-signal: 0 ... 5 V DC
Output	
Output I	
Internal resistor	300 Ω
Limit	current I_E: 45 mA voltage U_E: 10 V
Open loop voltage	≥ 23.5 V
Output rated operating current	45 mA
Output signal	These values are valid for the rated operational voltage 19 ... 30 V DC.
Output II	
Contact loading	terminals 10, 11, 12, 253 V AC/2 A/cos Φ > 0.7; 40 V DC/2 A resistive load
Lead monitoring	relay; signal at short-circuit R_B < 50 Ω, lead breakage R_B > 10 kΩ
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	ZELM 99 ATEX 0015
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD] [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1820 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4

Diagrams

Front view





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Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 1.9 W at 45 mA output current
Input	
Input current	approx. 3 mA
Signal level	1-signal: 16 ... 30 V DC 0-signal: 0 ... 5 V DC
Output	
Output I	
Internal resistor	92 Ω
Limit	current I_E: 70 mA voltage U_E: 12.5 V
Open loop voltage	≥ 19.2 V
Output rated operating current	70 mA
Output signal	These values are valid for the rated operational voltage 19 ... 30 V DC.
Output II	
Contact loading	terminals 10, 11, 12, 253 V AC/2 A/cos Φ > 0.7; 40 V DC/2 A resistive load
Lead monitoring	relay; signal at short-circuit R_B < 50 Ω, lead breakage R_B > 10 kΩ
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	ZELM 99 ATEX 0015
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIB, [Ex ia D] [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1820 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 70 mA at 12.5 V DC**
- **Logic input, non-polarized**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms.

It is controlled by means of a logic circuit. Voltage signals in a range of 16 V DC ... 30 V DC are accepted as 1-signal. The 0-signal must be within a range of 0 V DC ... 5 V DC. The current consumption of the logic inputs is about 3 mA each.

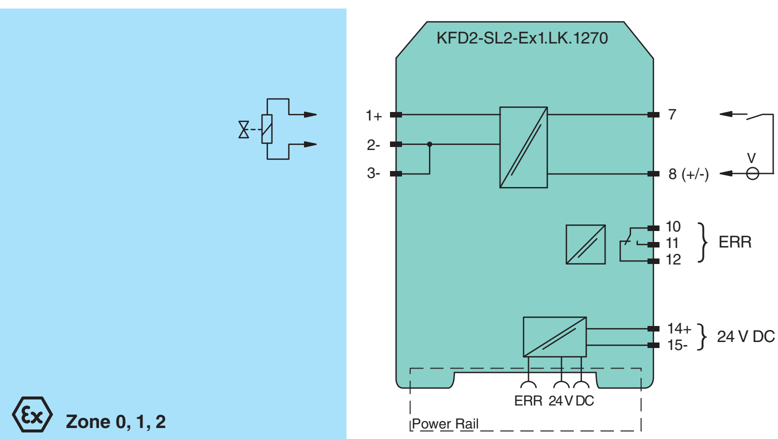
At full load, 12.5 V at 70 mA is available for the hazardous area load.

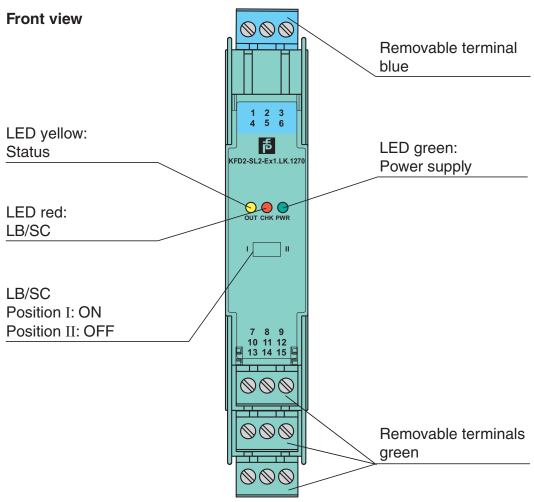
Line fault detection of the field circuit is indicated by a red LED, and initiation of a form C changeover relay contact.

During an error condition, the relay reverts to its de-energized state. The error signal switches on if the field impedance is > 10 kΩ for lead breakage or < 50 Ω for short circuits.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 45 mA at 11.7 V DC**
- **Logic input, non-polarized**
- **Lead monitoring**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms.

It is controlled by means of a logic circuit. Voltage signals in a range of 16 V DC ... 30 V DC are accepted as 1-signal. The 0-signal must be within a range of 0 V DC ... 5 V DC. The current consumption of the logic inputs is about 3 mA each.

At full load, 11.7 V at 45 mA is available for the hazardous area load.

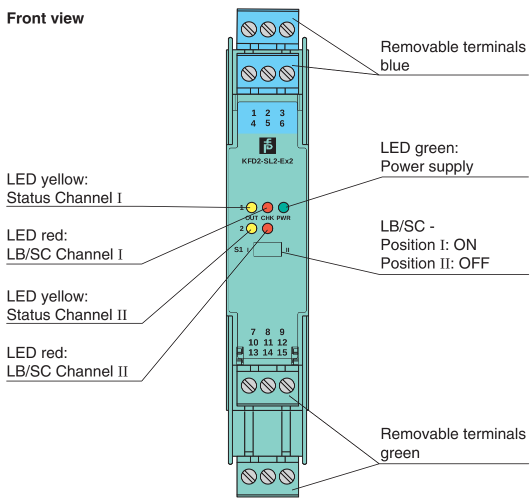
Line fault detection of the field circuit is indicated by a red LED. The error signal switches on if the field impedance is > 10 kΩ for lead breakage or < 50 Ω for short circuits.

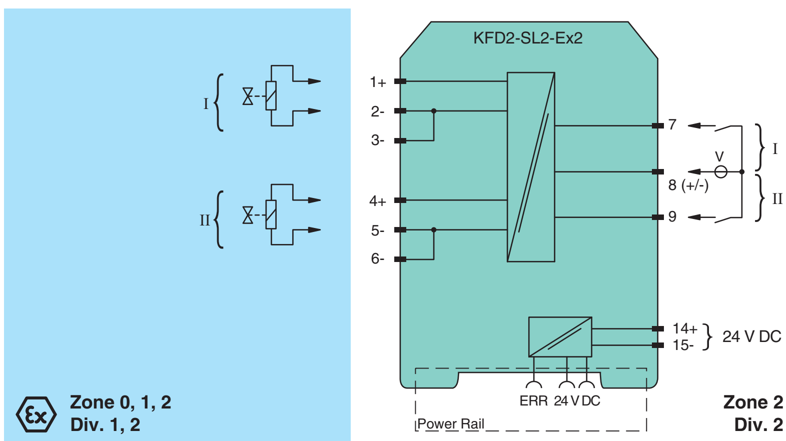
A unique collective error messaging feature is available when used with the Power Rail system.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	≤ 3.3 W at 45 mA output current
Input	
Input current	approx. 3 mA at 24 V DC
Signal level	1-signal: 16 ... 30 V DC 0-signal: 0 ... 5 V DC
Output	
Internal resistor	272 Ω
Limit	Current I_E: 45 mA voltage U_E: 11.7 V
Open loop voltage	≥ 24 V
Output rated operating current	45 mA
Output signal	these values are valid for rated operational voltages from 20 ... 30 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Ambient conditions	
Ambient temperature	-20 ... 50 °C (-4 ... 122 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	ZELM 00 ATEX 0024
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	TÜV 02 ATEX 1820 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	16-548FM-12
IECEx approval	IECEx TUN 04.0001
Approved for	[Ex ia] IIC, [Ex iaD]

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	≤ 3.3 W at 45 mA output current
Input	
Input current	approx. 3 mA at 24 V DC
Signal level	1-signal: 16 ... 30 V DC 0-signal: 0 ... 5 V DC
Output	
Internal resistor	272 Ω
Limit	current I_E: 45 mA voltage U_E: 11.7 V
Open loop voltage	≥ 24 V
Output rated operating current	45 mA
Output signal	these values are valid for rated operational voltages from 20 ... 30 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Ambient conditions	
Ambient temperature	-20 ... 50 °C (-4 ... 122 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	ZELM 00 ATEX 0024
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	TÜV 02 ATEX 1820 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	16-548FM-12
IECEx approval	IECEx TUN 04.0001
Approved for	[Ex ia] IIC, [Ex iaD]

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 45 mA at 11.7 V DC**
- **Logic input, non-polarized**
- **Up to SIL2 acc. to IEC 61508**

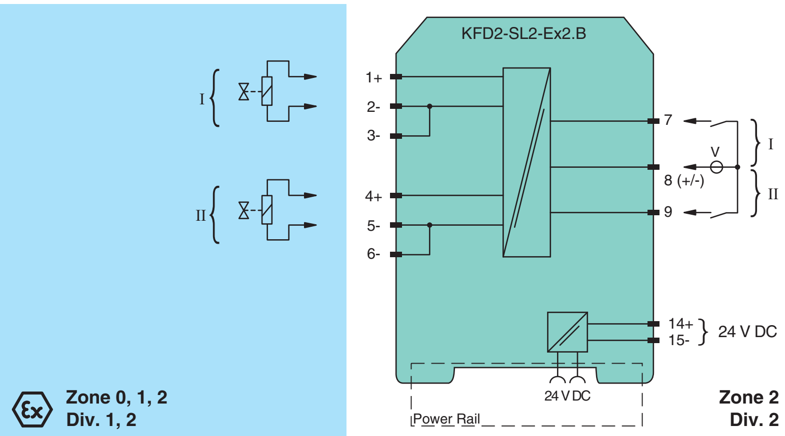
Function

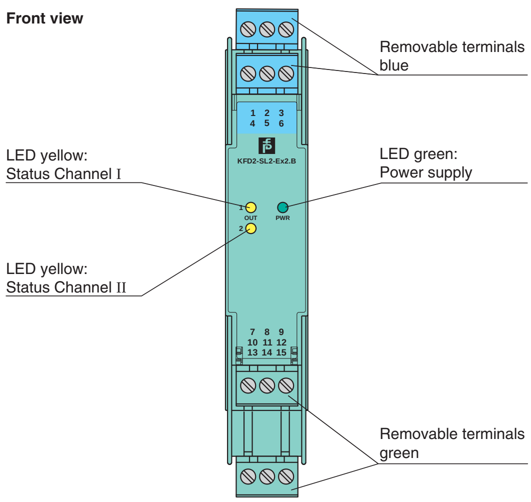
This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms.

It is controlled by means of a logic circuit. Voltage signals in a range of 16 V DC ... 30 V DC are accepted as 1-signal. The 0-signal must be within a range of 0 V DC ... 5 V DC. The current consumption of the logic inputs is about 3 mA each.

At full load, 11.7 V at 45 mA is available for the hazardous area load.

Diagrams





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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 20.4 mA at 13.5 V DC**
- **19 V DC ... 30 V DC input**
- **Line fault detection (LFD)**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. The device can be used in shut down applications with HART positioners.

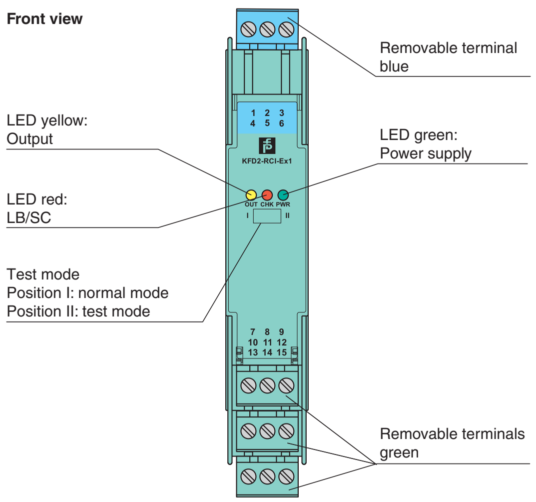
Via the logic input the positioner is energized or de-energized (shut down). Independent of the status, a second input enables HART communication with the positioner. With this the asset management system can request for example diagnostic information or can initiate a partial stroke test. The HART communication also works with de-energized positioner.

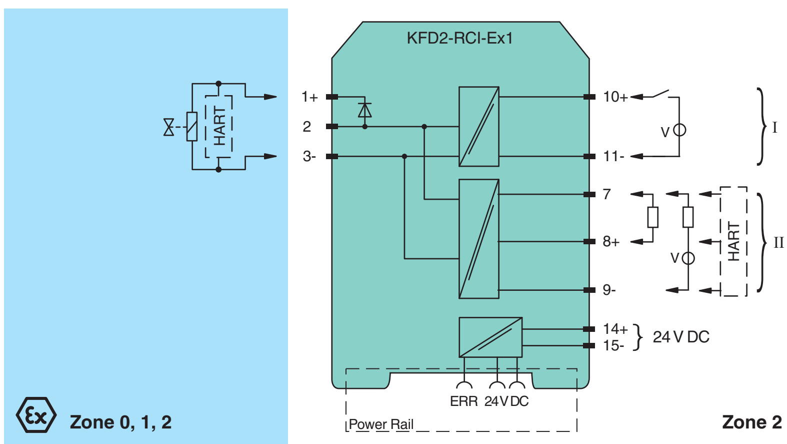
A unique collective error messaging feature is available when used with the Power Rail system.

Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	< 0.8 W
Input	
Input current	40 mA at 19 ... 30 V DC
Signal level	1-signal: 19 ... 30 V DC 0-signal: 0 ... 5 V DC
Power consumption	< 1.2 W
Operating mode	loop powered
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	CESI 09 ATEX 037
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	PF 09 CERT 1438 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
IECEx approval	IECEx CES 09.0008

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss	typ. 1.2 W
Power consumption	< 1.5 W
Input	
Signal level	1-signal: 15 ... 30 V DC; input current: approx. 2.3 mA at 24 V DC 0-signal: 0 ... 5 V DC or open input
Response delay	5 ... 30 ms (typical 10 ms)
Output	
Internal resistor	≤ 410 Ω
Limit	Current I_E: ≥ 17 mA; typ. 18 mA voltage U_E: ≥ 15.3 V; typ. 16 V
Open loop voltage	≥ 22.3 V
Output rated operating current	17 mA
Output signal	these values are valid for rated operational voltages from 20 ... 30 V DC
Transfer characteristics	
Switching frequency	15 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2132
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Output 15.3 V DC at 17 mA**
- **3 logic inputs with AND/OR logic**
- **Service port for isolator function test**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids and other similar loads.

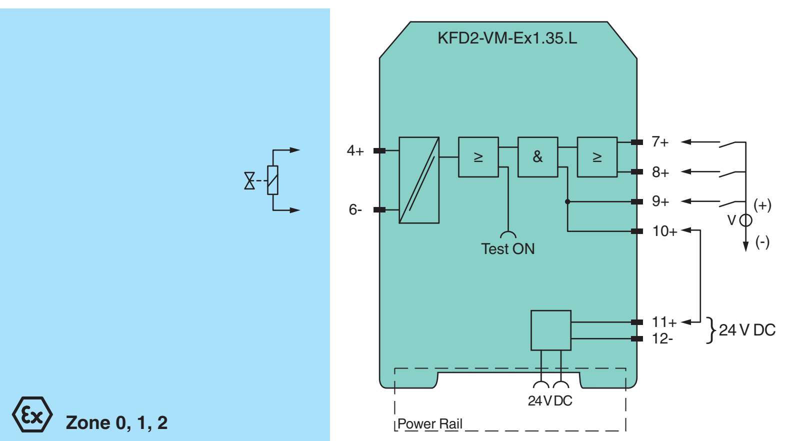
It is controlled by two "OR" and one "AND" configured logic input.

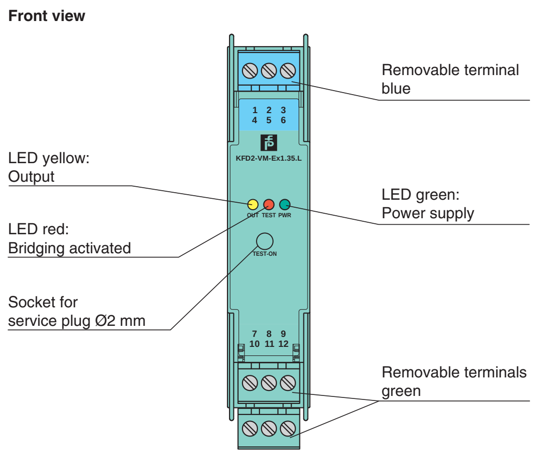
At full load, 15.3 V at 17 mA is available for the hazardous area load. The output signal has a resistive characteristic.

An override/test jack feature is available on the front plate of the device.

By engaging the service plug, the logic inputs are bypassed and the output is energized. The operation of this test feature is indicated by a red LED.

Diagrams





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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Relay contact output to hazardous area**
- **Logic input 15 V DC ... 30 V DC, non-polarized**

Function

This isolated barrier is used for intrinsic safety applications. It switches circuits inside the hazardous area.

Typical circuits used with this isolator include remote resets, fire alarm tests or remote calibration of strain gauges.

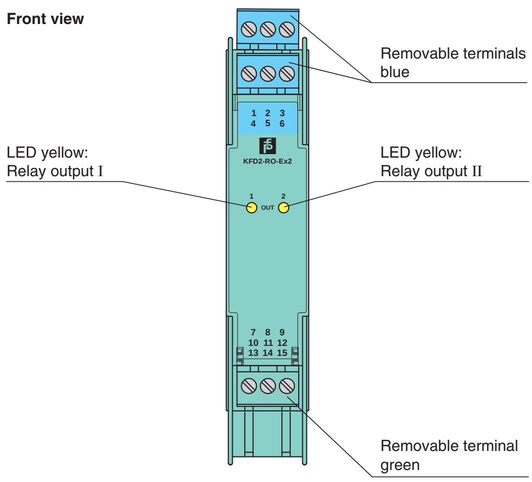
Both outputs are galvanically isolated to the inputs. The inputs are not polarized and share a common reference potential.

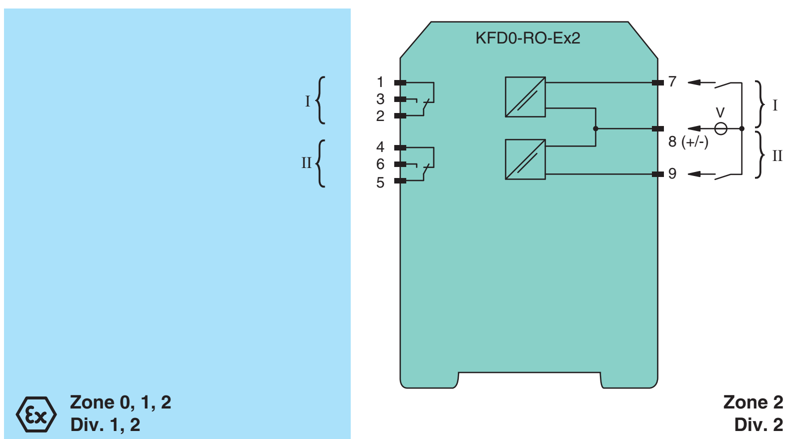
A fuse and an electronic current-limiting circuit protect the inputs of the relay module.

Technical data

Supply	
Power loss	0.8 W
Input	
Rated voltage U_i	15 ... 30 V DC
Rated current I_i	≤21 mA per channel
Output	
Contact loading	230 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 10 ms/approx. 5 ms
Mechanical life	5 x 10^6 switching cycles
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 65 °C (-4 ... 149 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	DMT 00 ATEX E 016
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	TÜV 00 ATEX 1621 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4
CSA approval	
Control drawing	116-0156

Diagrams





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Technical data

Supply	
Rated voltage	15 ... 35 V DC
Power consumption	approx. 1.5 W
Field circuit	
Interface	RS 232
Input	
Input signal	logic 0: +3 ... +15 V logic 1: -3 ... -15 V
Output	
Output signal	logic 0: +9 ... +12 V logic 1: -9 ... -12 V
Safe area	
Interface	RS 232
Input	
Input signal	logic 0: +3 ... +15 V logic 1: -3 ... -15 V
Output	
Output signal	logic 0: +9 ... +12 V logic 1: -9 ... -12 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 194 for entity parameters
EC-Type Examination Certificate	BAS 02 ATEX 0116
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC T4 (-40 °C $\leq T_{amb} \leq$ 60 °C)
UL approval	
Control drawing	116-0173 (cULus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **RS 232 input/output**

Function

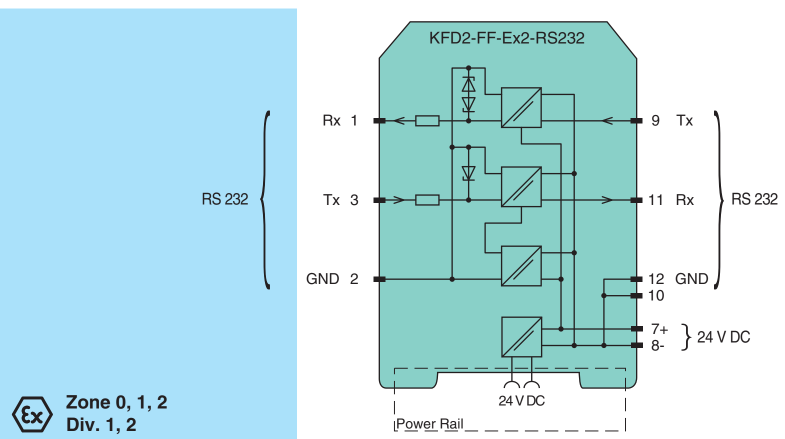
This isolated barrier is used for intrinsic safety applications. It is a repeater for the bi-directional transfer of RS 232 signals.

The input and output circuits are intrinsically safe and designed to transmit and receive RS 232 signals between the safe area and the hazardous area.

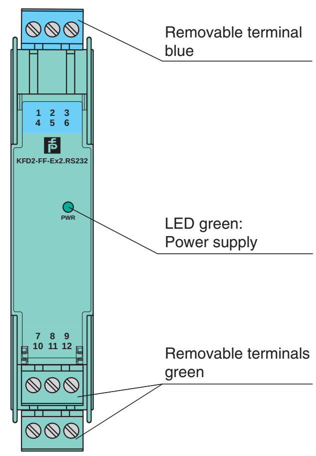
This barrier accepts input signals in the ±3 V ... ±15 V range providing a nominal ±10 V output that is independent of the input voltage.

The maximum rate of data exchange is 20 kBits per second.

Diagrams



Front view



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ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
KCD0-SD-Ex1.1245	1, 2	25.2	110	693
KFD0-SD2-Ex1.10100	1, 2	17	271	1152
KFD0-SD2-Ex1.1045	1, 2	25.2	93	590
KFD0-SD2-Ex1.1065	1, 2	17.22	220	947
KFD0-SD2-Ex1.1180	1, 2	25.2	184	1159
KFD0-SD2-Ex2.1045	1, 2; 4, 5	25.2	93	590
KFD0-SD2-Ex2.1245	1, 2; 4, 5	25.2	110	693
KFD2-FF-Ex2.RS232	1, 2	14.5	48	180
	2, 3	5.4	27	40
	1, 2, 3	19.9	75	200
KFD2-SL2-Ex1	1, 2, 3	28	110	770
KFD2-SL2-Ex1.B	1, 2, 3	28	110	770
KFD2-SL2-Ex1.LK	1, 2, 3	28	110	770
KFD2-SL2-Ex1.LK.1045	1, 2, 3	26	93	607
KFD2-SL2-Ex1.LK.1270	1, 2, 3	22.1	248	1380
KFD2-SL2-Ex2	1, 2, 3; 4, 5, 6	28	110	770
KFD2-SL2-Ex2.B	1, 2, 3; 4, 5, 6	28	110	770
KFD2-RCI-Ex1	1, 2, 3	25.4	93.6	595
KFD2-VM-Ex1.35.L	4, 6	25,2	67.2	423.5

Model Number	Terminals	U_i (V)	I_i (mA)
KFD0-RO-Ex2	1, 2, 3; 4, 5, 6	60	2000

CSA Entity Parameters

Model Number	Terminals	V_{max} (V)	Resistances (Ω)	V_{oc} (V)	I_{sc} (mA)
KFD0-RO-Ex2	1, 2, 3; 4, 5, 6	0	0	–	–

FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
KCD0-SD-Ex1.1245	1, 2	25.2	110	–	–
KFD0-SD2-Ex1.10100	1, 2	17	271	–	–
KFD0-SD2-Ex1.1045	1, 2	25.2	93	–	–
KFD0-SD2-Ex1.1065	1, 2	17.22	220	–	–
KFD0-SD2-Ex1.1180	1, 2	25.2	184	–	–
KFD0-SD2-Ex2.1045	1, 2; 4, 5	25.2	93	–	–
KFD0-SD2-Ex2.1245	1, 2; 4, 5	25.2	110	–	–
KFD2-SL2-Ex1	1, 2, 3	28	110	–	–
KFD2-SL2-Ex1.B	1, 2, 3	28	110	–	–
KFD2-SL2-Ex2	1, 2, 3; 4, 5, 6	28	110	–	–
KFD2-SL2-Ex2.B	1, 2, 3; 4, 5, 6	28	110	–	–

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UL Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
KCD0-SD-Ex1.1245	1, 2	25.2	110	–	–
KFD2-FF-Ex2.RS232	1, 2, 3	–	–	19.9	75
KFD0-SD2-Ex1.1045	1, 2, 3	25.2	93	–	–
KFD0-SD2-Ex1.1065	1, 2, 3	17.22	220	–	–
KFD0-SD2-Ex1.10100	1, 2, 3	17.0	271	–	–
KFD0-SD2-Ex1.1180	1, 2, 3	25.2	184	–	–
KFD0-SD2-Ex2.1045	1, 2, 3; 4, 5, 6	25.2	93	–	–
KFD0-SD2-Ex2.1245	1, 2, 3; 4, 5, 6	25.2	110	–	–

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Transmitter Power Supplies

Model Number	Channels	Input (Field): 2-wire Transmitter	Input (Field): 3-wire Transmitter	Input (Field): Current Source	Output (Control System): 0/4 mA ... 20 mA (Source)	Output (Control System): 0/4 mA ... 20 mA (Sink)	Output (Control System): 1 V ... 5 V	Output (Control System): 2 V ... 10 V	Specials: SMART	Specials: Higher Field Voltage	Specials: Signal Splitting (1 Input – 2 Outputs)	Supply 24 V DC	SIL	Zone 2/Division 2 Mounting	Page
KCD2-STC-Ex1	1	■		■	■	■	1		■			■	2	■	201
KFD2-STC4-Ex1	1	■	■	■	1				■			■	2	■	202
KFD2-STC4-Ex1-Y122583	1	■	■	■		1			■			■	2	■	203
KFD2-STC4-Ex1.H	1	■	■	■	1				■	■		■	2		204
KFD2-STV4-Ex1-1	1	■	■	■			1		■			■	2		205
KFD2-STV4-Ex1-2	1	■	■	■				1	■			■	2		206
KFD2-STC4-Ex1.2O	1	■	■	■	2				■		■	■	3	■	207
KFD2-STC4-Ex1.2O-Y122582	1	■	■	■		2			■		■	■	3	■	208
KFD2-STC4-Ex1.2O.H	1	■	■	■	2				■	■	■	■	3		209
KFD2-STV4-Ex1.2O-1	1	■	■	■			2		■		■	■	3	■	210
KFD2-STV4-Ex1.2O-2	1	■	■	■				2	■		■	■	3		211
KFD2-STC4-Ex2	2	■			2				■			■	2		212
KFD2-STC4-Ex2-Y203646	2	■				2			■			■	2		213
KFD2-STV4-Ex2-1	2	■					2		■			■	2		214
KFD2-STV4-Ex2-2	2	■						2	■			■	2		215
KFD2-STC3-Ex1	1	■			1				40 kHz			■			216
KFD2-STV3-Ex1-1	1	■					1		40 kHz			■			217
KFD2-STV3-Ex1-2	1	■						1	40 kHz			■			218
DN421	1	■							■			■			219

Transmitter Power Supplies with Trip Values

Model Number	Channels	Input (Field): 2-wire Transmitter	Input (Field): 3-wire Transmitter	Input (Field): Current Source	Output (Control System): 0/4 mA ... 20 mA (Source)	Output (Control System): Relay	Output (Control System): SMART	Supply: 24 V DC	Supply: 115 V AC/ 230 V AC	SIL	Zone 2/Division 2 Mounting	Page
KFD2-CRG2-Ex1.D	1	■	■	■	1	2		■		2	■	220
KFU8-CRG2-Ex1.D	1	■	■	■	1	2		■	■	2		221

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Transmitter Power Supplies with HART Communication (HART Loop Converter)

Model Number	Channels	Input (Field)		Output (Control System)		Supply 24 V DC	SIL	Zone 2/Division 2 Mounting	Page
		Signal	Transmitter Supply	0/4 mA ... 20 mA (Active/Passive)	Relay				
KFD2-HLC-Ex1.D	1	HART	■	3		■		■	222
KFD2-HLC-Ex1.D.2W	1	HART	■	3	2	■		■	223
KFD2-HLC-Ex1.D.4S	1	HART	■	3	4	■		■	224

Current Repeaters

Model Number	Channels	Input (Field)				Output (Control System)				Supply Loop Powered	SIL	Zone 2/Division 2 Mounting	Page
		0 mA ... 40 mA	1 mA ... 20 mA	4 mA ... 20 mA	Fire Alarm	0 mA ... 40 mA	1 mA ... 20 mA	4 mA ... 20 mA	SMART				
KFD0-SCS-Ex1.55	1			■				1	■	■	2	■	225
KFD0-CS-Ex1.50P	1			■	■			1		■	2	■	226
KFD0-CS-Ex1.51P	1	■			■	1				■	2	■	227
KFD0-CS-Ex1.52	1			■				1		■		■	228
KFD0-CS-Ex1.54	1		■		■		1		■	■		■	229
KFD0-CS-Ex2.50P	2			■	■			2		■	2	■	230
KFD0-CS-Ex2.51P	2	■			■	2				■	2	■	231
KFD0-CS-Ex2.52	2			■				2		■		■	232
KFD0-CS-Ex2.54	2		■		■		2		■	■		■	233

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Voltage Repeaters

Model Number	Channels	Transmission Range: -50 mV ... 50 mV	-500 mV ... 500 mV	-10 V ... 10 V	-20 V ... 0 V	0 V ... 9 V	0 V ... 12 V	Cutoff Frequency	Supply 24 V DC	SIL	Zone 2/Division 2 Mounting	Page
KFD2-VR2-Ex1.50M	1	■						350 Hz	■		■	234
KFD2-VR2-Ex1.500M	1		■					350 Hz	■			235
KFD2-VR-Ex1.12	1					■		1.2 kHz	■			236
KFD2-VR-Ex1.18	1						■	4 kHz	■			237
KFD2-VR-Ex1.19	1			■				4 kHz	■			238
KFD2-VR-Ex1.19-Y109129	1			■				50 kHz	■			239
KFD2-VR4-Ex1.26	1				■			20 kHz	■		■	240

Current and Voltage Converters

Model Number	Channels	Input (Field)				Output (Control System)			Supply		SIL	Zone 2/Division 2 Mounting	Page
		-100 mV ... 100 mV	0/2 V ... 10 V	0/4 mA ... 20 mA	Strain Gauge	0/4 mA ... 20 mA	0 mA ... ±20 mA	Relay	24 V DC	Loop Powered			
KFD0-CC-Ex1	1		■	■		1				■		■	241
KFD2-WAC2-Ex1.D	1	■			■		1	2	■				242

Temperature Converters and Repeaters

Model Number	Channels	Input (Field)				Output (Control System)			Supply		SIL	Zone 2/Division 2 Mounting	Page
		RTD	TC	Potentiometer	V	4 mA ... 20 mA	0/1 V ... 5 V	Resistance	24 V DC	Loop Powered			
KFD2-UT2-Ex1	1	■	■	■	■	1			■		2	■	243
KFD2-UT2-Ex1-1	1	■	■	■	■		1		■		2	■	244
KFD2-UT2-Ex2	2	■	■	■	■	2			■		2	■	245
KFD2-UT2-Ex2-1	2	■	■	■	■		2		■		2	■	246
KFD0-TR-Ex1	1	■				1				■		■	247
KFD0-TT-Ex1	1		■			1				■		■	248
KCD2-RR-Ex1	1	■						1	■			■	249

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Temperature Converters with Trip Values

Model Number	Channels	Input (Field)					Output (Control System)		Supply				Page
		RTD	TC	Potentiometer	V	mA	4 mA ... 20 mA	Relay	24 V DC	115 V AC/ 230 V AC	SIL	Zone 2/Division 2 Mounting	
KFD2-GU-Ex1	1	■	■		■	■		2	■				250
KFD2-GUT-Ex1.D	1	■	■	■	■		1	2	■		2	■	251
KFU8-GUT-Ex1.D	1	■	■	■	■		1	2	■	■	2		252

Potentiometers and Resistor Converters

Model Number	Channels	Input (Field)				Output (Control System)			Supply				Page
		2-wire	3-wire	4-wire	5-wire	0/4 mA ... 20 mA	0/1 V ... 5/10 V	Resistance	24 V DC	Loop Powered	SIL	Zone 2/Division 2 Mounting	
KFD2-UT2-Ex1	1	■	■	■		1			■		2	■	243
KFD2-UT2-Ex1-1	1	■	■	■			1		■		2	■	244
KFD2-UT2-Ex2	2	■	■	■*		2			■		2	■	245
KFD2-UT2-Ex2-1	2	■	■	■*			2		■		2	■	246
KCD2-RR-Ex1	1	■	■	■				1	■			■	249
KFD2-PT2-Ex1	1		■	■	■		1		■			■	253
KFD2-PT2-Ex1-1	1		■	■	■		1		■			■	254
KFD2-PT2-Ex1-4	1		■	■	■	1			■			■	255
KFD2-PT2-Ex1-5	1		■	■	■	1			■			■	256
KFD0-RC-Ex1	1		■	■	■	1				■		■	257

* 4-wire on channel I only

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Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 1.1 W
Input	
Input signal	4 ... 20 mA limited to approx. 30 mA
Voltage drop U_d	approx. 5 V on terminals 3+, 4-
Available voltage	≥ 15 V at 20 mA terminals 1+, 2-
Output	
Load	0 ... 300 Ω (source mode)
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt) 4 ... 20 mA (sink mode), operating voltage 15.5 ... 26 V
Ripple	20 mV_{rms}
Transfer characteristics	
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB)
Rise time	10 to 90 % ≤ 20 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 124 mm (0.5 x 4.5 x 4.9 in), housing type A2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	CESI 06 ATEX 021
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC, [Ex ia D] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X
FM approval	
Control drawing	16-533FM-12 (cFMus)
UL approval	
Control drawing	16-533FM-12 (cULus)
IECEx approval	IECEx CES 06.0001
Approved for	[Ex ia] IIC

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters and 2-wire SMART current sources**
- **Output 4 mA ... 20 mA or 1 V ... 5 V**
- **Sink or source mode**
- **Housing width 12.5 mm**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal to the safe area as an isolated current value.

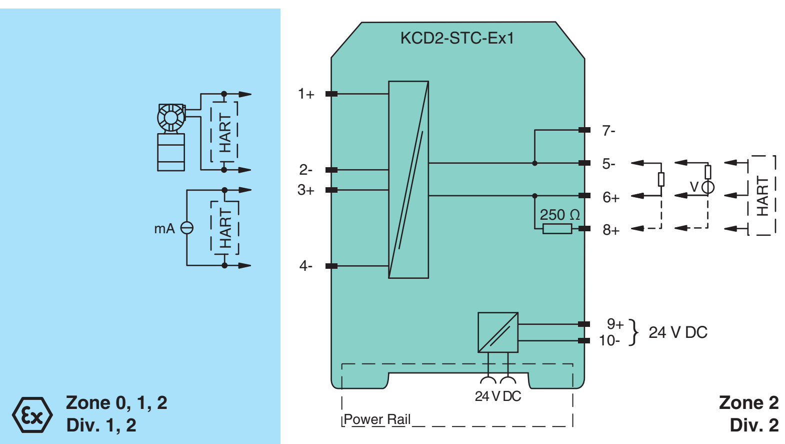
Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

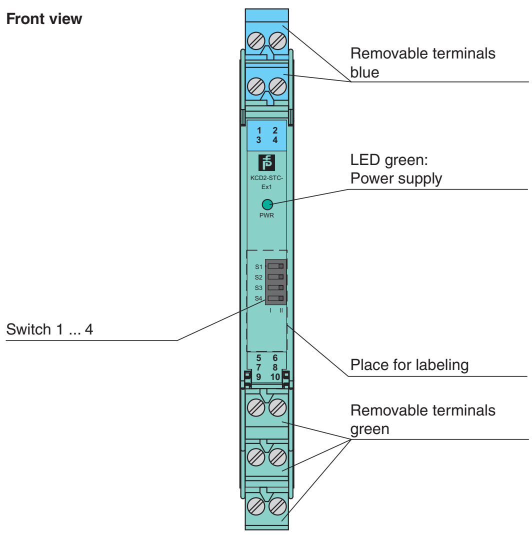
Selectable output of current source, sink mode, or voltage output is available via DIP switches.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 6 and 8 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams





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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal to the safe area as an isolated current value.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8 and 9 can be used.

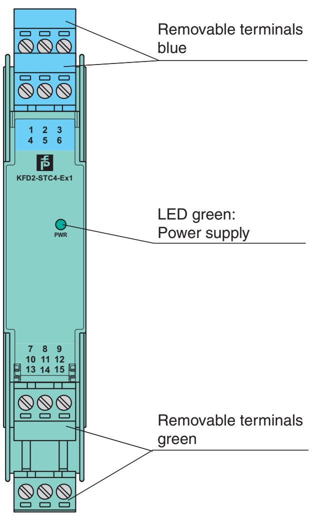
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

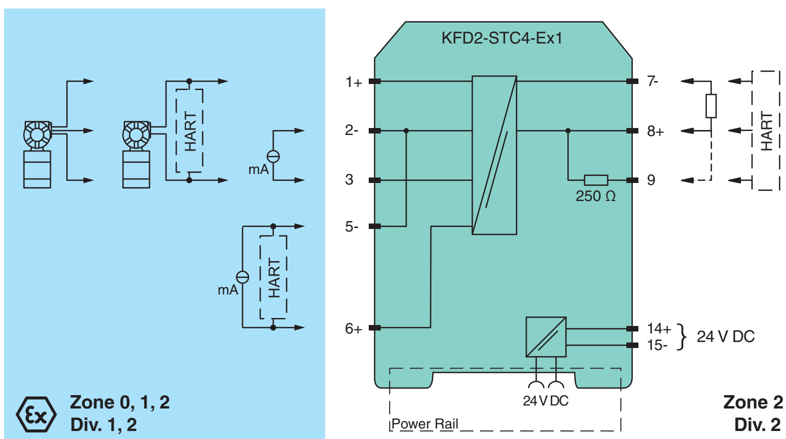
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.9 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Load	0 ... 800 Ω
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ⓔx I (M1) [EEx ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.9 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 µA_{rms}
External supply (loop)	11 ... 30 V DC
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	Ⓔx II (1)GD, [Ex ia] IIC, [Ex iaD] (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **0/4 mA ... 20 mA current sink output**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal to the safe area as an isolated current value.

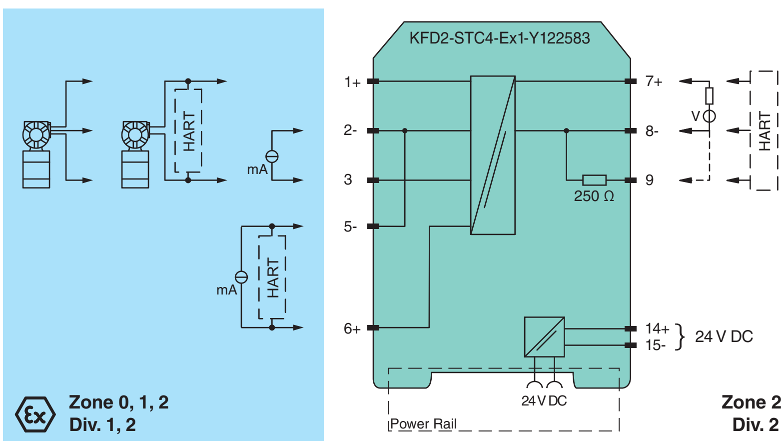
Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

It is designed to provide a sink mode output on the safe area terminals.

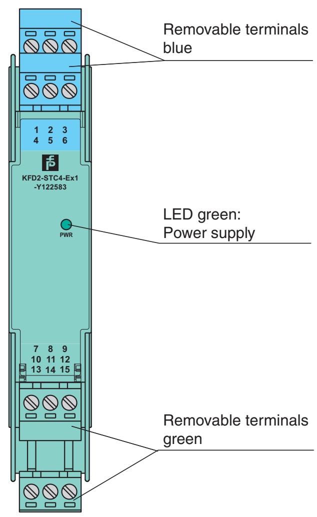
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8 and 9 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **High field voltage 17.6 V DC**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters with higher output voltage in a hazardous area, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal to the safe area as an isolated current value.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8 and 9 can be used.

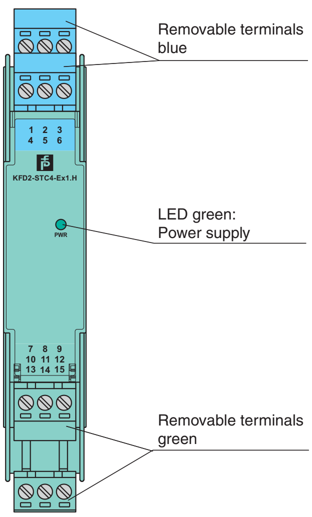
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

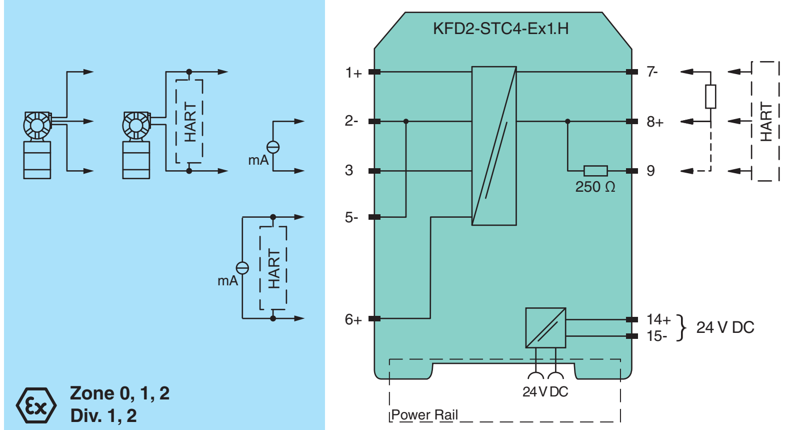
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.9 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 17.6 V at 20 mA terminals 1+, 3
Output	
Load	0 ... 800 Ω
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ex I (M1) [EEx ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.9 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Load	output resistance: 250 Ω
Output signal	0/1 ... 5 V
Ripple	≤ 12.5 mV
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/1 ... 5 V ≤ 5 mV incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	Ex II (1)GD, [Ex ia] IIC, [Ex iaD] (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Output 0/1 V ... 5 V**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

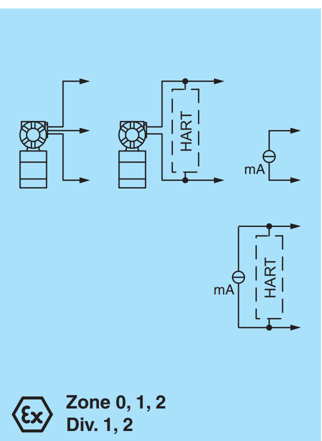
It transfers the analog input signal to the safe area as an isolated voltage value.

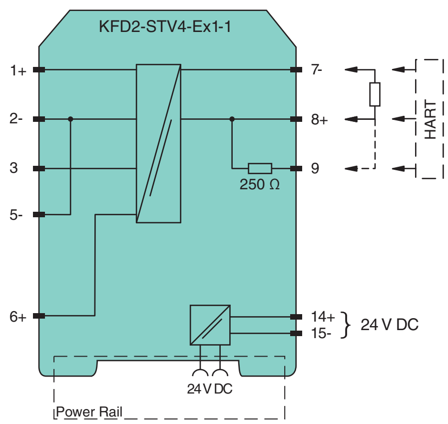
Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8 and 9 can be used.

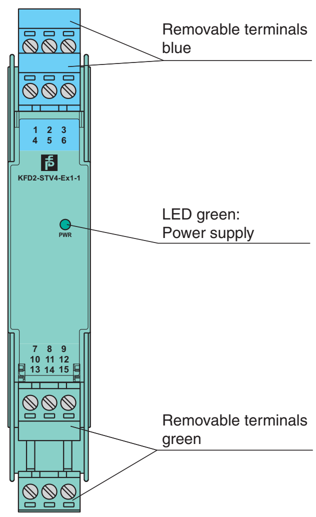
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams





Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

KFD2-STV4-Ex1-2

SMART Transmitter Power Supply

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Output 0/2 V ... 10 V**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal to the safe area as an isolated voltage value.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8 and 9 can be used.

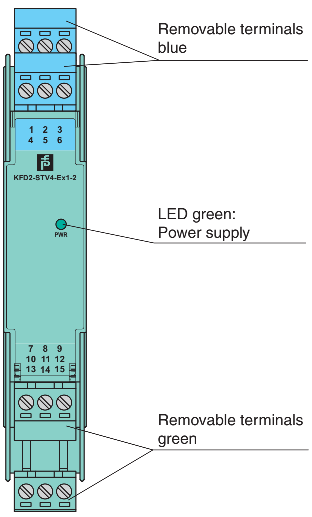
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

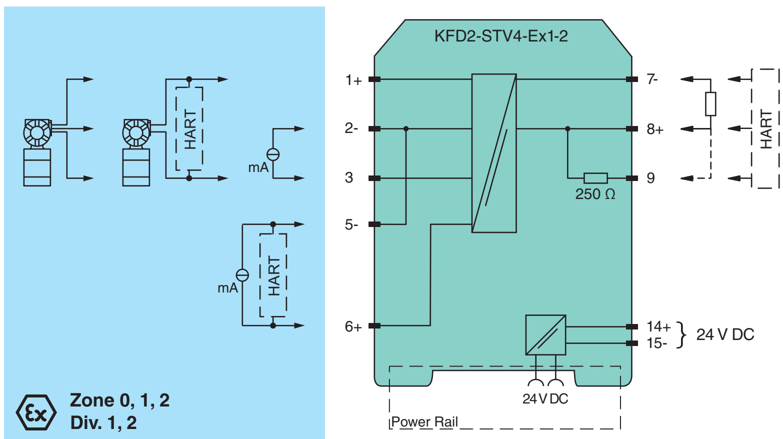
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.9 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Load	output resistance: 500 Ω
Output signal	0/2 ... 10 V
Ripple	≤ 25 mV
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/2 ... 10 V ≤ 10 mV incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	Ⓔx II (1)GD, [Ex ia] IIC, [Ex iaD] (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	2.5 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 76 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Load	0 ... 550 Ω
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	⟨Ex⟩ II (1)GD, [Ex ia] IIC, [Ex iaD] (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Dual output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

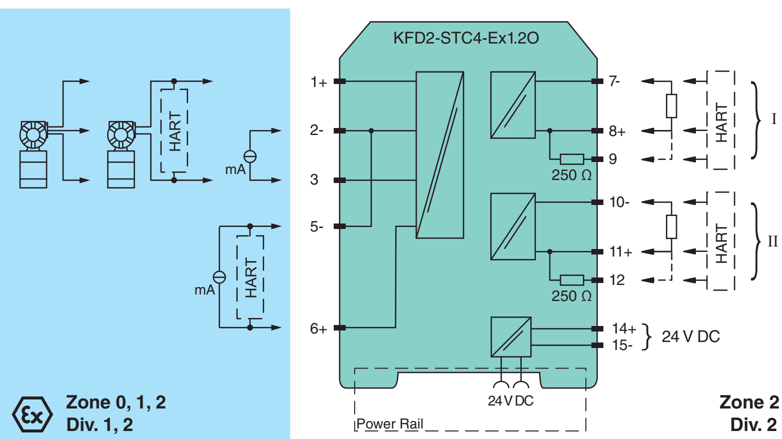
It transfers the analog input signal to the safe area as two isolated current values.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

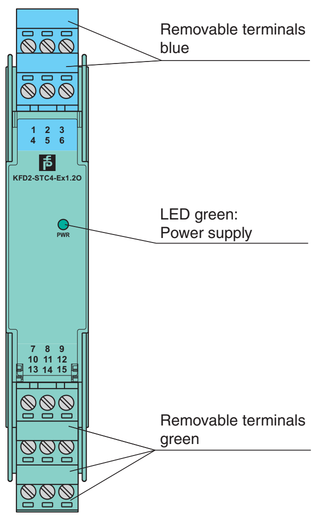
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

KFD2-STC4-Ex1.2O-Y122582

SMART Transmitter Power Supply

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Dual output 0/4 mA ... 20 mA, current sink**
- **Terminals with test points**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal to the safe area as two isolated current values.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

It is designed to provide a sink mode output on the safe area terminals.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

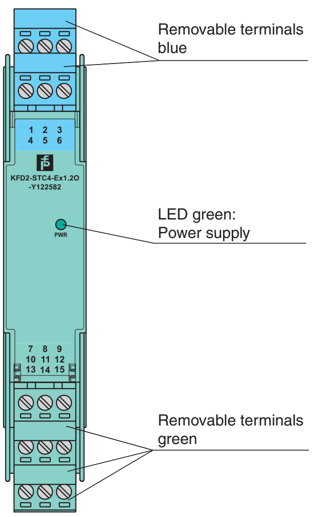
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

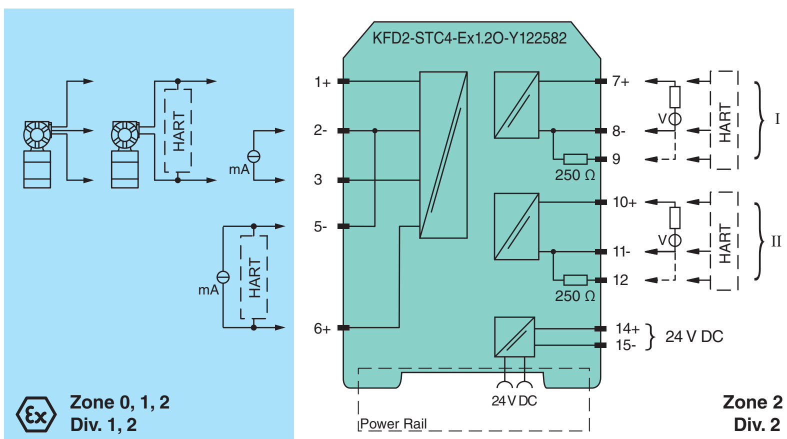
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	2.5 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 76 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
External supply (loop)	11 ... 30 V DC
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	⟨Ex⟩ II (1)GD, [Ex ia] IIC, [Ex iaD] (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	2.5 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 76 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 17.6 V at 20 mA terminals 1+, 3
Output	
Load	0 ... 550 Ω
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 µA$_{rms}$
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V$_{pp}$ 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V$_{pp}$ 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T$_{amb}$ ≤ 60 °C) [circuit(s) in zone 0/1/2]
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ⓔx I (M1) [EEx ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Dual output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **High field voltage 17.6 V DC**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters with higher output voltage in a hazardous area, and can also be used with 2-wire SMART current sources.

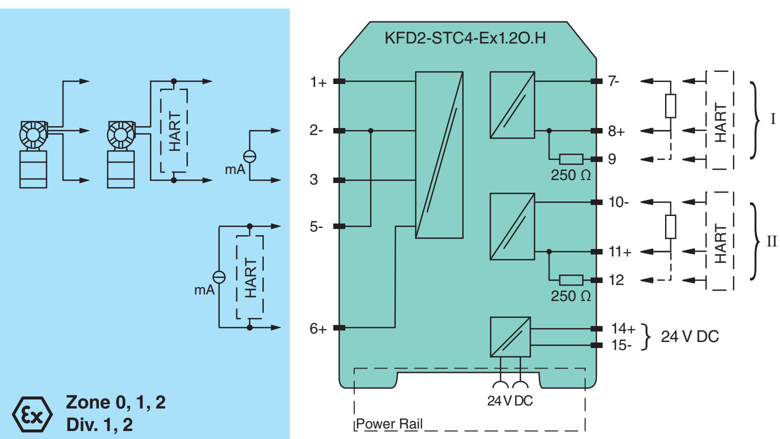
It transfers the analog input signal to the safe area as two isolated current values.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

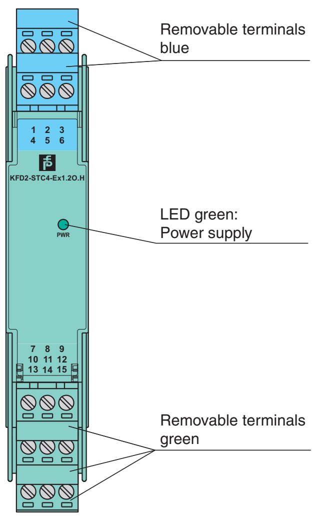
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



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KFD2-STV4-Ex1.2O-1

SMART Transmitter Power Supply

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Dual output 0/1 V ... 5 V**
- **Terminals with test points**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal to the safe area as two isolated voltage values.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

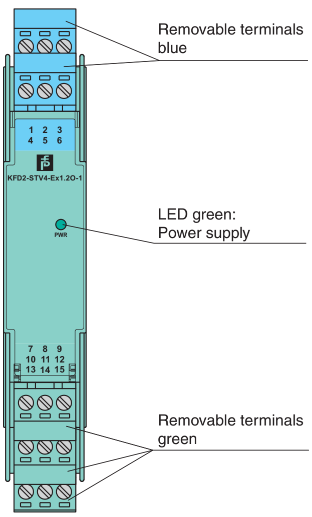
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

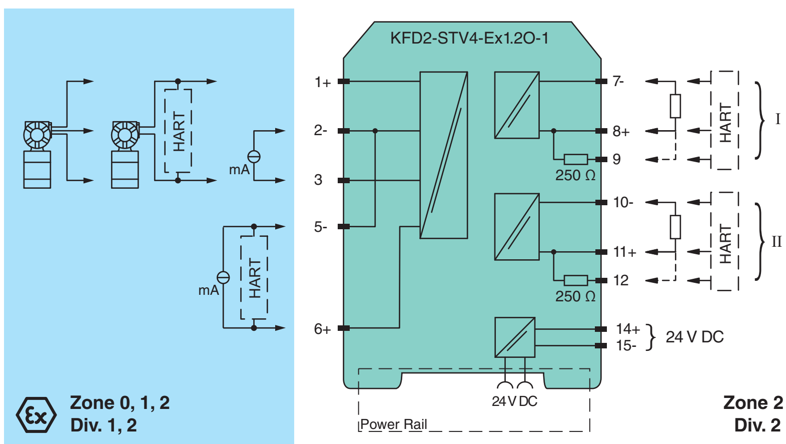
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	2.5 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 76 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Load	output resistance: 250 Ω
Output signal	0/1 ... 5 V
Ripple	≤ 12.5 mV
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/1 ... 5 V ≤ 5 mV incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	⟨Ex⟩ II (1)GD, [Ex ia] IIC, [Ex iaD] (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	2.5 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 76 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Load	output resistance: 500 Ω
Output signal	0/2 ... 10 V
Ripple	≤ 25 mV
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/2 ... 10 V ≤ 10 mV incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7060
Group, category, type of protection	Ex II (1)GD, [Ex ia] IIC, [Ex iaD] (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Dual output 0/2 V ... 10 V**
- **Terminals with test points**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

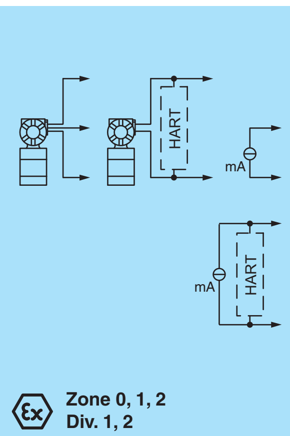
It transfers the analog input signal to the safe area as two isolated voltage values.

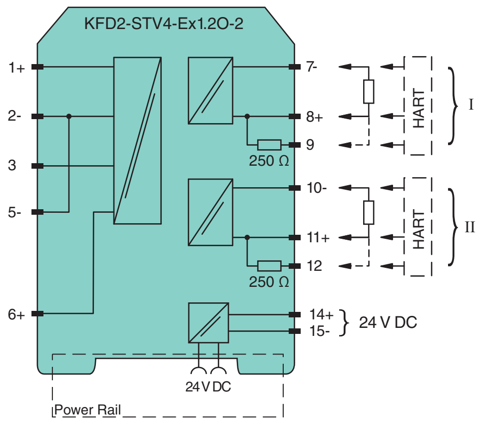
Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

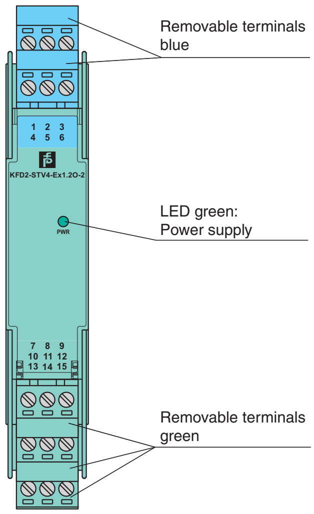
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams





Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters**
- **Output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire SMART transmitters in a hazardous area.

It transfers the analog input signal to the safe area as an isolated current value.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

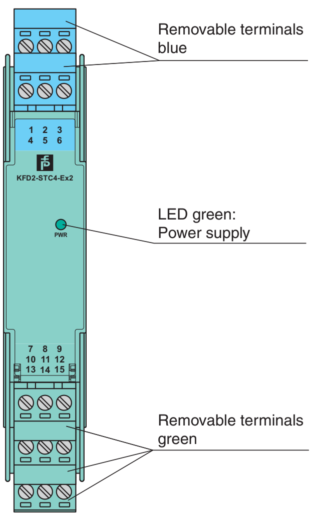
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

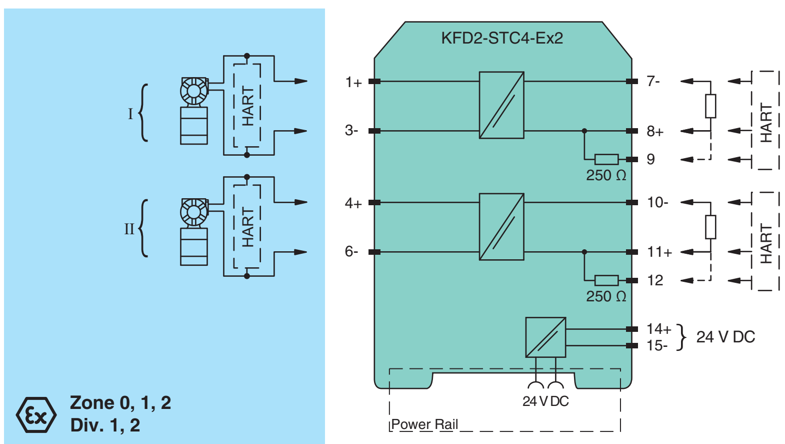
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.8 W
Input	
Input signal	0/4 ... 20 mA
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Output	
Load	0 ... 550 Ω
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	hazardous area into the safe area: bandwidth with 1 V_{pp} signal 0 ... 7.5 kHz (-3 dB) safe area to hazardous area: bandwidth with 1 V_{pp} signal 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7025
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.8 W
Input	
Input signal	0/4 ... 20 mA
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Output	
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 µA_{rms}
External supply (loop)	11 ... 30 V DC
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	hazardous area into the safe area: bandwidth with 1 V_{pp} signal 0 ... 7.5 kHz (-3 dB) safe area to hazardous area: bandwidth with 1 V_{pp} signal 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7025
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
UL approval	
Control drawing	116-0173 (cULus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters**
- **0/4 mA ... 20 mA current sink output**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire SMART transmitters in a hazardous area.

It transfers the analog input signal to the safe area as an isolated current value.

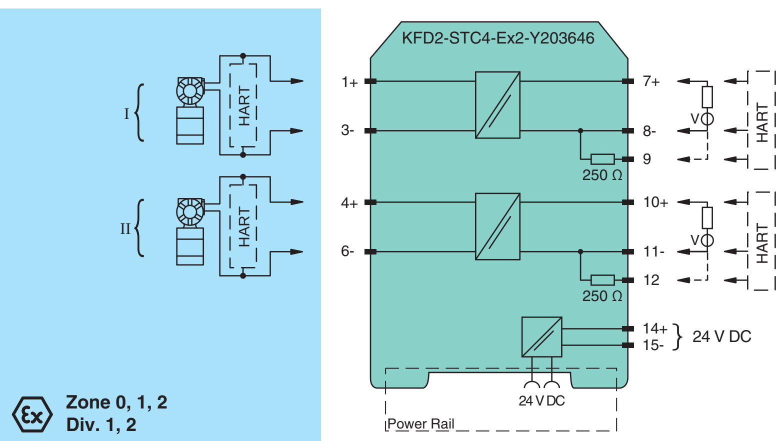
Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

It is designed to provide a sink mode output on the safe area terminals.

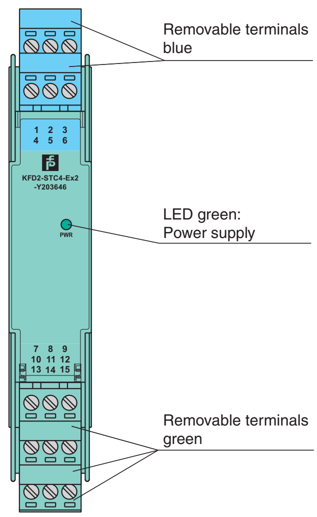
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

KFD2-STV4-Ex2-1

SMART Transmitter Power Supply

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters**
- **Output 0/1 V ... 5 V**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire SMART transmitters in a hazardous area.

It transfers the analog input signal to the safe area as an isolated voltage value.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

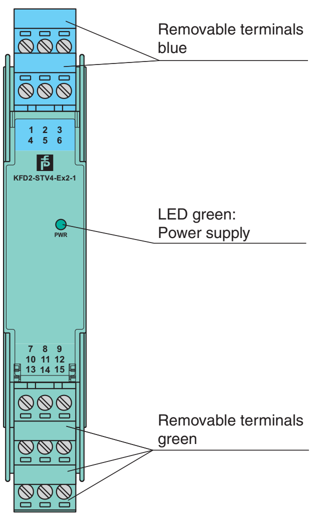
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

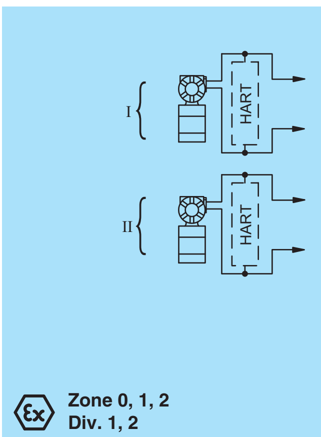
Technical data

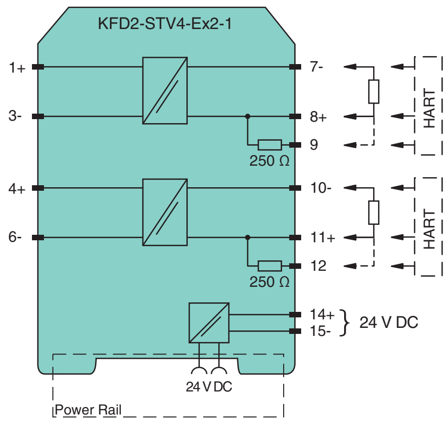
Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.8 W
Input	
Input signal	0/4 ... 20 mA
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Output	
Load	output resistance: 250 Ω
Output signal	0/1 ... 5 V
Ripple	≤ 12.5 mV
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/1 ... 5 V ≤ 5 mV incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7025
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view







Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.8 W
Input	
Input signal	0/4 ... 20 mA
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Output	
Load	output resistance: 500 Ω
Output signal	0/2 ... 10 V
Ripple	≤ 25 mV
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/2 ... 10 V ≤ 10 mV incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area into the safe area: bandwidth with 1 V_{pp} signal 0 ... 7.5 kHz (-3 dB) safe area to hazardous area: bandwidth with 1 V_{pp} signal 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 99 ATEX 7025
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters**
- **Output 0/2 V ... 10 V**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire SMART transmitters in a hazardous area.

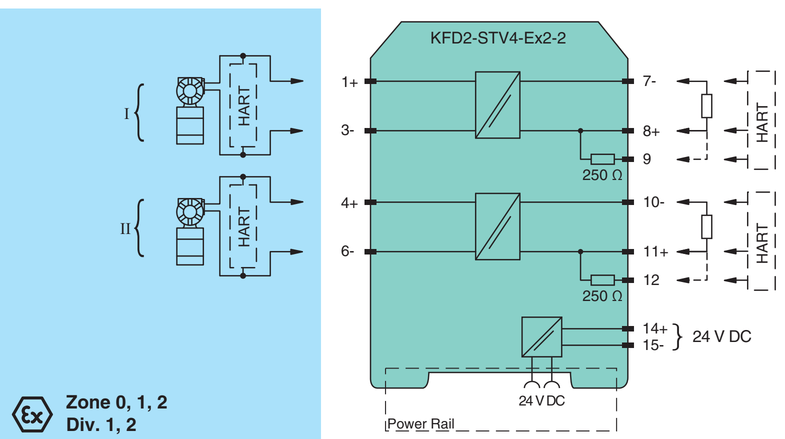
It transfers the analog input signal to the safe area as an isolated voltage value.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

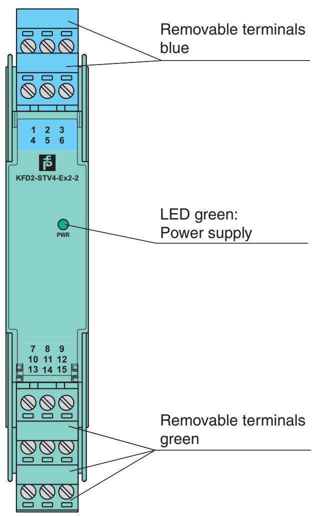
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- 1-channel isolated barrier
- 24 V DC supply (Power Rail)
- 2-wire SMART transmitter
- Output 4 mA ... 20 mA
- SMART capable up to 40 kHz (-1dB)
- Suitable for Honeywell DE protocol
- Terminals with test points

Function

This isolated barrier is used for intrinsic safety applications. It provides a 2-wire SMART transmitter with power in a hazardous area and transfers the analog signal to the safe area as an isolated current source.

Digital signals up to 40 kHz may be superimposed on the analog values in the hazardous or safe area and are transferred bi-directionally.

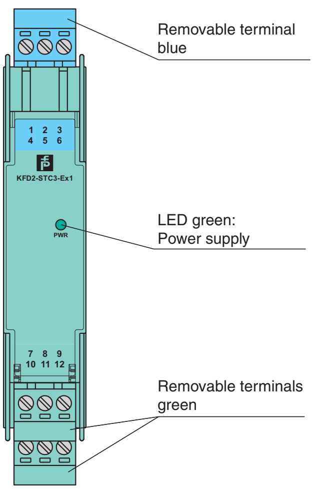
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

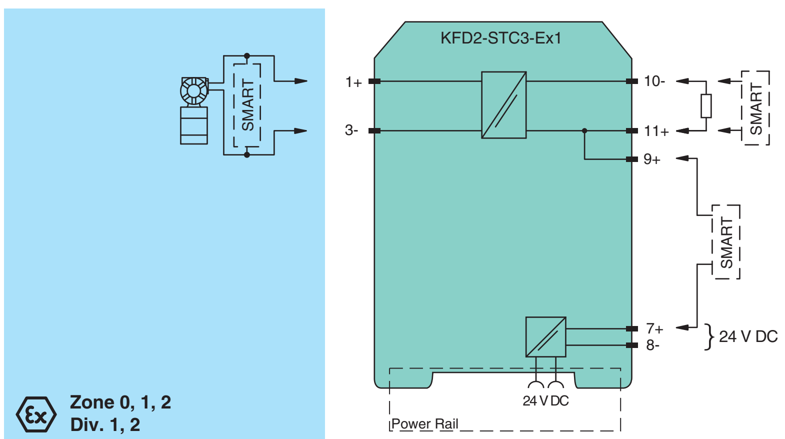
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2 W
Input	
Input signal	4 ... 20 mA
Available voltage	approx. 17 V at 4 ... 20 mA
Output	
Output signal	4 ... 20 mA, max. load 1000 Ω, for HART ≥ 230 Ω, Honeywell DE 230 ... 280 Ω (transmitter and communicator dependent)
Ripple	≤ 0.05 % of output signal range
Transfer characteristics	
Deviation	≤ 0.05 % of output signal range (current output), ≤ 10 µA at 20 °C (68 °F)
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area to safe area: bandwidth with 1 mA_{pp} signal 0 ... 40 kHz (-1 dB); 0 ... 50 kHz (-6 dB) safe area to hazardous area: bandwidth with 250 mV_{pp} signal 2 Hz ... 40 kHz (-1 dB); 1 Hz ... 50 kHz (-6 dB)
Rise time	10 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 115 x 115 mm (0.8 x 4.5 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7369
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 09 ATEX 0218X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 06.0088 IECEx BAS 09.0102X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2 W
Input	
Input signal	4 ... 20 mA
Available voltage	approx. 17 V at 4 ... 20 mA
Output	
Output signal	1 ... 5 V, internal resistance approx. 275 Ω
Ripple	≤ 0.05 % of output signal range
Transfer characteristics	
Deviation	≤ 0.03 % of output signal range (voltage output)
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area to safe area: bandwidth with 1 mA_{pp} signal 0 ... 40 kHz (-1 dB); 0 ... 50 kHz (-6 dB) safe area to hazardous area: bandwidth with 250 mV_{pp} signal 2 Hz ... 40 kHz (-1 dB); 1 Hz ... 50 kHz (-6 dB)
Rise time	10 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 115 x 115 mm (0.8 x 4.5 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7369
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 09 ATEX 0218X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 06.0088 IECEx BAS 09.0102X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **2-wire SMART transmitter**
- **Output 1 V ... 5 V**
- **SMART capable up to 40 kHz (-1dB)**
- **Suitable for Honeywell DE protocol**
- **Terminals with test points**

Function

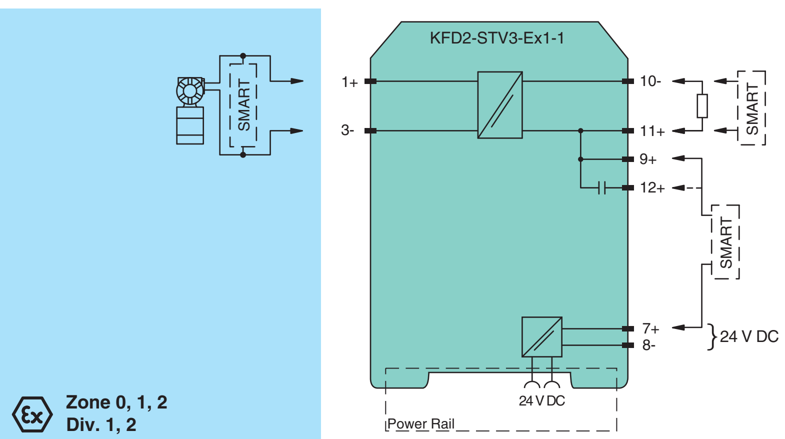
This isolated barrier is used for intrinsic safety applications. It provides a 2-wire SMART transmitter with power in a hazardous area and transfers the analog signal to the safe area as an isolated voltage source.

Digital signals up to 40 kHz may be superimposed on the analog values in the hazardous or safe area and are transferred bi-directionally.

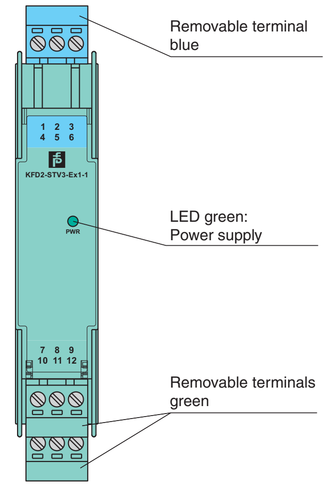
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **2-wire SMART transmitter**
- **Output 2 V ... 10 V**
- **SMART capable up to 40 kHz (-1dB)**
- **Suitable for Honeywell DE protocol**
- **Terminals with test points**

Function

This isolated barrier is used for intrinsic safety applications. It provides a 2-wire SMART transmitter with power in a hazardous area and transfers the analog signal to the safe area as an isolated voltage source.

Digital signals up to 40 kHz may be superimposed on the analog values in the hazardous or safe area and are transferred bi-directionally.

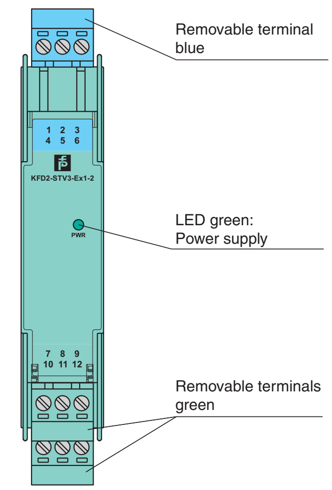
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

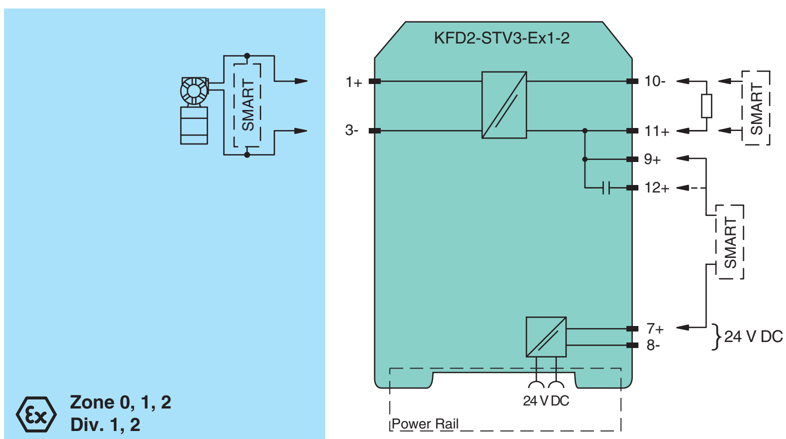
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2 W
Input	
Input signal	4 ... 20 mA
Available voltage	approx. 17 V at 4 ... 20 mA
Output	
Output signal	2 ... 10 V, internal resistance approx. 525 Ω Some Honeywell DE devices may not tolerate these levels.
Ripple	≤ 0.05 % of output signal range
Transfer characteristics	
Deviation	≤ 0.03 % of output signal range (voltage output)
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area to safe area: bandwidth with 1 mA_{pp} signal 0 ... 7 kHz (-1 dB); 0 ... 50 kHz (-6 dB) safe area to hazardous area: bandwidth with 250 mV_{pp} signal 2 Hz ... 40 kHz (-1 dB); 1 Hz ... 50 kHz (-6 dB)
Rise time	10 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 115 x 115 mm (0.8 x 4.5 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7369
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 09 ATEX 0218X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 06.0088 IECEx BAS 09.0102X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC or 20 ... 26.4 V AC
Power consumption	2.2 W/3.1 VA
Input	
Input signal	4 ... 20 mA terminals 2+, 3-
Available voltage	≥ 16 V at 20 mA terminals 1+, 2-
Output	
Load	0 ... 750 Ω
Output signal	4 ... 20 mA (overload > 25 mA)
Ripple	≤ 100 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 20 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	2 µA/K
Frequency range	0.8 ... 15 kHz (-3 dB)
Rise time	22 ms
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 175 g
Dimensions	22.5 x 99 x 114.5 mm (0.89 x 3.89 x 4.5 in)
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	TÜV 05 ATEX 2758
Group, category, type of protection	Ex II (2)GD [EEx ib] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)

Features

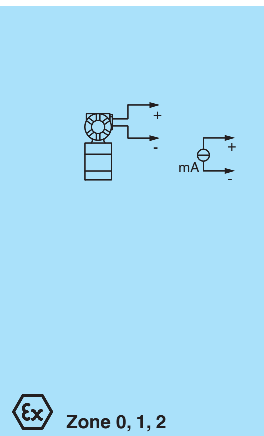
- **1-channel isolated barrier**
- **24 V AC/DC supply**
- **2-wire SMART transmitter**
- **Output 4 mA ... 20 mA**
- **Low Ex i values**
- **Suitable for Hartmann and Braun transmitter**

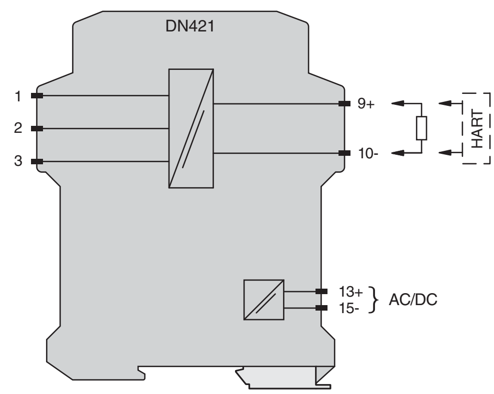
Function

This isolated barrier is used for intrinsic safety applications. It provides a 2-wire SMART transmitter with power in a hazardous area and transfers the signal to the safe area. It is designed to provide higher output voltage to the transmitter in the hazardous area.

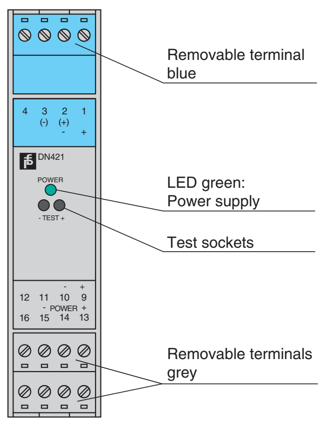
Digital signals may be superimposed on the analog values in the hazardous or safe area and are transferred bi-directionally.

Diagrams





Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire transmitters and 2-wire current sources**
- **Output 0/4 mA ... 20 mA**
- **2 relay contact outputs**
- **Programmable high/low alarm**
- **Linearization function (max 20 points)**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire transmitters in a hazardous area, and can also be used with active current sources.

Two relays and an active 0/4 mA ... 20 mA current source are available as outputs. The relay contacts and the current output can be integrated in security-relevant circuits. The current output is easily scaled.

On the display the measured value can be indicated in various physical units.

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

The input has a line fault detection.

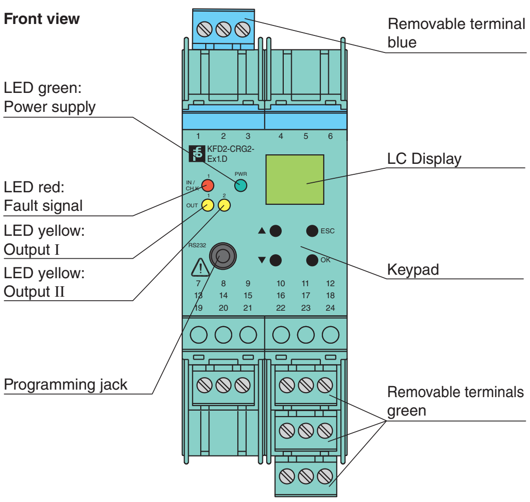
A unique collective error messaging feature is available when used with the Power Rail system.

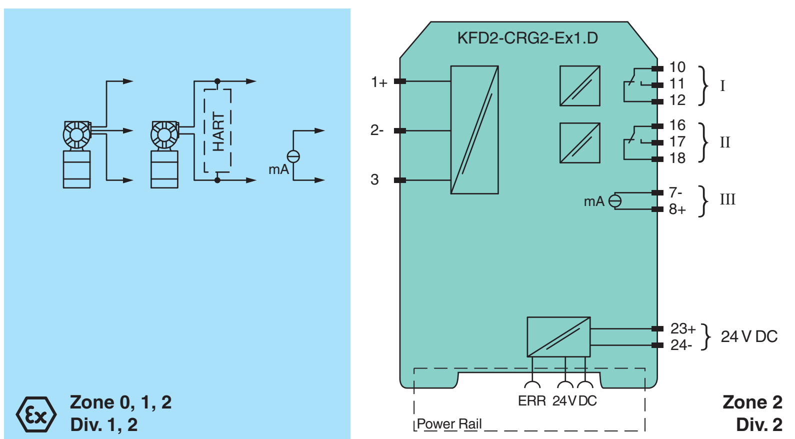
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	2.5 W
Input	
Input I	
Input signal	0/4 ... 20 mA
Available voltage	≥ 15 V at 20 mA
Open circuit voltage/short-circuit current	24 V/33 mA
Input resistance	45 Ω (terminals 2, 3)
Lead monitoring	breakage I < 0.2 mA; short-circuit I > 22 mA acc. to NAMUR NE43
Output	
Output signal	0 ... 20 mA or 4 ... 20 mA
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ≥ 0.7; 40 DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	Signal, analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	TÜV 01 ATEX 1701
Group, category, type of protection	Ex II (1) G [Ex ia] IIC Ex II (1) D [Ex iaD]
FM approval	
Control drawing	16-554FM-12 (cFMus)

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20 ... 90 V DC or 48 ... 253 V AC
Power consumption	2.2 W/4 VA
Input	
Input I	
Input signal	0/4 ... 20 mA
Available voltage	> 15 V at 20 mA
Open circuit voltage/short-circuit current	24 V/33 mA
Input resistance	45 Ω (terminals 2, 3)
Lead monitoring	breakage I < 0.2 mA; short-circuit I > 22 mA acc. to NAMUR NE43
Output	
Output signal	0 ... 20 mA or 4 ... 20 mA
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ≥ 0.7; 40 DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	Signal, analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	TÜV 01 ATEX 1701
Group, category, type of protection	Ex II (1) G [Ex ia] IIC Ex II (1) D [Ex iaD]
FM approval	
Control drawing	16-554FM-12 (cFMus)

Features

- **1-channel isolated barrier**
- **AC/DC wide range supply**
- **Input 2-wire and 3-wire transmitters and 2-wire current sources**
- **Output 0/4 mA ... 20 mA**
- **2 relay contact outputs**
- **Programmable high/low alarm**
- **Linearization function (max 20 points)**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire and 3-wire transmitters in a hazardous area, and can also be used with active current sources.

Two relays and an active 0/4 mA ... 20 mA current source are available as outputs. The relay contacts and the current output can be integrated in security-relevant circuits. The current output is easily scaled.

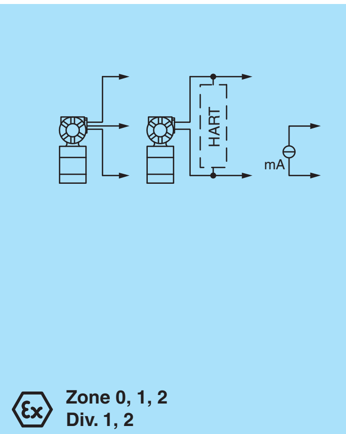
On the display the measured value can be indicated in various physical units.

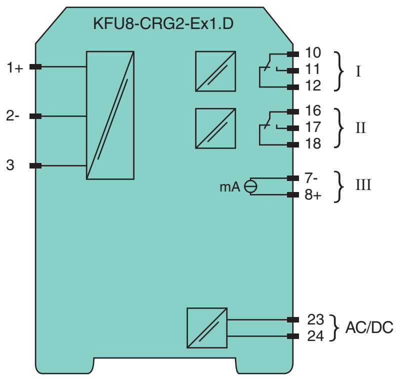
The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

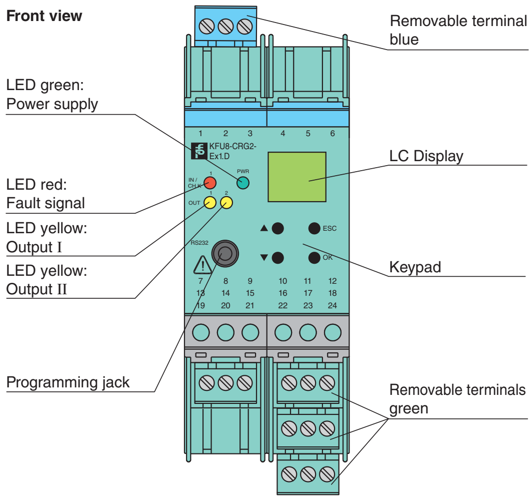
The input has a line fault detection.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams







K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input HART with transmitter supply**
- **3 analog outputs 4 mA ... 20 mA**
- **Sink and source mode output**
- **Configurable by keypad**

Function

This isolated barrier is used for intrinsic safety applications. It is a HART loop converter that provides power to transmitters or can be connected to existing HART loops in parallel.

It is able to evaluate up to four HART variables (PV, SV, TV, QV). Of those four HART variables, the data contained in any three of them can be converted to three different 4 mA ... 20 mA current signals. These loop signals can be connected to display devices or analog inputs on the process control system/control system.

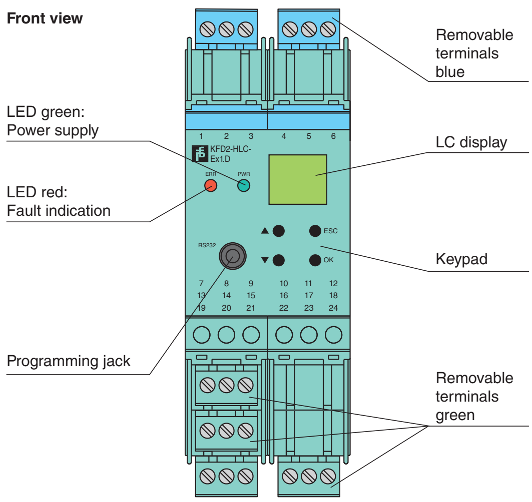
The unit is easily programmed by the use of a keypad located on the front of the unit.

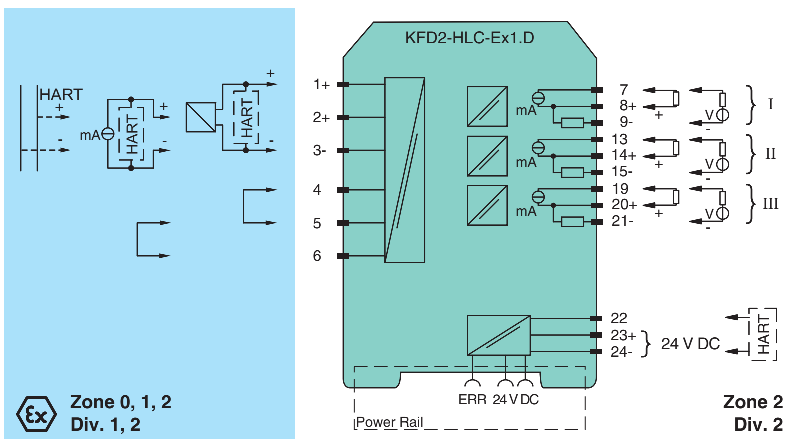
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	19 ... 30 V DC
Rated current	approx. 120 mA at 24 V DC
Power loss	2.3 W
Power consumption	2.9 W
Input	
Input signal	HART communication, transmitter supply
Open circuit voltage/short-circuit current	typ. 24 V/28 mA
Input resistance	250 Ω, 5 % (terminals 2, 3 and with jumper on 5, 6)
Available voltage	≥ 15.5 V at 20 mA, short-circuit proof
Output	
Output signal	analog
Current range	4 ... 20 mA, source or sink mode
Load	≤ 650 Ω, source mode
Voltage range	5 ... 30 V, sink mode from external supply
Collective error message	Power Rail and LED red
Fault signal	downscale I ≤ 2 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43) or hold measurement value
Other outputs	HART communicator on terminals 22, 24
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 07 ATEX 0174
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X

Diagrams





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Technical data

Supply	
Rated voltage	19 ... 30 V DC
Rated current	approx. 130 mA at 24 V DC
Power loss	2.5 W
Power consumption	3.1 W
Input	
Input signal	HART communication, transmitter supply
Open circuit voltage/short-circuit current	typ. 24 V/28 mA
Input resistance	250 Ω, 5 % (terminals 2, 3 and with jumper on 5, 6)
Available voltage	≥ 15.5 V at 20 mA, short-circuit proof
Output	
Collective error message	Power Rail and LED red
Output I, II	
Output signal	relay and LED yellow
Mechanical life	10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III, IV, V	
Output signal	analog
Current range	4 ... 20 mA, source or sink mode
Load	≤ 650 Ω, source mode
Voltage range	5 ... 30 V, sink mode from external supply
Fault signal	downscale I ≤ 2 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43) or hold measurement value
Other outputs	HART communicator on terminals 22, 24
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 07 ATEX 0174
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC II T4 X

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input HART with transmitter supply**
- **2 relay outputs (changeover contacts)**
- **3 analog outputs 4 mA ... 20 mA**
- **Sink and source mode output**
- **Configurable by keypad**

Function

This isolated barrier is used for intrinsic safety applications. It is a HART loop converter that provides power to transmitters or can be connected to existing HART loops in parallel.

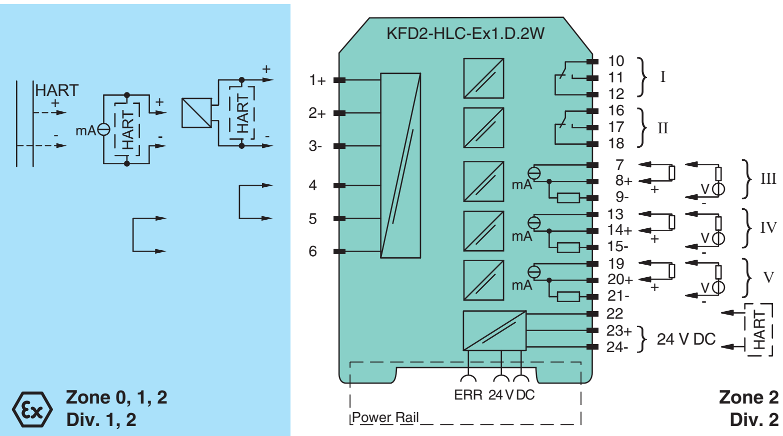
It is able to evaluate up to four HART variables (PV, SV, TV, QV). Of those four HART variables, the data contained in any three of them can be converted to three different 4 mA ... 20 mA current signals. These loop signals can be connected to display devices or analog inputs on the process control system/control system.

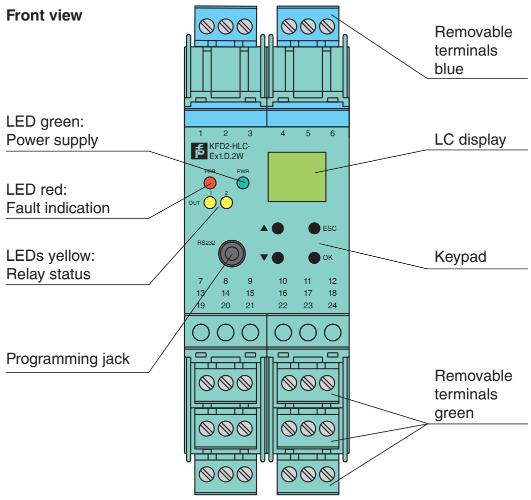
In addition to the current outputs, two form C changeover relay contacts are available and can be programmed to operate at trip values from the HART variables.

The unit is easily programmed by the use of a keypad located on the front of the unit.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input HART with transmitter supply**
- **4 relay outputs (NO)**
- **3 analog outputs 4 mA ... 20 mA**
- **Sink and source mode output**
- **Configurable by keypad**

Function

This isolated barrier is used for intrinsic safety applications. It is a HART loop converter that provides power to transmitters or can be connected to existing HART loops in parallel.

It is able to evaluate up to four HART variables (PV, SV, TV, QV). Of those four HART variables, the data contained in any three of them can be converted to three different 4 mA ... 20 mA current signals. These loop signals can be connected to display devices or analog inputs on the process control system/control system.

In addition to the current outputs, four form A normally open relay contacts are available and can be programmed to operate at trip values from the HART variables.

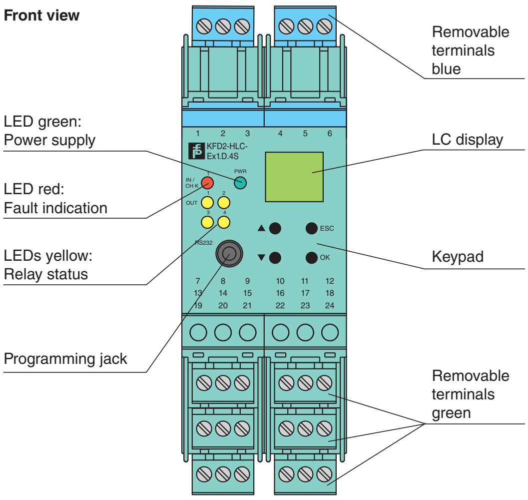
The unit is easily programmed by the use of a keypad located on the front of the unit.

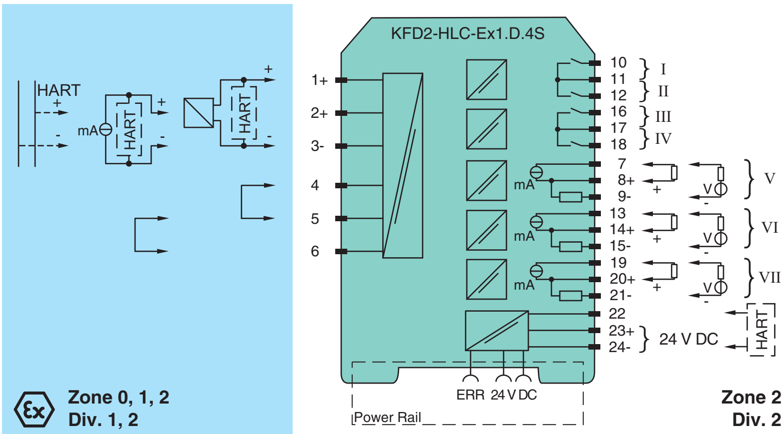
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	19 ... 30 V
Rated current	approx. 140 mA at 24 V DC
Power loss	2.7 W
Power consumption	3.3 W
Input	
Input signal	HART communication, transmitter supply
Open circuit voltage/short-circuit current	typ. 24 V/28 mA
Input resistance	250 Ω, 5 % (terminals 2, 3 and with jumper on 5, 6)
Available voltage	≥ 15.5 V at 20 mA, short-circuit proof
Output	
Collective error message	Power Rail and LED red
Output I, II, III, IV	
Output signal	relay and LED yellow
Mechanical life	10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output V, VI, VII	
Output signal	analog
Current range	4 ... 20 mA, source or sink mode
Load	≤ 650 Ω, source mode
Voltage range	5 ... 30 V, sink mode from external supply
Fault signal	downscale I ≤ 2 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43) or hold measurement value
Other outputs	HART communicator on terminals 22, 24
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 07 ATEX 0174
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC II T4 X

Diagrams





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Edition

Technical data

Supply	
Rated voltage	loop powered
Power loss	0.2 W
Field circuit	
Connection	terminals 1+, 2/3-
Available voltage	≥ 16 V for supply voltage > 21 V
Current	4 ... 20 mA (linear transmission 1 ... 22 mA)
Load	≤ 800 Ω (at 20 mA)
Supply circuit	
Voltage	max. 30 V DC
Current	4 ... 20 mA (quiescent current < 0.5 mA)
Power loss	150 mW at 20 mA and U_E < 24 V
Transfer characteristics	
Deviation	
After calibration	≤ ± 80 µA linearity, load and voltage dependence at 20 °C (68 °F)
Influence of ambient temperature	< 0.5 µA/K
Damping	approx. 3 dB
Rise time	≤ 20 µs at 0 Ω, ≤ 600 µs with 800 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2064
Group, category, type of protection	Ⓔx II (2)G [EEx ib] IIC
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G EEx nA II T4 X
FM approval	device with FM approval on request

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **HART I/P or transmitter power supply**
- **Low voltage drop**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

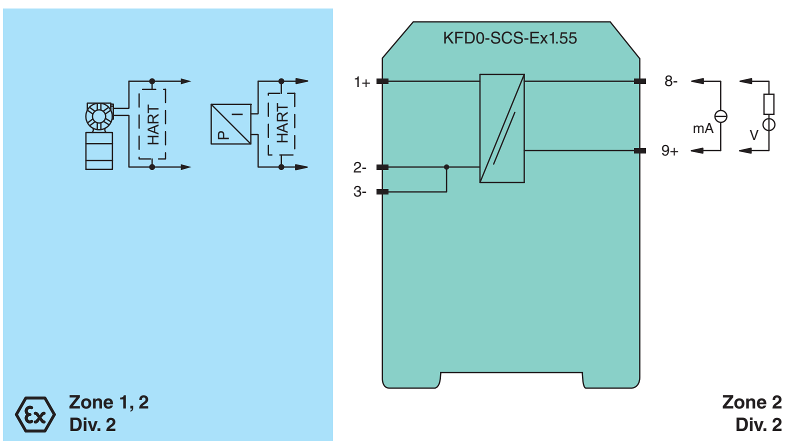
This isolated barrier is used for intrinsic safety applications. It is loop powered and isolates a 4 mA ... 20 mA signal for transmitters and positioners and is HART compatible.

With a noticeably lower power loss compared to active isolator modules, the barriers 5 V drop makes it suitable for transmitter applications with unstable power sources between 20 V DC ... 30 V DC.

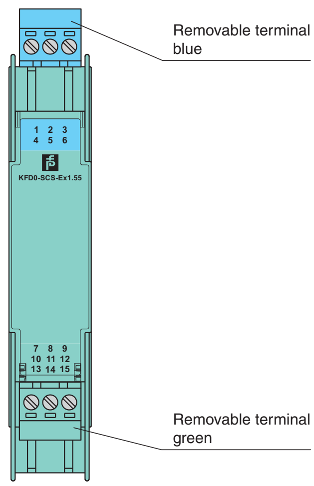
Line fault detection of the field circuit is possible if the control loop in the safe area is monitored for overscale or underscale conditions of the 4 mA ... 20 mA range.

The module can also be used for controlling solenoid valves and discrete outputs, such as LEDs. In this case, terminals 8- and 9+ are driven with a 24 V signal.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **I/P or transmitter power supply**
- **Accuracy 0.1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers DC signals from fire alarms, smoke alarms, and temperature sensors in hazardous areas. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

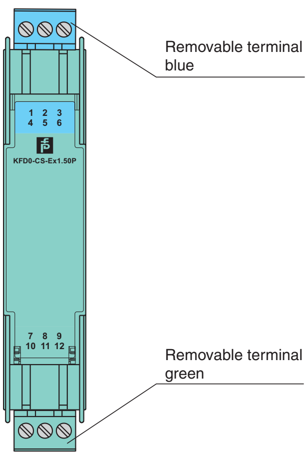
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

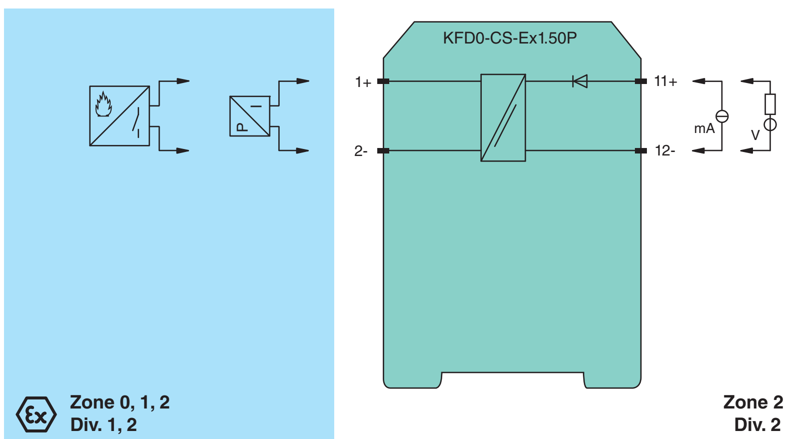
Technical data

Supply	
Rated voltage	loop powered
Safe circuit	
Voltage	5 ... 35 V DC
Current	4 ... 20 mA
Power loss	at 20 mA and U_{in} < 24.3 V: < 250 mW per channel at 20 mA and U_{in} > 24.3 V: < 500 mW per channel
Field circuit	
Voltage	for 5V < U_e < 24.3V: ≥ 0.9 x U_e - (0.37 x current in mA) - 1.0 for U_{in} > 24.3 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24.3 V : ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 20 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ at 20 °C (68 °F)
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Inputs/Outputs (not intrinsically safe)	
Voltage	4 ... 35 V DC
Current	0 ... 40 mA
Power loss	at 40 mA and U_{in} < 22 V: 700 mW per channel at 40 mA and U_{in} > 22 V: 1.2 W per channel
Inputs/Outputs (Intrinsically safe)	
Output voltage	for 4 V < U_{in} < 24 V: ≥ U_{in} - (0.37 x current in mA) - 1.0 for U_{in} > 24 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24 V: ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 200 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ and current ≤ 20 mA at 20 °C (68 °F)
Influence of ambient temperature	≤ ± 2 µA/K at U_{in} ≤ 20 V; ≤ ± 5 µA/K at U_{in} > 20 V
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	⟨Ex⟩ II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 0 mA ... 40 mA**
- **I/P or transmitter power supply**
- **Accuracy 1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

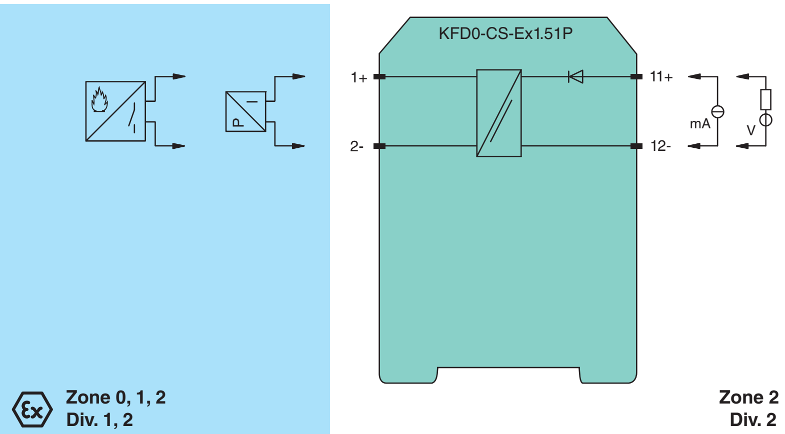
Function

This isolated barrier is used for intrinsic safety applications. It transfers DC signals from fire alarms, smoke alarms, and temperature sensors in hazardous areas. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

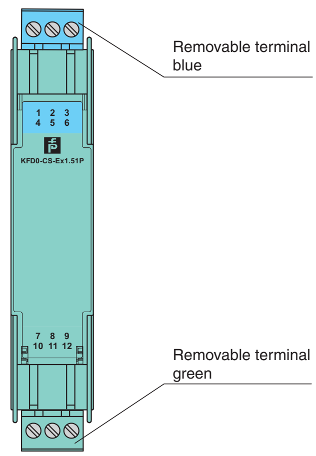
Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

KFD0-CS-Ex1.52

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **Accuracy 0.1 %**
- **Entity parameter I_o/I_{sc} = 0 mA**

Function

This isolated barrier is used for intrinsic safety applications. It is loop-powered and repeats a 4 mA ... 20 mA signal from a current source inside a hazardous area to the safe area (It does not provide power for transmitters inside the hazardous area.).

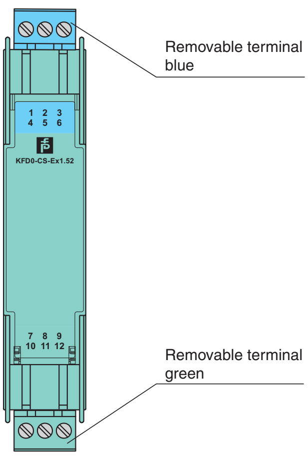
The 25.2 V, 0 mA entity parameters make it easy to design intrinsically safe systems.

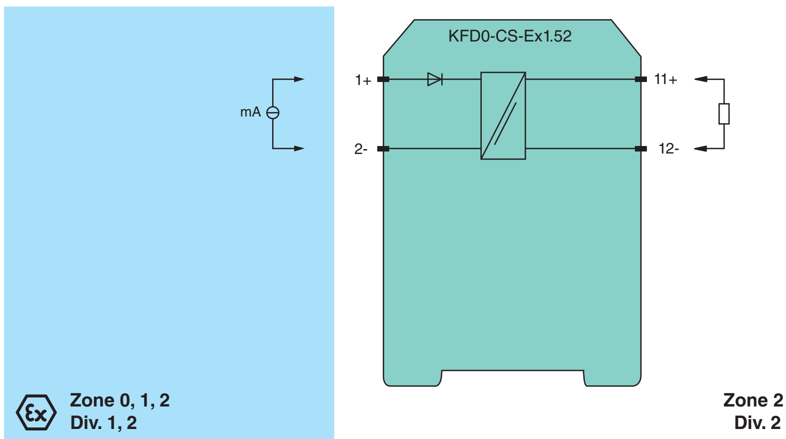
Technical data

Supply	
Rated voltage	loop powered
Power loss	0.2 W
Input	
Transmission range	current range 4 ... 20 mA voltage range 4 ... 24 V DC
Output	
Current	4 ... 20 mA
Voltage	4 ... 24 V DC for 4 V < U_e < 24 V: 0.9 x U_e - (0.11 x current in mA) - 2
Transfer characteristics	
Deviation	
After calibration	± 20 µA incl. calibration, linearity, hysteresis and load fluctuations at 20 °C (68 °F), $U_{in} \leq$ 20 V +20 µA/-50 µA incl. calibration, linearity, hysteresis and load fluctuations at 20 °C (68 °F), 20 V < U_{in} < 24 V
Influence of ambient temperature	± 1 µA/K (0 ... 50 °C (32 ... 122 °F)), $U_{in} \leq$ 12 V ± 2 µA/K (0 ... 60 °C (32 ... 140 °F)), $U_{in} \leq$ 18 V ± 5 µA/K (-20 ... 60 °C (-4 ... 140 °F)), $U_{in} \leq$ 24 V
Rise time	≤ 10 ms at 4 ... 20 mA and 250 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 03 ATEX 0141
Group, category, type of protection	[EEx ia] IIC (T_{amb} = 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Power loss	0.2 W
Input	
Short-circuit current	≤ 65 mA
Transmission range	voltage: 4 ... 26 V DC/0 ... 6 V_{pp} AC current: 1 ... 20 mA
Output	
Current	0 ... 20 mA
Voltage	0 ... 26 V for 4 V ≤ < U_e ≤ 26 V: ≥ U_e - (0.38 x current in mA) - 0.5
Transfer characteristics	
Deviation	
After calibration	≤ 3.5 mA current loss at 20 mA load current
Influence of ambient temperature	± 20 µA/K
Rise time	≤ 50 µs (load current ≥ 1 mA)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7087
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 08.0079

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **SMART fire alarm input**
- **Current input 1 mA ... 20 mA**

Function

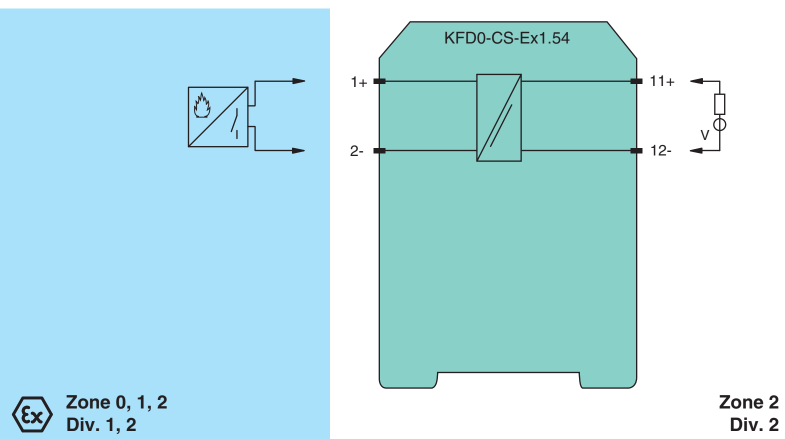
This isolated barrier is used for intrinsic safety applications. It provides control and signal transfer for SMART compatible fire and smoke alarm transmitters inside hazardous areas.

Digital signals may be superimposed (AC up to 6 V) on the analog values in the hazardous or safe area and are transferred bidirectionally.

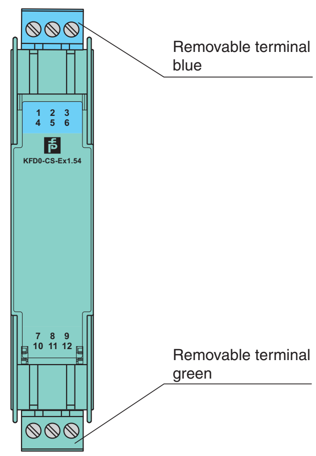
The fall time of the digital signal must be smaller than 50 µs, the current in the hazardous area must be bigger than 1 mA.

Since this isolator is loop-powered, use the technical data to verify that proper voltage is available to the field devices.

Diagrams



Front view



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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **I/P or transmitter power supply**
- **Accuracy 0.1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers DC signals from fire alarms, smoke alarms, and temperature sensors in hazardous areas. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

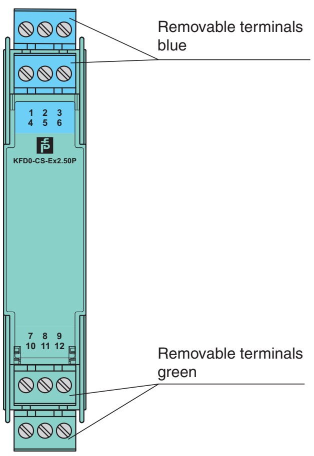
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

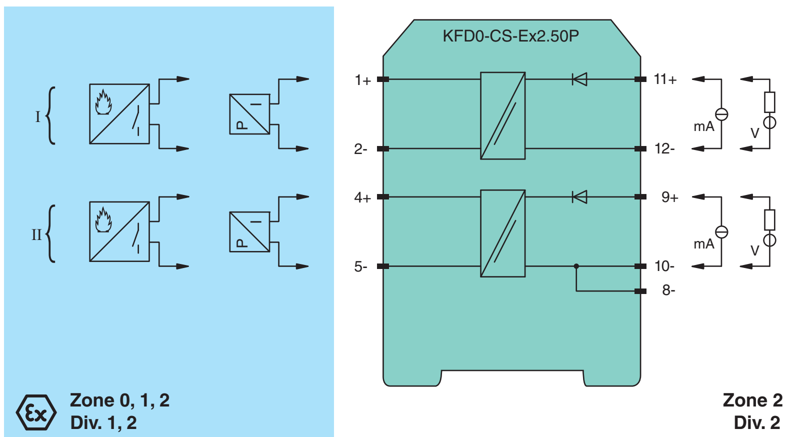
Technical data

Supply	
Rated voltage	loop powered
Safe circuit	
Voltage	5 ... 35 V DC
Current	4 ... 20 mA
Power loss	at 20 mA and U_{in} < 24.3 V: < 250 mW per channel at 20 mA and U_{in} > 24.3 V: < 500 mW per channel
Field circuit	
Voltage	for 5V < U_e < 24.3V: ≥ 0.9 x U_e - (0.37 x current in mA) - 1.0 for U_{in} > 24.3 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24.3 V : ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 20 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ at 20 °C (68 °F)
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Inputs/Outputs (not intrinsically safe)	
Voltage	4 ... 35 V DC
Current	0 ... 40 mA
Power loss	at 40 mA and U_{in} < 22 V: 700 mW per channel at 40 mA and U_{in} > 22 V: 1.2 W per channel
Inputs/Outputs (Intrinsically safe)	
Output voltage	for 4 V < U_{in} < 24 V: ≥ U_{in} - (0.37 x current in mA) - 1.0 for U_{in} > 24 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24 V: ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 200 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ and current ≤ 20 mA at 20 °C (68 °F)
Influence of ambient temperature	≤ ± 2 µA/K at U_{in} ≤ 20 V; ≤ ± 5 µA/K at U_{in} > 20 V
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	⟨Ex⟩ II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 0 mA ... 40 mA**
- **I/P or transmitter power supply**
- **Accuracy 1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

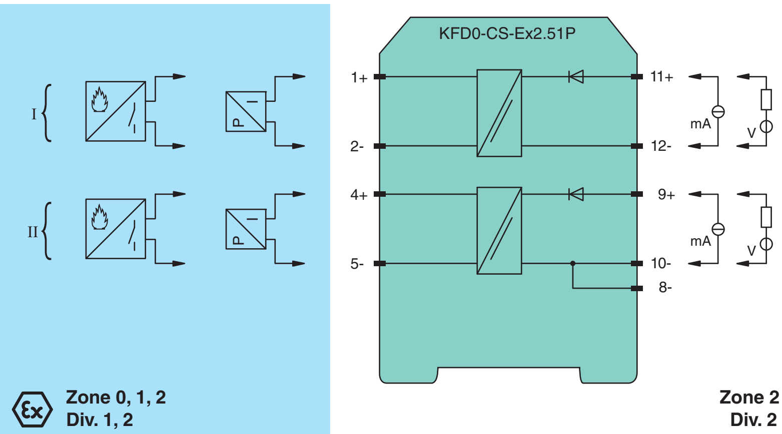
Function

This isolated barrier is used for intrinsic safety applications. It transfers DC signals from fire alarms, smoke alarms, and temperature sensors in hazardous areas. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

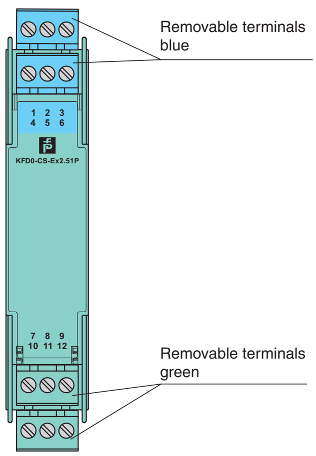
Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **Accuracy 0.1 %**
- **Entity parameter I_o/I_{sc} = 0 mA**

Function

This isolated barrier is used for intrinsic safety applications. It is loop-powered and repeats a 4 mA ... 20 mA signal from a current source inside a hazardous area to the safe area (It does not provide power for transmitters inside the hazardous area.).

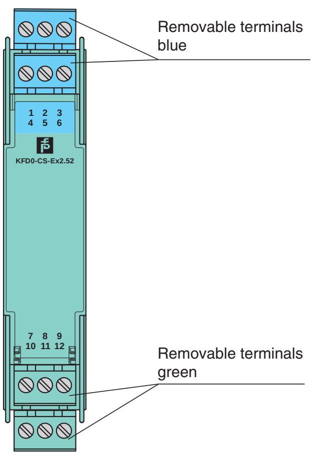
The 25.2 V, 0 mA entity parameters make it easy to design intrinsically safe systems.

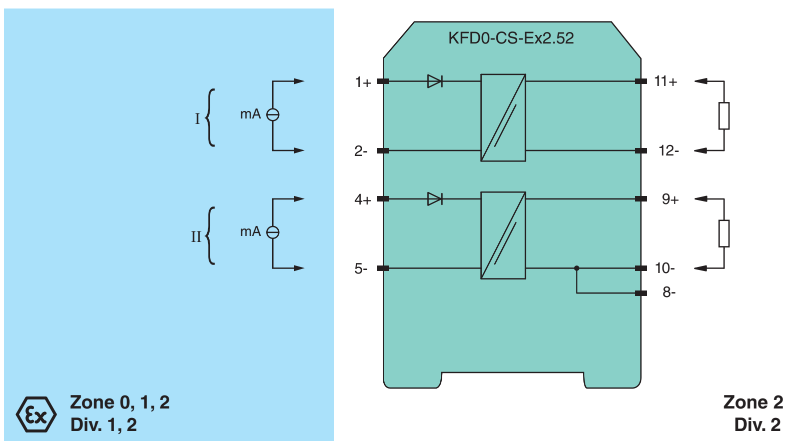
Technical data

Supply	
Rated voltage	loop powered
Power loss	0.4 W
Input	
Transmission range	current range 4 ... 20 mA voltage range 4 ... 24 V DC
Output	
Current	4 ... 20 mA
Voltage	4 ... 24 V DC for 4 V < U_e < 24 V: 0.9 x U_e - (0.11 x current in mA) - 2
Transfer characteristics	
Deviation	
After calibration	± 20 µA incl. calibration, linearity, hysteresis and load fluctuations at 20 °C (68 °F), U_{in} ≤ 20 V +20 µA/-50 µA incl. calibration, linearity, hysteresis and load fluctuations at 20 °C (68 °F), 20 V < U_{in} < 24 V
Influence of ambient temperature	± 1 µA/K (0 ... 50 °C (32 ... 122 °F)), U_{in} ≤ 12 V ± 2 µA/K (0 ... 60 °C (32 ... 140 °F)), U_{in} ≤ 18 V ± 5 µA/K (-20 ... 60 °C (-4 ... 140 °F)), U_{in} ≤ 24 V
Rise time	≤ 10 ms at 4 ... 20 mA and 250 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 03 ATEX 0141
Group, category, type of protection	[EEx ia] IIC (T_{amb} = 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	loop powered
Power loss	0.2 W
Input	
Short-circuit current	≤ 65 mA
Transmission range	voltage: 4 ... 26 V DC/0 ... 6 V_{pp} AC current: 1 ... 20 mA
Output	
Current	0 ... 20 mA
Voltage	0 ... 26 V for 4 V ≤ < U_e ≤ 26 V: ≥ U_e - (0.38 x current in mA) - 0.5
Transfer characteristics	
Deviation	
After calibration	≤ 3.5 mA current loss at 20 mA load current
Influence of ambient temperature	± 20 µA/K
Rise time	≤ 50 µs (load current ≥ 1 mA)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7087
Group, category, type of protection	⟨Ex⟩ II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 08.0079

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **SMART fire alarm input**
- **Current input 1 mA ... 20 mA**

Function

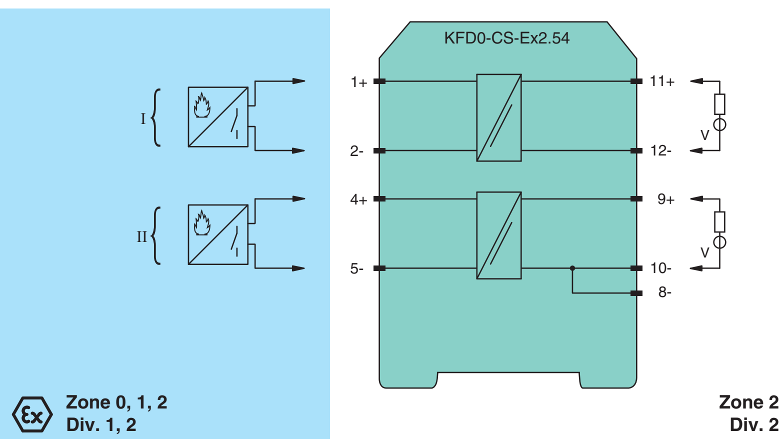
This isolated barrier is used for intrinsic safety applications. It provides control and signal transfer for SMART compatible fire and smoke alarm transmitters inside hazardous areas.

Digital signals may be superimposed (AC up to 6 V) on the analog values in the hazardous or safe area and are transferred bidirectionally.

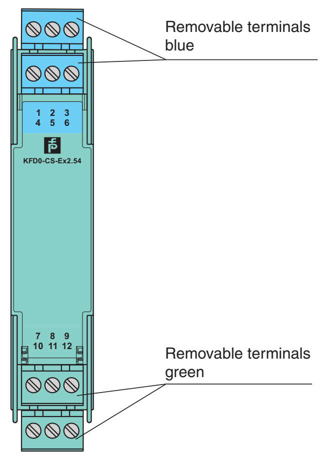
The fall time of the digital signal must be smaller than 50 µs, the current in the hazardous area must be bigger than 1 mA.

Since this isolator is loop-powered, use the technical data to verify that proper voltage is available to the field devices.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Voltage input 0 mV ... ± 50 mV**
- **Voltage output 0 mV ... ± 50 mV**
- **Selectable up/downscale burnout detection on Power Rail**

Function

This isolated barrier is used for intrinsic safety applications. It transfers low voltage signals from thermocouples, load cells, strain gauges, operational amplifiers, and inductive oscillation sensors located in hazardous areas to safe areas.

The input voltage of the terminals 4 and 5 is transferred to the terminals 7 and 8.

The input, output, and power supply are galvanically isolated from each other. Upscale or downscale lead breakage monitoring is selectable via switches located on the front panel of the device.

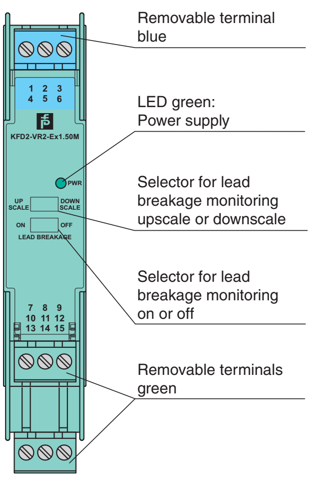
Note: This unit requires three minutes after power-up to reach the accuracy cited in the technical data.

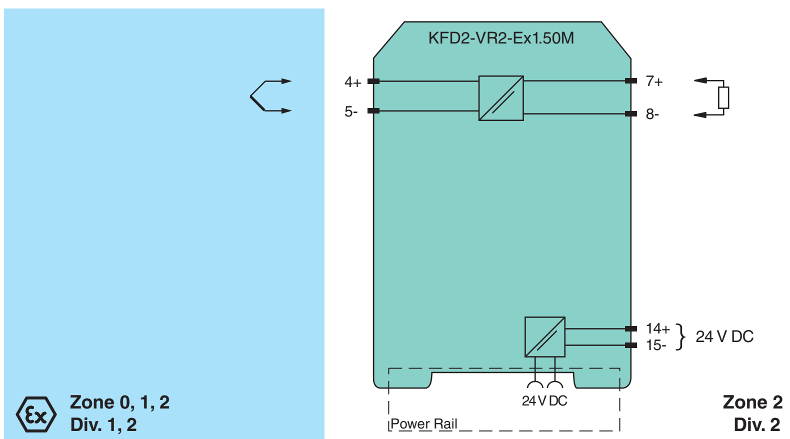
Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power loss/power consumption	0.3 W max.
Input	
Input resistance	≥ 20 MΩ
Transmission range	0 ... ± 50 mV
Offset voltage/current	≤ 5 µV/≤ 5 nA
Lead monitoring	100 nA
Output	
Load	Accuracy figures for infinite load impedance. Additional 0.03 % of span for a load resistance of 10 kΩ
Voltage	0 ... ± 50 mV
Fault signal	sensor breakage: > +100 mV (upscale), < -100 mV (downscale)
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): ± 3 µV up to ± 10 mV/± 0.03 % of the span up to +50 mV/± 0.05 % of the span up to -50 mV
Influence of ambient temperature	± 1 µV/K (typical ± 0.25 µV/K)
Absolute	< 0.25 K at 30 V voltage supply
Bandwidth	DC to 350 Hz (-3 dB)
Rise time	≤ 1 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 125 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0040
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 09 ATEX 0219X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus) or 116-0334 (cULus)
IECEx approval	IECEx BAS 06.0011, IECEx BAS 09.0103X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Diagrams

Front view





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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power loss/power consumption	0.3 W max.
Input	
Input resistance	≥ 20 MΩ
Transmission range	0 ... ± 500 mV
Offset voltage/current	≤ 5 µV/≤ 5 nA
Lead monitoring	100 nA
Output	
Load	Accuracy figures for infinite load impedance. Additional 0.03 % of span for a load resistance of 10 kΩ
Voltage	0 ... ± 500 mV
Fault signal	sensor breakage: > +500 mV (upscale), < -500 mV (downscale)
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): ± 30 µV up to ± 100mV/± 0.03 % of the span up to +500 mV/± 0.03 % of the span up to -500 mV
Influence of ambient temperature	± 10 µV/K (typical ± 5 µV/K)
Absolute	< 0.25 K at 30 V voltage supply
Bandwidth	DC to 350 Hz (-3 dB)
Rise time	≤ 1 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 125 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0040
Group, category, type of protection	Ex II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 09 ATEX 0219X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0334 (cULus)
IECEx approval	IECEx BAS 06.0011, IECEx BAS 09.0103X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Voltage input 0 mV ... ± 500 mV**
- **Voltage output 0 mV ... ± 500 mV**
- **Selectable up/downscale burnout detection on Power Rail**

Function

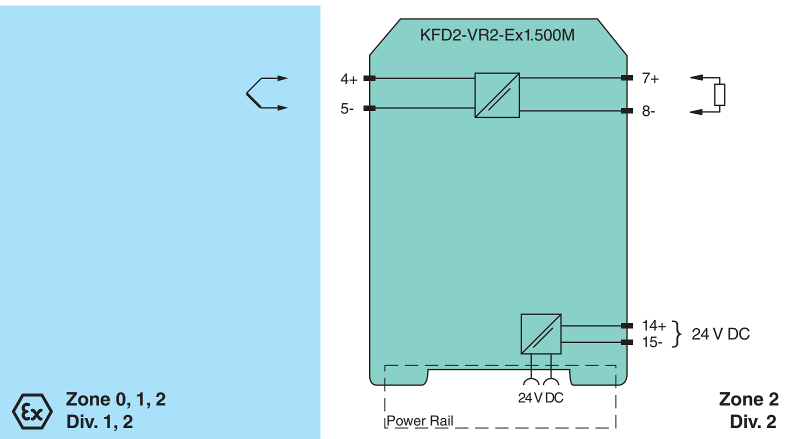
This isolated barrier is used for intrinsic safety applications. It transfers low voltage signals from thermocouples, load cells, strain gauges, operational amplifiers, and inductive oscillation sensors located in hazardous areas to safe areas.

The input voltage of the terminals 4 and 5 is transferred to the terminals 7 and 8.

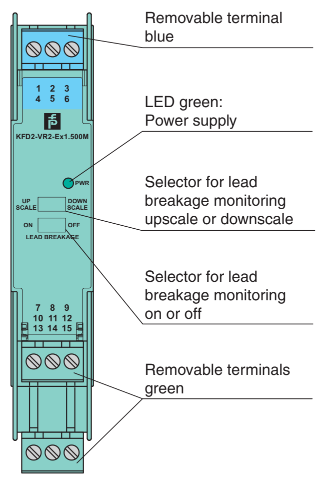
The input, output, and power supply are galvanically isolated from each other. Upscale or downscale lead breakage monitoring is selectable via switches located on the front panel of the device.

Note: This unit requires three minutes after power-up to reach the accuracy cited in the technical data.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Voltage input 0 V ... 9 V**
- **Voltage output 0 V ... 9 V**

Function

This isolated barrier is used for intrinsic safety applications. It transfers voltage signals from hazardous areas to safe areas.

The input voltage of the terminals 4 and 5 is transferred to the terminals 7 and 8. The terminals 4 and 8 have the same polarity.

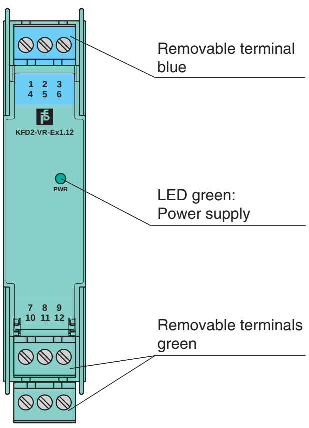
It repeats 0 V ... 9 V signals from strain gauges, transducers, and inductive motion sensors with signal frequencies up to 1.2 kHz.

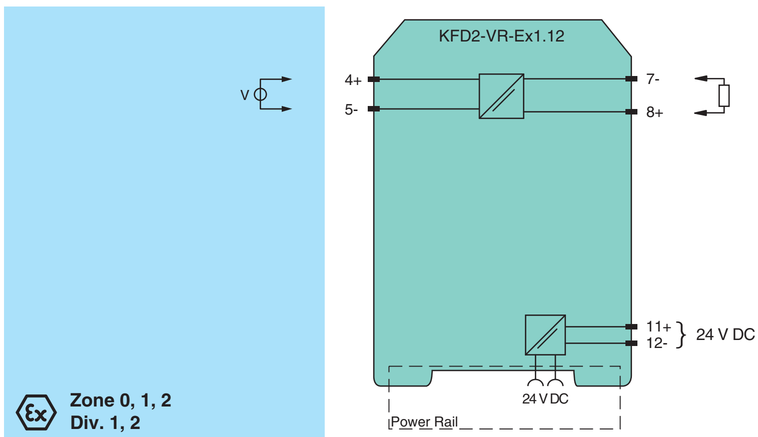
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Input	
Input resistance	≥ 10 MΩ
Transmission range	0 ... 9 V
Offset voltage/current	< 2 mV/< 7 nA
Output	
Voltage	0 ... 9 V
Output resistance	≤ 20 Ω
Transfer characteristics	
Deviation	
After calibration	± 5 mV at 20 °C (68 °F)
Influence of ambient temperature	≤ 0.005 % of range per K
Bandwidth	1.2 kHz (-3 dB)
Rise time	≤ 0.4 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ⓔx I (M1) [EEx ia] I

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Input	
Input resistance	≥ 10 MΩ
Transmission range	0 ... 12 V
Offset voltage/current	< 2 mV/< 7 mA
Output	
Voltage	0 ... 12 V
Output resistance	≤ 600 Ω
Transfer characteristics	
Deviation	
After calibration	± 5 mV at 20 °C (68 °F)
Influence of ambient temperature	≤ 0.005 % of range per K
Bandwidth	1.2 kHz (-3 dB)
Rise time	≤ 0.4 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7262
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 10 ATEX 0079X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 10.0040X
Approved for	Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Voltage input 0 V ... 12 V**
- **Voltage output 0 V ... 12 V**

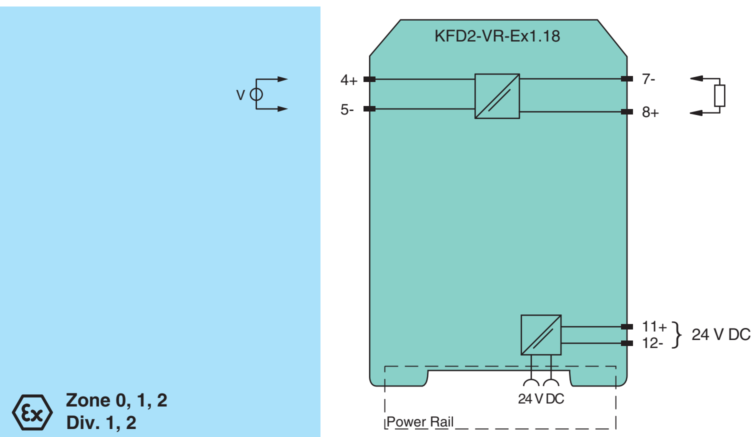
Function

This isolated barrier is used for intrinsic safety applications. It transfers voltage signals from hazardous areas to safe areas.

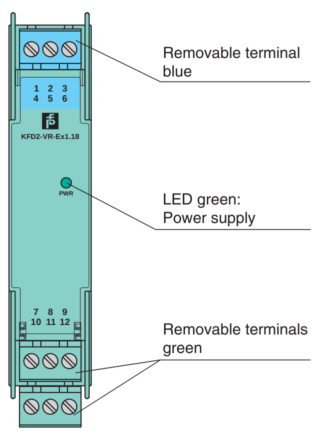
The input voltage of the terminals 4 and 5 is transferred to the terminals 7 and 8. The terminals 4 and 8 have the same polarity.

It repeats 0 V ... 12 V signals from strain gauges, transducers, and inductive motion sensors with signal frequencies up to 1.2 kHz.

Diagrams



Front view



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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Voltage input -10 V ... 10 V**
- **Voltage output -10 V ... 10 V**

Function

This isolated barrier is used for intrinsic safety applications. It transfers voltage signals from hazardous areas to safe areas.

The input voltage of the terminals 4 and 5 is transferred to the terminals 7 and 8. The terminals 4 and 8 have the same polarity.

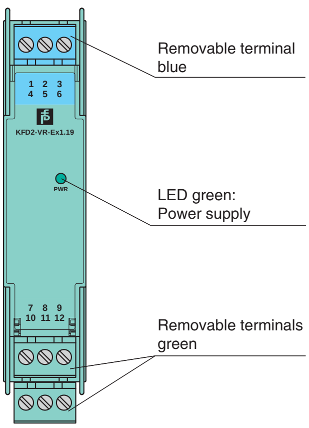
It repeats voltage signals from magnetic pickups, transducers, and flow meters between -10 V ... 10 V with signal frequencies up to 1.2 kHz.

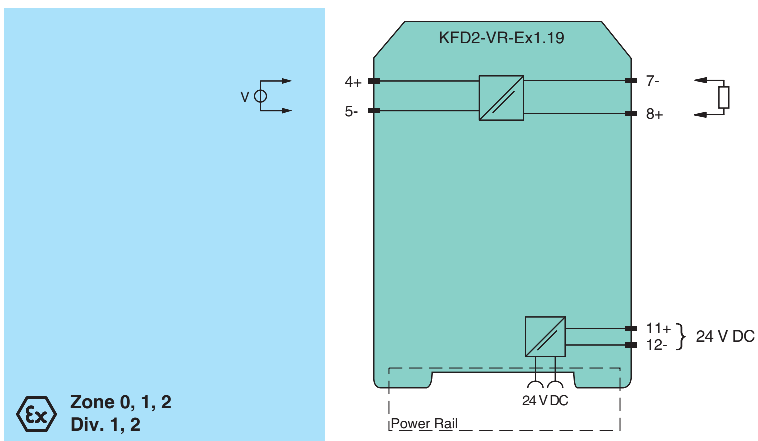
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Input	
Input resistance	≥ 10 MΩ
Transmission range	0 ... ± 10 V
Offset voltage/current	< 2 mV/< 7 mA
Output	
Voltage	-10 ... 10 V
Output resistance	≤ 600 Ω
Transfer characteristics	
Deviation	
After calibration	± 5 mV at 20 °C (68 °F)
Influence of ambient temperature	< 0.005 % of range per K
Bandwidth	1.2 kHz (-3 dB)
Rise time	< 0.4 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7262
Group, category, type of protection	⟨Ex⟩ II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 10 ATEX 0079X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 10.0040X
Approved for	Ex nA II T4

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Input	
Input resistance	≥ 10 MΩ
Offset voltage/current	< 10 mV/< 1 µA
Output	
Voltage	-10 ... 10 V
Output resistance	≤ 20 Ω
Transfer characteristics	
Deviation	
After calibration	± 30 mV at 20 °C (68 °F)
Influence of ambient temperature	< 0.01 % of span per K
Bandwidth	≤ 50 kHz (-3 dB)
Rise time	≤ 10 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7262
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 10 ATEX 0079X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 10.0040X
Approved for	Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Voltage input -10 V ... 10 V**
- **Transmission frequency up to 50 kHz**
- **Voltage output -10 V ... 10 V**

Function

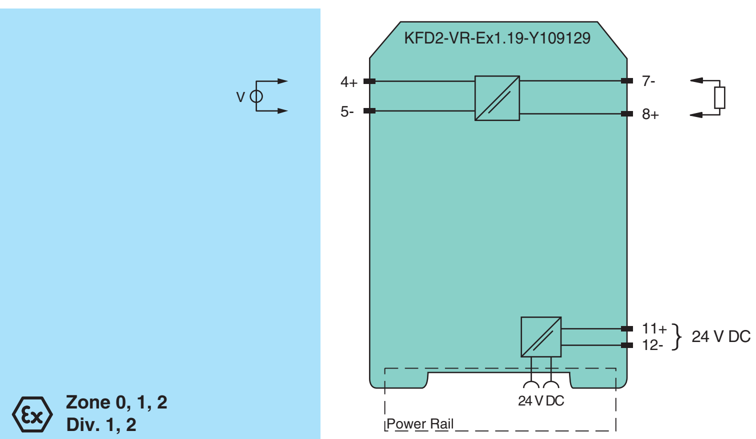
This isolated barrier is used for intrinsic safety applications. It transfers voltage signals from hazardous areas to safe areas.

The input voltage of the terminals 4 and 5 is transferred to the terminals 7 and 8. The terminals 4 and 8 have the same polarity.

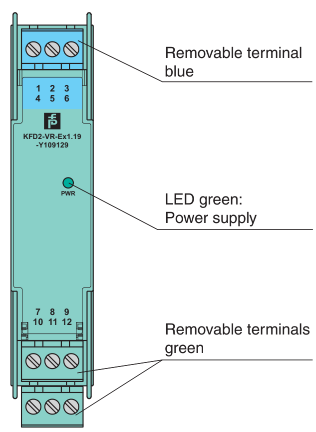
It repeats voltage signals from magnetic pickups, transducers, and flow meters between -10 V ... 10 V.

This barrier is designed for frequencies up to 50 kHz.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Voltage input 0 V ... -20 V**
- **Vibration sensor inputs**
- **Voltage/current field supply**
- **Voltage output 0 V ... -20 V**

Function

This isolated barrier is used for intrinsic safety applications. It provides a floating output to power a vibration sensor (i. e., Bently Nevada) or accelerometers in a hazardous area and transfers the voltage signal from that sensor to the safe area.

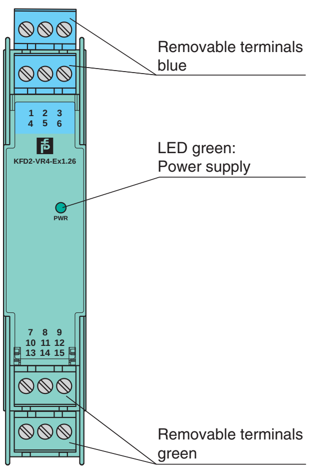
Designed to provide a voltage or current supply to the vibration sensor. Depending on connection the barrier provides 3.6 mA, 5.3 mA, or 8.9 mA supply current for 2-wire sensors, or 18 V at 20 mA for 3-wire sensors.

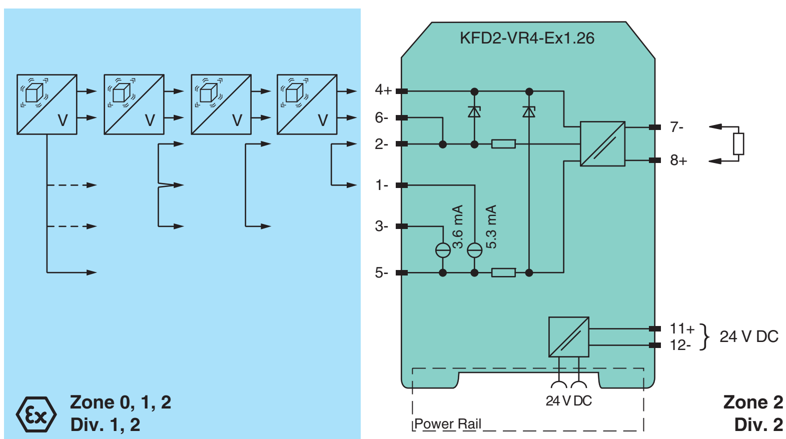
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	< 1.6 W
Input	
Input resistance	10 kΩ terminals 4 (common), 6-/2-
Output rated operating current	terminals 4 (common), 5-: > 10 mA at -21 V or > 20 mA at -18 V terminals 4 (common), 1-: 5.3 mA ±0.53 mA at -10 V terminals 4 (common), 3-: 3.6 mA ±0.7 mA at -10 V
Transmission range	0 ... -20 V
Output	
Load	≥ 2 kΩ
Voltage	0 ... -20 V
Output resistance	approx. 10 Ω Since this is much less than the end-to-end resistance of a zener barrier, it may be necessary to specify a monitor intended for use without a barrier. Please follow the advice of the monitor manufacturer.
Transfer characteristics	
Bandwidth	-0.1 dB at 10 kHz; -1 dB at 20 kHz
Time delay relative to input	7.2 ± 0.3 µs
Ripple	in 200 kHz bandwidth < 20 mV_{rms} in 20 kHz bandwidth < 3 mV_{rms}
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 125 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 02 ATEX 7206
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC
EC-Type Examination Certificate	DMT 01 ATEX E 133
Group, category, type of protection	Ex I (M1) [EEx ia] I
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	12 ... 35 V DC loop powered
Power loss	0.4 W
Input	
Current range	0 ... 20 mA, load ≤ 50 Ω
Voltage range	0 ... 10 V, load ≥ 100 kΩ
Output	
Load	(U -12 V)/0.02 A
Current output	4 ... 20 mA, limited to ≤ 35 mA
Fault signal	downscaling ≤ 3 mA
Transfer characteristics	
Deviation	
After calibration	0.1 % of full-scale value
Temperature effect	span: 0.050 % of span/K; zero point: 0.060 % of span/K
Linearization	≤ 0.04 % of full-scale value
Influence of supply voltage	6.5 ppm/V
Rise time	250 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	ZELM 00 ATEX 0034
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC
Statement of conformity	TÜV 01 ATEX 1777X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
CSA approval	
Control drawing	116-0132

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current or voltage input**
- **Output: 4 ... 20 mA**
- **Potentiometer or DIP switch selectable ranges**
- **Line fault detection (LFD)**

Function

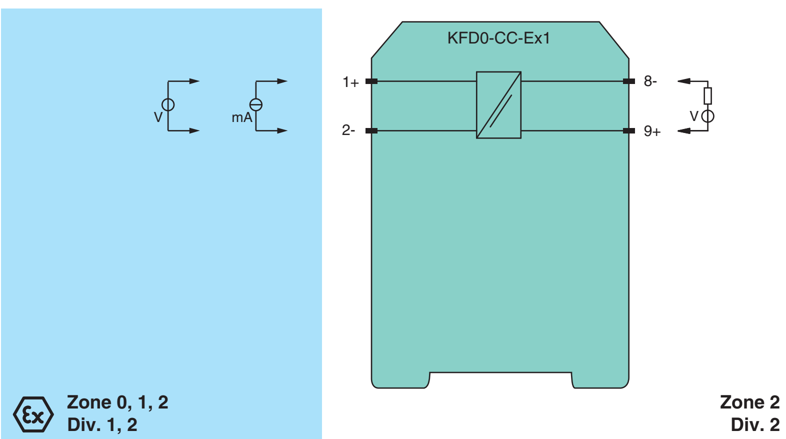
This isolated barrier is used for intrinsic safety applications. It converts a 2-wire voltage or current in the hazardous area to a 4 mA ... 20 mA signal in the safe area.

The device can be used to double signals in 20 mA measurement circuits due to the limited current signal input load of 50 Ω.

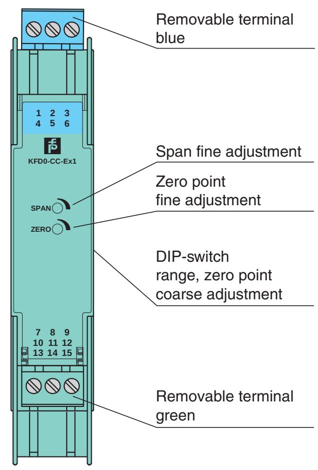
DIP switches and potentiometers make field calibration easy.

Since this isolator is loop-powered, use the technical data to verify that the proper voltage is available to the field devices.

Diagrams



Front view



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KFD2-WAC2-Ex1.D

Strain Gauge Converter

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Strain gauge input**
- **Output 0 mA ... ± 20 mA or 0 V ... ± 10 V**
- **Relay contact output**
- **Programmable high/low alarm**
- **RS 485 interface**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It is used with strain gauges, load cells and resistance measuring bridges.

Designed to provide 5 V excitation voltage, this barrier's high quality A/D converter allows it to be used with those devices requiring 10 V.

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software. The actual measurement for tare, zero point, and final value can be entered in this manner.

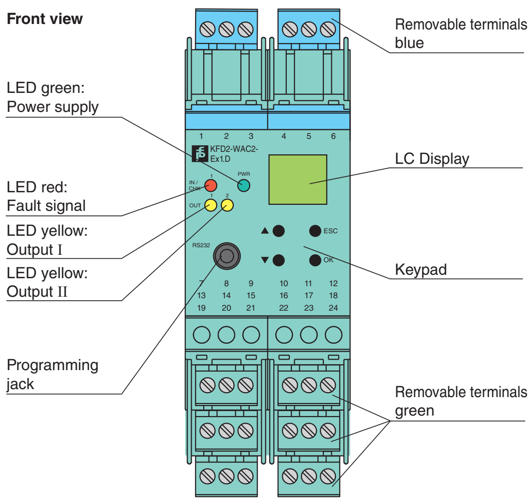
A unique collective error messaging feature is available when used with the Power Rail system.

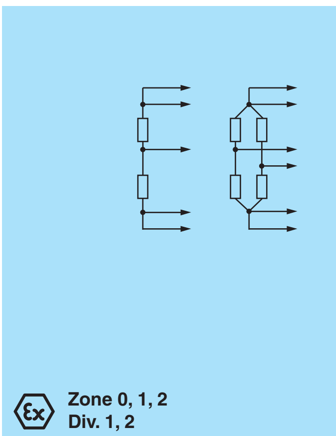
For additional information, refer to the manual and www.pepperl-fuchs.com.

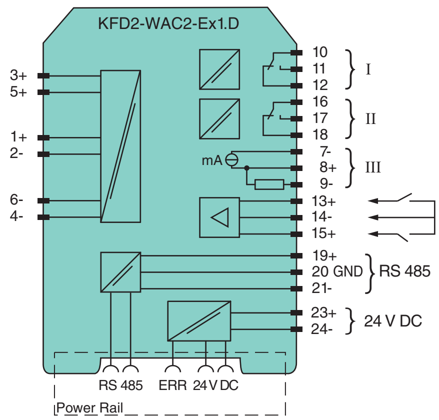
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 3 W
Interface	
Type	RS 485
Programming interface	RS 232 programming jack
Field circuit	
Lead resistance	≤ 25 Ω per lead
Sensor supply	1 ... 5 V
Short-circuit current	50 mA
Load	≥ 116 Ω up to 5V, ≥ 85 Ω up to 4V
Input	
Programmable Tare	0 ... 500 % of span
Input I	signal; analog
Input signal	-100 ... 100 mV
Input resistance	> 1 MΩ for voltage measurement
Input II, III	tare adjustment, calibration and zero
Active/Passive	I > 4 mA/I < 1.5 mA
Output	
Output I, II	relay output
Mechanical life	2 x 10^7 switching cycles
Output III	analog output
Current range	-20 ... 20 mA
Load	≤ 550 Ω
Line fault detection	downscale -21.5 mA (-10.75 V) or 2 mA (1 V), upscale 21.5 mA (10.75 V)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 250 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	TÜV 04 ATEX 2531
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD], [circuit(s) in zone 0/1/2]
FM approval	
Control drawing	116-0302 (cFMus)
IECEx approval	IECEx TUN 06.0005
Approved for	[Ex ia Ga] IIC, [Ex ia] I, [Ex iaD]

Diagrams







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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 0.95 W/0.95 W
Input	
RTD	type Pt10, Pt50, Pt100, Pt500, Pt1000 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt500GOST, Pt1000GOST (6651-94) type Cu10, Cu50, Cu100 (P50353-92) type Ni100 (DIN 43760)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-, 4-wire connection
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Output	
Output	analog current output
Current range	0 ... 20 mA or 4 ... 20 mA
Fault signal	downscale 0 or 2 mA, upscale 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 130 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	CESI 04 ATEX 143
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1797 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0316
CSA approval	
Control drawing	366-024CS-12 (cCSAus)
IECEx approval	IECEx TUN 07.0003
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Current output 0/4 mA ... 20 mA**
- **Sink or source mode**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is designed to connect RTDs, thermocouples, or potentiometers in the hazardous area, and provide a proportional 0/4 mA ... 20 mA signal to the safe area.

The barrier offers 3-port isolation between input, output, and power supply.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

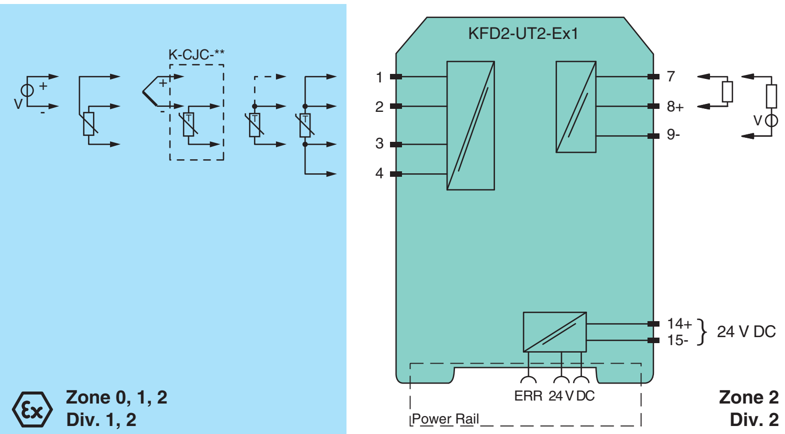
A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

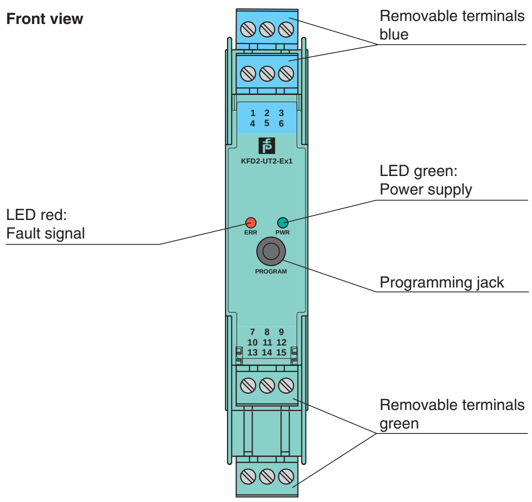
The unit is easily programmed with the **PACT***ware*™ configuration software.

A collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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KFD2-UT2-Ex1-1

Universal Temperature Converter

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Voltage output 0/1 V ... 5 V**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is designed to connect RTDs, thermocouples, or potentiometers in the hazardous area, and provide a proportional 0/1 V ... 5 V signal to the safe area.

The barrier offers 3-port isolation between input, output, and power supply.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

The unit is easily programmed with the **PACT***ware*™ configuration software.

A collective error messaging feature is available when used with the Power Rail system.

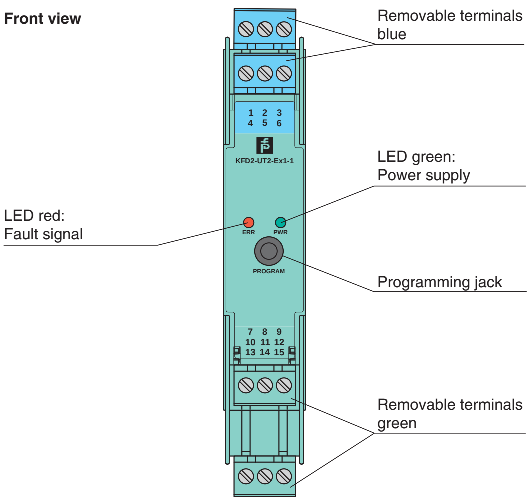
For additional information, refer to the manual and www.pepperl-fuchs.com.

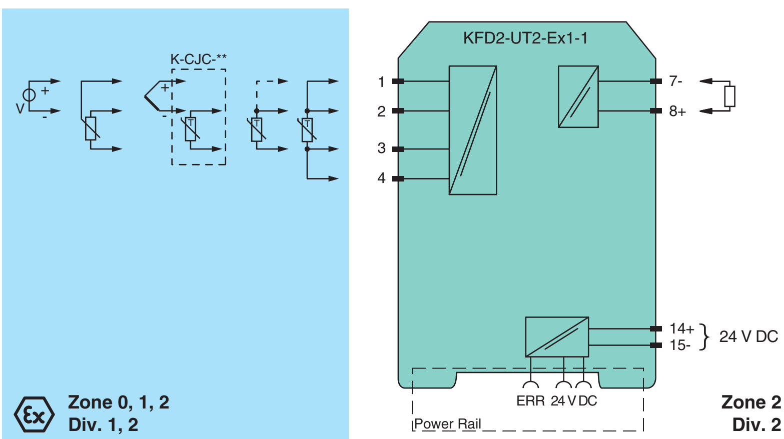
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 0.64 W/0.64 W
Input	
RTD	type Pt10, Pt50, Pt100, Pt500, Pt1000 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt500GOST, Pt1000GOST (6651-94) type Cu10, Cu50, Cu100 (P50353-92) type Ni100 (DIN 43760)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-, 4-wire connection
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Output	
Voltage output	0 ... 5 V or 1 ... 5 V; output resistance: ≤ 5 Ω; load: ≥ 10 kΩ
Fault signal	downscale 0 V or 0.5 V, upscale 5.375 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 130 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	CESI 04 ATEX 143
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1797 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0316
CSA approval	
Control drawing	366-024CS-12 (cCSAus)
IECEx approval	IECEx TUN 07.0003
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 1.5 W/1.5 W
Input	
RTD	type Pt10, Pt50, Pt100, Pt500, Pt1000 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt500GOST, Pt1000GOST (6651-94) type Cu10, Cu50, Cu100 (P50353-92) type Ni100 (DIN 43760)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-wire connection
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Output	
Output I, II	Analog current output
Current range	0 ... 20 mA or 4 ... 20 mA
Fault signal	downscale 0 or 2 mA, upscale 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 130 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	CESI 04 ATEX 143
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1797 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0316
CSA approval	
Control drawing	366-024CS-12 (cCSAus)
IECEx approval	IECEx TUN 07.0003
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Current output 0/4 mA ... 20 mA**
- **Sink or source mode**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is designed to connect RTDs, thermocouples, or potentiometers in the hazardous area, and provide a proportional 0/4 mA ... 20 mA signal to the safe area.

The barrier offers 3-port isolation between input, output, and power supply.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

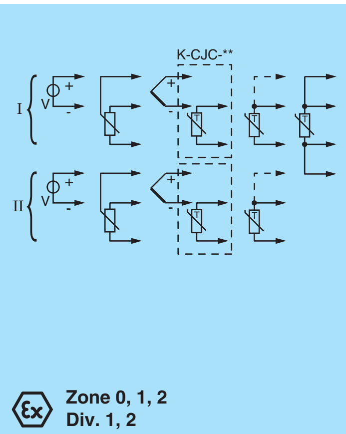
A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

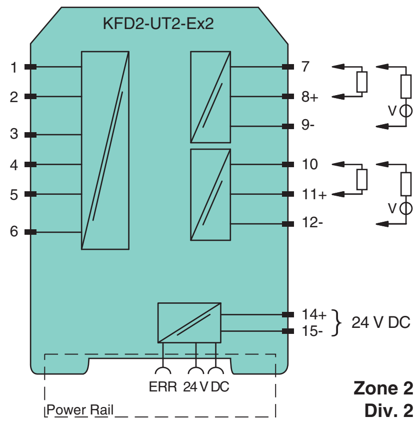
The unit is easily programmed with the **PACT***ware*™ configuration software.

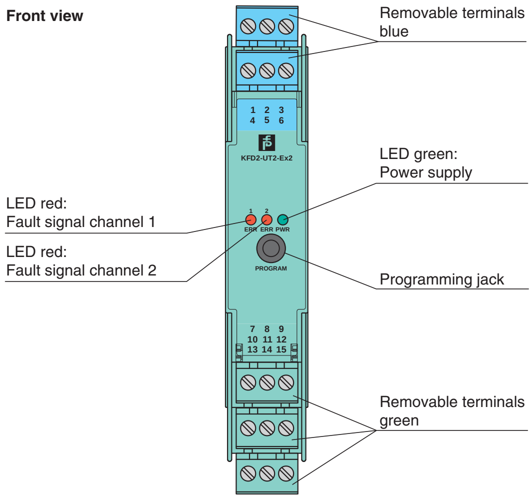
A collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams







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Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Voltage output 0/1 V ... 5 V**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is designed to connect RTDs, thermocouples, or potentiometers in the hazardous area, and provide a proportional 0/1 V ... 5 V signal to the safe area.

The barrier offers 3-port isolation between input, output, and power supply.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

The unit is easily programmed with the **PACT***ware*™ configuration software.

A collective error messaging feature is available when used with the Power Rail system.

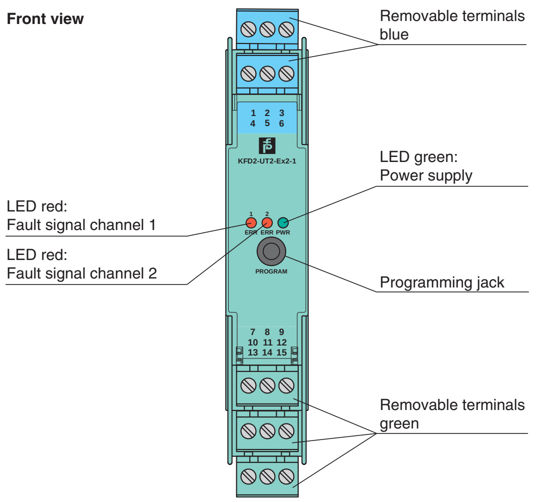
For additional information, refer to the manual and www.pepperl-fuchs.com.

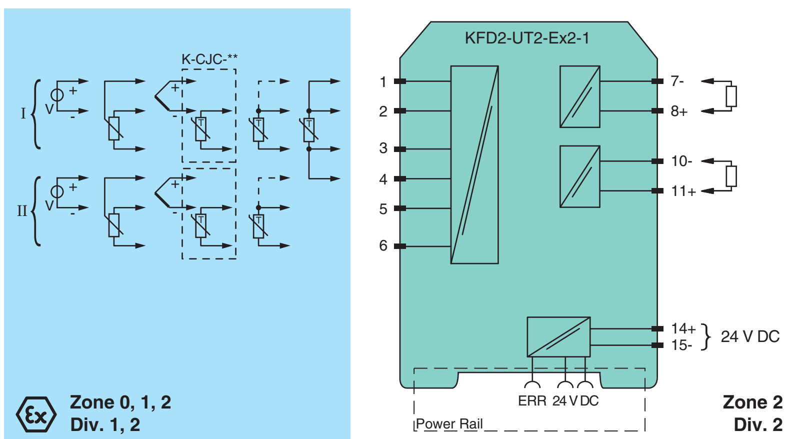
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 0.8 W/0.8 W
Input	
RTD	type Pt10, Pt50, Pt100, Pt500, Pt1000 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt500GOST, Pt1000GOST (6651-94) type Cu10, Cu50, Cu100 (P50353-92) type Ni100 (DIN 43760)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-wire connection
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Output	
Voltage output	0 ... 5 V or 1 ... 5 V; output resistance: ≤ 5 Ω; load: ≥ 10 kΩ
Fault signal	downscale 0 V or 0.5 V, upscale 5.375 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 130 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	CESI 04 ATEX 143
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1797 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0316
CSA approval	
Control drawing	366-024CS-12 (cCSAus)
IECEx approval	IECEx TUN 07.0003
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Diagrams

Front view





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Technical data

Supply	
Rated voltage	12 ... 35 V DC loop powered
Input	
Lead resistance	≤ 100 Ω per lead
Measuring current	approx. 1 mA
Output	
Load	(U -12 V)/0.02 A
Current output	4 ... 20 mA, limited to ≤ 35 mA
Fault signal	upscaling ≥ 22 mA (limited to 35 mA)
Transfer characteristics	
Measurement range f_n	span without linearization 25 ... 800 °C (77 ... 1472 °F)/ with linearization 25 ... 375 °C (77 ... 707 °F), both adjustable zero point without linearization -200 ... 400 °C (-328 ... 752 °F)/ with linearization -30 ... 375 °C (-22 ... 707 °F), both adjustable
Deviation	
After calibration	0.1 % of full-scale value incl. linearity and hysteresis
Influence of ambient temperature	span and zero point 0.015 %/K or ± 10 mΩ/K
Influence of supply voltage	6.5 ppm/V
Rise time	250 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	ZELM 00 ATEX 0036
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC
Statement of conformity	TÜV 01 ATEX 1777X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
CSA approval	
Control drawing	116-0132

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **2- or 3-wire Pt100 RTD input**
- **Output 4 mA ... 20 mA, temperature linearization selectable**
- **DIP switch selectable ranges**
- **Sensor breakage detection**

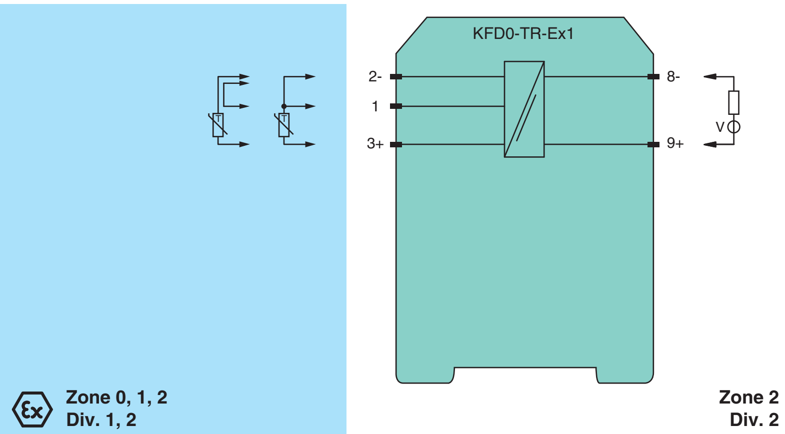
Function

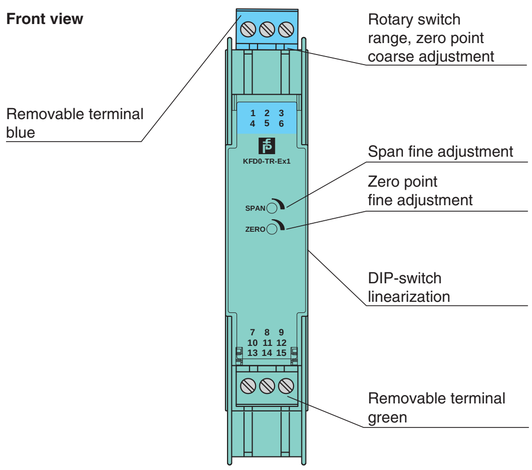
This isolated barrier is used for intrinsic safety applications. It is a loop-powered isolator that converts the resistance from a 3-wire RTD in the hazardous area to a 4 mA ... 20 mA signal in the safe area.

A selectable analog linearization ensures a temperature linear 4 mA ... 20 mA output between 25 °C ... 375 °C.

It also features conveniently located DIP switches, rotary switches and potentiometers to make field calibration easy.

Diagrams





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Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Thermocouple input**
- **Output 4 mA ... 20 mA**
- **Internal cold junction compensation**
- **Sensor breakage detection**
- **DIP switch selectable ranges**

Function

This isolated barrier is used for intrinsic safety applications. It is a loop-powered isolator that converts thermocouple inputs in the hazardous area to a 4 mA ... 20 mA signal in the safe area.

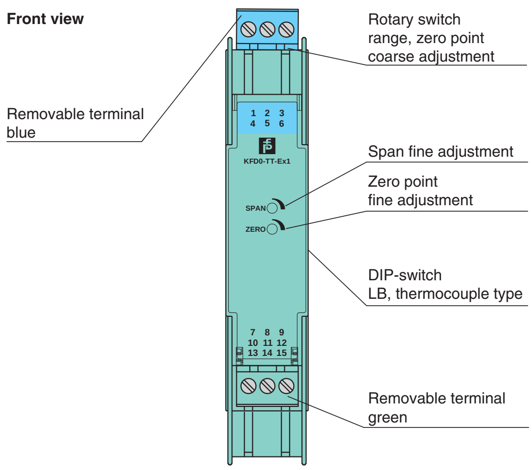
The internal cold junction compensation can be bypassed by using terminals 1 and 3.

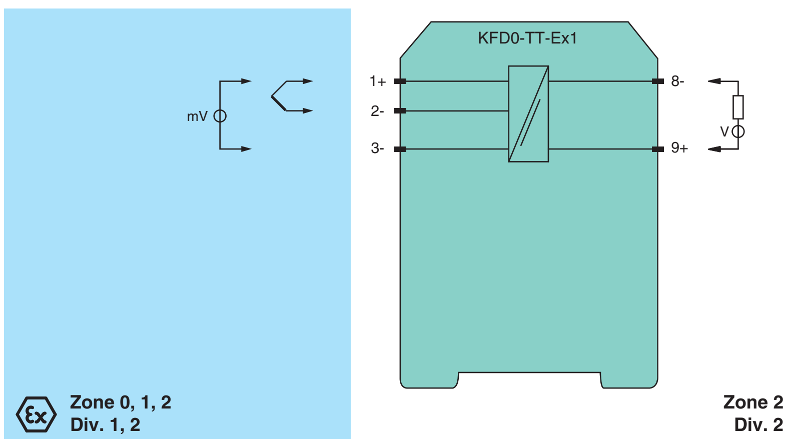
The output current is linear to input voltage, not proportional to temperature. Zero, span, and burnout detection are field-configurable.

Technical data

Supply	
Rated voltage	12 ... 35 V DC loop powered
Input	
Lead resistance	≤ 100 Ω per lead
Current	lead monitoring ON: ≤ 15 nA; OFF: ≤ 1 nA
Output	
Load	(U -12 V)/0.02 A
Current output	4 ... 20 mA, limited to ≤ 35 mA
Fault signal	downscaling ≤ 3 mA, upscaling ≥ 22 mA
Transfer characteristics	
Measurement range f_n	span 4 ... 100 mV, zero point -12 ... 60 mV, both adjustable
Deviation	
After calibration	0.1 % of full-scale value ± 1 K for the cold junction
Temperature effect	temperature deviation 0.015 % of the span/K or 1.5 µV/K cold junction ± 2 K (calibrated at T_{amb} = 20 °C (68 °F))
Influence of supply voltage	6.5 ppm/V
Characteristic curve	the output voltage is linearly proportionate to the input voltage (not to temperature)
Rise time	250 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	ZELM 00 ATEX 0035
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC
Statement of conformity	TÜV 01 ATEX 1777X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
CSA approval	
Control drawing	116-0132

Diagrams





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Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	0.35 W (24 V and 1 mA sense current)
Input	
Line fault detection	yes, at Pt100
Lead resistance	≤ 10 % of resistance value
Transmission range	0 ... 10 mA
Available voltage	9 V
Lead monitoring	50 nA
Output	
Current	0 ... 10 mA
Available voltage	0 ... 7 V
Fault signal	< 10 Ω or > 400 Ω, depending on lead disconnected (measuring current ≤ 1mA)
Transfer characteristics	
Deviation	$I_m \geq 1$ mA: ± 0.1 % of R_m or ± 0.1 Ω (the larger value is applicable) $I_m < 1$ mA: accuracy reduces in proportion to I_m. e. g. $I_m = 0.1$ mA: ± 1 % of R_m or 1 Ω (the larger value is applicable).
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 124 mm (0.5 x 4.5 x 4.9 in), housing type A2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 10 ATEX 0061
Group, category, type of protection	Ex II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 10 ATEX 0062X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	pending
UL approval	
Control drawing	116-0332 (cULus)
IECEx approval	IECEx BAS 10.0024 IECEx BAS 10.0025X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Resistance and RTD input (Pt100, Pt500, Pt1000)**
- **Resistance output**
- **Accuracy 0.1 %**
- **Line fault detection (LFD) for Pt100**

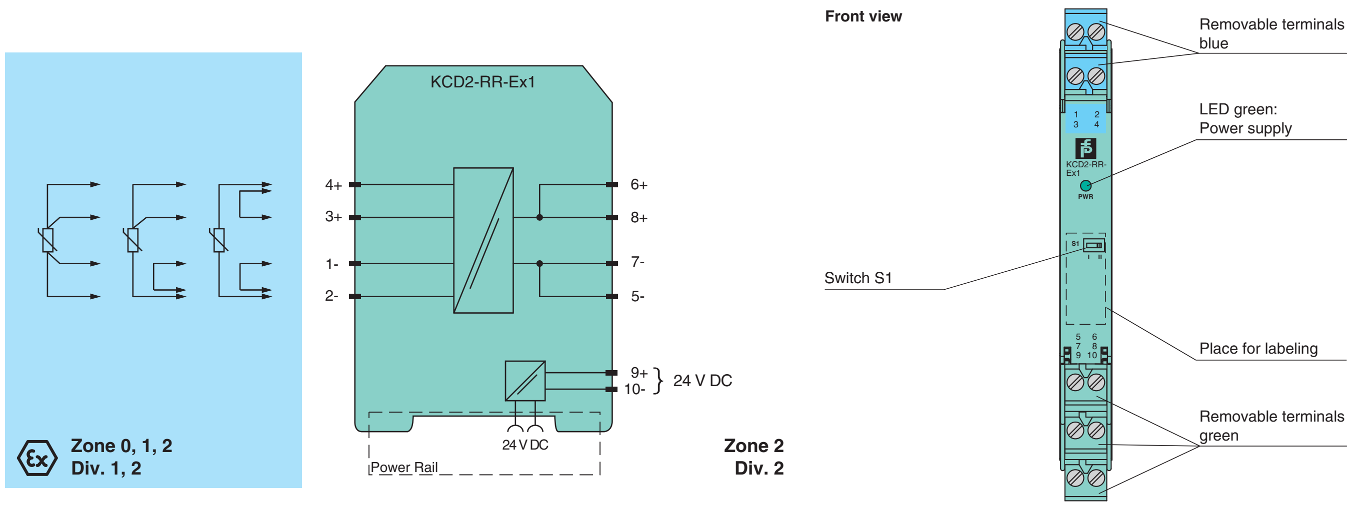
Function

This isolated barrier is used for intrinsic safety applications. It transfers RTD resistance values from hazardous areas to safe areas.

A 2-, 3-, or 4-wire mode is available depending on the required accuracy.

The monitor registers the same load as if it were connected directly to the resistance in a hazardous area.

Diagrams



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KFD2-GU-Ex1

Temperature Trip Value

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Thermocouple, RTD, voltage or current input**
- **2 relay contact outputs**
- **Programmable high/low alarm**
- **Sensor breakage detection**

Function

This isolated barrier is used for intrinsic safety applications. It accepts a variety of inputs including RTDs or thermocouples and provides a relay trip whenever it reaches a user-programmed set point.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

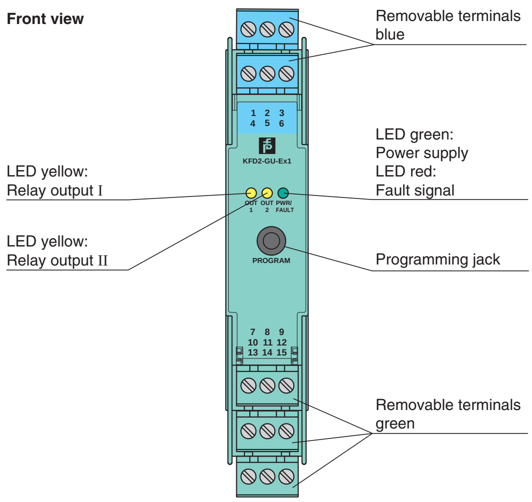
The unit is easily programmed with the **PACT***ware*™ configuration software.

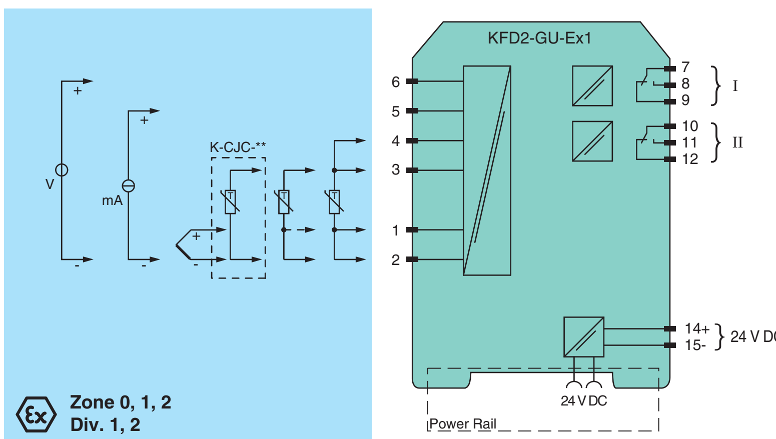
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	19 ... 35 V DC
Power consumption	0.8 W
Input	
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985)
Load	20 Ω for 20 mA; 200 kΩ for 10 V
Output	
Output I, II	
Contact loading	253 V AC/2 A/500 VA/cos Φ min. 0.7; 40 V DC/2 A resistive load
Mechanical life	2 x 10^7 switching cycles
Transfer characteristics	
Deviation	
Voltage input	± 0.02 % of 10 V measuring range
Resistance input	± 0.025 % of measuring range (4-wire connection)
Current input	± 0.02 % of 20 mA measuring range
Pt100	± 0.01 % of abs. temperature value of switching point in K + 0.2 K (4-wire connection)
Thermocouple	± 0.05 % of abs. temperature value of switching point in K + 1.1 K (1.2 K for thermocouple types R and S) this includes ± 0.8 K error of the cold junction compensation (+0.9 K for thermocouple types R and S).
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7152
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1493 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 06.0022

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 2 W/2.2 W
Input	
RTD	Pt100, Pt500, Pt1000, Ni100, Ni1000
Types of measuring	2-, 3-, 4-wire technology
Lead resistance	≤ 50 Ω
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, L, N, R, S, T
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	0 ... 10 V, 2 ... 10 V, 0 ... 1 V, -100 ... 100 mV
Potentiometer	0.8 ... 20 kΩ
Types of measuring	2-, 3-, 5-wire technology
Input resistance	≥ 250 kΩ (0 ... 10 V) ≥ 1 MΩ (0 ... 1 V, -100 ... 100 mV)
Measuring current	approx. 400 µA with resistance measuring sensor
Output	
Output I, II	relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	Analog current output
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	TÜV 03 ATEX 2140
Group, category, type of protection	Ⓔx II (1) G [Ex ia] IIC Ⓔx II (1) D [Ex iaD]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4 X

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Redundant TC input**
- **Current output 0/4 mA ... 20 mA**
- **2 relay contact outputs**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is designed for a wide range of measurement applications. It converts the signal of an RTD, thermocouple, potentiometer, or voltage source to a proportional output current. It also provides a relay trip value.

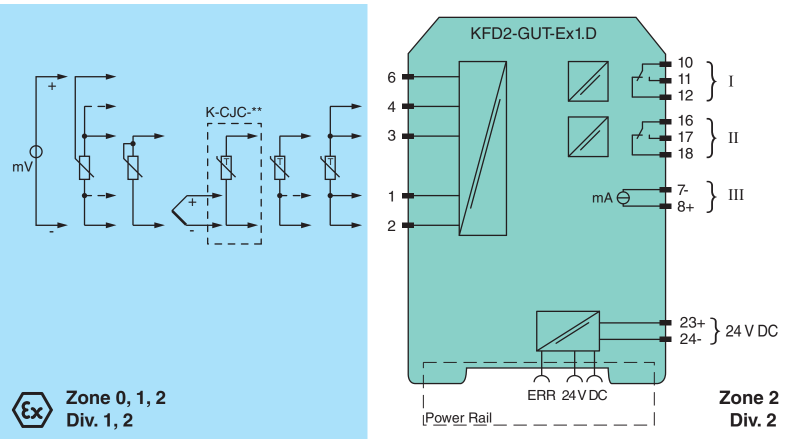
A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

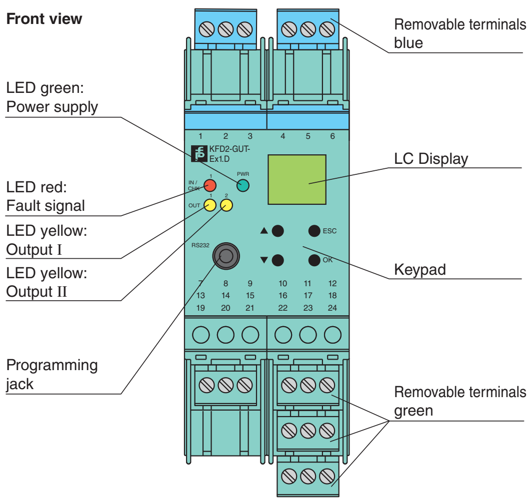
The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

A unique collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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Features

- 1-channel isolated barrier
- AC/DC wide range supply
- TC, RTD, potentiometer or voltage input
- Redundant TC input
- Current output 0/4 mA ... 20 mA
- 2 relay contact outputs
- Line fault (LFD) and sensor burnout detection
- Up to SIL2 acc. to IEC 61508

Function

This isolated barrier is used for intrinsic safety applications. It is designed for a wide range of measurement applications. It converts the signal of an RTD, thermocouple, potentiometer, or voltage source to a proportional output current. It also provides a relay trip value.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

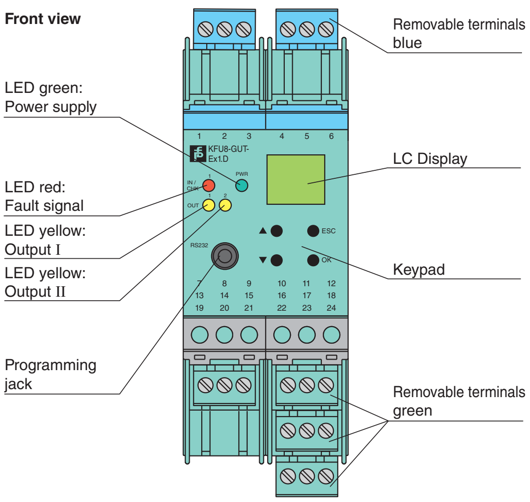
The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

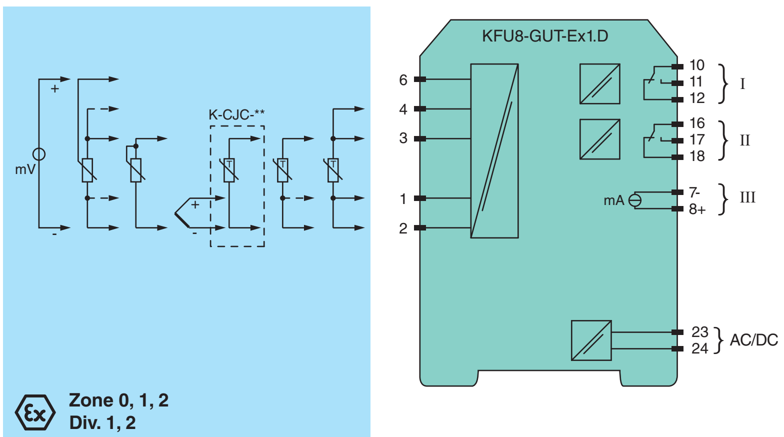
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC
Power loss/power consumption	≤ 2 W; 2.5 VA/2.2 W; 3 VA
Input	
RTD	Pt100, Pt500, Pt1000, Ni100, Ni1000
Types of measuring	2-, 3-, 4-wire technology
Lead resistance	≤ 50 Ω
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, L, N, R, S, T
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	0 ... 10 V, 2 ... 10 V, 0 ... 1 V, -100 ... 100 mV
Potentiometer	0.8 ... 20 kΩ
Types of measuring	2-, 3-, 5-wire technology
Input resistance	≥ 250 kΩ (0 ... 10 V) ≥ 1 MΩ (0 ... 1 V, -100 ... 100 mV)
Measuring current	approx. 400 µA with resistance measuring sensor
Output	
Output I, II	relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	Analog current output
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	TÜV 03 ATEX 2140
Group, category, type of protection	Ex II (1) G [Ex ia] IIC Ex II (1) D [Ex iaD]

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	0.6 W
Input	
Lead resistance	5 % of the potentiometer resistance (adjustable)
Potentiometer	
Types of measuring	3-, 4-, 5-wire technology
Nominal resistance	≥ 800 Ω
Supply voltage	approx. 4.7 V
Output	
Voltage output	0 ... 10 V
Output resistance	≤ 30 Ω
Transfer characteristics	
Deviation	
Linearity	≤ ± 5 mV
Influence of ambient temperature	≤ 0.5 mV/K
Rise time	10 to 90 % ≤ 8 ms; 10 to 90 % within 1 % of span ≤ 25 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7171
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1797 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 10.0060 IECEx BAS 10.0061X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Potentiometer input**
- **Voltage output 0 V ... 10 V**
- **Lead resistance compensation adjustment**
- **Accuracy 0.05 %**

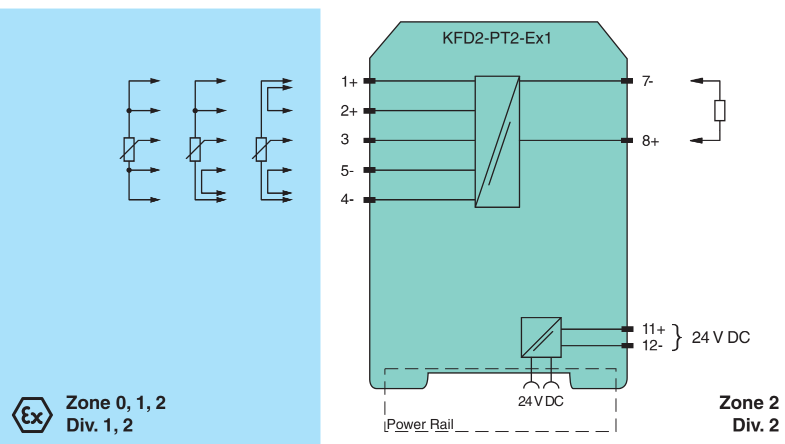
Function

This isolated barrier is used for intrinsic safety applications. It provides the source voltage to a potentiometer and transfers its wiper position from hazardous areas to safe areas. It then converts the signal to a 0 V ... 10 V voltage output (consistant with 0 mA ... 20 mA current output, see for example KFD2-PT2-Ex1-4).

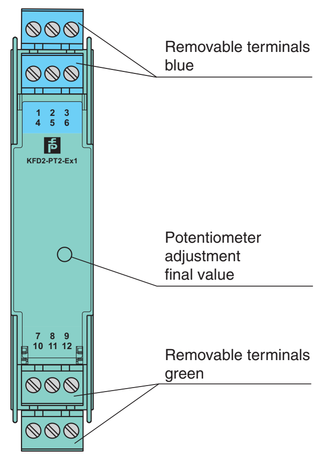
The unit can be used in a 3-, 4-, or 5-wire configuration depending on the required measurement accuracy. Terminals 2 and 5 are used as the sense line for the potentiometer lead resistance compensation in a 5-wire configuration.

The barrier's potentiometer can be used to compensate for lead resistance up to 5 % of the hazardous area potentiometer value.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Potentiometer input**
- **Voltage output 0 V ... 5 V**
- **Lead resistance compensation adjustment**
- **Accuracy 0.05 %**

Function

This isolated barrier is used for intrinsic safety applications. It provides the source voltage to a potentiometer and transfers its wiper position from hazardous areas to safe areas. It then converts the signal to a 0 V ... 5 V voltage output (consistant with 0 mA ... 20 mA current output, see for example KFD2-PT2-Ex1-4).

The unit can be used in a 3-, 4-, or 5-wire configuration depending on the required measurement accuracy. Terminals 2 and 5 are used as the sense line for the potentiometer lead resistance compensation in a 5-wire configuration.

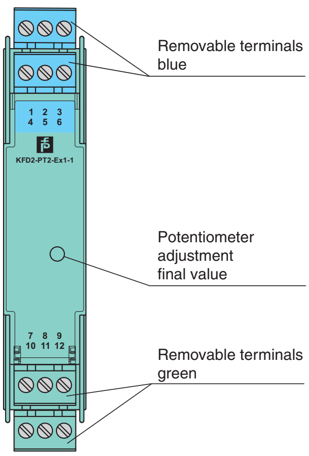
The barrier's potentiometer can be used to compensate for lead resistance up to 5 % of the hazardous area potentiometer value.

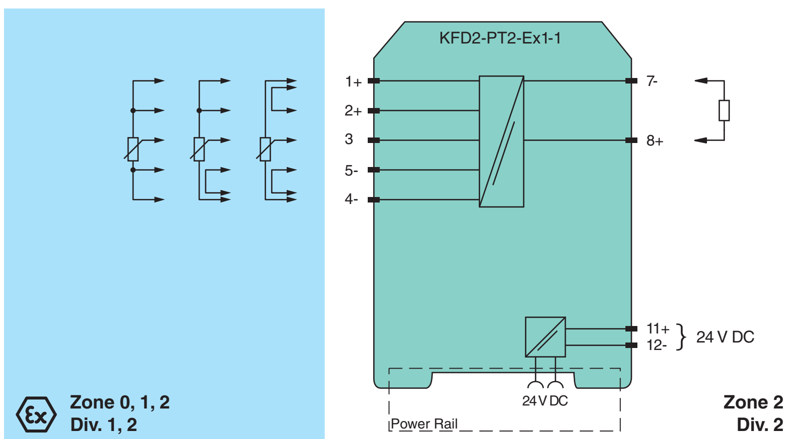
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	0.6 W
Input	
Lead resistance	5 % of the potentiometer resistance (adjustable)
Potentiometer	
Types of measuring	3-, 4-, 5-wire technology
Nominal resistance	≥ 800 Ω
Supply voltage	approx. 4.7 V
Output	
Voltage output	0 ... 5 V
Output resistance	≤ 30 Ω
Transfer characteristics	
Deviation	
Linearity	≤ ± 5 mV
Influence of ambient temperature	≤ 0.5 mV/K
Rise time	10 to 90 % ≤ 8 ms; 10 to 90 % within 1 % of span ≤ 25 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7171
Group, category, type of protection	Ex II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1797 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 10.0060 IECEx BAS 10.0061X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.3 W
Input	
Lead resistance	5 % of the potentiometer resistance (adjustable)
Potentiometer	
Types of measuring	3-, 4-, 5-wire technology
Nominal resistance	≥ 800 Ω
Supply voltage	approx. 4.7 V
Output	
Current output	0 ... 20 mA, load ≤ 1 kΩ
Transfer characteristics	
Deviation	
Linearity	≤ ± 10 µA
Influence of ambient temperature	≤ 1 µA/K
Rise time	10 to 90 % ≤ 8 ms; 10 to 90 % within 1 % of span ≤ 25 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7171
Group, category, type of protection	⟨Ex⟩ II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1797 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 10.0060 IECEx BAS 10.0061X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Potentiometer input**
- **Current output 0 mA ... 20 mA**
- **Lead resistance compensation adjustment**
- **Accuracy 0.05 %**

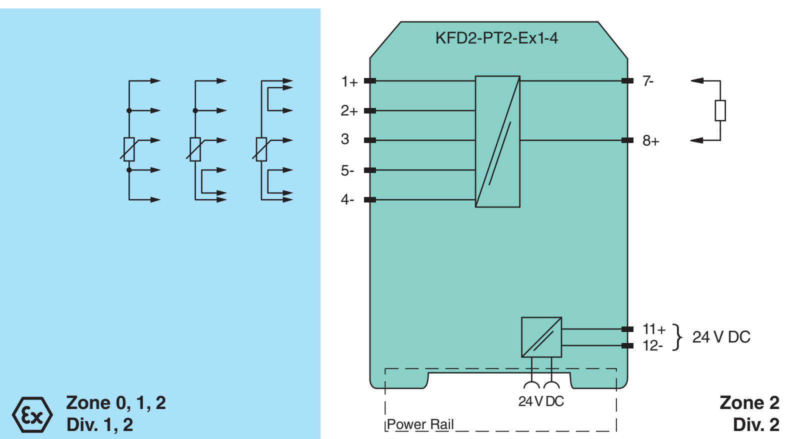
Function

This isolated barrier is used for intrinsic safety applications. It provides the source voltage to a potentiometer and transfers its wiper position from hazardous areas to safe areas. It then converts the signal to a 0 mA ... 20 mA current output.

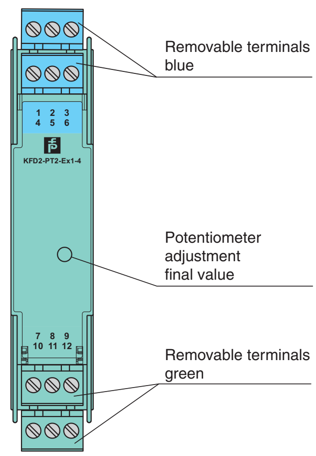
The unit can be used in a 3-, 4-, or 5-wire configuration depending on the required measurement accuracy. Terminals 2 and 5 are used as the sense line for the potentiometer lead resistance compensation in a 5-wire configuration.

The barrier's potentiometer can be used to compensate for lead resistance up to 5 % of the hazardous area potentiometer value.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Potentiometer input**
- **Current output 4 mA ... 20 mA**
- **Lead resistance compensation adjustment**
- **Accuracy 0.05 %**

Function

This isolated barrier is used for intrinsic safety applications. It provides the source voltage to a potentiometer and transfers its wiper position from hazardous areas to safe areas. It then converts the signal to a 4 mA ... 20 mA current output.

The unit can be used in a 3-, 4-, or 5-wire configuration depending on the required measurement accuracy. Terminals 2 and 5 are used as the sense line for the potentiometer lead resistance compensation in a 5-wire configuration.

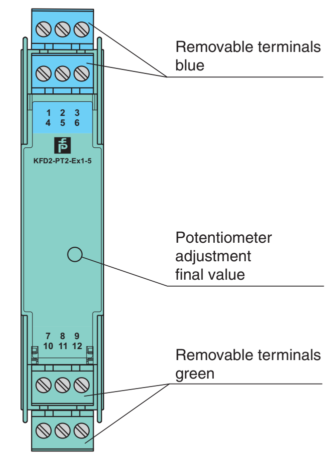
The barrier's potentiometer can be used to compensate for lead resistance up to 5 % of the hazardous area potentiometer value.

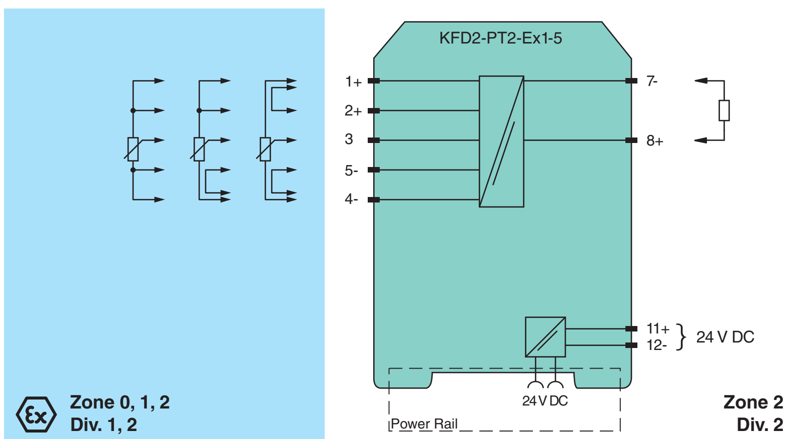
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.3 W
Input	
Lead resistance	5 % of the potentiometer resistance (adjustable)
Potentiometer	
Types of measuring	3-, 4-, 5-wire technology
Nominal resistance	≥ 800 Ω
Supply voltage	approx. 4.7 V
Output	
Current output	4 ... 20 mA, load ≤ 1 kΩ
Transfer characteristics	
Deviation	
Linearity	± 10 µA
Influence of ambient temperature	≤ 1 µA/K
Rise time	10 to 90 % ≤ 8 ms; 10 to 90 % within 1 % of span ≤ 25 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7171
Group, category, type of protection	⟨Ex⟩ II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 02 ATEX 1797 X
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G Ex nA II T4
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132
IECEx approval	IECEx BAS 10.0060 IECEx BAS 10.0061X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Diagrams

Front view





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Technical data

Supply	
Rated voltage	12 ... 35 V DC loop powered
Input	
Lead resistance	≤ 100 Ω per lead
Measuring current	approx. 1 mA
Output	
Load	(U -12 V)/0.02 A
Current output	4 ... 20 mA, limited to ≤ 35 mA
Fault signal	lead breakage: upscaling ≥ 22 mA, limited to ≤ 35 mA
Transfer characteristics	
Measurement range f_n	(adjustable) 0.5 ... 11 kΩ; final value: 0.45 ... 11 kΩ; zero point: 0 ... 10 % of full-scale value
Deviation	
After calibration	0.1 % of full-scale value
Temperature effect	Span 5 µA/K; zero point 5 µA/K
Linearization	≤ 0.04 % of full-scale value
Influence of supply voltage	6.5 ppm/V
Rise time	700 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	TÜV 98 ATEX 1381
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC [Ex iaD]
Statement of conformity	TÜV 01 ATEX 1777X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Resistance input 0.5 kΩ ... 11 kΩ**
- **Output 4 mA ... 20 mA**
- **Rotary switch selectable ranges**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It converts a 500 Ω ... 11 kΩ resistance in the hazardous area to a 4 mA ... 20 mA signal in the safe area.

A 3-wire connection is possible to compensate for lead resistance. If only 2-wire connection is desired, a jumper between terminal 1 and 2 must be connected.

Additional features include rotary switches and potentiometers for easy field calibration.

K-System

Digital Inputs

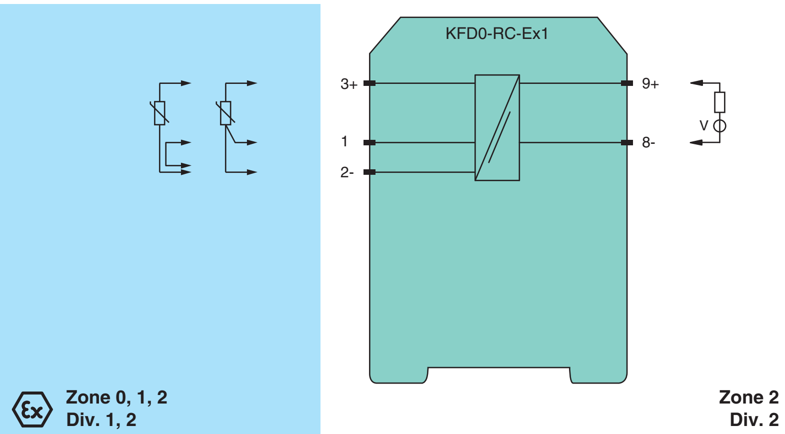
Digital Outputs

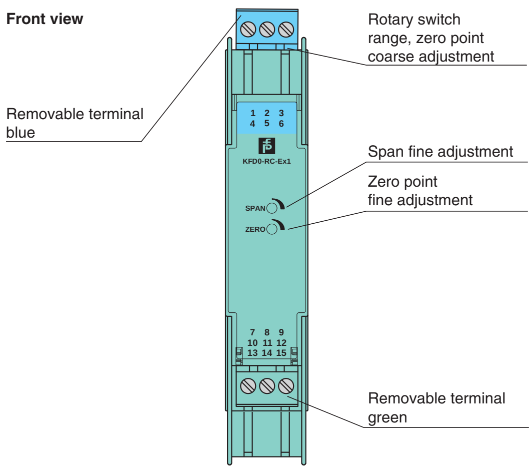
Analog Inputs

Analog Outputs

Accessories

Diagrams





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ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
Transmitter Power Supplies				
DN421	1, 2	19.6	30.4	596
	2, 3	5	52	64
KCD2-STC-Ex1	1, 2	25.2	100	630
	3, 4	7.2	100	25
KFD2-STC4-Ex1	1, 3	25.4	86.8	551
	2, 3	3.5	74	64
	1, 2, 3	25.4	115	584
	5, 6	8.7	0	–
KFD2-STC4-Ex1-Y122583	1, 3	25.4	86.8	551
	2, 3	3.5	74	64
	1, 2, 3	25.4	115	584
	5, 6	8.7	0	–
KFD2-STC4-Ex1.H	1, 3	27.2	93	632
	2, 3	3.5	73	64
	1, 2, 3	27.2	117	639
	5, 6	8.7	0	–
KFD2-STV4-Ex1-1	1, 3	25.4	86.8	551
	2, 3	3.5	74	64
	1, 2, 3	25.4	115	584
	5, 6	8.7	0	–
KFD2-STV4-Ex1-2	1, 3	25.4	86.8	551
	2, 3	3.5	74	64
	1, 2, 3	25.4	115	584
	5, 6	8.7	0	–
KFD2-STC4-Ex1.2O	1, 3	25.4	86.8	551
	2, 3	3.5	74	64
	1, 2, 3	25.4	115	584
	5, 6	8.7	0	–
KFD2-STC4-Ex1.2O-Y122582	1, 3	25.4	86.8	551
	2, 3	3.5	74	64
	1, 2, 3	25.4	115	584
	5, 6	8.7	0	–
KFD2-STC4-Ex1.2O.H	1, 3	27.2	93	632
	2, 3	3.5	73	64
	1, 2, 3	27.2	117	639
	5, 6	8.7	0	–
KFD2-STV4-Ex1.2O-1	1, 3	25.4	86.8	551
	2, 3	3.5	74	64
	1, 2, 3	25.4	115	584
	5, 6	8.7	0	–
KFD2-STV4-Ex1.2O-2	1, 3	25.4	86.8	551
	2, 3	3.5	74	64
	1, 2, 3	25.4	115	584
	5, 6	8.7	0	–
KFD2-STC4-Ex2	1, 3; 4, 6	25.2	93	586
KFD2-STC4-Ex2-Y203646	1, 3; 4, 6	25.2	93	586
KFD2-STV4-Ex2-1	1, 3; 4, 6	25.2	93	586
KFD2-STV4-Ex2-2	1, 3; 4, 6	25.2	93	586
KFD2-STC3-Ex1	1, 3	25.2	93	587
KFD2-STV3-Ex1-1	1, 3	25.2	93	587
KFD2-STV3-Ex1-2	1, 3	25.2	93	587

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Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
Transmitter Power Supplies with Trip Value				
KFD2-CRG2-Ex1.D	1, 3	25.8	93	603
	2, 3	5	0.3	0.3
	1, 2, 3	25.8	112	720
KFU8-CRG2-Ex1.D	1, 3	25.8	93	603
	2, 3	5	0.3	0.3
	1, 2, 3	25.8	112	720
Transmitter Power Supplies with HART Communication (HART Loop Converter)				
KFD2-HLC-Ex1.D	1, 3, 4	25.2	104.9	661
	2, 3, 5	1.1	11.9	4
KFD2-HLC-Ex1.D.2W	1, 3, 4	25.2	104.9	661
	2, 3, 5	1.1	11.9	4
KFD2-HLC-Ex1.D.4S	1, 3, 4	25.2	104.9	661
	2, 3, 5	1.1	11.9	4
Current Repeaters				
KFD0-SCS-Ex1.55	1, 3	23.1	28	647
KFD0-CS-Ex1.50P	1, 2	25.2	93	585
KFD0-CS-Ex1.51P	1, 2	25.2	93	585
KFD0-CS-Ex1.52	1, 2	25.2	0	–
KFD0-CS-Ex1.54	1, 2	28	93	653
KFD0-CS-Ex2.50P	1, 2; 4, 5	25.2	93	585
KFD0-CS-Ex2.51P	1, 2; 4, 5	25.2	93	585
KFD0-CS-Ex2.52	1, 2; 4, 5	25.2	0	–
KFD0-CS-Ex2.54	1, 2; 4, 5	28	93	653
Voltage Repeaters				
KFD2-VR2-Ex1.50M	4, 5	5.5	2.4	3.3
KFD2-VR2-Ex1.500M	4, 5	5.5	2.4	3.3
KFD2-VR-Ex1.12	4, 5	12	2.8	8.4
KFD2-VR-Ex1.18	4, 5	18	4.2	19
KFD2-VR-Ex1.19	4, 5	18	4.2	19
KFD2-VR-Ex1.19-Y109129	4, 5	15.5	7.2	28
KFD2-VR4-Ex1.26	1, 3, 4, 5	25.2	90	570
	2, 4, 6	1.2	0.12	0.036
Current and Voltage Converters				
KFD0-CC-Ex1	1, 2	9.6	0.5	1.1
KFD2-WAC2-Ex1.D	1, 2, 3, 4, 5, 6	14	238	833
Temperature Converters and Repeaters				
KFD2-UT2-Ex1	1, 2, 3, 4	9	22	50
KFD2-UT2-Ex1-1	1, 2, 3, 4	9	22	50
KFD2-UT2-Ex2	1, 2, 3, 4, 5, 6	9	22	50
KFD2-UT2-Ex2-1	1, 2, 3, 4, 5, 6	9	22	50
KFD0-TR-Ex1	1, 2, 3	16.1	33	131
KFD0-TT-Ex1	1, 2, 3	16.1	0.8	3.2
KCD2-RR-Ex1	1, 2, 3, 4	12.4	17.4	54
Temperature Converters with Trip Value				
KFD2-GU-Ex1	1, 2, 3, 4, 5, 6	10.5	27	70
KFD2-GUT-Ex1.D	1, 2, 3, 4, 6	13.1	21	67
	2, 6	13.1	8	67
KFU8-GUT-Ex1.D	1, 2, 3, 4, 6	13.1	21	67
	2, 6	13.1	8	67
Potentiometers and Resistor Converters				
KFD2-PT2-Ex1	1, 2, 3, 4, 5	10.4	31.4	82
KFD2-PT2-Ex1-1	1, 2, 3, 4, 5	10.4	31.4	82
KFD2-PT2-Ex1-4	1, 2, 3, 4, 5	10.4	31.4	82
KFD2-PT2-Ex1-5	1, 2, 3, 4, 5	10.4	31.4	82
KFD0-RC-Ex1	1, 2, 3	16.2	13.1	53

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CSA Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)
Current Repeaters			
KFD0-CS-Ex1.50P	1, 2	25.2	93
KFD0-CS-Ex1.51P	1, 2	25.2	93
KFD0-CS-Ex1.52	1, 2	28	0
KFD0-CS-Ex1.54	1, 2	28	93
KFD0-CS-Ex2.50P	1, 2; 4, 5	25.2	93
KFD0-CS-Ex2.51P	1, 2; 4, 5	25.2	93
KFD0-CS-Ex2.52	1, 2; 4, 5	28	0
KFD0-CS-Ex2.54	1, 2; 4, 5	28	93
Voltage Repeaters			
KFD2-VR-Ex1.18	4, 5	18	4.2
KFD2-VR-Ex1.19	4, 5	18	4,2
KFD2-VR-Ex1.19-Y109129	4, 5	15.5	7.2
Current and Voltage Converters			
KFD0-CC-Ex1	1, 2	9.6	0.5
Temperature Converters and Repeaters			
KFD2-UT2-Ex1	1, 2, 3, 4	9	22
KFD2-UT2-Ex1-1	1, 2, 3, 4	9	22
KFD2-UT2-Ex2	1, 2, 3, 4, 5, 6	9	22
KFD2-UT2-Ex2-1	1, 2, 3, 4, 5, 6	9	22
KFD0-TR-Ex1	1, 2, 3	8.9	19
KFD0-TT-Ex1	1, 2, 3	6.4	6.4
Potentiometers and Resistor Converters			
KFD2-PT2-Ex1	1, 2, 3, 4, 5	10.4	31.4
KFD2-PT2-Ex1-1	1, 2, 3, 4, 5	10.4	31.4
KFD2-PT2-Ex1-4	1, 2, 3, 4, 5	10.4	31.4
KFD2-PT2-Ex1-5	1, 2, 3, 4, 5	10.4	31.4

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FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
Transmitter Power Supplies					
KCD2-STC-Ex1	1, 2	25.2	100	–	–
	3, 4	7.2	100	–	–
Transmitter Power Supplies with Trip Value					
KFD2-CRG2-Ex1.D	1, 3	25,8	93.7	–	–
	2, 3	5	0.3	–	–
	1, 2, 3	25,8	112	–	–
KFU8-CRG2-Ex1.D	1, 3	25,8	93.7	–	–
	2, 3	5	0.3	–	–
	1, 2, 3	25,8	112	–	–
Current Repeaters					
KFD0-CS-Ex1.50P	1, 2	25.2	93	–	–
KFD0-CS-Ex1.51P	1, 2	25.2	93	–	–
KFD0-CS-Ex1.52	1, 2	28	0	–	–
KFD0-CS-Ex1.54	1, 2	28.5	95	–	–
KFD0-CS-Ex2.50P	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex2.51P	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex2.52	1, 2; 4, 5	28	0	–	–
KFD0-CS-Ex2.54	1, 2; 4, 5	28.5	95	–	–
Voltage Repeaters					
KFD2-VR-Ex1.18	4, 5	18	4.2	–	–
KFD2-VR-Ex1.19	4, 5	18	4.2	–	–
KFD2-VR-Ex1.19-Y109129	4, 5	15.5	7.2	–	–
Current and Voltage Converters					
KFD2-WAC2-Ex1.D	1, 2, 3, 4, 5, 6	14	238	–	–
Temperature Converters and Repeaters					
KCD2-RR-Ex1	1, 2, 3, 4	–	–	12.4	17.4
Potentiometers and Resistor Converters					
KFD2-PT2-Ex1	1, 2, 3, 4, 5	–	–	11	33
KFD2-PT2-Ex1-1	1, 2, 3, 4, 5	–	–	10.4	31.4
KFD2-PT2-Ex1-4	1, 2, 3, 4, 5	–	–	10.4	31.4
KFD2-PT2-Ex1-5	1, 2, 3, 4, 5	–	–	10.4	31.4

UL Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
Transmitter Power Supplies					
KCD2-STC-Ex1	1, 2	25.2	100	–	–
	3, 4	7.2	100	–	–
KFD2-STC4-Ex1	1, 3	25.4	86.8	–	–
	2, 3	3.5	74	–	–
	1, 2, 3	–	–	25.4	115
KFD2-STC4-Ex1-Y122583	1, 3	25.4	86.8	–	–
	2, 3	3.5	74	–	–
	1, 2, 3	–	–	25.4	115
KFD2-STC4-Ex1.H	1, 3	27.2	93	–	–
	2, 3	3.5	73	–	–
	1, 2, 3	27.2	117	–	–
KFD2-STV4-Ex1-1	1, 3	25.4	86.8	–	–
	2, 3	3.5	74	–	–
	1, 2, 3	–	–	25.4	115
KFD2-STV4-Ex1-2	1, 3	25.4	86.8	–	–
	2, 3	3.5	74	–	–
	1, 2, 3	–	–	25.4	115

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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
KFD2-STC4-Ex1.2O	1, 3	25.4	86.8	–	–
	2, 3	3.5	74	–	–
	1, 2, 3	–	–	25.4	115
KFD2-STC4-Ex1.2O-Y122582	1, 3	25.4	86.8	–	–
	2, 3	3.5	74	–	–
	1, 2, 3	–	–	25.4	115
KFD2-STC4-Ex1.2O.H	1, 3	27.2	93	–	–
	2, 3	3.5	73	–	–
	1, 2, 3	27.2	117	–	–
KFD2-STV4-Ex1.2O-1	1, 3	25.4	86.8	–	–
	2, 3	3.5	74	–	–
	1, 2, 3	–	–	25.4	115
KFD2-STV4-Ex1.2O-2	1, 3	25.4	86.8	–	–
	2, 3	3.5	74	–	–
	1, 2, 3	–	–	25.4	115
KFD2-STC4-Ex2	1, 3; 4, 6	25.2	93	–	–
KFD2-STC4-Ex2-Y203646	1, 3; 4, 6	25.2	93	–	–
KFD2-STV4-Ex2-1	1, 3; 4, 6	25.2	93	–	–
KFD2-STV4-Ex2-2	1, 3; 4, 6	25.2	93	–	–
KFD2-STC3-Ex1	1, 3	28	93	–	–
KFD2-STV3-Ex1-1	1, 3	28	93	–	–
KFD2-STV3-Ex1-2	1, 3	28	93	–	–
Current Repeaters					
KFD0-CS-Ex1.50P	1, 2	25.2	93	–	–
KFD0-CS-Ex1.51P	1, 2	25.2	93	–	–
KFD0-CS-Ex1.52	1, 2	28	0	–	–
KFD0-CS-Ex1.54	1, 2	28.5	95	–	–
KFD0-CS-Ex2.50P	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex2.51P	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex2.52	1, 2; 4, 5	28	0	–	–
KFD0-CS-Ex2.54	1, 2; 4, 5	28.5	95	–	–
Voltage Repeaters					
KFD2-VR2-Ex1.50M	4, 5	5.5	2.4	–	–
KFD2-VR2-Ex1.500M	4, 5	5.5	2.4	–	–
KFD2-VR-Ex1.18	4, 5	18	4.2	–	–
KFD2-VR-Ex1.19	4, 5	18	4.2	–	–
KFD2-VR-Ex1.19-Y109129	4, 5	15.5.	7.2	–	–
KFD2-VR4-Ex1.26	1, 3, 4, 5	-25.4	90	–	–
	2, 4, 6	1.2	0.12	–	–
	2, 3, 4, 5, 6	–	–	-26.4	90
Temperature Converters and Repeaters					
KFD2-UT2-Ex1	1, 2, 3, 4	9	22	–	–
KFD2-UT2-Ex1-1	1, 2, 3, 4	9	22	–	–
KFD2-UT2-Ex2	1, 2, 3; 4, 5, 6	9	22	–	–
KFD2-UT2-Ex2-1	1, 2, 3; 4, 5, 6	9	22	–	–
KCD2-RR-Ex1	1, 2, 3, 4	12.4	17	–	–
Temperature Converters with Trip Value					
KFD2-GU-Ex1	1, 2, 3, 4, 5, 6	–	–	10.5	27
Potentiometers and Resistor Converters					
KFD2-PT2-Ex1	1, 2, 3, 4, 5	–	–	10.4	31.4
KFD2-PT2-Ex1-1	1, 2, 3, 4, 5	–	–	10.4	31.4
KFD2-PT2-Ex1-4	1, 2, 3, 4, 5	–	–	10.4	31.4
KFD2-PT2-Ex1-5	1, 2, 3, 4, 5	–	–	10.4	31.4

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Current Drivers

Model Number	Channels	Input (Control System) 0 mA ... 20 mA	Input 0 mA ... 40 mA	Input 4 mA ... 20 mA	Input 0 V ... 10 V	Output (Field) mA	Output 0 V ... 10 V	Output Fire Alarm	Output Line Fault Detection	SMART	Supply 24 V DC	Supply Loop Powered	SIL	Installation in Zone 2/Division 2	Page
KCD2-SCD-Ex1	1			■		■				■	■		2	■	264
KFD2-SCD-Ex1.LK	1			■		■			■	■	■		2	■	265
KFD2-SCD2-Ex1.LK	1			■		■			■	■	■		2		266
KFD2-SCD2-Ex1-Y1	1			■		■			■	■	■		2		267
KFD2-CD2-Ex1	1			■		■					■		2		268
KFD2-CD-Ex1.32.**	1	■			■	■	■				■		2	■	269
KFD2-SCD2-Ex2.LK	2			■		■			■	■	■		2		270
KFD2-SCD2-Ex2-Y1	2			■		■			■	■	■		2		271
KFD2-CD2-Ex2	2			■		■					■		2		272
KFD0-SCS-Ex1.55	1			■		■			■	■		■	2	■	273
KFD0-CS-Ex1.50P	1			■		■		■				■	2	■	274
KFD0-CS-Ex1.51P	1		■			■		■				■	2	■	275
KFD0-CS-Ex1.53	1		■			■						■	2	■	276
KFD0-CS-Ex2.50P	2			■		■		■				■	2	■	277
KFD0-CS-Ex2.51P	2		■			■		■				■	2	■	278
KFD0-CS-Ex2.53	2		■			■						■	2	■	279

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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current output up to 650 Ω load**
- **HART I/P and valve positioner**
- **Lead breakage monitoring**
- **Accuracy 0.1 %**
- **Housing width 12.5 mm**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It drives SMART I/P converters, electrical valves, and positioners in hazardous areas.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

Current transferred across the DC/DC converter is repeated at terminals 1 and 2.

An open field circuit presents a high input impedance to the control side to allow lead breakage monitoring by control system.

If the loop resistance for the digital communication is too low, an internal resistor of 250 Ω between terminals 6 and 8 is available, which may be used as the HART communication resistor.

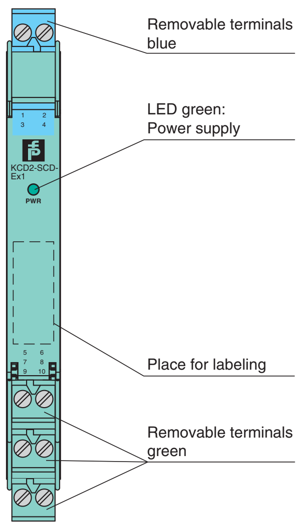
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

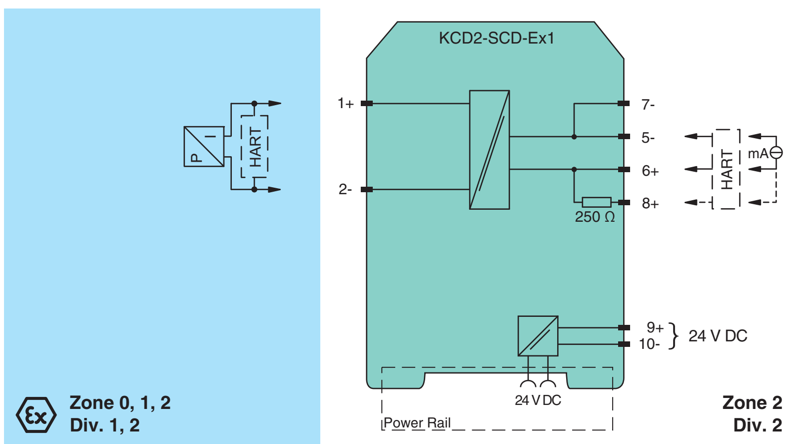
Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 700 mW
Input	
Input signal	4 ... 20 mA limited to approx. 30 mA
Input resistance	> 100 kΩ at max. 23 V, with field wiring open
Output	
Current	4 ... 20 mA
Load	0 ... 650 Ω
Voltage	≥ 13 V at 20 mA
Ripple	20 mV_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ ± 0.1 % incl. non-linearity and hysteresis
Influence of ambient temperature	< 2 µA/K (0 ... 60 °C (32 ... 140 °F)); < 4 µA/K (-20 ... 0 °C (-4 ... 32 °F))
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB)
Rise time	10 to 90 % ≤ 100 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 124 mm (0.5 x 4.5 x 4.9 in), housing type A2
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	CESI 06 ATEX 021
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC, [Ex ia D] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X
FM approval	
Control drawing	16-533FM-12 (cFMus)
UL approval	
Control drawing	16-533FM-12 (cULus)
IECEx approval	IECEx CES 06.0001
Approved for	[Ex ia] IIC

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.3 W
Input	
Voltage drop U_d	approx. 4 V or internal resistance 200 Ω at 20 mA
Input resistance	> 100 kΩ, when wiring resistance in the field < 50 Ω or > 800 Ω at 20 mA
Current	4 ... 20 mA limited to approx. 25 mA
Output	
Current	4 ... 20 mA
Load	100 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): ≤ ± 0.1 % incl. non-linearity and hysteresis
Influence of ambient temperature	≤ ± 20 ppm/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 115 x 115 mm (0.8 x 4.5 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7215
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **HART I/P and valve positioner**
- **Line fault detection (LFD)**
- **Accuracy 0.1 %**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It drives SMART I/P converters, electrical valves, and positioners in hazardous areas.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

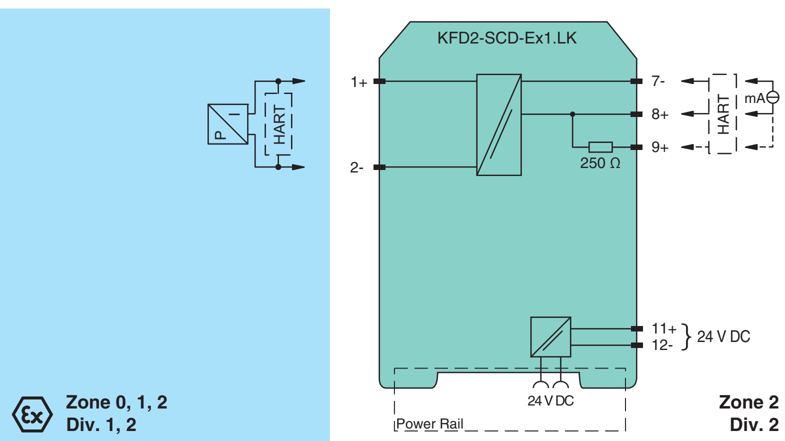
Current transferred across the DC/DC converter is repeated at terminals 1 and 2.

An open and shorted field circuit presents a high input impedance to the control side to allow line fault detection by control system.

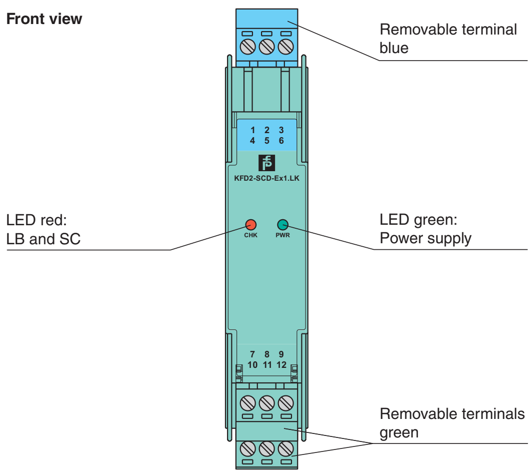
If the loop resistance for the digital communication is too low, an internal resistor of 250 Ω between terminals 8 and 9 is available, which may be used as the HART communication resistor.

Sockets for the connection of a HART communicator are integrated into the terminals of the device.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **HART I/P and valve positioner**
- **Line fault detection (LFD)**
- **Accuracy 0.05 %**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It drives SMART I/P converters, electrical valves, and positioners in hazardous areas.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

Current transferred across the DC/DC converter is repeated at terminals 1 and 2.

An open and shorted field circuit presents a high input impedance to the control side to allow line fault detection by control system.

If the loop resistance for the digital communication is too low, an internal resistor of 250 Ω between terminals 8 and 9 is available, which may be used as the HART communication resistor.

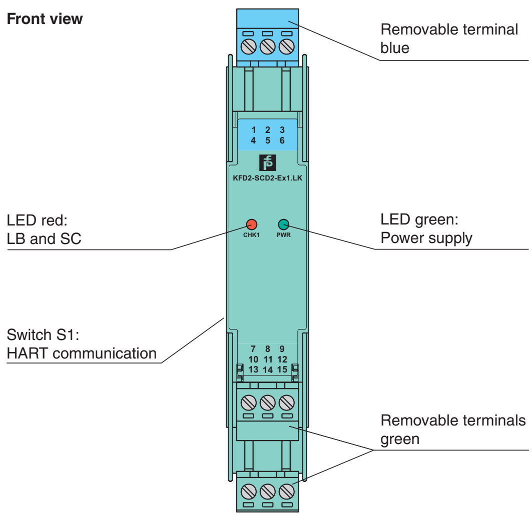
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

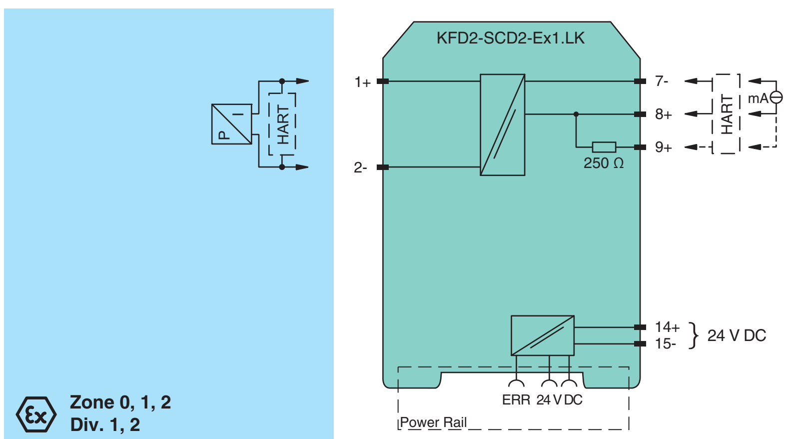
A unique collective error messaging feature is available when used with the Power Rail system.

Technical data

Supply	
Rated voltage	10 ... 35 V DC
Power consumption	1 W at 20 mA
Input	
Voltage drop U_d	approx. 4 V or internal resistance 200 Ω at 20 mA
Input resistance	> 100 kΩ, when wiring resistance in the field > 16 V (equivalent to 800 Ω at 20 mA)
Current	4 ... 20 mA limited to approx. 25 mA
Output	
Current	4 ... 20 mA
Load	100 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): 10 µA incl. non-linearity, calibration, hysteresis, supply and load changes
Influence of ambient temperature	1 µA/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7240
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 04.0014
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Diagrams





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Technical data

Supply	
Rated voltage	10 ... 35 V DC
Power loss	0.8 W
Power consumption	1 W at 20 mA
Input	
Voltage drop U_d	approx. 4 V (equivalent to 200 Ω at 20 mA)
Input resistance	> 100 kΩ, when wiring resistance in the field > 16 V (equivalent to 800 Ω at 20 mA)
Current	4 ... 20 mA limited to approx. 25 mA
Output	
Current	4 ... 20 mA
Load	0 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): 10 µA incl. non-linearity, calibration, hysteresis, supply and load changes
Influence of ambient temperature	1 µA/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7240
Group, category, type of protection	Ex II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 04.0014
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **HART I/P and valve positioner**
- **Lead breakage monitoring**
- **Accuracy 0.05 %**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It drives SMART I/P converters, electrical valves, and positioners in hazardous areas.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

Current transferred across the DC/DC converter is repeated at terminals 1 and 2.

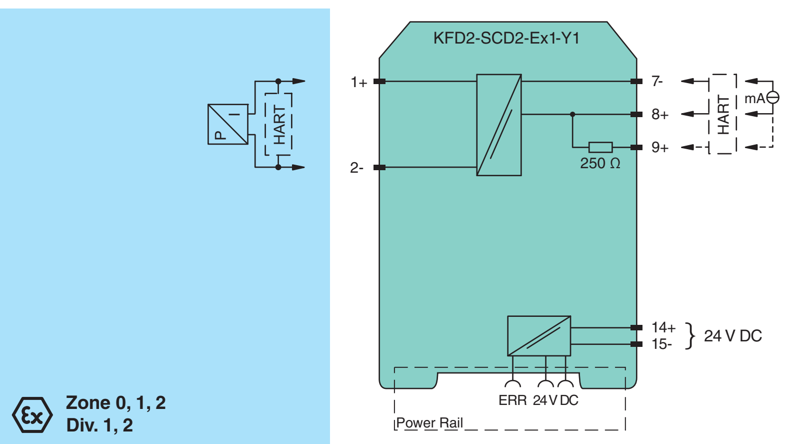
An open field circuit presents a high input impedance to the control side to allow lead breakage monitoring by control system.

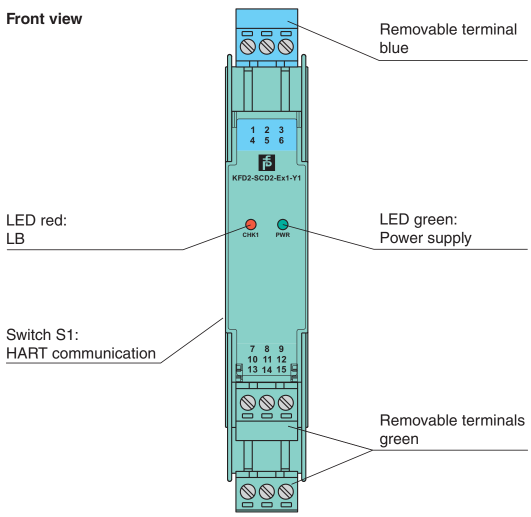
If the loop resistance for the digital communication is too low, an internal resistor of 250 Ω between terminals 8 and 9 is available, which may be used as the HART communication resistor.

Sockets for the connection of a HART communicator are integrated into the terminals of the device.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **I/P and valve positioners**
- **Accuracy 0.05 %**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It drives a 4 mA ... 20 mA signal from the safe area to I/P converters, electrical valves, and positioners located in the hazardous area.

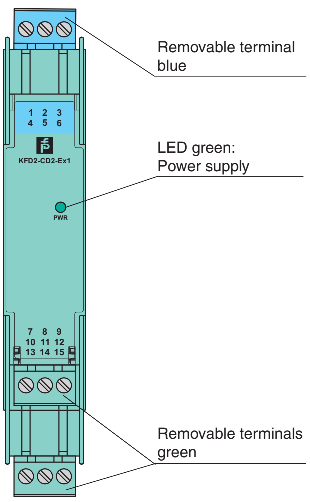
The voltage drop at the current input (terminals 7-, 8+) is lower than 2.5 V equivalent to an input resistance of 125 Ω at 20 mA.

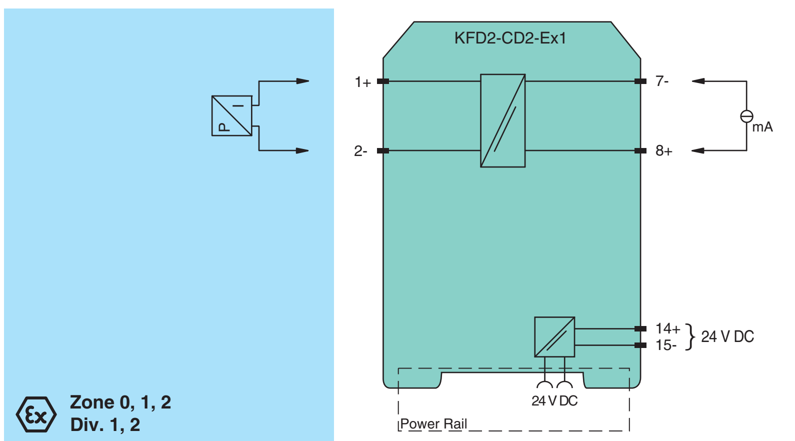
Technical data

Supply	
Rated voltage	10 ... 35 V DC
Power consumption	1 W at 20 mA
Input	
Voltage drop U_d	approx. 2.5 V or internal resistance 125 Ω at 20 mA
Input resistance	≤ 2.5 V, equivalent to 125 Ω at 20 mA
Ripple	50 μA_{rms}
Current	4 ... 20 mA limited to approx. 24 mA
Output	
Current	4 ... 20 mA
Load	0 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): 10 µA incl. non-linearity, calibration, hysteresis, supply and load changes
Influence of ambient temperature	1 µA/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7240
Group, category, type of protection	Ex II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 04.0014
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Diagrams

Front view





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Technical data

Input	Output					
	0 ... 20 mA	4 ... 20 mA	0 ... 5 V	1 ... 5 V	0 ... 10 V	2 ... 10 V
0 ... 20 mA	0	2	–	–	12	1
4 ... 20 mA	1	(0)	–	–	13	(12)
0 ... 5 V	3	5	(15)	–	–	–
1 ... 5 V	–	(3)	–	(15)	–	–
0 ... 10 V	6	8	21	–	15	–
2 ... 10 V	–	(6)	–	–	–	(15)

Ordering example:
- Input 0 ... 10 V and output 4 ... 20 mA is code number 8.
- Model number is KFD2-CD-Ex1.32.8.
- The values shown in parentheses are subsets of the larger signal range.

Supply	
Rated voltage	20 ... 35 V DC
Input	
Input current	≤ 100 µA up to 50 °C (122 °F) at 10 V
Limit	optional current input: Input current: approx. ≤ 40 mA optional voltage input: input voltage: 12 V DC
Output	
Current	optional current output: 0 ... 20 mA/ optional voltage output: ≤ 20 mA
Voltage	optional current output: 17 V at 20 mA/ optional voltage output: 0 ... 10 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 02 ATEX 7203
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Features

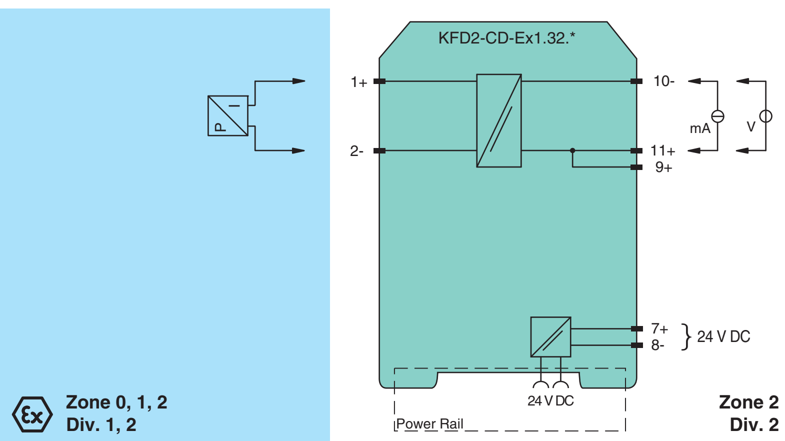
- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current or voltage output**
- **Factory configured input/output**
- **Accuracy 0.1 %**
- **Up to SIL2 acc. to IEC 61508**

Function

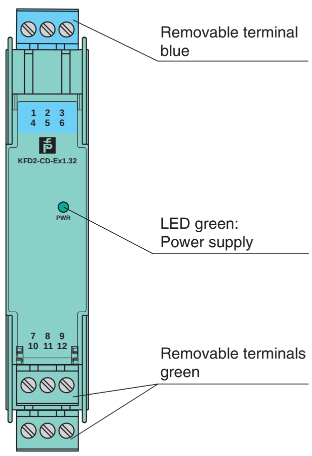
This isolated barrier is used for intrinsic safety applications. It drives a voltage or current signal from the safe area to I/P converters, electrical valves and positioners located in the hazardous areas.

This barrier is designed to provide various inputs and outputs of voltage and current.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **HART I/P and valve positioner**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It drives SMART I/P converters, electrical valves, and positioners in hazardous areas.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

An open and shorted field circuit presents a high input impedance to the control side to allow line fault detection by control system.

If the loop resistance for the digital communication is too low, an internal resistor of 250 Ω between terminals 8, 9 and 11, 12 is available, which may be used as the HART communication resistor.

Terminal 3 (6) is connected to terminal 2 (5) via a 100 Ω resistor. Terminal 3 (6) can be used for an earth leakage connection in combination with the KFD2-ELD-Ex16.

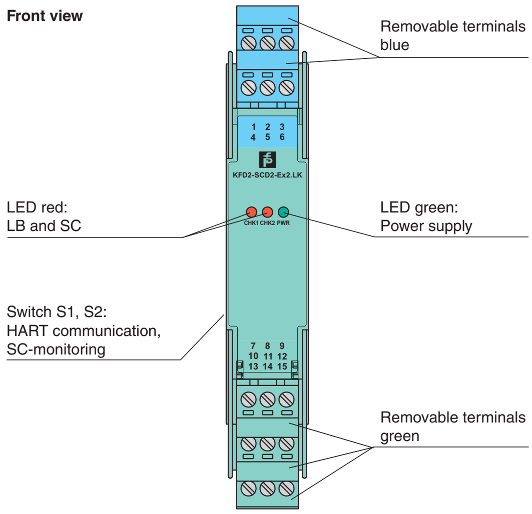
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

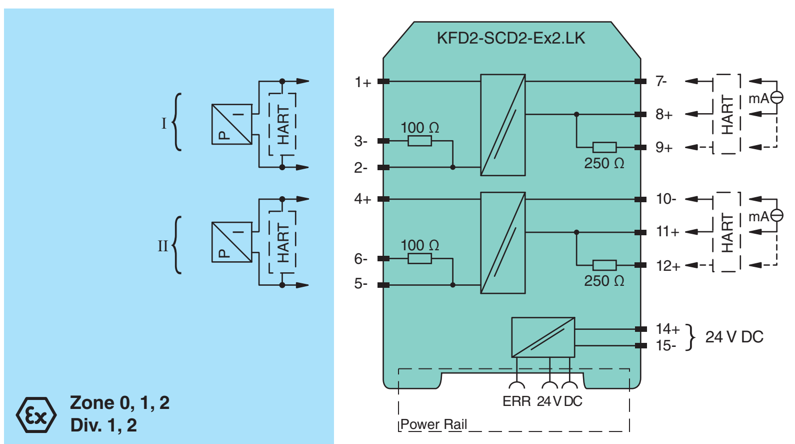
A unique collective error messaging feature is available when used with the Power Rail system.

Technical data

Supply	
Rated voltage	10 ... 35 V DC
Power consumption	1.8 W at 20 mA
Input	
Voltage drop U_d	< 4 V
Input resistance	> 100 kΩ, when an open circuit is applied to the field circuit
Current	4 ... 20 mA limited to approx. 25 mA
Output	
Current	4 ... 20 mA
Load	100 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): 10 µA incl. non-linearity, calibration, hysteresis, supply and load changes
Influence of ambient temperature	1 µA/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7240
Group, category, type of protection	Ex II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 04.0014
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Diagrams





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Technical data

Supply	
Rated voltage	10 ... 35 V DC
Power consumption	1.8 W at 20 mA
Input	
Voltage drop U_d	approx. 4 V (equivalent to 200 Ω at 20 mA)
Input resistance	> 100 kΩ, when wiring resistance in the field > 16 V (equivalent to 800 Ω at 20 mA)
Current	4 ... 20 mA limited to approx. 25 mA
Output	
Current	4 ... 20 mA
Load	0 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): 10 µA incl. non-linearity, calibration, hysteresis, supply and load changes
Influence of ambient temperature	1 µA/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in, housing type B2
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7240
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 04.0014
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **HART I/P and valve positioner**
- **Lead breakage monitoring**
- **Accuracy 0.05 %**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It drives SMART I/P converters, electrical valves, and positioners in hazardous areas.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

Current transferred across the DC/DC converter is repeated at terminals 1, 2 and 4, 5.

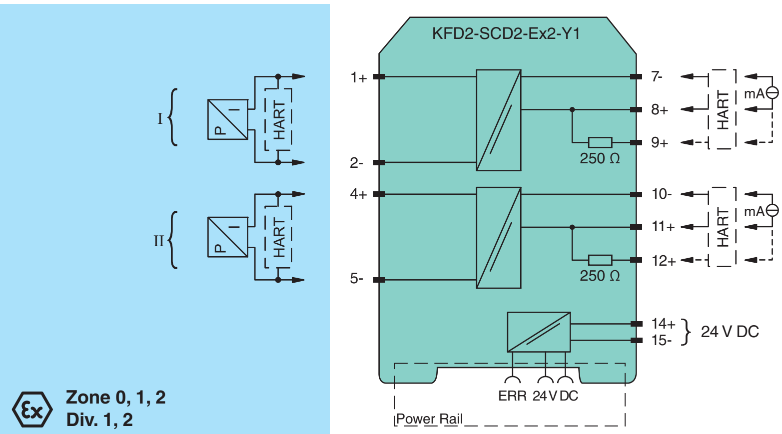
An open field circuit presents a high input impedance to the control side to allow lead breakage monitoring by control system.

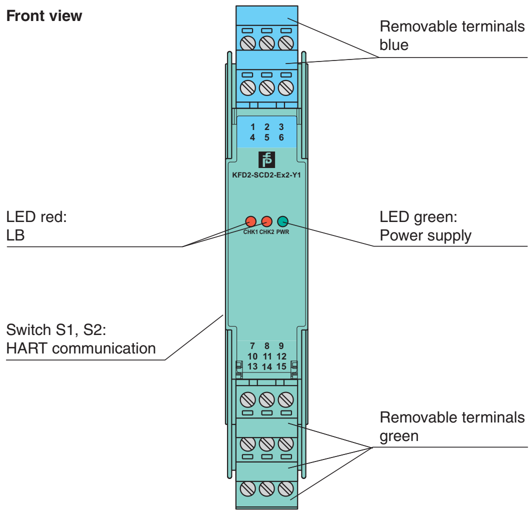
If the loop resistance for the digital communication is too low, an internal resistor of 250 Ω between terminals 8, 9 and 11, 12 is available, which may be used as the HART communication resistor.

Sockets for the connection of a HART communicator are integrated into the terminals of the device.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **I/P and valve positioners**
- **Accuracy 0.05 %**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It drives a 4 mA ... 20 mA signal from the safe area to I/P converters, electrical valves, and positioners located in the hazardous area.

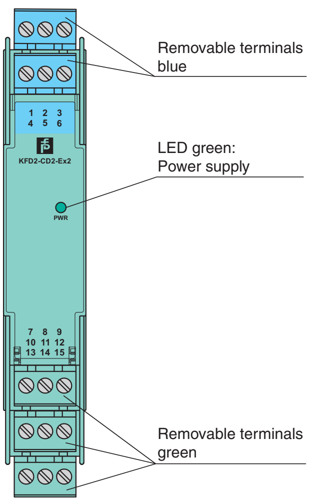
The voltage drop at the current input (terminals 7-, 8+ and 10-, 11+) is lower than 2.5 V equivalent to an input resistance of 125 Ω at 20 mA.

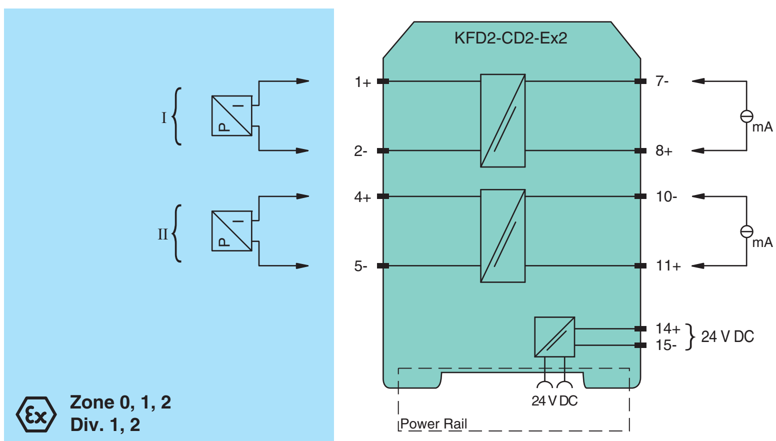
Technical data

Supply	
Rated voltage	10 ... 35 V DC
Power consumption	1 W at 20 mA
Input	
Voltage drop U_d	approx. 2.5 V or internal resistance 125 Ω at 20 mA
Input resistance	≤ 2.5 V, equivalent to 125 Ω at 20 mA
Ripple	50 μA_{rms}
Current	4 ... 20 mA limited to approx. 25 mA
Output	
Current	4 ... 20 mA
Load	0 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): 10 µA incl. non-linearity, calibration, hysteresis, supply and load changes
Influence of ambient temperature	1 µA/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7240
Group, category, type of protection	Ⓔⓧ II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔⓧ II 3G Ex nA II T4 [device in zone 2]
UL approval	
Control drawing	116-0173 (cULus)
IECEx approval	IECEx BAS 04.0014
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	loop powered
Power loss	0.2 W
Field circuit	
Connection	terminals 1+, 2/3-
Available voltage	≥ 16 V for supply voltage > 21 V
Current	4 ... 20 mA (linear transmission 1 ... 22 mA)
Load	≤ 800 Ω (at 20 mA)
Supply circuit	
Voltage	max. 30 V DC
Current	4 ... 20 mA (quiescent current < 0.5 mA)
Power loss	150 mW at 20 mA and U_E < 24 V
Transfer characteristics	
Deviation	
After calibration	≤ ± 80 µA linearity, load and voltage dependence at 20 °C (68 °F)
Influence of ambient temperature	< 0.5 µA/K
Damping	approx. 3 dB
Rise time	≤ 20 µs at 0 Ω, ≤ 600 µs with 800 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2064
Group, category, type of protection	Ex II (2)G [EEx ib] IIC
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G EEx nA II T4 X
FM approval	device with FM approval on request

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **HART I/P or transmitter power supply**
- **Low voltage drop**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

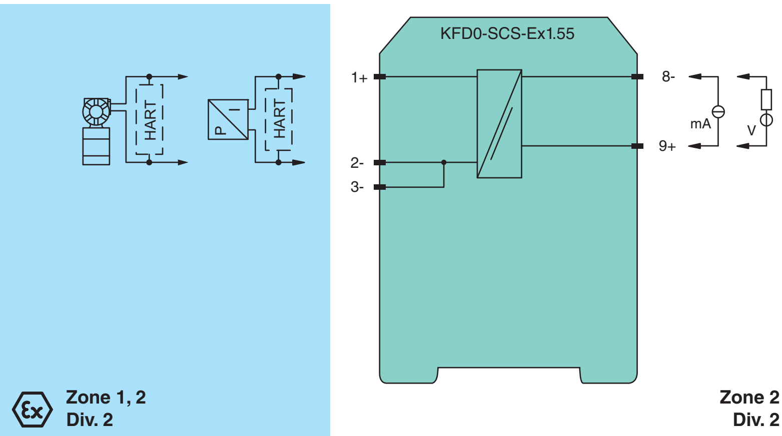
This isolated barrier is used for intrinsic safety applications. It is loop powered and isolates a 4 mA ... 20 mA signal for transmitters and positioners and is HART compatible.

With a noticeably lower power loss compared to active isolator modules, the barriers 5 V drop makes it suitable for transmitter applications with unstable power sources between 20 V DC ... 30 V DC.

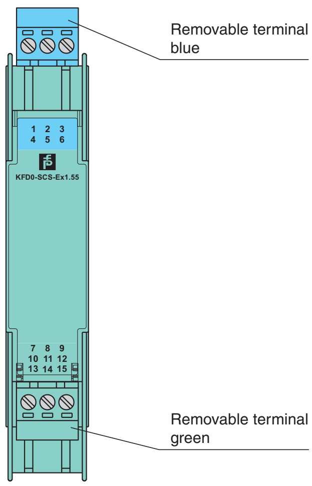
Line fault detection of the field circuit is possible if the control loop in the safe area is monitored for overscale or underscale conditions of the 4 mA ... 20 mA range.

The module can also be used for controlling solenoid valves and discrete outputs, such as LEDs. In this case, terminals 8- and 9+ are driven with a 24 V signal.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **I/P or transmitter power supply**
- **Accuracy 0.1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers DC signals from fire alarms, smoke alarms, and temperature sensors in hazardous areas. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

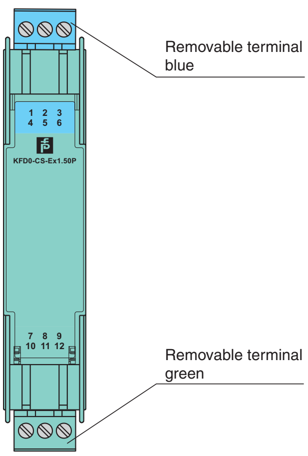
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

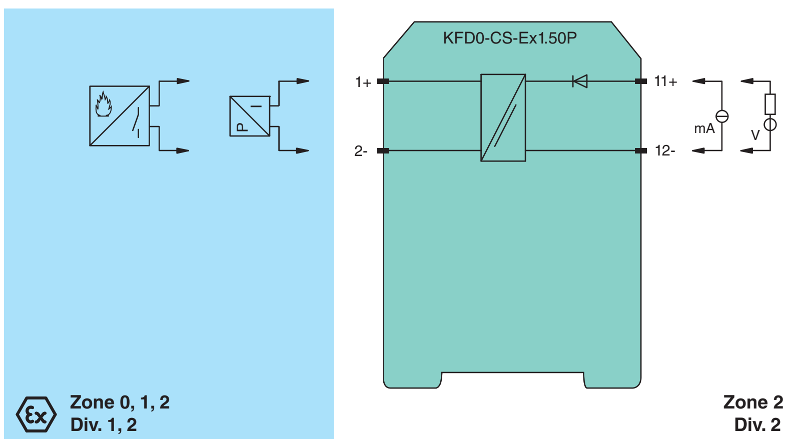
Technical data

Supply	
Rated voltage	loop powered
Safe circuit	
Voltage	5 ... 35 V DC
Current	4 ... 20 mA
Power loss	at 20 mA and U_{in} < 24.3 V: < 250 mW per channel at 20 mA and U_{in} > 24.3 V: < 500 mW per channel
Field circuit	
Voltage	for 5V < U_e < 24.3V: ≥ 0.9 x U_e - (0.37 x current in mA) - 1.0 for U_{in} > 24.3 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24.3 V : ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 20 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ at 20 °C (68 °F)
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Inputs/Outputs (not intrinsically safe)	
Voltage	4 ... 35 V DC
Current	0 ... 40 mA
Power loss	at 40 mA and U_{in} < 22 V: 700 mW per channel at 40 mA and U_{in} > 22 V: 1.2 W per channel
Inputs/Outputs (Intrinsically safe)	
Output voltage	for 4 V < U_{in} < 24 V: ≥ U_{in} - (0.37 x current in mA) - 1.0 for U_{in} > 24 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24 V: ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 200 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ and current ≤ 20 mA at 20 °C (68 °F)
Influence of ambient temperature	≤ ± 2 µA/K at U_{in} ≤ 20 V; ≤ ± 5 µA/K at U_{in} > 20 V
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 0 mA ... 40 mA**
- **I/P or transmitter power supply**
- **Accuracy 1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

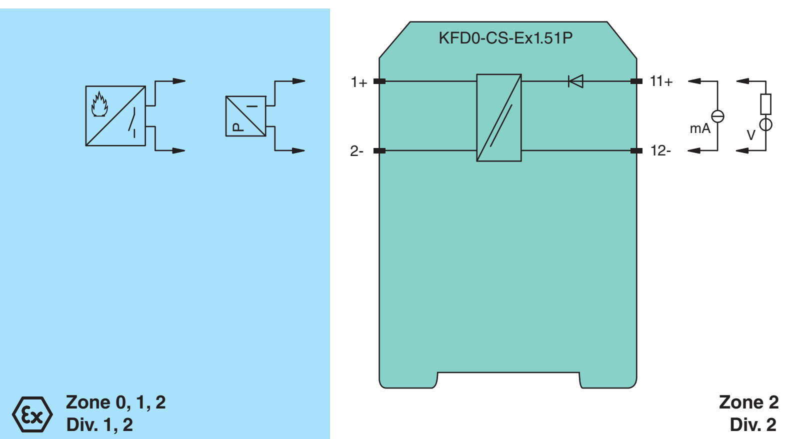
Function

This isolated barrier is used for intrinsic safety applications. It transfers DC signals from fire alarms, smoke alarms, and temperature sensors in hazardous areas. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

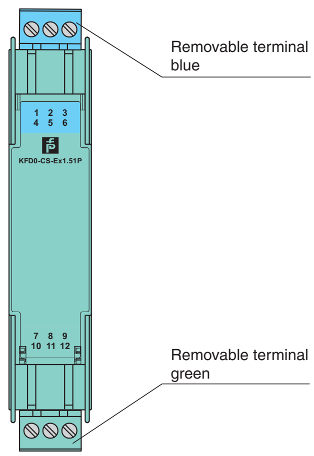
Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

KFD0-CS-Ex1.53

Features

- **1-channel isolated barrier**
- **DC supply (loop powered)**
- **Current input/output 0 mA ... 40 mA**
- **Accuracy 1 %**
- **Low voltage drop**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It is a loop-powered and controls I/P converters.

It is ideal for applications where the control system in the safe area handles a small load.

Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

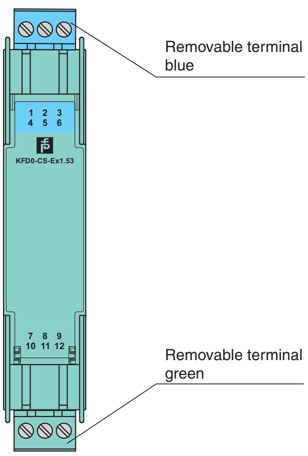
Note: The input voltage of 10 V must not be exceeded.

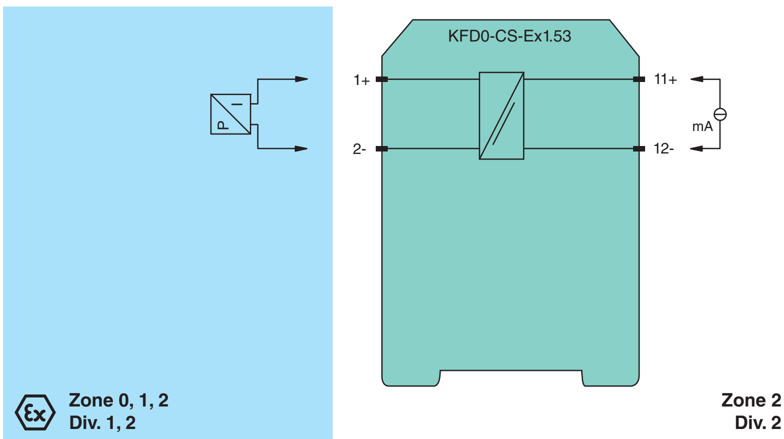
Technical data

Supply	
Rated voltage	loop powered
Power loss	0.2 W
Input	
Rated voltage U_i	10 V DC
Rated current I_i	0 ... 40 mA
Output	
Load	≤ 270 Ω at 20 mA
Short-circuit current	≤ 95 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	± 200 µA incl. calibration, linearity, hysteresis and load fluctuations at the output
Influence of ambient temperature	≤ 2 µA/K (0 ... 50 °C (32 ... 122 °F)), ≤ 5 µA/K (-20 ... 60 °C (-4 ... 140 °F))
Rise time	≤ 20 ms at 4 ... 20 mA and 250 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	loop powered
Safe circuit	
Voltage	5 ... 35 V DC
Current	4 ... 20 mA
Power loss	at 20 mA and U_{in} < 24.3 V: < 250 mW per channel at 20 mA and U_{in} > 24.3 V: < 500 mW per channel
Field circuit	
Voltage	for 5V < U_e < 24.3V: ≥ 0.9 x U_e - (0.37 x current in mA) - 1.0 for U_{in} > 24.3 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24.3 V : ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 20 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ at 20 °C (68 °F)
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **I/P or transmitter power supply**
- **Accuracy 0.1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

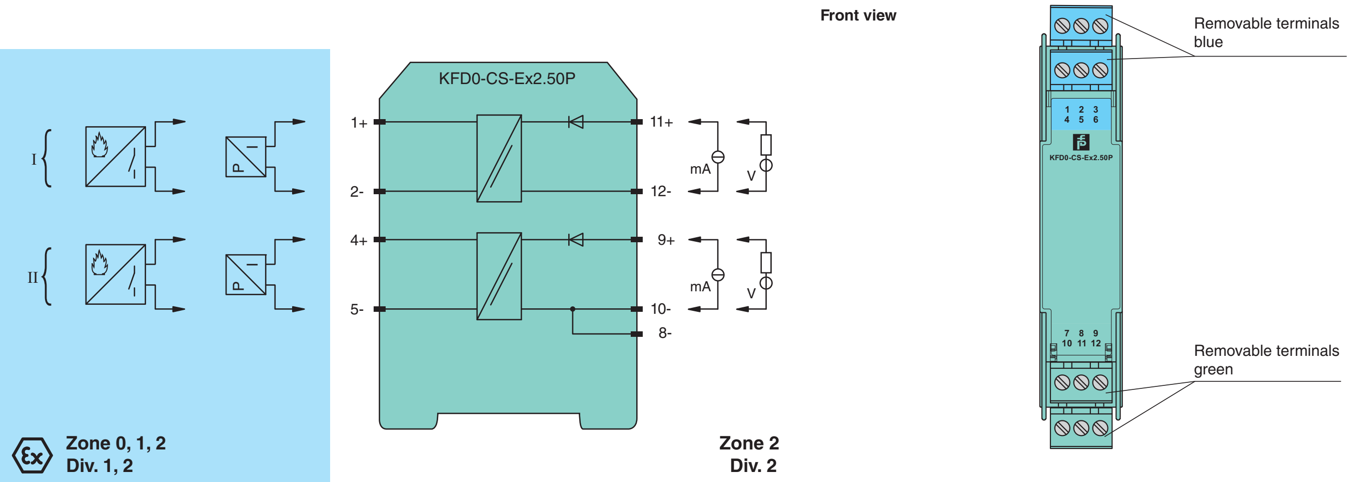
Function

This isolated barrier is used for intrinsic safety applications. It transfers DC signals from fire alarms, smoke alarms, and temperature sensors in hazardous areas. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

Diagrams



Edition 908837 (US) / 208599 (EU) 11/2010

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 0 mA ... 40 mA**
- **I/P or transmitter power supply**
- **Accuracy 1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers DC signals from fire alarms, smoke alarms, and temperature sensors in hazardous areas. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

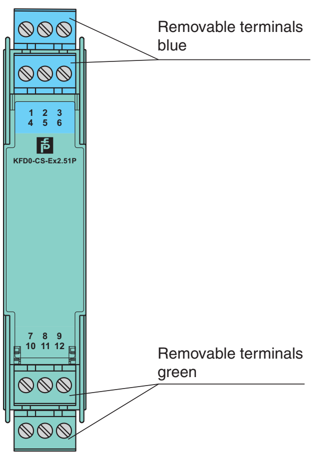
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

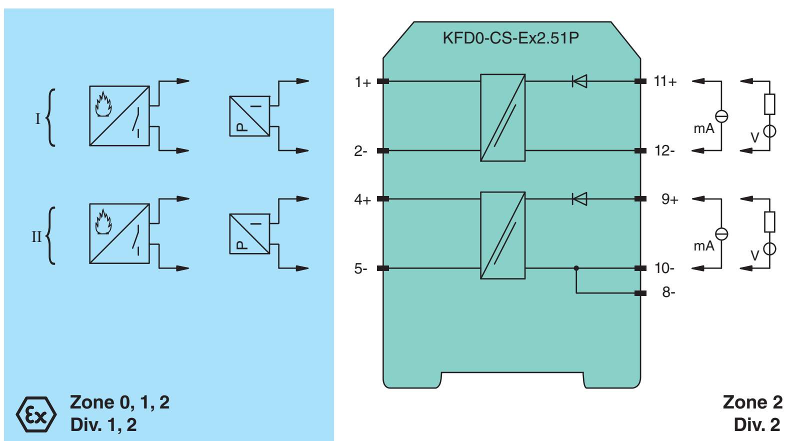
Technical data

Supply	
Rated voltage	loop powered
Inputs/Outputs (not intrinsically safe)	
Voltage	4 ... 35 V DC
Current	0 ... 40 mA
Power loss	at 40 mA and U_{in} < 22 V: 700 mW per channel at 40 mA and U_{in} > 22 V: 1.2 W per channel
Inputs/Outputs (Intrinsically safe)	
Output voltage	for 4 V < U_{in} < 24 V: ≥ U_{in} - (0.37 x current in mA) - 1.0 for U_{in} > 24 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24 V: ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 200 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ and current ≤ 20 mA at 20 °C (68 °F)
Influence of ambient temperature	≤ ± 2 µA/K at U_{in} ≤ 20 V; ≤ ± 5 µA/K at U_{in} > 20 V
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Power loss	0.4 W
Input	
Rated voltage U_i	10 V DC
Rated current I_i	0 ... 40 mA
Output	
Load	≤ 270 Ω at 20 mA
Short-circuit current	≤ 95 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	± 200 µA incl. calibration, linearity, hysteresis and load fluctuations at the output
Influence of ambient temperature	≤ 2 µA/K (0 ... 50 °C (32 ... 122 °F)), ≤ 5 µA/K (-20 ... 60 °C (-4 ... 140 °F))
Rise time	≤ 20 ms at 4 ... 20 mA and 250 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	see page 280 for entity parameters
EC-Type Examination Certificate	BAS 98 ATEX 7343
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Statement of conformity	TÜV 99 ATEX 1499 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0129
UL approval	
Control drawing	116-0173 (cULus)
CSA approval	
Control drawing	116-0132

Features

- **2-channel isolated barrier**
- **DC supply (loop powered)**
- **Current input/output 0 mA ... 40 mA**
- **Accuracy 1 %**
- **Low voltage drop**
- **Up to SIL2 acc. to IEC 61508**

Function

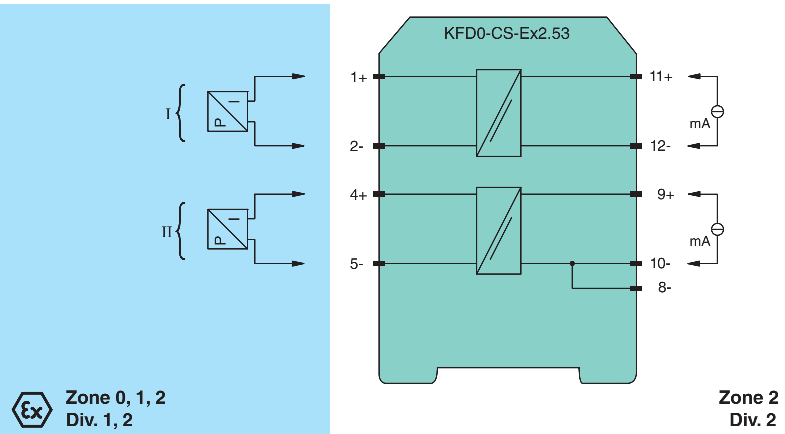
This isolated barrier is used for intrinsic safety applications. It is a loop-powered and controls I/P converters.

It is ideal for applications where the control system in the safe area handles a small load.

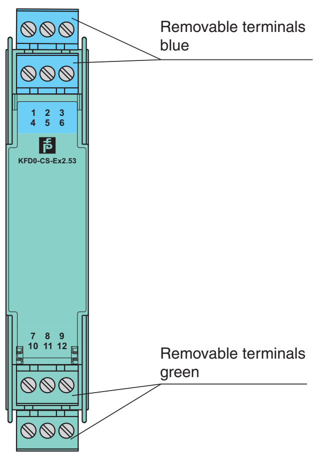
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

Note: The input voltage of 10 V must not be exceeded.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
KCD2-SCD-Ex1	1, 2	25.2	100	630
KFD2-SCD-Ex1.LK	1, 2	25.2	93	585
KFD2-SCD2-Ex1.LK	1, 2	25.2	93	585
KFD2-SCD2-Ex1-Y1	1, 2	25.2	93	585
KFD2-CD2-Ex1	1, 2	25.2	93	585
KFD2-CD-Ex1.32.*	1, 2	25.2	93/95	586
KFD2-SCD2-Ex2.LK	1, 2; 4, 5	25.2	93	585
KFD2-SCD2-Ex2-Y1	1, 2; 4, 5	25.2	93	585
KFD2-CD2-Ex2	1, 2; 4, 5	25.2	93	585
KFD0-SCS-Ex1.55	1, 3	23.1	28	647
KFD0-CS-Ex1.50P	1, 2	25.2	93	585
KFD0-CS-Ex1.51P	1, 2	25.2	93	585
KFD0-CS-Ex1.53	1, 2	10.5	95	247
KFD0-CS-Ex2.50P	1, 2; 4, 5	25.2	93	585
KFD0-CS-Ex2.51P	1, 2; 4, 5	25.2	93	585
KFD0-CS-Ex2.53	1, 2; 4, 5	10.5	95	247

CSA Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)
KFD2-SCD-Ex1.LK	1, 2	25.2	93
KFD2-CD-Ex1.32.*	1, 2	28	93
KFD0-CS-Ex1.50P	1, 2	25.2	93
KFD0-CS-Ex1.51P	1, 2	25.2	93
KFD0-CS-Ex1.53	1, 2	10.5	95
KFD0-CS-Ex2.50P	1, 2; 4, 5	25.2	93
KFD0-CS-Ex2.51P	1, 2; 4, 5	25.2	93
KFD0-CS-Ex2.53	1, 2; 4, 5	10.5	95

FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
KCD2-SCD-Ex1	1, 2	25.2	100	–	–
KFD2-SCD-Ex1.LK	1, 2	25.2	93	–	–
KFD2-CD-Ex1.32.*	1, 2	28	93	–	–
KFD0-CS-Ex1.50P	1, 2	25.2	93	–	–
KFD0-CS-Ex1.51P	1, 2	25.2	93	–	–
KFD0-CS-Ex1.53	1, 2	10.5	95	–	–
KFD0-CS-Ex2.50P	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex2.51P	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex2.53	1, 2; 4, 5	10.5	95	–	–

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UL Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
KCD2-SCD-Ex1	1, 2	25.2	100	–	–
KFD2-SCD-Ex1.LK	1, 2	25.2	93	–	–
KFD2-SCD2-Ex1.LK	1, 2	25.2	93	–	–
KFD2-SCD2-Ex1-Y1	1, 2	25.2	93	–	–
KFD2-CD2-Ex1	1, 2	25.2	93	–	–
KFD2-CD-Ex1.32.*	1, 2	25.2	95	–	–
KFD2-SCD2-Ex2.LK	1, 2; 4, 5	25.2	93	–	–
KFD2-SCD2-Ex2-Y1	1, 2; 4, 5	25.2	93	–	–
KFD2-CD2-Ex2	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex1.50P	1, 2	25.2	93	–	–
KFD0-CS-Ex1.51P	1, 2	25.2	93	–	–
KFD0-CS-Ex1.53	1, 2	10.5	95	–	–
KFD0-CS-Ex2.50P	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex2.51P	1, 2; 4, 5	25.2	93	–	–
KFD0-CS-Ex2.53	1, 2; 4, 5	10.5	95	–	–

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Supply and Installation

Model Number	Description	Page
KFA6-STR-1.24.500	Power Supply, 24 V, 500 mA	285
KFA6-STR-1.24.4	Power Supply, 24 V, 4 A	286
KFD2-EB2	Power Feed Module	287
KFD2-EB2.R4A.B	Redundant Power Feed Module	288
UPR-03-*	Universal Power Rail, insert for DIN rail, 3-lead	289
UPR-05-*	Universal Power Rail, insert for DIN rail, 5-lead	290
UPR-E	End Cap for Universal Power Rail UPR-**-*	289, 290
UPR-I	Insulation Spacer for Universal Power Rail UPR-**-*	295
K-DUCT-BU-UPR-03	Profile Rail with UPR-03-* insert, 3-lead, wiring comb field side blue	291
K-DUCT-BU-UPR-05	Profile Rail with UPR-05-* insert, 5-lead, wiring comb field side blue	292
K-DUCT-GY-UPR-03	Profile Rail with UPR-03-* insert, 3-lead, wiring comb field side grey	293
K-DUCT-GY-UPR-05	Profile Rail with UPR-05-* insert, 5-lead, wiring comb field side grey	294
E/AL-NS35	End Bracket	296
TS 35 Typ 12	End Bracket	296
K-MS	Mounting Socket	295

Terminal Blocks

Model Number	Description	Type		Module		Number of Poles	Test Sockets	Cold Junction Compensation	Packaging Unit, Color				Page
		Screw Terminal	Cage Clamp Terminal	KC-Modules	KF-Modules				Green	Blue	Black	Red	
K-CJC-BK	Terminal Block	■			■	3		■			1		297
K-CJC-BU	Terminal Block	■			■	3		■		1			297
KC-ST-5BU	Terminal Block	■		■		2				5			297
KC-ST-5GN	Terminal Block	■		■		2			5				297
KF-ST-5BU	Terminal Block	■			■	3				5			298
KF-ST-5GN	Terminal Block	■			■	3			5				298
KC-STP-5BU	Terminal Block	■		■		2	■			5			298
KC-STP-5GN	Terminal Block	■		■		2	■		5				298
KF-STP-5BU	Terminal Block	■			■	3	■			5			299
KF-STP-5GN	Terminal Block	■			■	3	■		5				299
KC-CTT-3GN2BU	Terminal Block		■	■		2	■		3	2			299
KC-CTT-5BU	Terminal Block		■	■		2	■			5			299
KC-CTT-5GN	Terminal Block		■	■		2	■		5				299
KF-CTT-3GN2BU	Terminal Block		■		■	3	■		3	2			300
KF-CTT-5BU	Terminal Block		■		■	3	■			5			300
KF-CTT-5GN	Terminal Block		■		■	3	■		5				300
KF-CP	Coding Pins			■	■							20 x 6	300

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Commissioning

Model Number	Description	Page
PACT*ware*™ 4.X	FDT-Framework	301
K-ADP-USB	Adapter with USB Interface	302
K-ADP1	Adapter with RS 232 Interface	303
IS01	Simulator	304

Further Accessories

Model Number	Description	Page
F-KD-Ex2	Clamp Module	305
F-KDR-Ex2	Clamp Module	306
F-NR-Ex1	NAMUR Resistance Network	307
K-500R0%1	Measuring Resistor	308
KF-SEAL	Adhesive Sticker	308
KCD0-LGH	Place Holder Barrier, KC Module	309
KFD0-LGH	Place Holder Barrier, KF Module	310
KFD0-LGH-GN	Place Holder Barrier, KF Module	311
KFD0-LGH-Y34868	Place Holder Barrier, KF Module	312

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Technical data

Supply	
Rated voltage	90 ... 253 V AC, 48 ... 63 Hz
Power loss	2.5 W
Output	
Current	500 mA at 60 °C (140 °F), permanent short-circuit protection (electronic)
Voltage	24 V ± 0.5 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

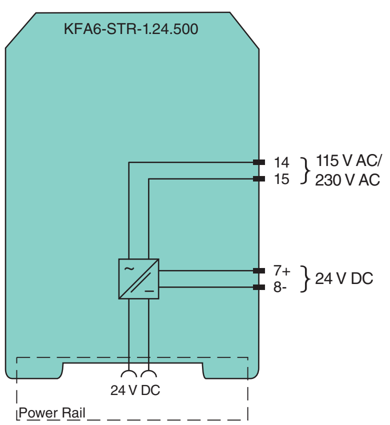
- **115/230 V AC supply**
- **Output 24 V DC, 500 mA**
- **Electronic short circuit protection**
- **Power Rail connection**

Function

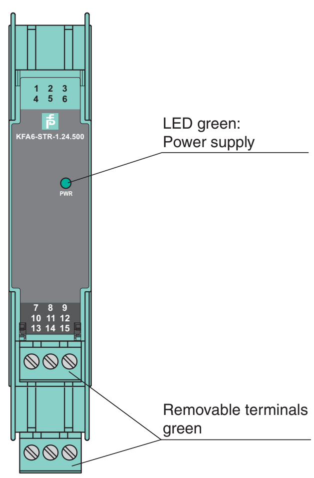
This regulated power supply provides 24 V DC, at 500 mA.

The KFA6-STR-1.24.500 features removable terminals and mounts directly on the Power Rail. This allows usage as Power Rail supply as well as stand alone power supply.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

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Features

- **115/230 V AC supply**
- **Output 24 V DC, 4 A**
- **Fused output**
- **Power Rail connection**

Function

This regulated power supply provides 24 V DC, at 4 A. It features removable terminals, LED fault indication, and mounts directly on the Power Rail.

Designed with a replaceable fuse and LED, it will provide a green visual indication for normal operation or a flashing red indication if a fault occurs.

Attention: Ignoring the safety instructions (i. e., touching hot sections when the device is open, handling malpractices) can be extremely dangerous.

When exceeding the values stated in the technical data, there is a danger of overheating. As a result, the operation of the power supply and its electrical safety may be impaired.

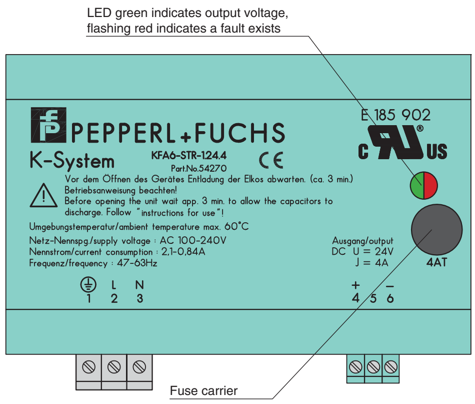
Before starting installation or service, switch mains off. Do not plug or unplug powered!

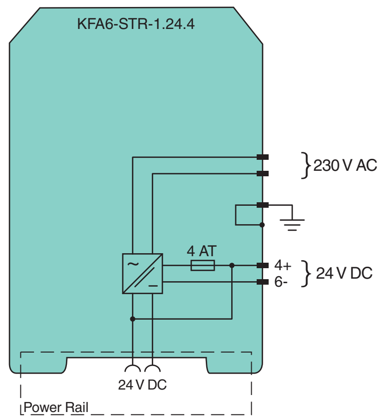
Technical data

Supply	
Rated voltage	92 ... 265 V AC, 47 ... 63 Hz
Rated current	2.1 ... 0.84 A
Failure override time	> 75 ms/230 V AC; 5 ms/115 V AC
Output	
Current	0 ... 4 A, Power Rail limiting by means of fuse 4 AT, electron. limitation typ. 4.6 A
Voltage	23.28 ... 24.72 V DC
Ripple	< 100 mV_{pp}
Efficiency	typ. 87 %
Overvoltage protected	< 28 V DC
Electromagnetic compatibility	
Safety	acc. to VDE 0805/EN 60950
Radio-interference supression	acc. to VDE 0875 Part 11, EN 55011 class B
Electrostatic discharge	acc. to IEC 60801-2
Contact discharging	8 kV
Air discharging	15 kV
Electromagnetic fields	acc. to IEC 801-3, 10 V/m
Burst IEC 60801-4	Input: 4 kV; output/capacitively coupled: 2 kV
Surge IEC 60801-5	asymmetrical: L, N -> PE 4 kV; symmetrical: L -> N 2 kV
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 800 g
Dimensions	140 x 103.5 x 99 mm (5.5 x 4.1 x 3.9 in)
Mounting	mounting clips for snap-mounting on DIN rail as per DIN EN 60715
Connection possibilities	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Data for application in connection with Ex-areas	
UL approval	UL recognized E185902

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC The maximum rated operational voltage of the devices plugged onto the Power Rail must not be exceeded.
Power loss	≤ 1 W
Output	
Power Rail feed	output current: ≤ 4 A
Fault signal	relay output: NO
Contact loading	40 V DC; 2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Fusing	5 AT
Ambient conditions	
Ambient temperature	-25 ... 60 °C (-13 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	
Statement of conformity	TÜV 00 ATEX 1618 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0160
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC
CSA approval	
Control drawing	116-0160
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC

Features

- **Interface for Power Rail**
- **Supply rating 4 A, external fused**
- **Relay contact output, reversible**
- **LED status indication**

Function

The power feed module interfaces 24 V DC power to the Power Rail at a maximum current of 4 A. The twin input terminals allow for daisy-chaining of supply (max. 10 A).

A green LED on the front of the unit indicates that power is on, and a red LED illuminates during error conditions.

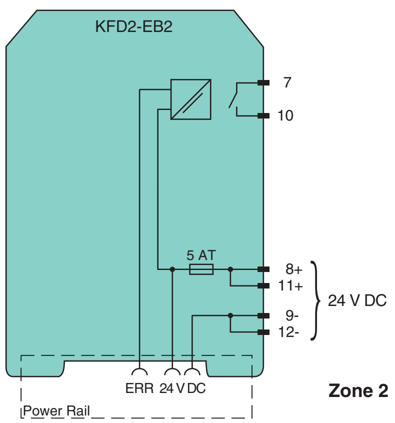
In the event of a field wiring or barrier fault from any barrier on the Power Rail, the integral collective error messaging relay alerts the controller via a single discrete I/O point.

This relay can be configured as normally open or normally closed.

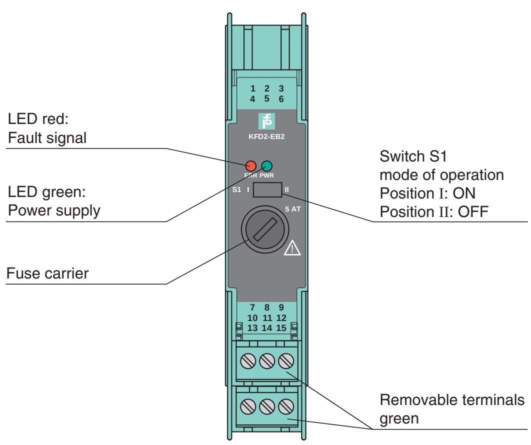
In the sense of functional safety (SIL) the device provides no dangerous failures. Thereby the safe condition of the supplied barrier must be defined as the powerless state. Thus the device will not influence the safety calculation or the SIL value.

This device is compatible with all versions of the Power Rail.

Diagrams



Front view



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Features

- **Interface for Power Rail**
- **Used for redundant configuration**
- **Supply rating 4 A, external fused**
- **Relay contact output, reversible**

Function

The power feed module interfaces 24 V DC power to the Power Rail at a maximum current of 4 A and is designed for applications requiring redundant power. The twin input terminals allow for daisy-chaining of supply (max. 10 A).

A green LED on the front of the unit indicates that power is on, and a red LED illuminates during error conditions.

In the event of a field wiring or barrier fault from any barrier on the Power Rail, the integral collective error messaging relay alerts the controller via a single digital I/O point. This relay can be configured as normally open or normally closed.

Additionally, the bus implemented in the Power Rail is forwarded to the outside terminals 13 and 15 for usage with KFD2-WAC2-Ex1.D RS 485 connection. Terminal 14 is only for test purposes.

In the sense of functional safety (SIL) the device provides no dangerous failures. Thereby the safe condition of the supplied barrier must be defined as the powerless state. Thus the device will not influence the safety calculation or the SIL value.

This device is compatible with all versions of the Power Rail and provides group fusing.

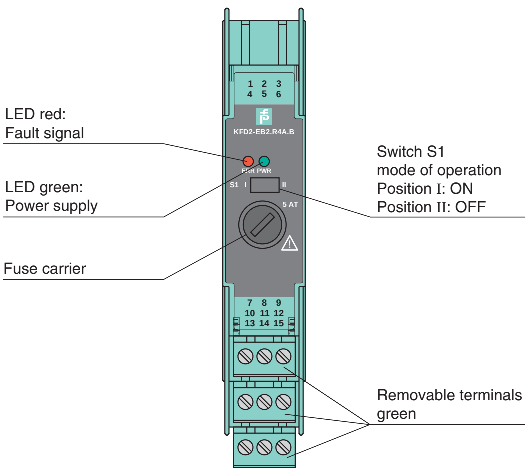
Note: Redundant systems require two KFD2-EB.R4A.B modules.

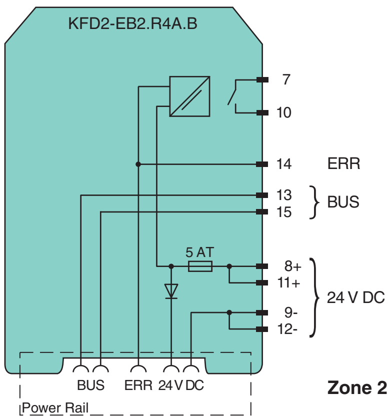
Technical data

Supply	
Rated voltage	20 ... 30 V DC The maximum rated operational voltage of the devices plugged onto the Power Rail must not be exceeded.
Power loss	≤ 2.4 W
Output	
Power Rail feed	output current: ≤ 4 A
Fault signal	relay output: NO
Contact loading	40 V DC; 2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Fusing	5 AT
Ambient conditions	
Ambient temperature	-25 ... 60 °C (-13 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	
Statement of conformity	TÜV 00 ATEX 1618 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0160
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC
CSA approval	
Control drawing	116-0160
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC

Diagrams

Front view





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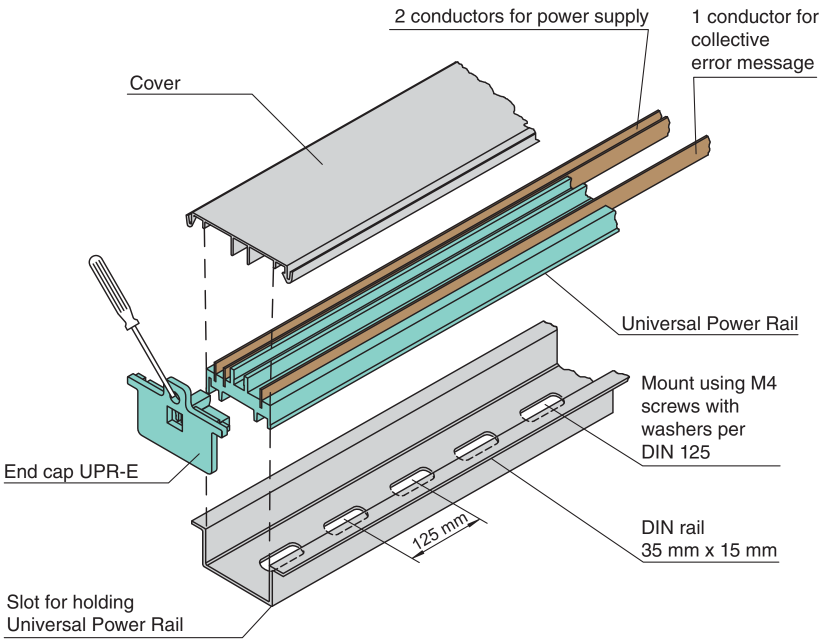
Dimensions



Technical data

Electrical specifications	
Rated voltage	24 V DC
Rated current	4 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Dimensions	UPR-03-S: 35 x 15 x 800 mm (1.4 x 0.6 x 31.5 in) UPR-03: 35 x 15 x 2000 mm (1.4 x 0.6 x 78.7 in)

Features

- **Gold plated 3-conductor insert in 35 mm DIN rail acc. to EN 60715**
- **Provides DC supply voltage to all equipped K-System modules**
- **Standard length 0.8 m (2.6 ft) or 2 m (6 ft), simple to customize to application space**
- **Eliminates daisy-chains**

Function

The universal Power Rail is a plastic insert with integral gold-plated conductors that fits into its own integral, 35 mm DIN rail and supplies components with power.

It has two conductors for power and one conductor for collective error messaging.

It reduces wiring and maintenance costs because it eliminates the need to daisy-chain the wires. It also simplifies expansion – just snap in a new module when you're ready to expand a system.

It comes in 2 m segments (UPR-03) or in 0.8 m segments (UPR-03-S) but can be cut to any size.

It is delivered with two UPR-E end caps. More end caps can be ordered separately.

In conjunction with K-System modules the universal Power Rail can be mounted in Zone 2.

Accessories

UPR-E

End cap for UPR-03-* and UPR-05-*

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Features

- **Gold plated 5-conductor insert in 35 mm DIN rail acc. to EN 60715**
- **Provides DC supply voltage and the bus connection to all equipped K-System modules**
- **Standard length 0.8 m (2.6 ft) or 2 m (6 ft), simple to customize to application space**
- **Eliminates daisy-chains**

Function

The universal Power Rail is a plastic insert with integral gold-plated conductors that fits into its own integral, 35 mm DIN rail and supplies components with power.

It has two conductors for power, one conductor for collective error messaging, and two conductors for bus connections.

It reduces wiring and maintenance costs because it eliminates the need to daisy-chain the wires. It also simplifies expansion – just snap in a new module when you're ready to expand a system.

It comes in 2 m segments (UPR-05) or in 0.8 m segments (UPR-05-S) but can be cut to any size.

It is delivered with two UPR-E end caps. More end caps can be ordered separately.

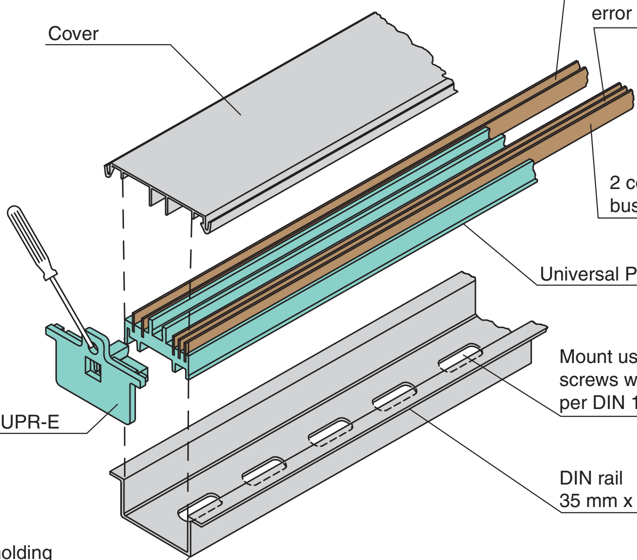
In conjunction with K-System modules the universal Power Rail can be mounted in Zone 2.

Accessories

UPR-E

End cap for UPR-03-* and UPR-05-*

Dimensions



Technical data

Electrical specifications	
Rated voltage	24 V DC
Rated current	4 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Dimensions	UPR-05-S: 35 x 15 x 800 mm (1.4 x 0.6 x 31.5 in) UPR-05: 35 x 15 x 2000 mm (1.4 x 0.6 x 78.7 in)

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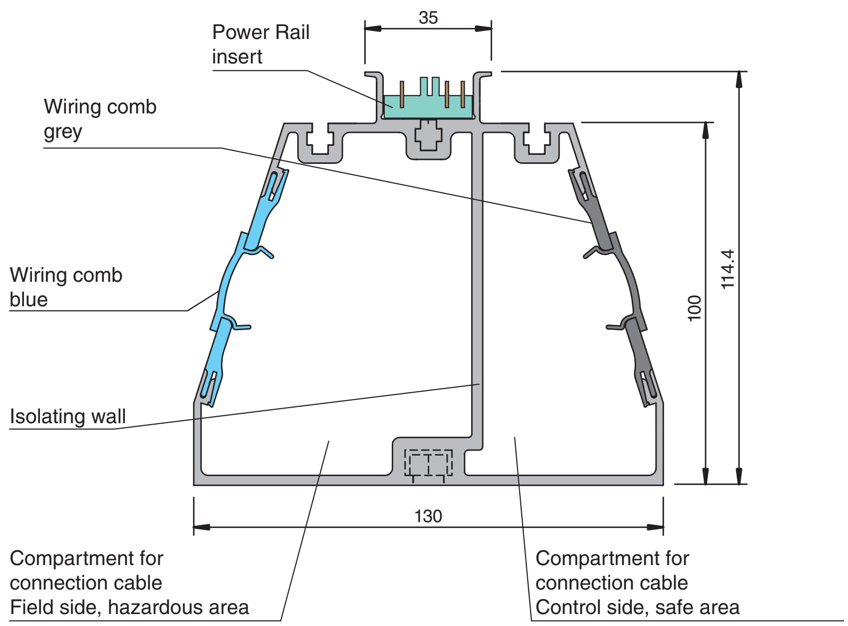
Dimensions



Technical data

Mechanical specifications	
Dimensions	130 x 114.4 x 1800 mm (5 x 4.5 x 71 in)

Features

- **Cable trunking with integrated Power Rail UPR-03**
- **Safe spacious separation of safe and hazardous signals**
- **No additional cable guides necessary**
- **Provides DC supply voltage to all equipped K-System modules**
- **Standard length 1.8 m (5.8 ft), simple to customize to application space**

Function

The profile rail can be used to provide space-saving mounting for interface modules and accommodate the associated wiring. The system and field cables for safe and hazardous signals are easily installed in the integral cable ducts of the profile rail. Thus no additional cable guides are necessary.

The power supply to the individual modules is preferably provided via the Power Rail UPR-03 that is integrated into the system. Additionally the Power Rail UPR-03 has one lead for collective error messaging.

The asymmetrical segmented connection compartment can be changed dependent on the required space by turning the profile rail. Please note that the Power Rail insert must be also rotated and the wiring combs of different colors must be changed too.

In conjunction with K-System modules the profile rail can be mounted in Zone 2.

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Features

- **Cable trunking with integrated Power Rail UPR-05**
- **Safe spacious separation of safe and hazardous signals**
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Function

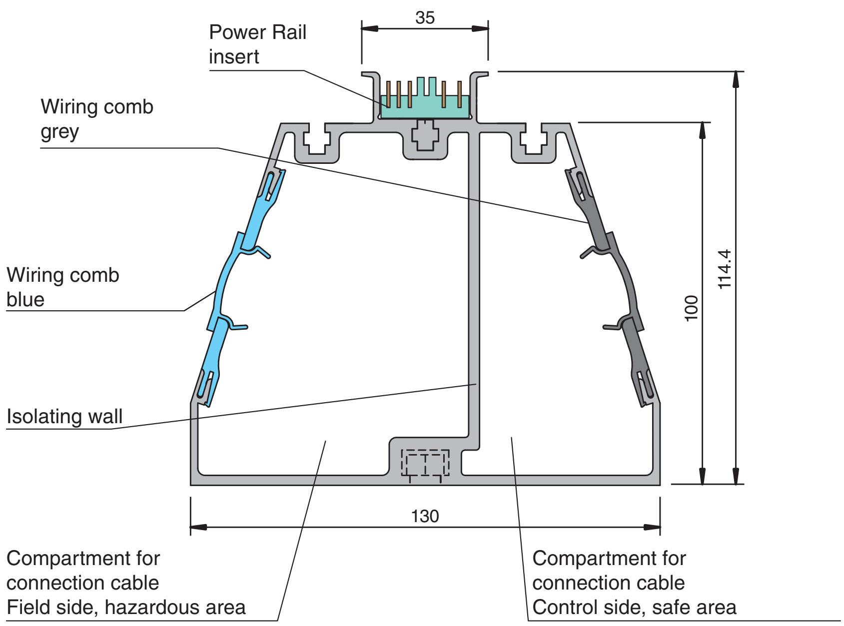
The profile rail can be used to provide space-saving mounting for interface modules and accommodate the associated wiring. The system and field cables for safe and hazardous signals are easily installed in the integral cable ducts of the profile rail. Thus no additional cable guides are necessary.

The power supply to the individual modules is preferably provided via the Power Rail UPR-05 that is integrated into the system. Additionally the Power Rail UPR-05 has one lead for collective error messaging and two leads for bus connections.

The asymmetrical segmented connection compartment can be changed dependent on the required space by turning the profile rail. Please note that the Power Rail insert must be also rotated and the wiring combs of different colors must be changed too.

In conjunction with K-System modules the profile rail can be mounted in Zone 2.

Dimensions



Technical data

Mechanical specifications	
Dimensions	130 x 114.4 x 1800 mm (5 x 4.5 x 71 in)

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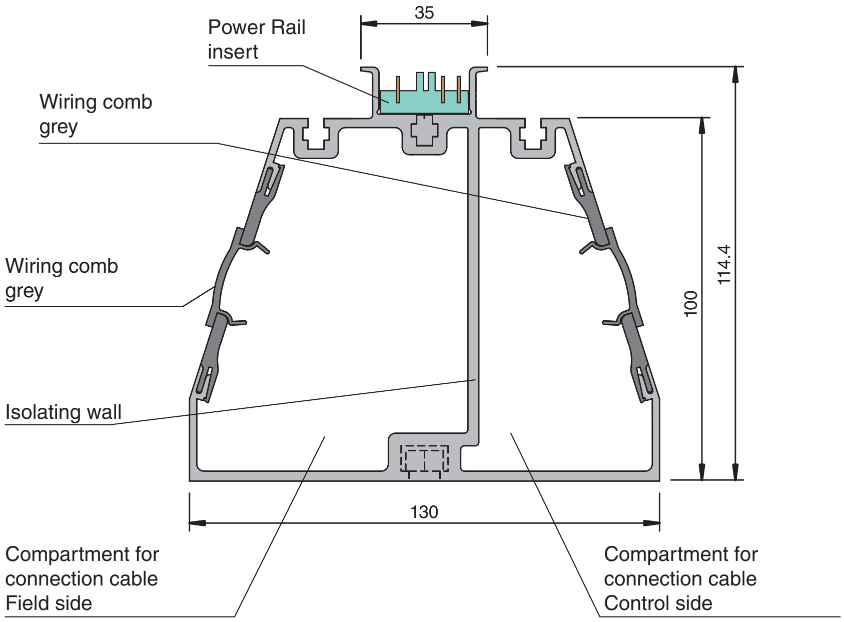
Dimensions



Technical data

Mechanical specifications	
Dimensions	130 x 114.4 x 1800 mm (5 x 4.5 x 71 in)

Features

- **Cable trunking with integrated Power Rail UPR-03**
- **Safe spacious separation of field and control signals**
- **No additional cable guides necessary**
- **Provides DC supply voltage to all equipped K-System modules**
- **Standard length 1.8 m (5.8 ft), simple to customize to application space**

Function

The profile rail can be used to provide space-saving mounting for interface modules and accommodate the associated wiring. The system and field cables are easily installed in the integral cable ducts of the profile rail. Thus no additional cable guides are necessary.

The power supply to the individual modules is preferably provided via the Power Rail UPR-03 that is integrated into the system. Additionally the Power Rail UPR-03 has one lead for collective error messaging.

The asymmetrical segmented connection compartment can be changed dependent on the required space by turning the profile rail. Please note that the Power Rail insert must be also rotated.

In conjunction with K-System modules the profile rail can be mounted in Zone 2.

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Features

- Cable trunking with integrated Power Rail UPR-05
- Safe spacious separation of field and control signals
- No additional cable guides necessary
- Provides DC supply voltage and the bus connection to all equipped K-System modules
- Standard length 1.8 m (5.8 ft), simple to customize to application space

Function

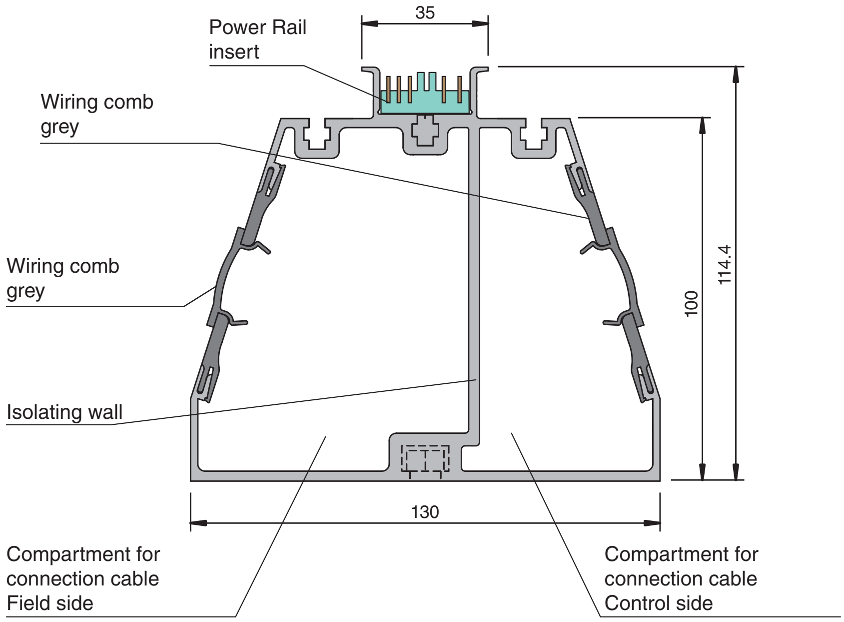
The profile rail can be used to provide space-saving mounting for interface modules and accommodate the associated wiring. The system and field cables are easily installed in the integral cable ducts of the profile rail. Thus no additional cable guides are necessary.

The power supply to the individual modules is preferably provided via the Power Rail UPR-05 that is integrated into the system. Additionally the Power Rail UPR-05 has one lead for collective error messaging and two leads for bus connections.

The asymmetrical segmented connection compartment can be changed dependent on the required space by turning the profile rail. Please note that the Power Rail insert must be also rotated.

In conjunction with K-System modules the profile rail can be mounted in Zone 2.

Dimensions



Technical data

Mechanical specifications	
Dimensions	130 x 114.4 x 1800 mm (5 x 4.5 x 71 in)

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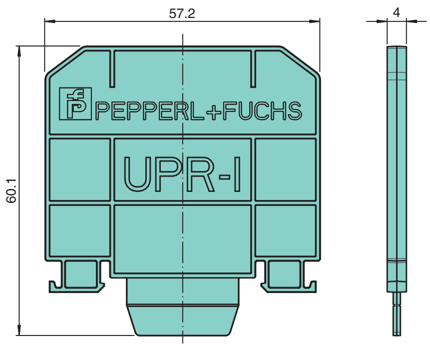
Insulation Spacer for UPR-**-*
UPR-I



Features

- **Electrical insulation of segmented Power Rail inserts**

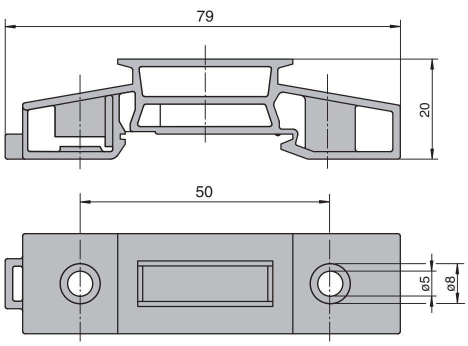
Function

The insulation spacer mounts onto a 35 mm DIN rail. It is used for electrical insulation of segmented Power Rail inserts.

Technical data

Mechanical specifications	
Material	Polycarbonate
Mass	approx. 20 g
Dimensions	4 x 57 x 60 mm (0.16 x 2.24 x 2.36 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715

Mounting Socket
K-MS



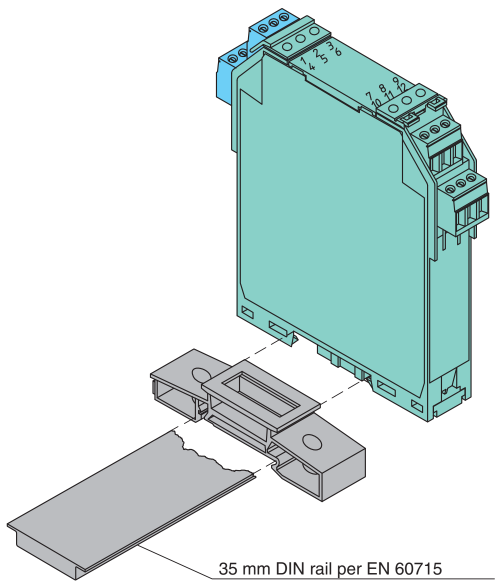
Features

- **1-channel**
- **KF module DIN rail isolation block**
- **Snaps on to 35 mm DIN rail acc. to EN 60715**
- **Easy panel mounting**

Function

This mounting socket enables the "snap-on" mounting of K devices on a 35 mm DIN rail when there is not enough space to install the Power Rail device contacts.

Sockets can be mounted in rows, so mounting can be accomplished with a minimum loss of space. The socket may also be used to cover unused mounting positions on the Power Rail.



Technical data

Mechanical specifications	
Material	Polyamide PA 66
Mass	approx. 30 g
Dimensions	20 x 20 x 79 mm (0.8 x 0.8 x 3.1 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715

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End Bracket
E/AL-NS35

Features

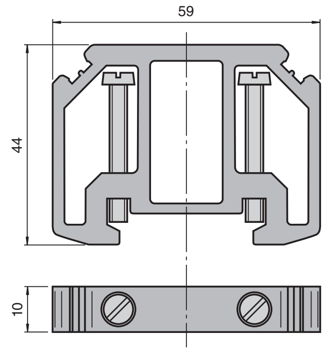
- **For end support**

Function

The end bracket is used for end support of devices on the 35 mm DIN rail. It is pushed onto DIN rail and fixed with two screws.

Note: This component is not supplied by Pepperl+Fuchs.

Supplier: Phoenix Contact



Technical data

Mechanical specifications	
Material	aluminium
Mass	approx. 25 g
Dimensions	10 x 44 x 59 mm (0.4 x 1.7 x 2.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715

End Bracket
TS 35 Typ 12

Features

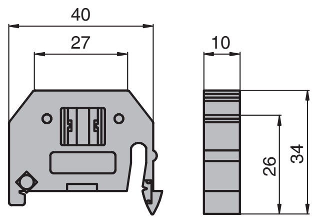
- **End terminal as termination for DIN rail**

Function

TS 35 Type 12 end brackets are used as terminations when K devices are mounted on the DIN rail.

Note: This component is not supplied by Pepperl+Fuchs.

Supplier: Wago



Technical data

Mechanical specifications	
Mass	approx. 10 g
Dimensions	10 x 34 x 40 mm (0.4 x 1.34 x 1.57 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715

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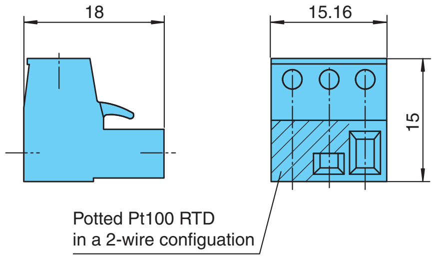
Terminal Block with Cold Junction Compensation K-CJC-BU K-CJC-BK



Features

- **3-pin screw terminal**
- **For KF modules**
- **Integrated Cold Junction Compensation**
- **Packaging unit: 1 piece, blue**
- **Packaging unit: 1 piece, black**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The black terminal block is used for connection of field signals as well as the connection of control signals.

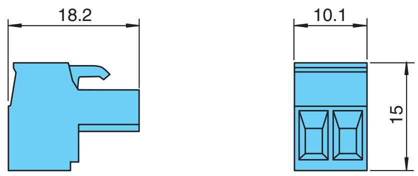
This terminal block has an integrated encapsulated Pt100 RTD for cold junction compensation.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 5 g
Dimensions	15.2 x 15 x 18 mm (0.6 x 0.6 x 0.7 in)
Construction type	removable screw terminal with integrated cold junction compensation

Terminal Block KC-ST-5BU KC-ST-5GN



Features

- **2-pin screw terminal**
- **For KC modules**
- **Packaging unit: 5 pieces blue**
- **Packaging unit: 5 pieces green**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 4 g
Dimensions	10.1 x 15 x 18.2 mm (0.4 x 0.5 x 0.7 in)
Construction type	removable screw terminal

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

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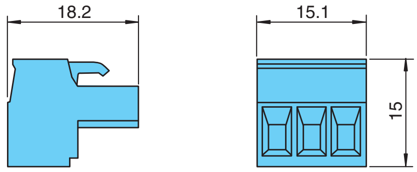
Terminal Block
KF-ST-5BU
KF-ST-5GN



Features

- **3-pin screw terminal**
- **For KF modules**
- **Packaging unit: 5 pieces blue**
- **Packaging unit: 5 pieces green**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

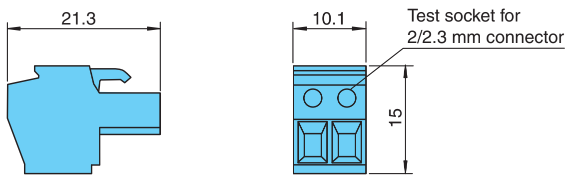
Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 5 g
Dimensions	15.1 x 15 x 18.2 mm (0.5 x 0.5 x 0.7 in)
Construction type	removable screw terminal

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

Terminal Block with Test Points
KC-STP-5BU
KC-STP-5GN



Features

- **2-pin screw terminal**
- **For KC modules**
- **Integrated test points for connection of HART communicators**
- **Packaging unit: 5 pieces blue**
- **Packaging unit: 5 pieces green**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

This terminal block has integrated test points for connection of HART communicators.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 4 g
Dimensions	10.1 x 15 x 21.3 mm (0.4 x 0.5 x 0.84 in)
Construction type	removable screw terminal with integrated test points

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

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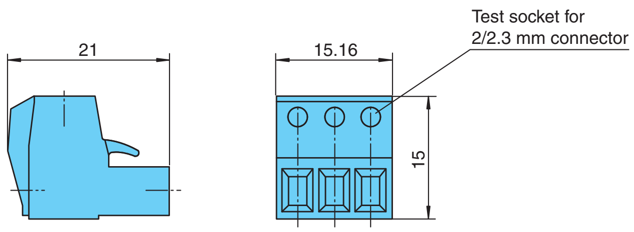


Terminal Block with Test Points
KF-STP-5BU
KF-STP-5GN

Features

- **3-pin screw terminal**
- **For KF modules**
- **Integrated test points for connection of HART communicators**
- **Packaging unit: 5 pieces blue**
- **Packaging unit: 5 pieces green**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

This terminal block has integrated test points for connection of HART communicators.

The terminal block can be coded with the provided coding pins KF-CP.

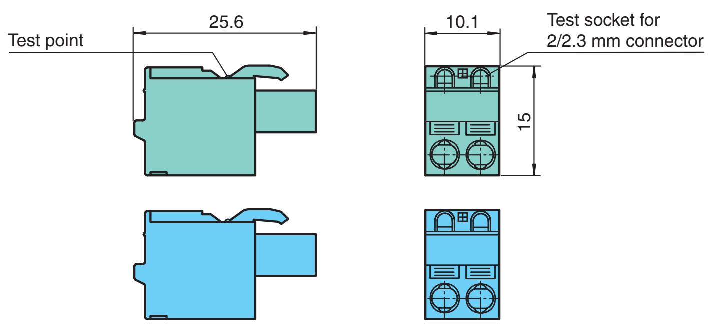
Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 5 g
Dimensions	15.2 x 15 x 21 mm (0.6 x 0.6 x 0.83 in)
Construction type	removable screw terminal with integrated test points

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.



Terminal Block with Test Points
KC-CTT-3GN2BU
KC-CTT-5BU
KC-CTT-5GN

Features

- **2-pin cage clamp terminal**
- **For KC modules**
- **Integrated test points for connection of HART communicators**
- **Packaging unit: 3 pieces green, 2 pieces blue**
- **Packaging unit: 5 pieces blue**
- **Packaging unit: 5 pieces green**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

This terminal block has integrated test points for connection of HART communicators.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 4 g
Dimensions	10.1 x 15 x 25.6 mm (0.4 x 0.5 x 1 in)
Construction type	removable cage clamp terminal with integrated test points

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

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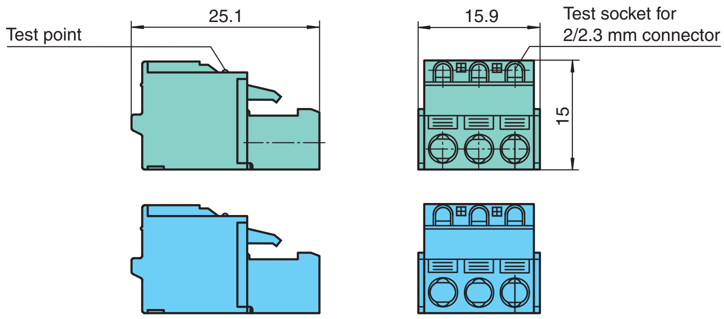
Terminal Block with Test Points
KF-CTT-3GN2BU
KF-CTT-5BU
KF-CTT-5GN



Features

- 3-pin cage clamp terminal
- For KF modules
- Integrated test points for connection of HART communicators
- Packaging unit: 3 pieces green, 2 pieces blue
- Packaging unit: 5 pieces blue
- Packaging unit: 5 pieces green

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

This terminal block has integrated test points for connection of HART communicators.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

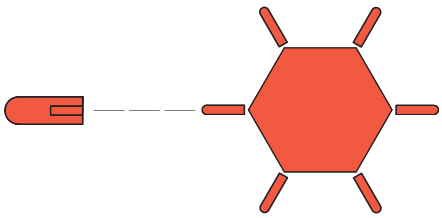
Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 5 g
Dimensions	15.9 x 15 x 25.1 mm (0.63 x 0.6 x 1 in)
Construction type	removable cage clamp terminal with integrated test points

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

Coding Pins
KF-CP



Features

- Coding of K-System terminal blocks
- Packaging unit: 20 x 6 coding pins

Function

The terminals can be coded with an coding pin by inserting the red tab into a particular slot of the terminal block.

Technical data

Mechanical specifications	
Material	red insulating material
Mass	approx. 1 g per coding pin
Dimensions	0.5 x 2 x 8 mm (0.02 x 0.08 x 0.3 in)

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Technical data

Interface	
Connection	adapter with RS 232 interface K-ADP1 or USB interface K-ADP-USB (for K-System) adapter for gateways with RS 232 intrface K-ADP2 (for RPI-System) adapter for gateways with RS 485 interface K-ADP4 (for RPI-System) USB/RS 485 interface converter (for LB-System)
Software	
Hardware requirements	PACTware requires 50 MBytes hard drive memory and a minimum of 40 MBytes main memory. Depending on the complexity of the projects and the DTMs used, the main memory requirement can be greater. A computer with a Pentium IV 450 MHz processor or better is recommended, XGA graphics, and a Microsoft-compatible mouse or equivalent pointing device arealso required.
Software requirements	PACTware runs in operating systems Windows XP/Vista/7. The software .NET Framework 2.0 must be installed. For printing and online help, MS Internet Explorer 4.0 or higher is required
Languages	German, English, French, Spanish, Russian can be selected
Licensing	PACTware does not require licensing. Please take the license conditions of the DTMs out of the data sheets of the corresponding DTMs.
Configuration	
Representation of the system configuration	Graphic representation of all communication and device DTMs in the tree structure. In case of online operation colour code for identification of defective units and simulation operation. Multiple windows can be open simultaneously. It is therefore possible to view the set device parameters, to monitor the measurement value and to display the device diagnostic simultaneously.
System planning, application processing	Generation of a configuration by means of a graphical application processing menu. Editing of available projects. Selection switch markings for each channel. Offline configuration, saving of project data to hard disk or disk. Automatic comparison of the project plan to the actual available system when establishing connections on the device and parameter levels.
Associated products	CD-ROM with PACTware and complete DTM-Collection of all available DTMs of the Pepperl+Fuchs H-, K-, and E-System devices, HART Multiplexers, Remote I/O-Systems, FieldConnex devices, and level devices.

Features

- **Universal DTM host platform**
- **For all DTMs of Pepperl+Fuchs**
- **Approved FDT/DTM technology**
- **Free of charge**
- **Internet download possible**

Function

Manufacturer and fieldbus independent configuration tool with FDT interface (**F**ield **D**evice **T**ool)

- Based on FDT technology
- Device Type Manager (DTMs) available for all Pepperl+Fuchs devices and systems
- Commissioning, configuration and parameter assignment independent of the process control system
- Communication DTMs available for serial interfaces and fieldbus systems
- Maintenance, diagnostics and error correction
- In accordance with VDI/VDE 2187

Accessories

Microsoft .NET

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Features

- **Isolated USB interface cable**
- **Used with K-, E- and H-System devices**
- **Used with PACT*ware*™**

Function

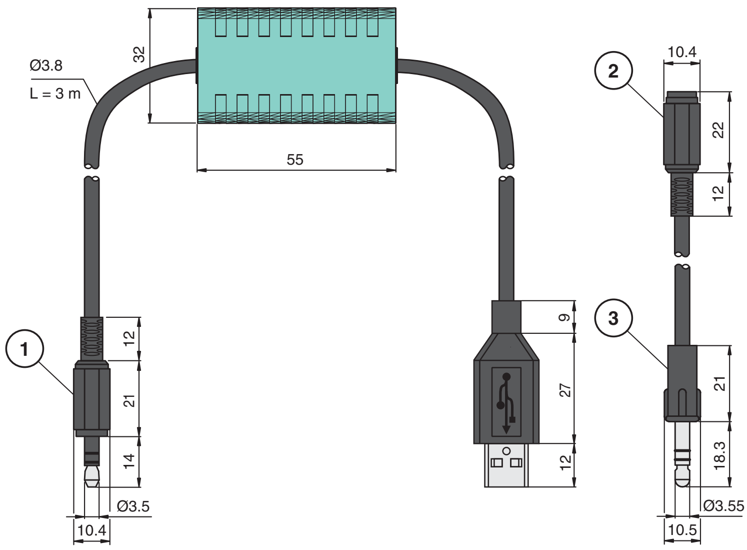
The K-ADP-USB is a programming adapter that connects the USB interface of a PC/notebook for the **PACT***ware***™** configuration software and can be used to program K-, E- and H system barriers via the programming socket on the front panel of these barriers.

As K-, E- and H-System devices have formerly been equipped with programming sockets with different standard dimensions (3.55 mm x 18.3 mm, see drawing, pos. 3 – newer devices 3.5 mm x 14 mm, pos. 1), an adapter (pos. 2) for the parameterisation of all devices is attached to K-ADP-USB.

The 18.3 mm version can still be used for urgent service assignments. However, the user must be aware of the fact that the plug protrudes from new units by approx. 4 mm. Extensive pushing of the plug may lead to damage on units.

For information about programming and software, refer to www.pepperl-fuchs.com.

Dimensions



Technical data

Electrical specifications	
Current consumption	50 mA (via USB)
Electrical isolation	functional insulation acc. to IEC 62103, rated insulation voltage 50 V_{eff}
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Connection	to the PC: USB type A to the device: connector 3.5 mm and 3.55 mm
Cable	
Length L	3 m

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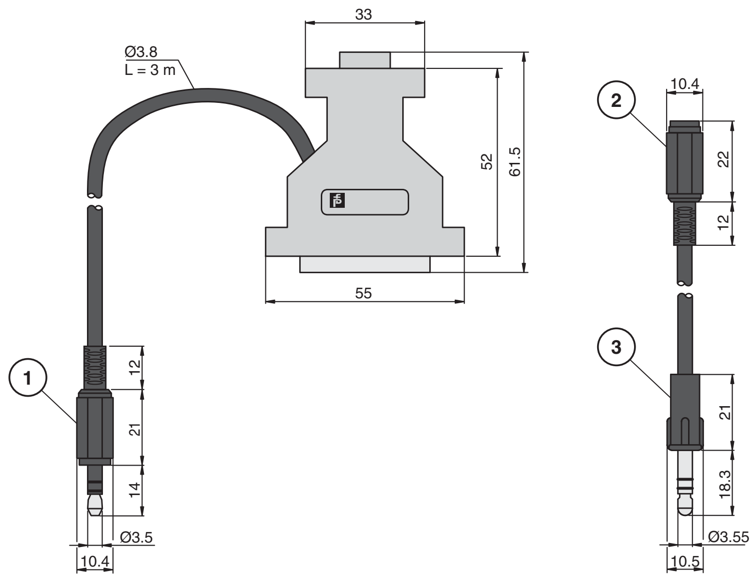
Dimensions



Technical data

Electrical specifications	
Electrical isolation	functional insulation acc. to IEC 62103, rated insulation voltage 50 V_{eff}
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Connection	to the PC: 9-pin and 25-pin to the device: connector 3.5 mm and 3.55 mm
Cable	
Length L	3 m

Features

- **Isolated RS 232 interface cable**
- **Used with K-, E- and H-System devices**
- **Used with PACT*ware*™**

Function

The K-ADP1 is an interface adapter that connects the serial interface of a PC/notebook for the **PACT***ware***™** configuration software and can be used to program K-, H-, and E-System barriers via the programming socket on the front panel of these barriers.

As K-, E- and H-System devices have formerly been equipped with programming sockets with different standard dimensions (3.55 mm x 18.3 mm, see drawing, pos. 3 – newer devices 3.5 mm x 14 mm, pos. 1), an adapter (pos. 2) for the parameterisation of all devices is attached to K-ADP1.

The 18.3 mm version can still be used for urgent service assignments. However, the user must be aware of the fact that the plug protrudes from new units by approx. 4 mm. Extensive pushing of the plug may lead to damage on units.

For information about programming and software, refer to www.pepperl-fuchs.com.

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel**
- **Loop powered**
- **NAMUR sensor simulator and pulse generator**
- **Simulates line faults**

Function

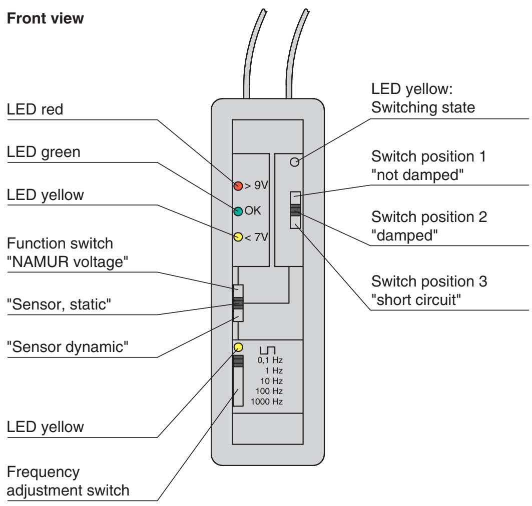
This simulator imitates a NAMUR proximity sensor by implementing a three-position switch. A three-position switch facilitates the selection of various test conditions.

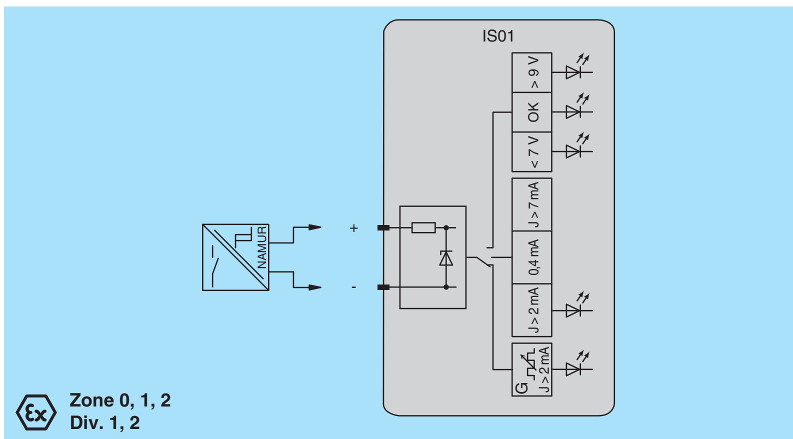
The first position (NAMUR voltage) simulates a 1 kΩ resistive load, while the second position (sensor static) offers various sensor-damping conditions, including a short circuit simulation. The third switch position (sensor dynamic) offers the user several frequency settings between 0.1 Hz ... 1 kHz using a rectangular wave with a 50 % duty cycle.

Technical data

Ambient conditions	
Ambient temperature	-20 ... 50 °C (-4 ... 122 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	40 x 130 x 25 mm (1.6 x 5.1 x 1 in)
Construction type	gray ABS handheld housing
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	DMT 02 ATEX E 008
Group, category, type of protection, temperature classification	Ⓔx II 1G EEx ia IIB T4 [circuit(s) in zone 0/1/2]

Diagrams





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Technical data

Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	6.5 x 68.5 x 90.5 mm (0.2 x 2.7 x 3.6 in)
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	
Group, category, type of protection, temperature classification	Ex II 2G EEx ia IIC T6

Features

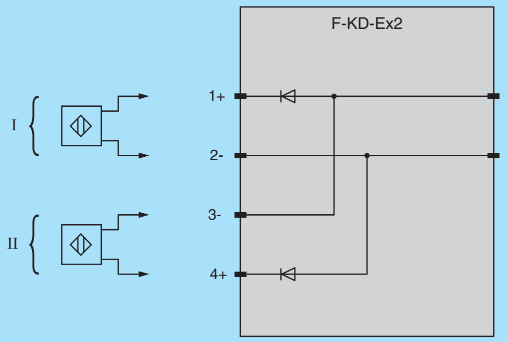
- **2-channel**
- **NAMUR sensor input**
- **Reduces field wiring by 50%**
- **Supports 2:1 technology**

Function

This terminal block module is equipped with a diode network and is designed for use with the KFD2-SRA-Ex4 barrier with its exclusive 2:1 operating mode.

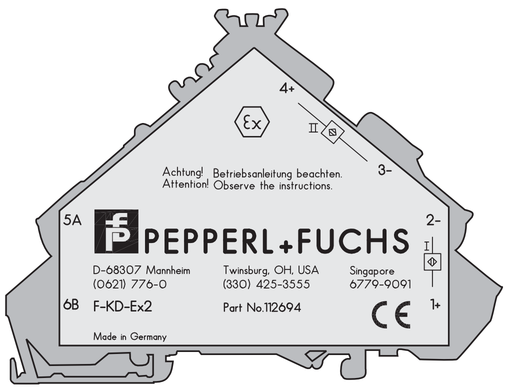
This terminal block will interface with NAMUR sensors that are not equipped with an integrated diode or with dry contacts located in the hazardous area.

Diagrams



Zone 0, 1, 2
Div. 1, 2

Side view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel**
- **Dry contact input**
- **Reduces field wiring by 50%**
- **Supports 2:1 technology**

Function

This terminal block module is equipped with a diode/resistor network and is designed for use with the KFD2-SRA-Ex4 barrier with its exclusive 2:1 operating mode.

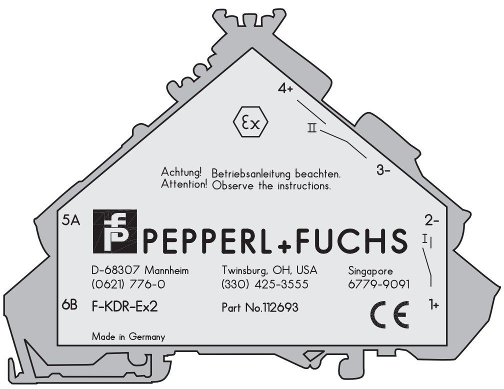
Built with diodes for polarity protection together with lead breakage and short circuit monitoring resistors, this terminal block is ideal for use with dry contacts located in the hazardous area.

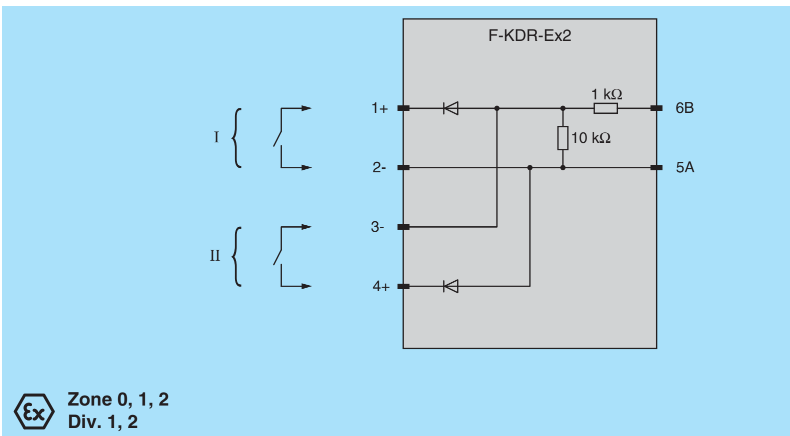
Technical data

Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	6.5 x 68.5 x 90.5 mm (0.2 x 2.7 x 3.6 in)
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	
Group, category, type of protection, temperature classification	Ⓔx II 2G EEx ia IIC T6

Diagrams

Side view





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Technical data

Supply	
Rated voltage	max. 20 V DC
Electrical specifications	
Resistor	1 kΩ/0.6 W 10 kΩ/0.6 W
Input	
Error detection	lead breakage, short circuit, open switch, closed switch
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	screw terminals, wire cross section: ≤ 1.5 mm^2
Mass	approx. 20 g
Dimensions	Ø15.5 x 35 mm (0.61 x 1.38 in)

Features

- **1-channel**
- **Dry contact input**
- **For line fault detection (LFD)**

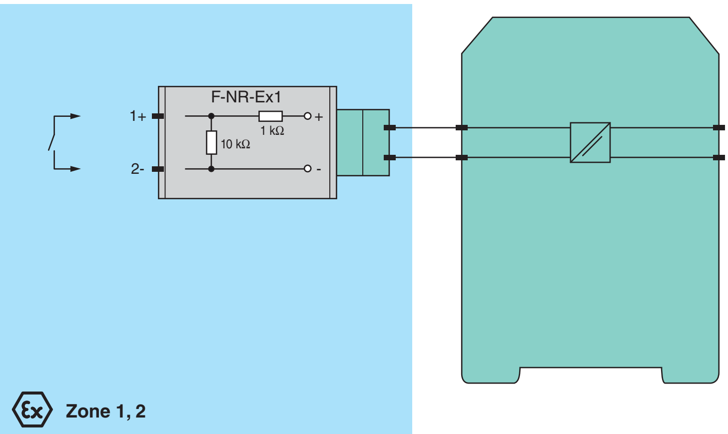
Function

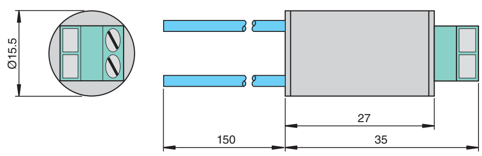
The NAMUR Resistance is used to monitor lead breakage and short circuit detection in switch amplifier circuits controlled by mechanical contacts.

The component is installed directly to the control contact or inside its terminal box.

The component can be used with all switch amplifiers featuring line fault detection.

Diagrams





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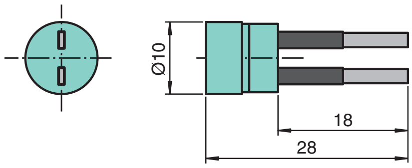
Measuring Resistor
K-500R0%1



Features

- 1-channel
- High precision resistor
- Conversion of 4 mA ... 20 mA/2 V ... 10 V

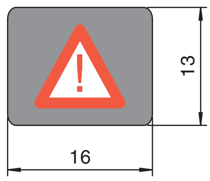
Function

A 500 Ω 0.1% high-precision resistor that can be used to convert 4 mA ... 20 mA to 2 V ... 10 V.

Technical data

Electrical specifications	
Measuring resistor	500 Ω, 0.1 %, TK10
Mechanical specifications	
Dimensions	Ø10 x 28 mm (0.4 x 1.1 in)

Adhesive Sticker
KF-SEAL



Features

- Destructive, removable Scotchmark sticker 3812, white, matte
- Rectangular shape, 16 mm x 13 mm
- For securing front-side programming switches and sockets as well as potentiometers, designed to match the K-system
- Packaging unit: 20 pieces

Technical data

Mechanical specifications	
Dimensions	16 x 13 mm (0.63 x 0.5 in)

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Technical data

Electrical specifications	
Rated voltage	≤ 50 V
Rated current	≤ 2 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 80 g
Dimensions	12.5 x 114 x 104 mm (0.5 x 4.5 x 4.1 in), housing type A2
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X

Features

- **IS K-System place holder module**
- **Housing width 12.5 mm**
- **Marshalling for field and control side circuits**
- **Jumper configurable**

Function

This place holder barrier is a module for use in cable distribution. It improves accessibility and compactness within a control cabinet.

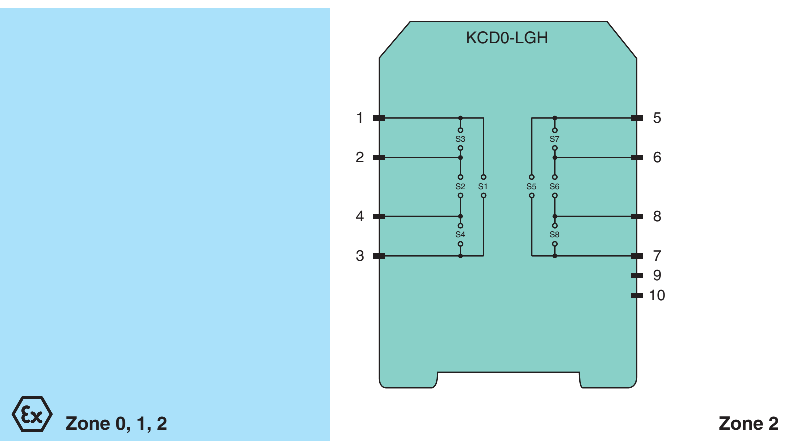
Different configurations are possible by using solder bridges.

Intrinsically safe circuits can be connected to terminals 1, 2, 3 and 4. Terminals 1 to 4 are linked.

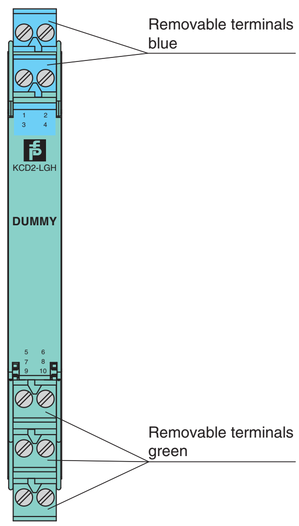
Safe area circuits can be connected to terminals 5 to 8.

In addition, two green replaceable terminals are attached with the device.

Diagrams



Front view



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Features

- **IS K-System place holder module**
- **Housing width 20 mm**
- **Marshalling for field and control side circuits**
- **Jumper configurable**

Function

The place holder barrier is a module for use in cable distribution. It improves accessibility and compactness within a control cabinet.

Different configurations are possible by using solder bridges.

Intrinsically safe circuits can be connected to terminals 1, 2 and 3 or 4, 5 and 6. Terminals 1 to 6 are linked.

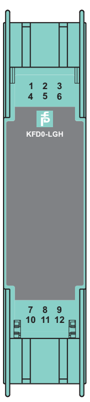
Safe area circuits can be connected to terminals 7, 8 and 9 or 10, 11 and 12.

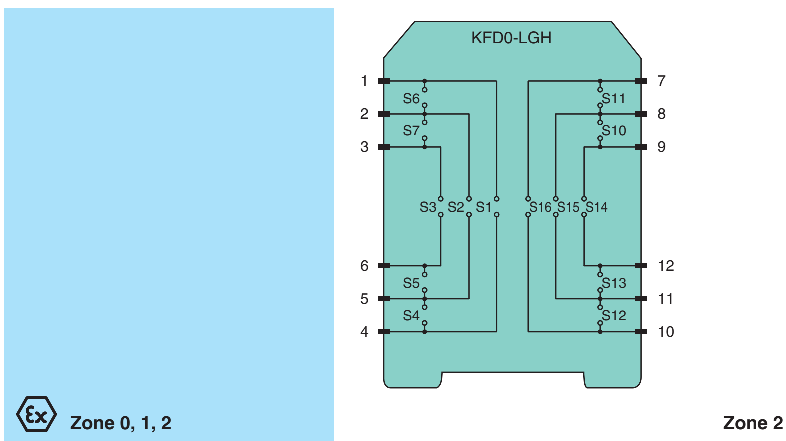
Technical data

Electrical specifications	
Rated voltage	≤ 50 V
Rated current	≤ 2 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 93 x 115 mm (0.8 x 3.7 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X

Diagrams

Front view





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Technical data

Electrical specifications	
Rated voltage	≤ 50 V
Rated current	≤ 2 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X

Features

- **Non-IS K-System place holder module**
- **Housing width 20 mm**
- **Marshalling for field and control side circuits**
- **Jumper configurable**

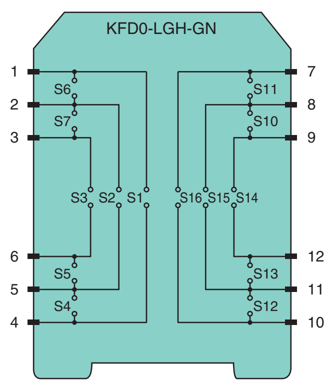
Function

This place holder barrier is a module for use in cable distribution cables. It improves accessibility and compactness within a control cabinet.

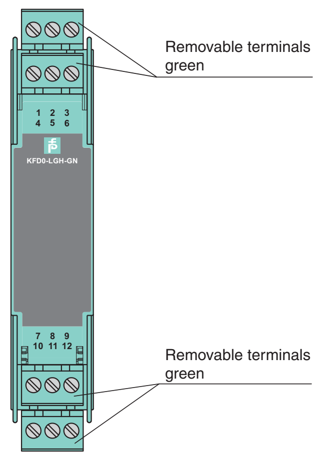
Different configurations are possible by using solder bridges.

Safe area circuits can be connected to the terminals.

Diagrams



Front view



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Features

- IS K-System place holder module
- Housing width 20 mm
- Marshalling for field and control side circuits
- No electrical function: empty housing

Function

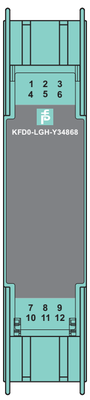
This place holder barrier is an empty housing that fills unused space on DIN rail or Power Rail.

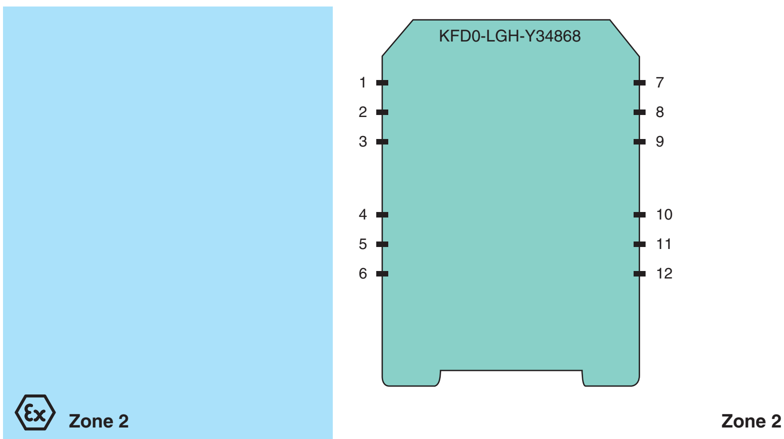
Technical data

Electrical specifications	
Rated voltage	≤ 50 V
Rated current	≤ 2 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 93 x 115 mm (0.8 x 3.7 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X

Diagrams

Front view





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H-System

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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Introduction

The H-System offers the ideal Termination Board solution for hazardous location applications. Universal and DCS-specific Termination Boards are available. Customized versions are also available for specific I/O requirements including system connectors, terminal block type and special electronic function. The design of an H-System project is optimized with Fault Indication Boards, HART Communication Boards and a complete range of accessories. The H-System includes a wide range of plug-in, isolated barriers that are mounted on Termination Boards. The H-System is easy to specify, integrate and expand and has become synonymous with safety and reliability.

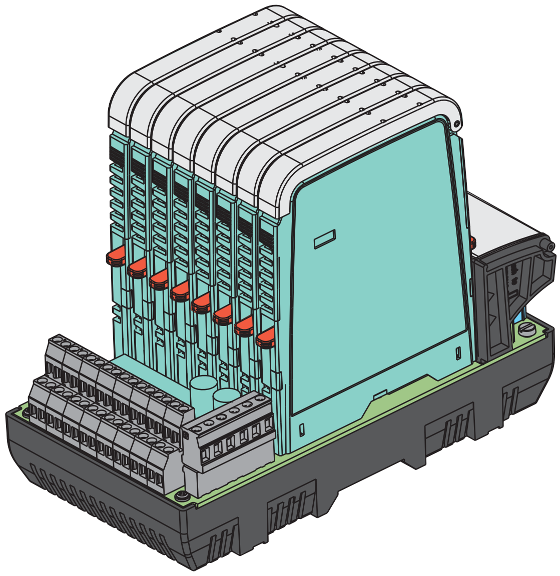

Figure 1 H-System Termination Board with isolated barriers

Modules and Termination Boards

Depending on the functionality and application, the H-System barriers have two housing widths, the 12.5 mm HiC modules and the 18 mm HiD modules, all with the features and interoperability of the H-System. The pin-out and terminal designations for each board are consistent throughout the range; therefore, any H-System module can be installed on any H-System Termination Board. The board can be coded in combination with the modules to ensure the safety relevant data is maintained for the connected field devices.

HiC module housing

Used for high signal integrity

- Small housing, only 12.5 mm wide
- Highest packing density in single loop integrity

Figure 2 12.5 mm housing (HiC module)

HiD module housing

Used for high channel density

- Compact 18 mm housing
- Highest channel density on the market
- As low as 4.5 mm per channel

Figure 3 18 mm housing (HiD module)

Termination Boards

- For HiC and HiD isolated barrier modules
- 8- or 16-position Termination Boards
- Redundant and fused powered
- Diagnostic and fault monitoring

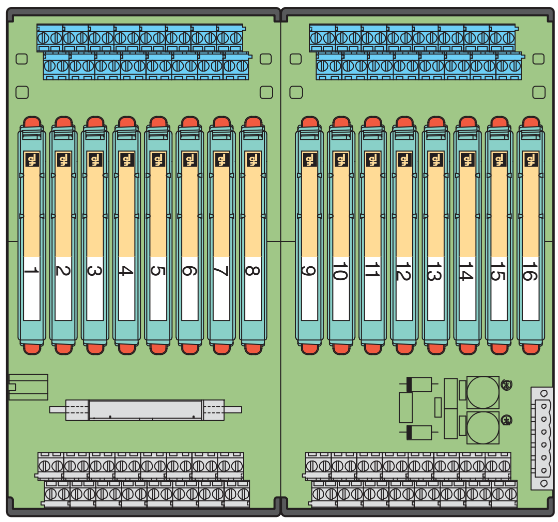

Figure 4 16-position Termination Board

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Accessory boards

Fault Indication Board

The Fault Indication Board reports power supply failure or other circuit errors supported by the modules.The internal fault bus works in a quasi safety mode and can be wired in a ring (daisy chain) or redundant star configuration.

Errors are displayed on the Fault Indication Board via an LED and are made available through a potential-free relay contact.

Figure 5 Fault Indication Board

HART Communication Board

The HART Communication Board can interface with HART enabled H-System Termination Boards. It contains one slot to mount the 32-channel HART multiplexer type HiDMux2700.

Pre-assembled cables provide easy connection between the H-System Termination Boards and the HART Communication Board.

It offers redundantly fused, power supply connections with LED indication. Redundant RS 485 terminals are also available and can be wired in a daisy chain configuration.

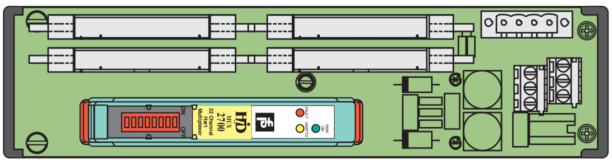

Figure 6 HART Communication Board

Topology

This figure illustrates a typical H-System solution. It contains a Termination Board, Fault Indication Board and HART Communication Board.

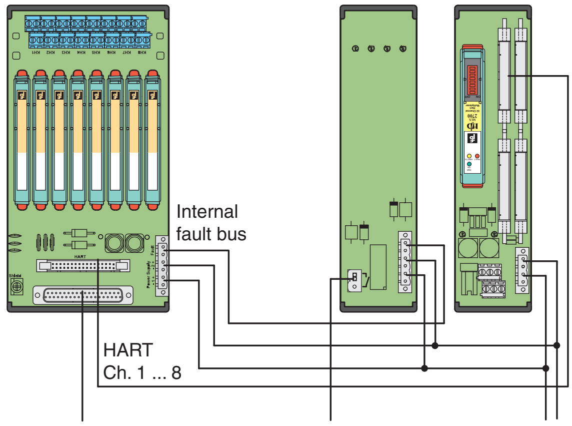

Figure 7 H-System topology

Mounting

The Termination Boards are mounted on a 35 mm DIN rail. The DIN rail is centered under the Termination Board.

The H-System Termination Boards have been designed for protection category IP20 with isolated barriers installed (IP00 without modules) according to EN 60529; therefore, the boards must be appropriately protected against splashing water and contamination.

Mounting the Termination Board

- Place the Termination Board onto the DIN rail (Figure 8).
- Tighten the fastening screws (Figure 9).

The Termination Board is now properly mounted and secured.

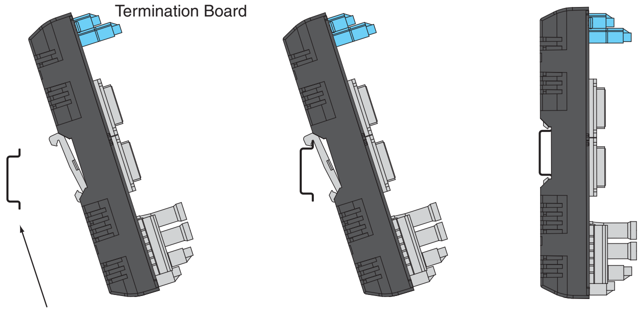

Figure 8 Proper mounting of the H-System Termination Board

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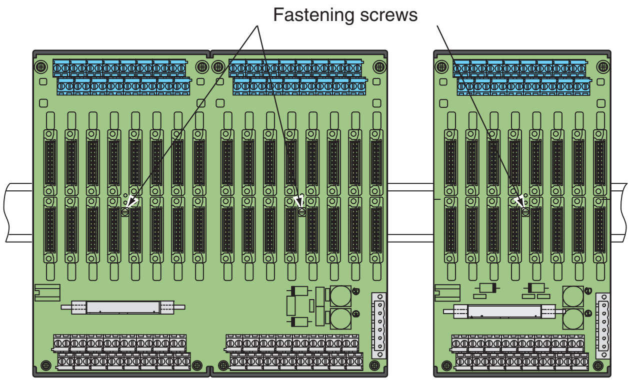

Figure 9 *Top view of the H-System Termination Board – horizontal mounting*

Mounting the module on the Termination Board

- Ensure that the red Quick Lok Bar (1) is in the upper position.
- Observe the plug orientation of the device. Insert the coding pins (2) of the module in the corresponding coding holes on the board. Now center the adjustment pins (3) to the adjustment holes on the Termination Board.
- Carefully press the device into the contacts and adjustment holes.
- For the mechanical adjustment of the module press the red Quick Lok Bar (1) down on either side of the device (see Figure 10)

This completes the mounting of a module.

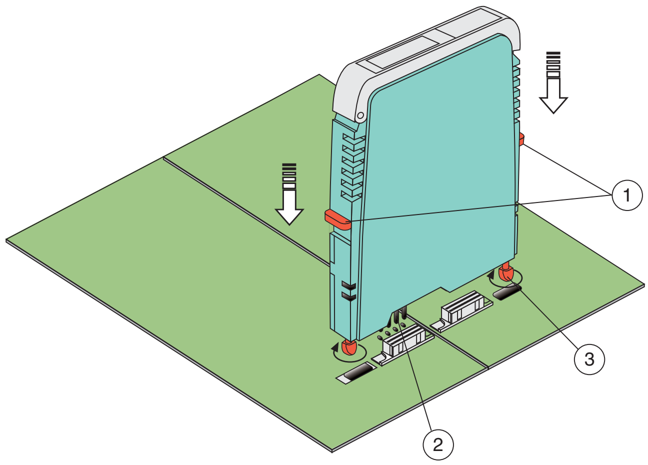

Figure 10 *Proper mounting of an H-System isolated barrier*

Terminal designation

Field side

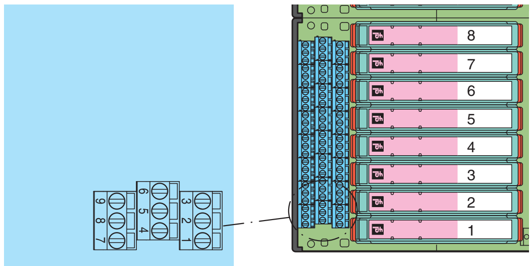

Figure 11 *Example: field side arrangement of the terminals*

Control side

Screw clamp terminals

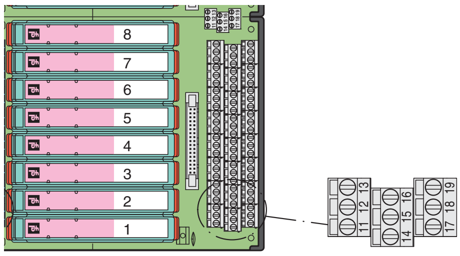

Figure 12 *Example: control side arrangement of the terminals*

SUB-D (male) connector, 37-pin

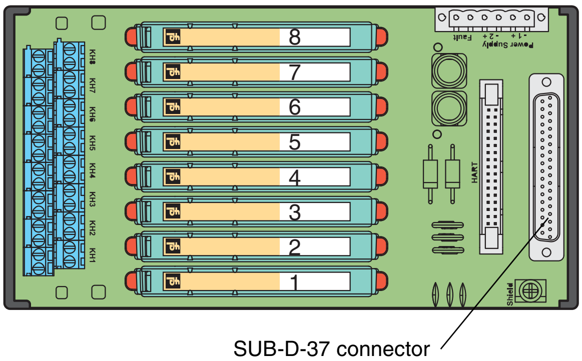

Figure 13 *Control side SUB-D-37 connector*

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Model number description

Modules

Hi		2			

Type of signal

0 **Analog modules**

2010 to 2020	Converters
2020 to 2030	Transmitter Power Supplies
2031 to 2040	Current Drivers
2060 to 2090	Temperature Converter

8 **Digital modules**

2820 to 2860	Switch Amplifiers
2870 to 2880	Solenoid

Housing

C 12.5 mm modules

D 18 mm modules

Hi H-System

Termination Boards

		–		–		–		–		–	SC

Connection in hazardous area

SC screw clamp terminals

Connection in safe area

SC screw clamp terminals

SD37 SUB-D (male) connectors, 37-pin

Channel

***** no specification

DCS system

UNI-** Universal board

Number of slots

08 8 slots

16 16 slots

Termination Board type

HiDTB for HiD modules

HiCTB for HiC modules

* Unused options may be left out.

H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Edition 908837 (US) / 208599 (EU) 11/2010

Example HiCTB16-UNI-SD37-SC

HiCTB	16	–	UNI	–	SD37	–	SC

Connection in hazardous area
SC Screw clamp terminals

Connection in safe area
SD37 SUB-D (male) connectors, 37-pin

DCS system
UNI Universal board

Number of slots
16 16 slots

Termination Board type
HiCTB for HiC modules

Safety information

The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

These devices are used in C&I technology for the galvanic isolation of C&I signals, such as 20 mA and 10 V unit signals, and also for the adaptation and/or standardization of signals. Devices which have intrinsically safe control circuits are used to operate field devices within hazardous areas.

The devices are not suitable for the isolation of signals in power engineering, unless this is specifically referred to in the respective data sheet.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Intrinsic safety circuits that were operated with circuits of other types of protection may not be used as intrinsically safe circuits afterwards.

Installation and commissioning

Commissioning and installation must be carried out by specially trained and qualified personnel only.

Installation of the interface devices in the safe area

The devices are constructed to satisfy the IP20 protection classification and must be protected from adverse environmental conditions such as water spray or dirt exceeding the pollution degree 2.

The devices must be installed outside the hazardous area!

Depending on the level of protection, the intrinsically safe circuits of the devices (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that the intrinsically safe circuits are safely separated from all non-intrinsically safe circuits.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of H-System devices (demonstration of intrinsic safety). EN 60079-14/ IEC 60079-14 or NEC and CEC electrical codes for US and Canada respectively must be observed (where appropriate). If available, also the product certification control drawing must be observed.

If more channels of one device are to be connected in parallel, it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety, the maximum values of the parallel connection are to be regarded.

The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

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Installation and commissioning of the interface devices within Zone 2/Div. 2 of the hazardous area

Only devices with the corresponding manufacturer's Declaration of Conformity or separate certificate of conformity can be installed in Zone 2/Div. 2.

The individual data sheets indicate whether these conditions are met.

For US and Canada installations, in Zone 2/Div. 2 follow the NEC and CEC wiring methods. The enclosure must be able to accept Zone 2/Div. 2 wiring methods. The referenced product certification control drawing must be observed.

For all other applications, the devices should be installed in a switch or junction box that:

- meets at least IP54 in accordance to EN 60529.
- meets to the requirements of resistance to light and resistance to impact according to EN 60079-0/ IEC 60079-0.
- meets to the requirements of thermal endurance according to EN 60079-15/IEC 60079-15.
- must not cause ignition danger by electrostatic charge during intended use, maintenance and cleaning.

Depending on the level of protection, the intrinsically safe circuits of the devices (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that the intrinsically safe circuits are safely separated from all non-intrinsically safe circuits.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of H-System devices (demonstration of intrinsic safety). EN 60079-14/ IEC 60079-14 or NEC and CEC electrical codes for US and Canada respectively must be observed (where appropriate). If available, also the product certification control drawing must be observed.

If more channels of one device are to be connected in parallel, it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety, the maximum values of the parallel connection are to be regarded.

The EC-Type Examination Certificates, standard certificates/approvals or the manufacturer's Declaration of Conformity should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices which are operated in hazardous areas. Repairs on the device are not allowed.

Isolation coordinates for devices with Ex-certificate according to EN 50020 and EN 60079-11

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Isolation coordinates for installations for galvanic isolation according to EN 50178 and EN 61140

The devices of the H-System are electronic equipment for use in secluded electrical operating sites where only skilled personnel or electrically instructed personnel will have admission or access.

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

For additional details, see data sheets.

Technical data

Electrical data

Power supply (modules)

- HiC modules: 19.6 V DC to 30 V DC
- HiD modules: 20.4 V DC to 30 V DC

The voltage drop across the series diode on the Termination Board must be considered.

Each module is protected internally. The Termination Boards have redundant power supply connections with fuses that can be replaced by the customer.

Mechanical data

Location

Mounting outside hazardous areas possible as well as in Zone 2/Div. 2 where a manufacturer's Declaration of Conformity exists.

Protection degree

- Termination Boards: IP20 with modules plugged in (IP00 without modules)
- Modules: IP20

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Mass

Termination Boards:

- HiCTB08 approx. 420 g
- HiCTB16 approx. 840 g
- HiDTB08 approx. 600 g
- HiDTB16 approx. 1200 g

Modules:

- HiC module approx. 100 g
- HiD module approx. 140 g

Material

Modules: Polycarbonate

Termination Boards: Polycarbonate, fiber glass reinforced

Dimensions

Termination Boards (height inclusive module assembly):

- HiCTB08: 108 x 200 x 163 mm
- HiCTB16: 216 x 200 x 163 mm
- HiDTB08: 150 x 200 x 163 mm
- HiDTB16: 300 x 200 x 163 mm

Modules:

- HiC module: 12.5 x 106 x 130 mm
- HiD module: 18 x 106 x 130 mm

Housing drawings please refer to appendix.

Fire protection class

Housing: V2 according to UL 94 standard. (Unless stated otherwise all details relate to the reference conditions.)

Labeling

A plastic label holder is available on the front of the module:

- HiC modules, HiD modules: 35 x 10.5 mm

A large label carrier kit HiALC-… for the Termination Boards is available as an option.

Ambient conditions

Ambient temperature:

-20 °C to 60 °C, (-4 °F to 140 °F)

Storage temperature:

-40 °C to 90 °C, (-40 °F to 194 °F)

Relative humidity:

max. 95 % no moisture condensation

Vibration resistance

acc. to EN 60068-2-6, 10 Hz to 150 Hz, 1 g, high crossover frequency

Shock resistance

acc. to EN 60068-2-27, 15 g, 11 ms, half-sine

Reference conditions

- temperature: 20 °C (68 °F)
- relative humidity: 50 %
- supply voltage: 24 V DC
- working resistance, where applicable: 250 Ω
- full scale value: 20 mA

Conformity with standards and directives

General

- Isolator modules with and without explosion protection, mostly with Ex ia IIC/Class I Div. 1, international approvals
- EMC acc. to NAMUR NE21 and EN 61326
- LEDs acc. to NAMUR NE44
- Software acc. to NAMUR NE53

Digital inputs/outputs according to NAMUR

The standards references for this interface have changed many times:

German standard (old): **DIN 19234**: Electrical distance sensors – DC interface for distance sensors and switch amplifiers; 1990-06

European standard (old): **EN 50227**: Low voltage switch gear and control gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 1996-10

German version (old): **DIN EN 50227**: Low voltage switch gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 1997, German nomenclature VDE 0660, part 212

Current designation: DIN EN 60947-5-6: Low voltage switch gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 2000, German nomenclature: VDE 0660 part 212

Current IEC designation: IEC 60947-5-6: Low voltage switch gear and control gear – part 5-6: Control circuit devices and switching elements – DC interface for proximity sensors and switching amplifiers (NAMUR), 1999.

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Switch Amplifiers

Model Number	Housing			Input (Field)		Output (Control System)			Supply				Page
	HiC	HiD	Channels	NAMUR Sensor/ Dry Contact	Line Fault Detection	Relay	20 V DC ... 31 V DC	Transistor (Active/Passive)	24 V DC (Bus Powered)	24 V DC (Loop Powered)	SIL	Zone 2/Division 2 Mounting	
HiC2821	■		1	■	■	2			■		2	■	324
HiC2822	■		2	■	■	2			■		2	■	325
HiC2841	■		1	■	■			2	■		2	■	326
HiC2842	■		2	■	■			2	■		2	■	327
HiC2851	■		1	SN*	■		■	■	■		3		328
HiD2821		■	1	■	■	4			■		2		329
HiD2822		■	2	■	■	4			■		2		330
HiD2824		■	4	■	■	4			■		2		331
HiD2842		■	2	■	■		4	4	■		2		332
HiD2844		■	4	■	■		4	4	■		2		333

* Pepperl+Fuchs Safety Sensors

Frequency Converters

Model Number	Housing		Functions		Input (Field)				Output (Control System)						Page
	HiC	HiD	Speed Monitor	Frequency Conversion	Current/Voltage	Magnetic Pickup	NAMUR Sensor/ Dry Contact	Line Fault Detection	Relay	Transistor (Active/Passive)	0/4 mA ... 20 mA Sink/Source	Supply 24 V DC (Bus Powered)	SIL	Zone 2/Division 2 Mounting	
HiD2891		■	■	■	■	■	■	■	1	1	1	■			334

H-System

Digital Inputs

Digital Outputs

Analog Inputs

Analog Outputs

Termination Boards

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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls a form A normally open relay contact for the safe area load. The module output changes state when the input signal changes state. The mode of operation can be reversed with switch S1 on the side of the unit.

One additional relay is available for the fault output. Line fault detection (LFD) can be selected or disabled via switch S2.

During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault. A separate output bus is available. The fault conditions can be monitored via a Fault Indication Board.

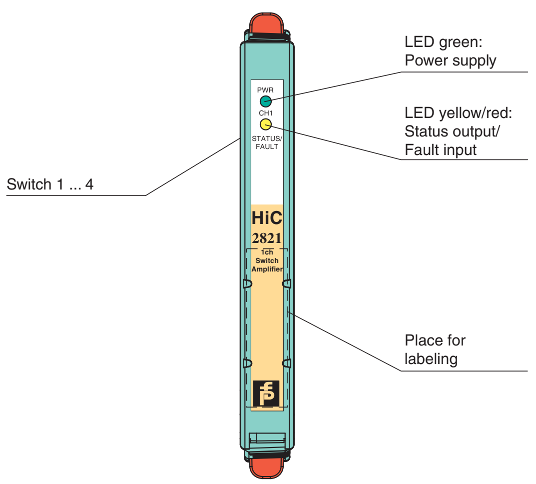
This module mounts on a HiC Termination Board.

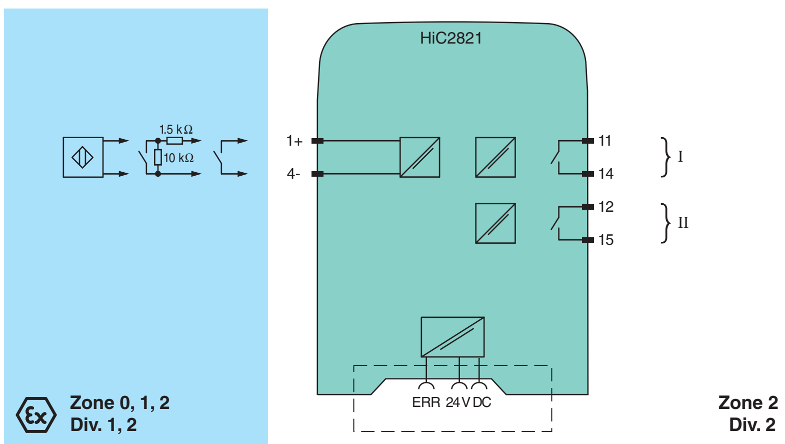
Technical data

Supply	
Rated voltage	19 ... 30 V DC via Termination Board
Power consumption	≤ 500 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal or error message; relay
Contact loading	50 V DC/0.5 A
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0093 X
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ex I (M1) [Ex ia] I
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4 X
FM approval	
Control drawing	16-534FM-12 (cFMus)
IECEx approval	IECEx BAS 06.0026X
Approved for	[Ex ia] IIC, [Ex ia] I

Diagrams

Front view





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Technical data

Supply	
Rated voltage	19 ... 30 V DC via Termination Board
Power consumption	≤ 600 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal; relay
Contact loading	50 V DC/0.5 A
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0093 X
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ex I (M1) [Ex ia] I
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4 X
FM approval	
Control drawing	16-534FM-12 (cFMus)
IECEx approval	IECEx BAS 06.0026X
Approved for	[Ex ia] IIC, [Ex ia] I

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Dry contact or NAMUR inputs**
- **2 relay contact outputs**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

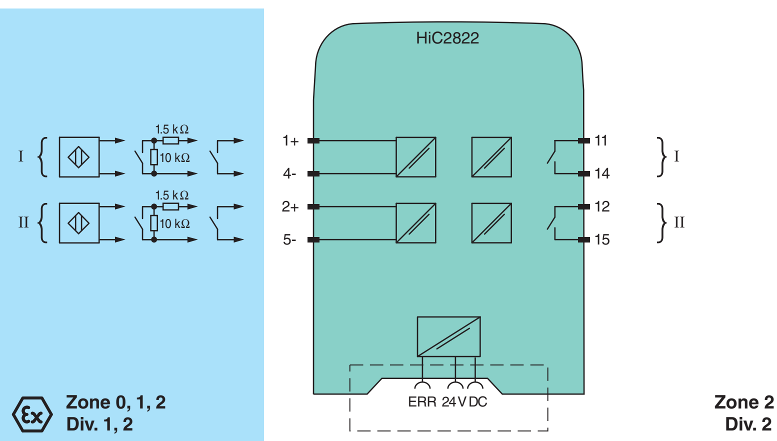
The proximity sensor or switch controls a form A normally open relay output for the safe area load. The module output changes state when the input signal changes state. The mode of operation can be reversed with the switches S1 and S3 on the side of the unit.

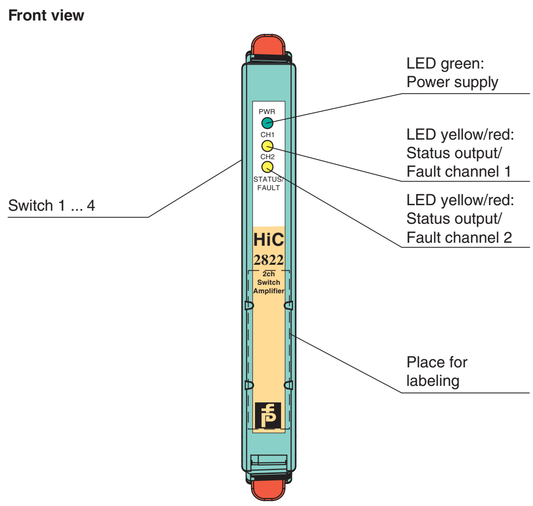
Line fault detection (LFD) can be selected or disabled via the switches S2 and S4.

During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault. A separate fault output bus is available. The fault conditions can be monitored via a Fault Indication Board.

This module mounts on a HiC Termination Board.

Diagrams





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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Dry contact or NAMUR inputs**
- **2 passive transistor outputs**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls two passive transistors for the safe area load. Both transistor outputs are isolated from each other and isolated from the power supply.

The mode of operation can be reversed using switch S1. Switch S3 allows output II to be switched between a signal output and an error message output. Switch S2 enables or disables line fault detection of the field circuit.

During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44. A separate output bus is available. The fault conditions can be monitored via a Fault Indication Board.

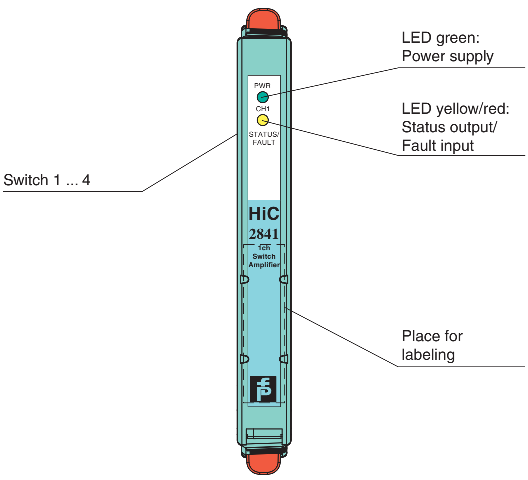
This module mounts on a HiC Termination Board.

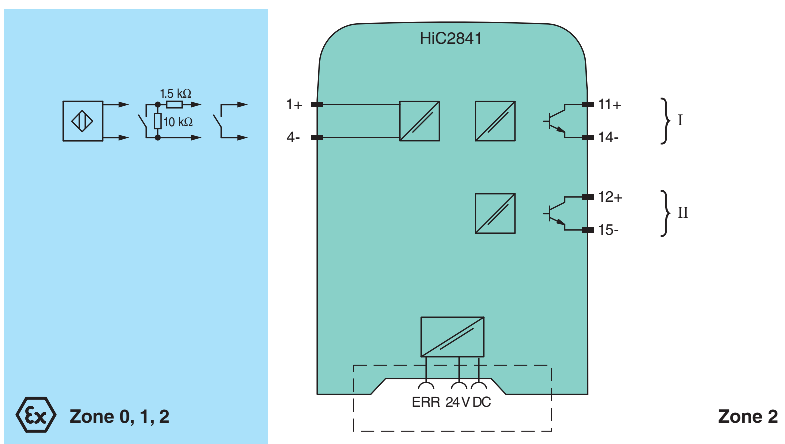
Technical data

Supply	
Rated voltage	19 ... 30 V DC via Termination Board
Power consumption	≤ 500 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 100 µs/≥ 100 µs
Output	
Rated voltage	30 V DC
Rated current	50 mA
Response time	≤ 200 µs
Signal level	1-signal: (external voltage) - 1 V max. for 50 mA (T_{amb} = 25 °C (77 °F)) 0-signal: blocked output (off-state current ≤ 10 µA)
Output I	signal; transistor
Output II	signal or error message; transistor
Error message output	
Output type	open collector transistor (internal fault bus)
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	BVS 09 ATEX E 157
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC, [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ⓔx I (M1) [Ex ia] I
IECEx approval	IECEx BVS 09.0060
Approved for	[Ex ia Ga] IIC, [Ex ia] I, [Ex iaD]

Diagrams

Front view





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Technical data

Supply	
Rated voltage	19 ... 30 V DC via Termination Board
Power consumption	≤ 600 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 100 µs/≥ 100 µs
Output	
Rated voltage	30 V DC
Rated current	50 mA
Response time	≤ 200 µs
Signal level	1-signal: (external voltage) - 1 V max. for 50 mA (T_{amb} = 25 °C (77 °F)) 0-signal: blocked output (off-state current ≤ 10 µA)
Output I	signal; transistor
Output II	signal; transistor
Error message output	
Output type	open collector transistor (internal fault bus)
Transfer characteristics	
Switching frequency	≤ 5 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	BVS 09 ATEX E 157
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22] Ex I (M1) [Ex ia] I
IECEx approval	IECEx BVS 09.0060
Approved for	[Ex ia Ga] IIC, [Ex ia] I, [Ex iaD]

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Dry contact or NAMUR inputs**
- **2 passive transistor outputs**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls two passive transistors for the safe area load. Both transistor outputs are isolated from each other and isolated from the power supply.

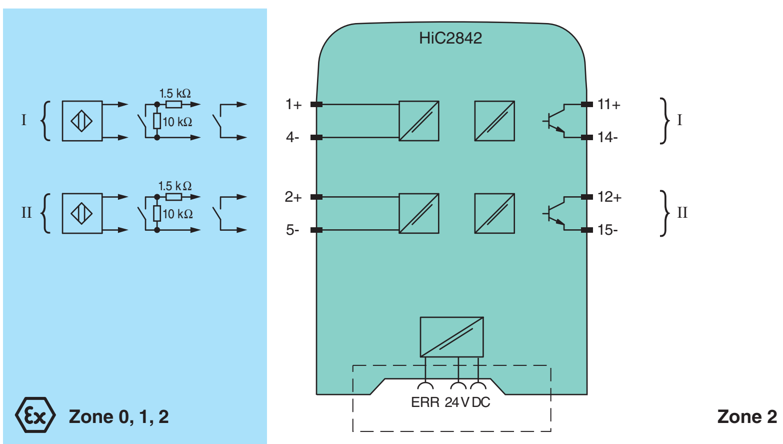
The mode of operation can be reversed using switches S1 and S3. Switches S2 and S4 enable or disable line fault detection of the field circuit.

During an error condition, the transistors revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44. A separate output bus is available. The fault conditions can be monitored via a Fault Indication Board.

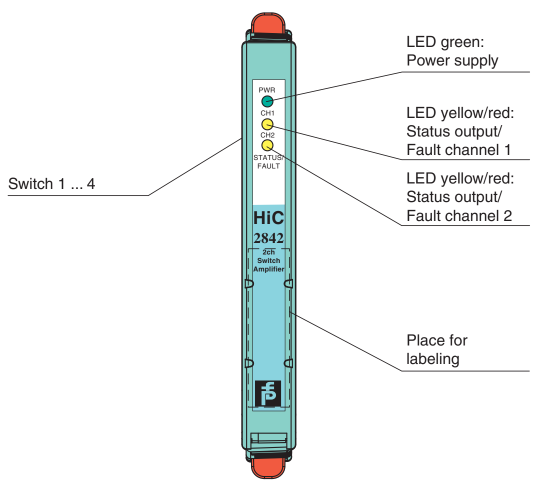
This module mounts on a HiC Termination Board.

H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Diagrams



Front view



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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Input for dry contacts or SN/S1N sensors**
- **Active signal output**
- **Passive signal output (NAMUR compatible)**
- **For usage in accordance with ISO 13849-1**
- **Line fault detection (LFD)**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (SN/S1N proximity sensors and approved mechanical contacts) from a hazardous area to a safe area. It has additional protective circuitry to maintain a reliable safety function.

The proximity sensor or switch controls one 24 V DC voltage source safety output, one passive NAMUR compatible signal output, and a separate collective error message. Lead breakage (LB) and short circuit (SC) conditions are continuously monitored.

Unlike a SN/S1N series safety sensor, a mechanical contact requires a 10 kΩ resistor to be placed across the contact in addition to a 1.5 kΩ resistor in series.

During an error condition, the outputs I and II de-energize.

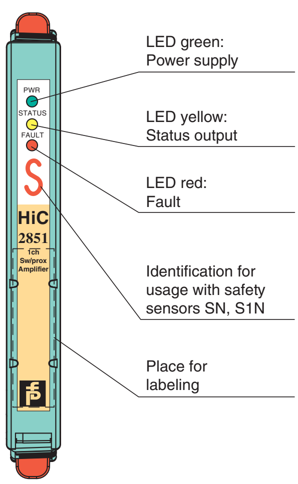
This barrier mounts on a HiC Termination Board.

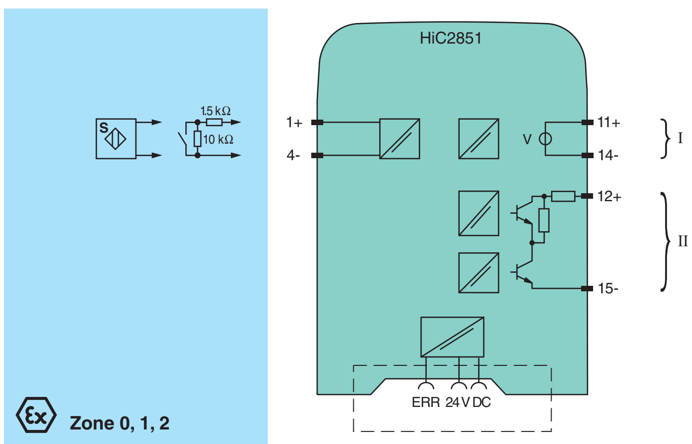
Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 1300 mW
Input	
Open circuit voltage/short-circuit current	approx. 8.4 V DC/approx. 11.7 mA
Lead resistance	≤ 50 Ω, consider capacities and inductances
Switching point	1-signal: I > 2.8 mA 0-signal: I < 2.1 mA
Response delay	≤ 1 ms
Output	
Rated voltage	output II: typ. 8 V DC, max. 22 V DC
Output I	signal, 20 ... 31 V DC at max. 15 mA
Output II	signal or error message, passive transistor output (resistive) 0-signal: 14 kΩ ± 10 % 1-signal: 1.8 kΩ ± 10 %
Transfer characteristics	
Switching frequency	
Output I	≤ 50 Hz
Output II	≤ 50 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 180 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	BASEEFA 07 ATEX 0302X
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC; [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X
FM approval	
Control drawing	16-534FM-12 (cFMus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V DC via Termination Board
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Connectable sensor types	potential free contact or proximity sensor
Switching point	contact open 0.2 ... 1.2 mA, contact closed 2.1 ... 6.5 mA
Lead monitoring	breakage 0 ... 0.2 mA, short-circuit 6.5 mA ... maximum value
Output	
Output	signal: relay DPST per STATUS, phase selectable fault: relay DPST per STATUS, one pole N.O. (terminals 12, 15), the other N.C. (terminals 13, 16)
Response time	20 ms
Contact loading	50 V DC/0.5 A non-inductive
Error message output	
Output type	open collector transistor, fault bus signal
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier for ESD applications**
- **24 V DC supply (bus powered)**
- **Dry contact or NAMUR inputs**
- **2 relay contact outputs**
- **2 fault relay contact outputs**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

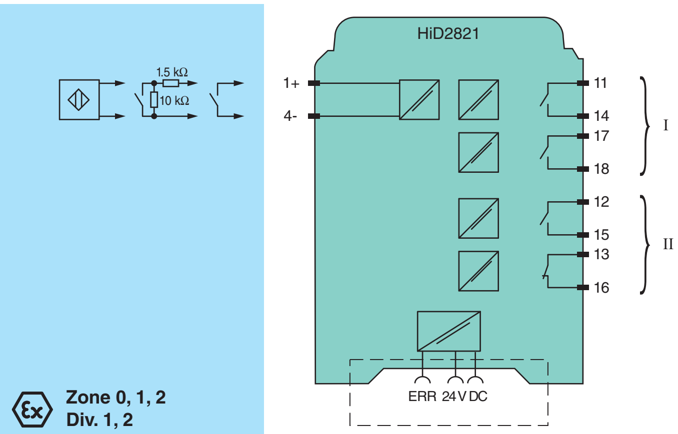
The proximity sensor or switch controls two form A normally open relay outputs for the safe area load. The module output changes state when the input signal changes state. The normal output state can be reversed with the selector switches on the side of the unit.

Two additional relays are available for the fault output. Line fault detection (LFD) can be selected or disabled via a selector switch.

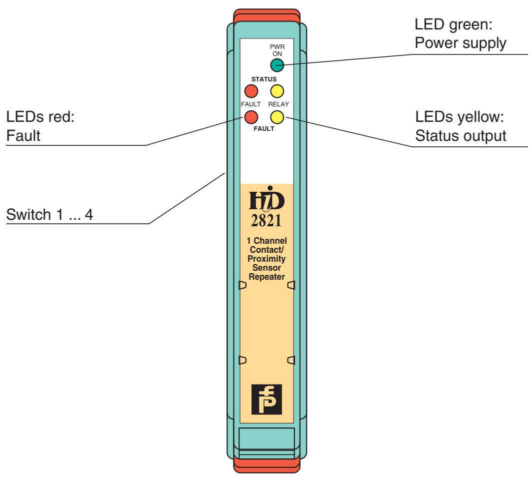
During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault. A separate fault output bus is available. The fault conditions can be monitored via a Fault Indication Board.

This module mounts on a HiD Termination Board.

Diagrams



Front view



H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Dry contact or NAMUR inputs**
- **2 relay contact outputs per channel**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls two form A normally open relay outputs for the safe area load. The module output changes state when the input signal changes state. The normal output state can be reversed with the selector switches on the side of the unit.

Line fault detection (LFD) can be selected or disabled via a selector switch.

During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault. A separate fault output bus is available. The fault conditions can be monitored via a Fault Indication Board.

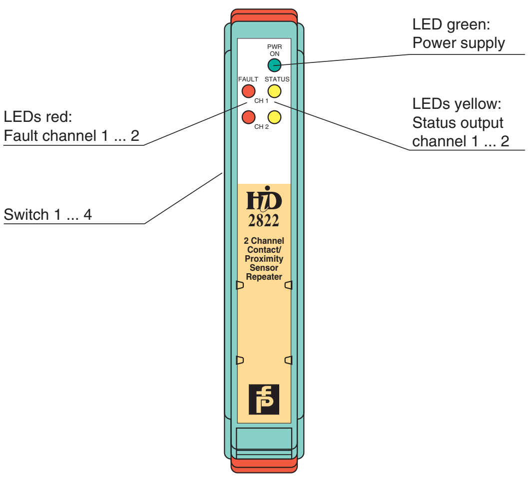
This module mounts on a HiD Termination Board.

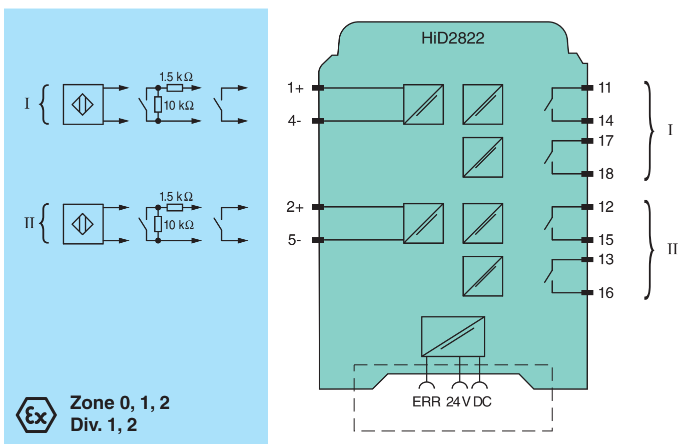
Technical data

Supply	
Rated voltage	20.4 ... 30 V DC via Termination Board
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Connectable sensor types	potential free contact or proximity sensor
Switching point	contact open 0.2 ... 1.2 mA, contact closed 2.1 ... 6.5 mA
Lead monitoring	breakage 0 ... 0.2 mA, short-circuit 6.5 mA ... maximum value
Output	
Output	signal: relay DPST per channel, phase selectable
Response time	20 ms
Contact loading	50 V DC/0.5 A non-inductive
Error message output	
Output type	open collector transistor (common to both channels), fault bus signal
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20.4 ... 30 V DC via Termination Board
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Connectable sensor types	potential free contact or proximity sensor
Switching point	contact open 0.2 ... 1.2 mA, contact closed 2.1 ... 6.5 mA
Lead monitoring	breakage 0 ... 0.2 mA, short-circuit 6.5 mA ... maximum value
Output	
Output	signal: relay SPST per channel, phase selectable
Response time	20 ms
Contact loading	50 V DC/0.5 A non-inductive
Error message output	
Output type	open collector transistor (common to all channels), fault bus signal
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **4-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Dry contact or NAMUR inputs**
- **4 relay contact outputs**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

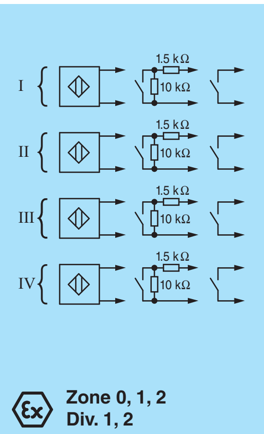
The proximity sensor or switch controls two form A normally open relay outputs for the safe area load. The module output changes state when the input signal changes state. The normal output state can be reversed with the selector switches on the side of the unit.

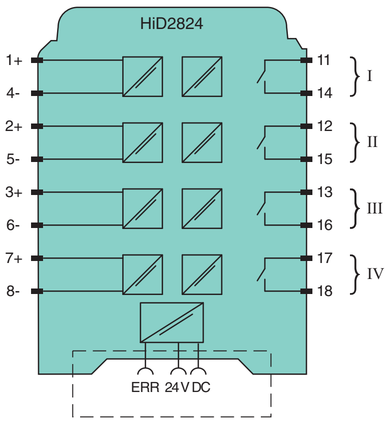
Line fault detection (LFD) can be selected or disabled via a selector switch.

During an error condition, the relay reverts to its de-energized state and the LEDs indicate the fault. A separate fault output bus is available. The fault conditions can be monitored via a Fault Indication Board.

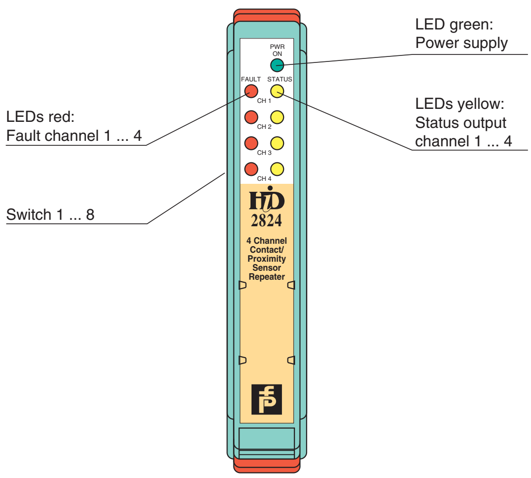
This module mounts on a HiD Termination Board.

Diagrams





Front view



H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- 2-channel isolated barrier
- 24 V DC supply (bus powered)
- Dry contact or NAMUR inputs
- 2 passive transistor outputs per channel
- Line fault detection (LFD)
- Up to SIL2 acc. to IEC 61508

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

The proximity sensor or switch controls two passive transistors for the safe area load. The module output changes state when the input signal changes state. The normal output state can be reversed with the selector switches on the side of the unit.

Line fault detection (LFD) can be selected or disabled via a selector switch.

During an error condition, the transistor reverts to its de-energized state and the LEDs indicate the fault. A separate fault output bus is available. The fault conditions can be monitored via a Fault Indication Board.

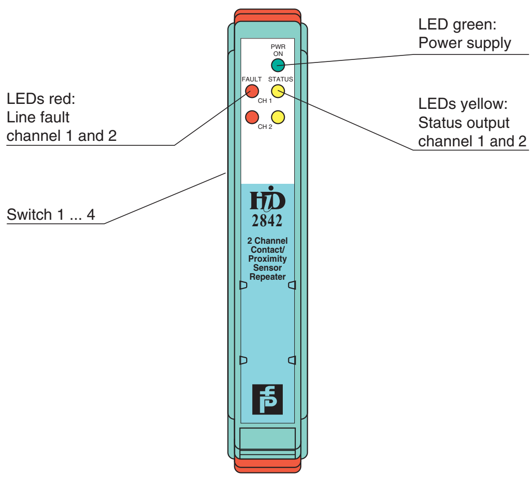
This module mounts on a HiD Termination Board.

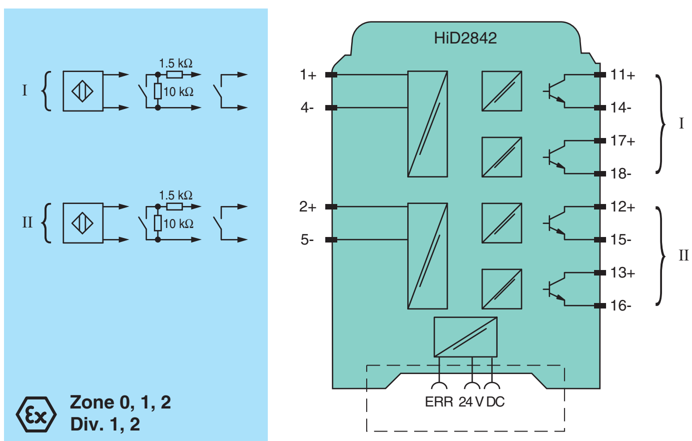
Technical data

Supply	
Rated voltage	20.4 ... 30 V DC via Termination Board
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Connectable sensor types	potential free contact or proximity sensor
Switching point	contact open 0.2 ... 1.2 mA, contact closed 2.1 ... 6.5 mA
Lead monitoring	breakage 0 ... 0.2 mA, short-circuit 6.5 mA ... maximum value
Output	
Rated voltage	30 V
Rated current	50 mA
Output	two optocoupled transistors per channel
Signal level	1-signal: (external voltage) -1 V 0-signal: blocked output (off-state current max. 50 µA, typical 5 µA)
Error message output	
Output type	open collector transistor (internal fault bus)
Transfer characteristics	
Switching frequency	< 2 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20.4 ... 30 V DC via Termination Board
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Connectable sensor types	potential free contact or proximity sensor
Switching point	contact open 0.2 ... 1.2 mA, contact closed 2.1 ... 6.5 mA
Lead monitoring	breakage 0 ... 0.2 mA, short-circuit 6.5 mA ... maximum value
Output	
Rated voltage	30 V
Rated current	50 mA
Output	one optocoupled transistor per channel
Signal level	1-signal: (external voltage) -1 V 0-signal: blocked output (off-state current max. 50 µA, typical 5 µA)
Error message output	
Output type	open collector transistor (internal fault bus)
Transfer characteristics	
Switching frequency	< 2 kHz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **4-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Dry contact or NAMUR inputs**
- **4 passive transistor outputs**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It transfers digital signals (NAMUR sensors/mechanical contacts) from a hazardous area to a safe area.

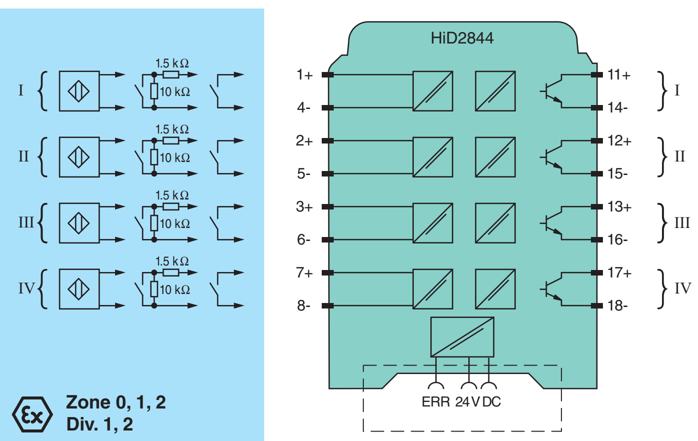
The proximity sensor or switch controls a passive transistor for the safe area load. The module output changes state when the input signal changes state. The normal output state can be reversed with the selector switches on the side of the unit.

Line fault detection (LFD) can be selected or disabled via a selector switch.

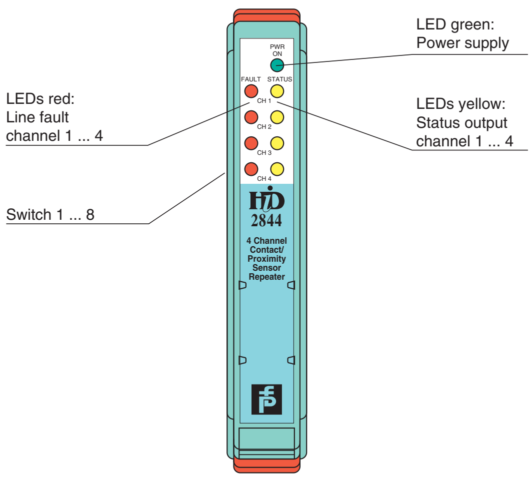
During an error condition, the transistor reverts to its de-energized state and the LEDs indicate the fault. A separate fault output bus is available. The fault conditions can be monitored via a Fault Indication Board.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Dry contact, mag pickup, NAMUR or current/voltage inputs**
- **Current or voltage output**
- **Sink and source mode output**
- **Relay contact output**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It changes a digital input (NAMUR sensor/mechanical contact, magnetic pick-up sensors) into a proportional analog output (current source, current sink, or voltage source). It also functions as a switch isolator and trip alarm.

The input from the hazardous area is transferred to the safe area via a passive transistor output.

One relay output can be programmed to actuate at desired frequencies for min/max control or during a fault condition.

The unit is easily programmed by the use of a DIP switches on the side of the unit or with the **PACT***ware*™ configuration software.

Line fault detection of the field circuit is indicated by a red LED.

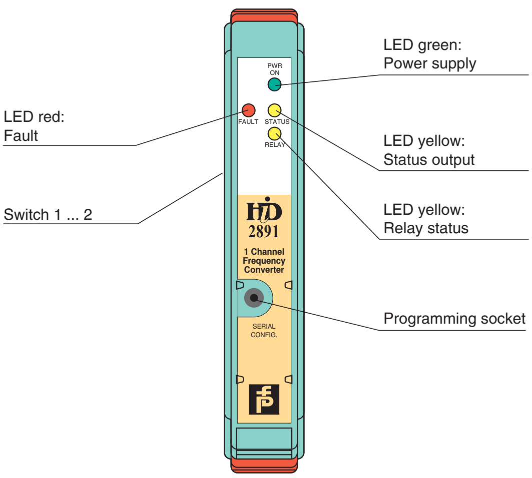
This module mounts on a HiD Termination Board.

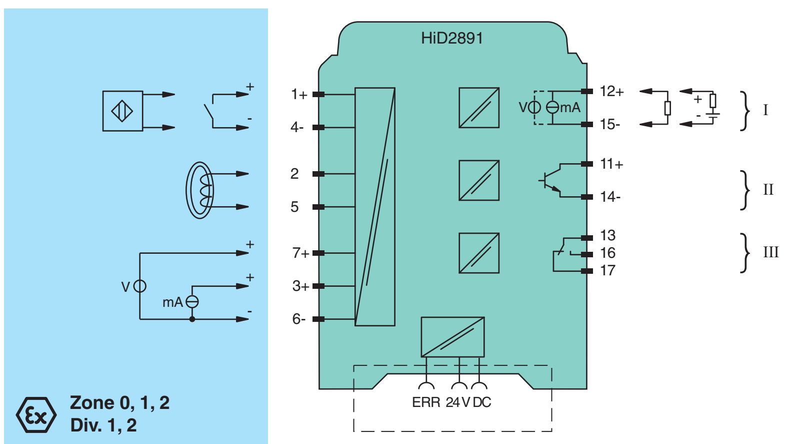
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	20.4 ... 30 V DC
Input	
Connectable sensor types	potential free contact or proximity sensor, magnetic pick-up, voltage or current level
Input resistance	magnetic pick-up: 10 kΩ current logic level: 50 Ω voltage logic level: 30 kΩ
Input frequency	max. 10 kHz
Pulse duration	min. 40 µs
Output	
Output	analog output: proportional to input frequency digital output: optocoupled transistor relay output: SPDT
Output signal	analog output: - current source 0/4 ... 20mA, load 0 ... 550 Ω - current sink 0/4 ... 20mA, working voltage 3 ... 30 V - voltage 0/1 ... 5 V on internal shunt 250 Ω - voltage 0/2 ... 10 V on internal shunt 500 Ω
Ripple	typ. 15 mV_{eff}
Leakage current	digital output typ. 5 µA, max. 50 µA
Saturation voltage	digital output 1.2 V at 50 mA
Error message output	
Output type	relay output: high/low alarm, input repeater (max. 5 Hz), error message fault bus signal: open collector transistor on common bus
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Measuring time	≥ 100 ms
Influence of temperature	< ± 0.01 %/K, typ. ± 0.005%/K
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 335 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]

Diagrams





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ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
HiC2821	1, 4	10.5	17.1	45
HiC2822	1, 4; 2, 5	10.5	17.1	45
HiC2841	1, 4	10.5	17.1	45
HiC2842	1, 4; 2, 5	10.5	17.1	45
HiC2851	1, 4	10.5	17.1	45
HiD2821	1, 4	13.2	20	66
HiD2822	1, 4; 2, 5	13.2	20	66
HiD2824	1, 4; 2, 5; 3, 6; 7, 8	13.2	20	66
HiD2842	1, 4; 2, 5	13.2	20	66
HiD2844	1, 4; 2, 5; 3, 6; 7, 8	13.2	20	66
HiD2891	1, 4	10	10	25
	2, 5	10	1	2.5
	3, 6	1.5	1	0.4
	6, 7	1.5	1	0.4

CSA Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)
HiD2821	1, 4	13.2	20
HiD2822	1, 4; 2, 5	13.2	20
HiD2824	1, 4; 2, 5; 3, 6; 7, 8	13.2	20
HiD2842	1, 4; 2, 5	13.2	20
HiD2844	1, 4; 2, 5; 3, 6; 7, 8	13.2	20

FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
HiC2821	1, 4	10.5	17.1	–	–
HiC2822	1, 4; 2, 5	10.5	17.1	–	–
HiC2851	1, 4	10.5	17.1	–	–

Edition 908837 (US) / 208599 (EU) 11/2010

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Solenoid Drivers

Model Number	Housing: HiC	Housing: HiD	Channels	Input (Control System): Contact Input	Input (Control System): Logic Input	Output (Field): Voltage (V)	Output (Field): Max. Current (mA)	Supply: 24 V DC (Bus Powered)	Supply: 24 V DC (Loop Powered)	SIL	Zone 2/Division 2 Mounting	Page
HiC2871	■		1		■	12	45		■	3	■	338
HiD2871		■	1		■	12	40	■	■	3		339
HiD2872		■	2	■	■	12	40	■	■	3		340
HiD2873		■	1	■	■	12	40	■				341
HiD2874		■	2	■	■	12	40	■				342
HiD2875		■	1	■	■	11.2	40	■	■	3		343
HiD2876		■	2	■	■	11.2	40	■	■	3		344
HiD2877		■	1	■	■	11.2	40	■				345
HiD2878		■	2	■	■	11.2	40	■				346
HiD2881		■	1	■	■	13	60	■	■	3		347

Relay Outputs

Model Number	Housing: HiC	Housing: HiD	Channels	Input (Control System): Contact Input	Input (Control System): Logic Input	Output (Field): Relay	Supply: 24 V DC (Bus Powered)	Supply: 24 V DC (Loop Powered)	SIL	Zone 2/Division 2 Mounting	Page
HiD2862		■	2	■	■	■	■	■			348

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Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current limit 45 mA at 12 V DC**
- **Up to SIL3 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is loop powered, so the available energy at the output is received from the input signal. The output signal has a resistive characteristic. As a result the output voltage and current are dependent on the load and the input voltage.

At full load, 12 V at 45 mA is available for the hazardous area application.

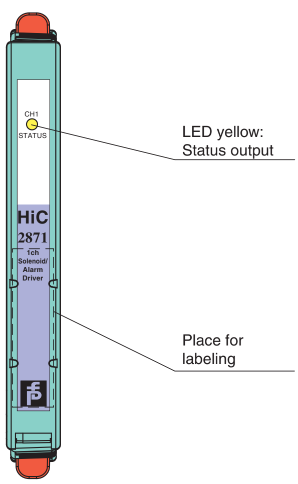
This module mounts on a HiC Termination Board.

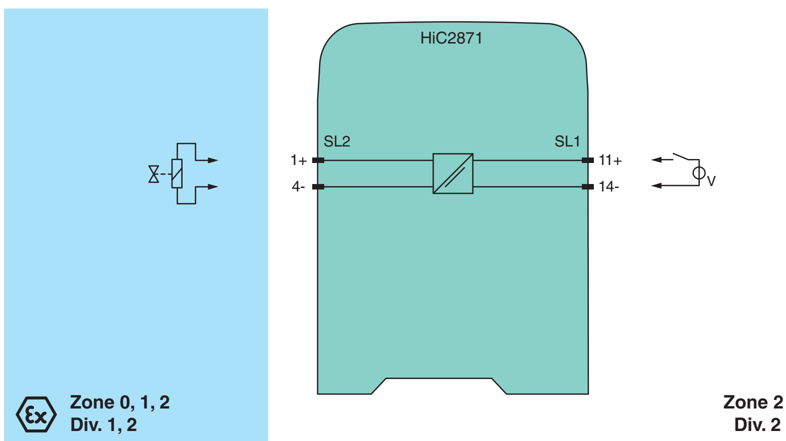
Technical data

Supply	
Power loss	< 1 W
Input	
Rated voltage U_i	19 ... 30 V loop powered
Current	72 mA at 19 V input voltage, load = 265 Ω 50 mA at 30 V input voltage, load = 265 Ω
Output	
Internal resistor	≤ 238 Ω
Limit	current I_E: ≥ 45 mA voltage U_E: ≥ 12 V
Open loop voltage	≥ 22.7 V
Output rated operating current	45 mA
Output signal	These values are valid for the rated operational voltage 19 ... 30 V DC.
Energized/De-energized delay	single operation: 300 µs/50 µs; periodical: 5 µs/50 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	BASEEFA 06 ATEX 0171X
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X
FM approval	
Control drawing	16-534FM-12 (cFMus)
IECEx approval	IECEx BAS 06.0031X
Approved for	[Ex ia] IIC, [Ex ia] I

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board 21 ... 30 V DC loop powered
Input	
Control input	voltage free contact or open collector output on with contact close or transistor on output off with contact open or transistor off
Input current	20 mA with open output 70 mA at 300 Ω load 75 mA with shorted output
Power loss	1.2 W at 24 V, 300 Ω load
Inrush current	1 A, 0.5 ms loop powered
Output	
Output characteristics	40 mA at 12 V DC, 60 mA current limit
Switching frequency f	max. 50 Hz
Response time	turn-on time 1 ms, turn-off time 8 ms, at 300 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus or loop powered)**
- **Output 40 mA at 12 V DC, 60 mA current limit**
- **Contact or logic control input**
- **Low current output for LEDs**
- **Up to SIL2 acc. to IEC 61508 (bus powered)**
- **Up to SIL3 acc. to IEC 61508 (loop powered)**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

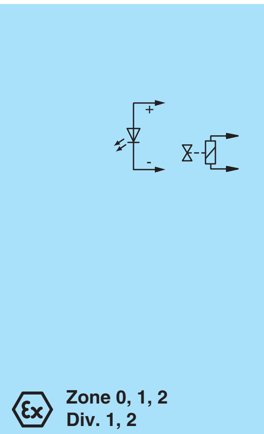
It is controlled with a loop-powered control signal, a switch contact, or transistor.

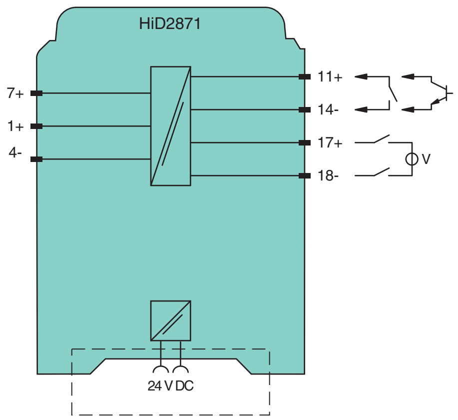
At full load, 12 V at 40 mA (with 60 mA current limit) is available for the hazardous area application.

An alternative low current output is available for driving a single LED without installing an external current limiting resistor.

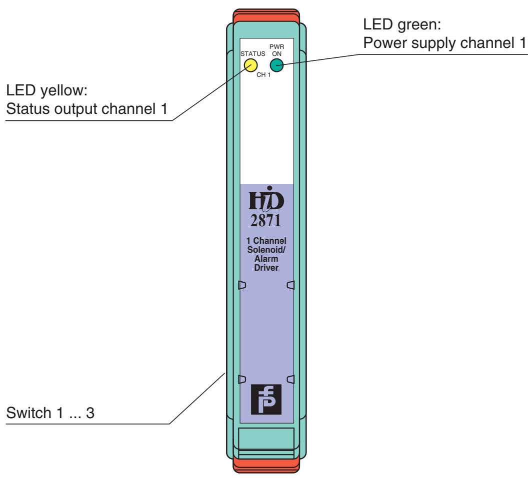
This module mounts on a HiD Termination Board.

Diagrams





Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus or loop powered)**
- **Output 40 mA at 12 V DC, 60 mA current limit**
- **Contact or logic control input**
- **Low current output for LEDs**
- **Up to SIL2 acc. to IEC 61508 (bus powered)**
- **Up to SIL3 acc. to IEC 61508 (loop powered)**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is controlled with a loop-powered control signal, a switch contact, or transistor.

At full load, 12 V at 40 mA (with 60 mA current limit) is available for the hazardous area application.

An alternative low current output is available for driving a single LED without installing an external current limiting resistor.

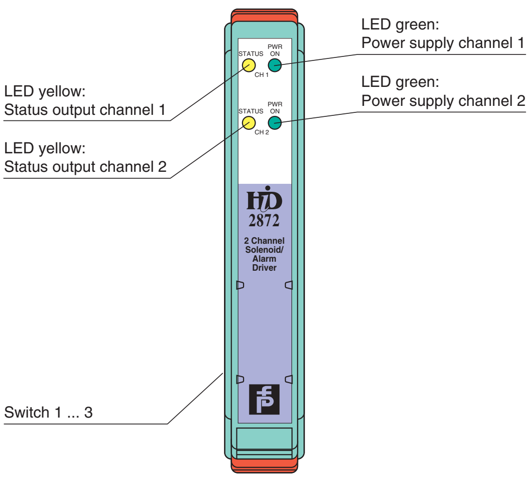
This module mounts on a HiD Termination Board.

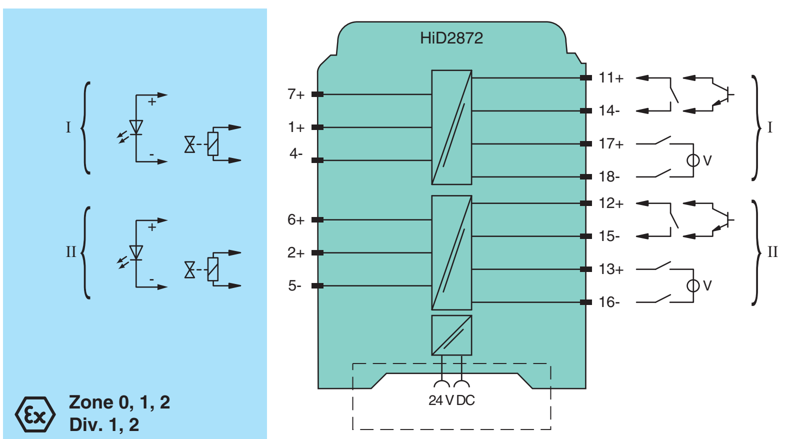
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board 21 ... 30 V DC loop powered
Input	
Control input	voltage free contact or open collector output on with contact close or transistor on output off with contact open or transistor off
Input current	20 mA with open output 70 mA at 300 Ω load 75 mA with shorted output
Power loss	1.2 W at 24 V, 300 Ω load (per channel)
Inrush current	1 A, 0.5 ms loop powered
Output	
Output characteristics	40 mA at 12 V DC, 60 mA current limit
Switching frequency f	max. 50 Hz
Response time	turn-on time 1 ms, turn-off time 8 ms, at 300 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.1 W at 24 V, 300 Ω load
Input	
Control input	external switch (dry contact or open collector) non isolated or logic level input fully floating
Operating mode	output on with contact close or transistor on or logic > 4 V output off with contact open or transistor off or logic level < 1.5 V
Output	
Output characteristics	40 mA at 12 V DC, 52 mA current limit
Load	0.1 ... 5 kΩ
Switching frequency f	max. 250 Hz
Response time	turn-on time 1 ms, turn-off time 2 ms, at 300 Ω load
Fault level	lead short-circuit detection at < 25 Ω lead breakage detection at > 100 kΩ typical
Fault current	4 mA typical
Error message output	
Output type	open collector transistor
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Output 40 mA at 12 V DC, 52 mA current limit**
- **Contact or logic control input**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is controlled with a switch contact, transistor, or logic-level signal.

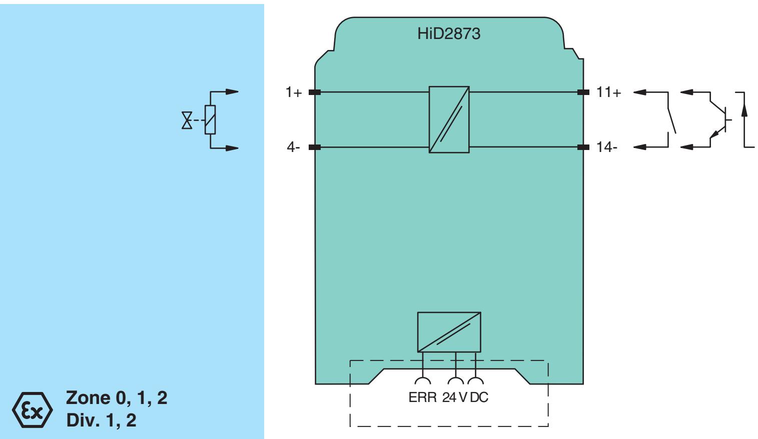
At full load, 12 V at 40 mA (with 52 mA current limit) is available for the hazardous area application.

Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions are monitored via a Fault Indication Board.

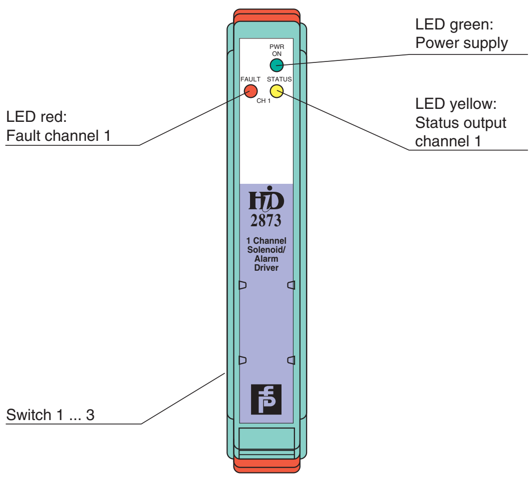
This module mounts on a HiD Termination Board.

H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Output 40 mA at 12 V DC, 52 mA current limit**
- **Contact or logic control input**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is controlled with a switch contact, transistor, or logic-level signal.

At full load, 12 V at 40 mA (with 52 mA current limit) is available for the hazardous area application.

Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions are monitored via a Fault Indication Board.

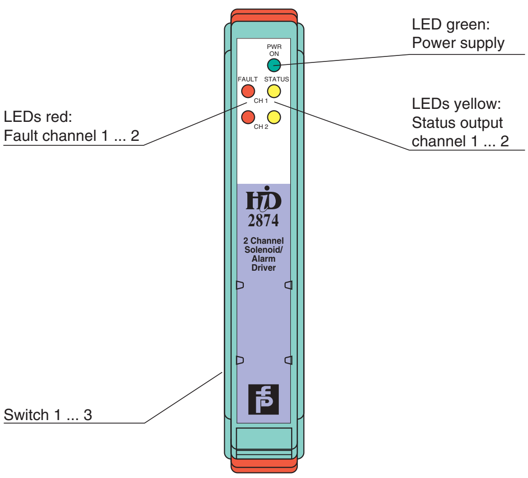
This module mounts on a HiD Termination Board.

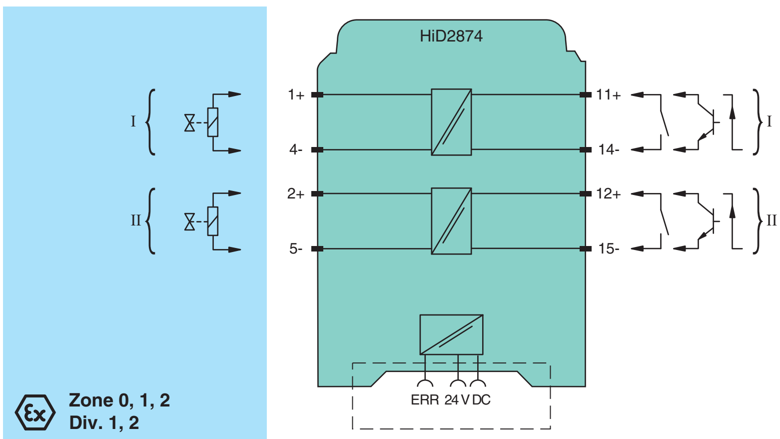
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.1 W at 24 V, 300 Ω load (per channel)
Input	
Control input	external switch (dry contact or open collector) non isolated or logic level input fully floating
Operating mode	output on with contact close or transistor on or logic level > 4 V output off with contact open or transistor off or logic level < 1.5 V
Output	
Output characteristics	40 mA at 12 V DC, 52 mA current limit
Load	0.1 ... 5 kΩ
Switching frequency f	max. 250 Hz
Response time	turn-on time 1 ms, turn-off time 2 ms, at 300 Ω load
Fault level	lead short-circuit detection at < 25 Ω lead breakage detection at > 100 kΩ typical
Fault current	4 mA typical
Error message output	
Output type	open collector transistor (common to both channels)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board 21 ... 30 V DC loop powered
Input	
Control input	voltage free contact or open collector output on with contact close or transistor on output off with contact open or transistor off
Input current	30 mA with open output 70 mA with 300 Ω load 80 mA with shorted output
Power loss	1.2 W at 24 V, 300 Ω load
Inrush current	1 A, 0.5 ms loop powered
Output	
Output characteristics	40 mA at 11.2 V DC, 55 mA current limit
Switching frequency f	max. 50 Hz
Response time	turn-on time 1 ms, turn-off time 8 ms, at 300 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus or loop powered)**
- **Output 40 mA at 11.2 V DC, 55 mA current limit**
- **Contact or logic control input**
- **Entity parameter I_o/I_{sc} = 93 mA**
- **Up to SIL2 acc. to IEC 61508 (bus powered)**
- **Up to SIL3 acc. to IEC 61508 (loop powered)**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is controlled with a loop-powered control signal, a switch contact, or transistor.

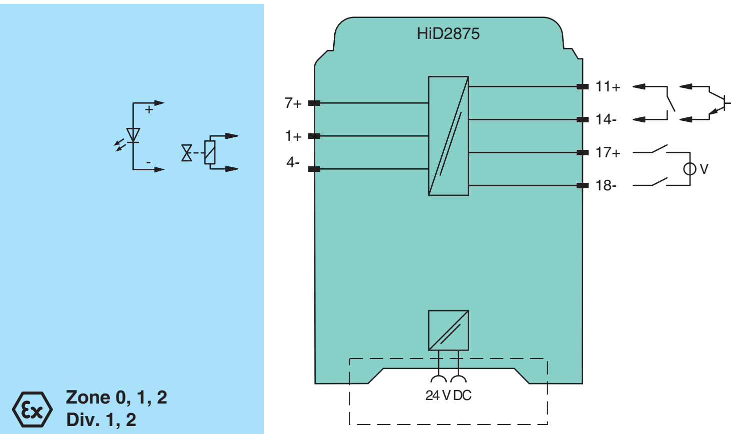
At full load, 11.2 V at 40 mA (with 55 mA current limit) is available for the hazardous area application.

An alternative low current output is available for driving a single LED without installing an external current limiting resistor.

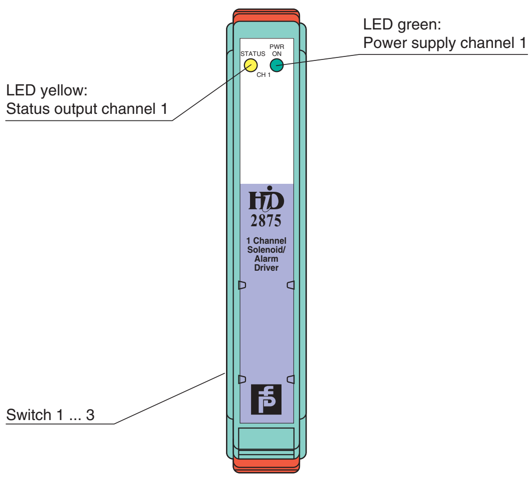
This module has a low I_o/I_{sc} = 93 mA entity parameter.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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Features

- **2-channel isolated barrier**
- **24 V DC supply (bus or loop powered)**
- **Output 40 mA at 11.2 V DC, 55 mA current limit**
- **Contact or logic control input**
- **Entity parameter I_o/I_{sc} = 93 mA**
- **Up to SIL2 acc. to IEC 61508 (bus powered)**
- **Up to SIL3 acc. to IEC 61508 (loop powered)**

Function

This isolated barrier is used for intrinsic safety applications. It supplies power to solenoids, LEDs, and audible alarms located in a hazardous area.

It is controlled with a loop-powered control signal, a switch contact, or transistor.

At full load, 11.2 V at 40 mA (with 55 mA current limit) is available for the hazardous area application.

An alternative low current output is available for driving a single LED without installing an external current limiting resistor.

This module has a low I_o/I_{sc} = 93 mA entity parameter.

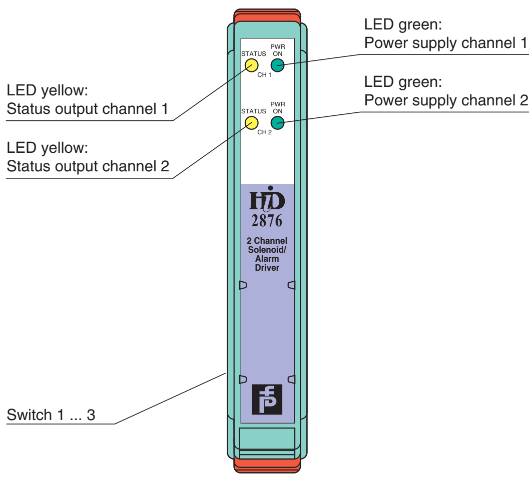
This module mounts on a HiD Termination Board.

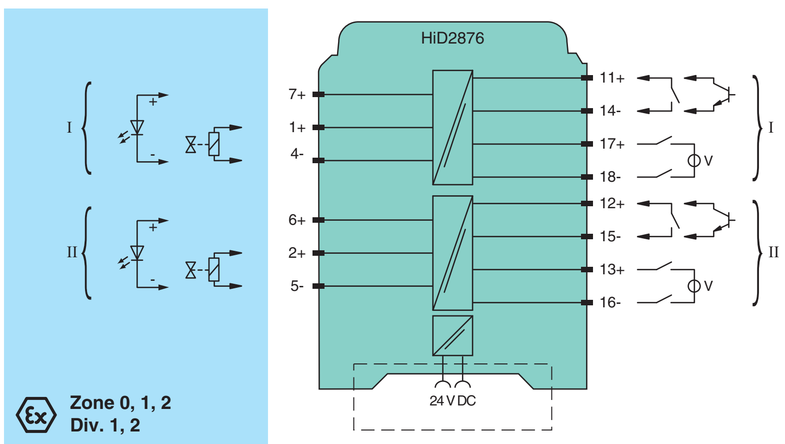
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board 21 ... 30 V DC loop powered
Input	
Control input	voltage free contact or open collector output on with contact close or transistor on output off with contact open or transistor off
Input current	30 mA with open output 70 mA with 300 Ω load 80 mA with shorted output
Power loss	1.2 W at 24 V, 300 Ω load (per channel)
Inrush current	1 A, 0.5 ms loop powered
Output	
Output characteristics	40 mA at 11.2 V DC, 55 mA current limit
Switching frequency f	max. 50 Hz
Response time	turn-on time 1 ms, turn-off time 8 ms, at 300 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1 W at 24 V, 300 Ω load
Input	
Control input	external switch (dry contact or open collector) non isolated or logic level input fully floating
Operating mode	output on with contact close or transistor on or logic level > 4 V output off with contact open or transistor off or logic level < 1.5 V
Output	
Output characteristics	40 mA at 11.2 V DC, 52 mA current limit
Load	0.1 ... 5 kΩ
Switching frequency f	max. 250 Hz
Response time	turn-on time 1 ms, turn-off time 2 ms, at 300 Ω load
Fault level	lead short-circuit detection at < 25 Ω lead breakage detection at > 100 kΩ typical
Fault current	4 mA typical
Error message output	
Output type	open collector transistor
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Output 40 mA at 11.2 V DC, 52 mA current limit**
- **Contact or logic control input**
- **Entity parameter I_o/I_{sc} = 93 mA**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It is used to supply power to solenoid valves, audible alarms, or LED indicators in the hazardous area.

It is controlled with a switch contact, transistor, or logic-level signal.

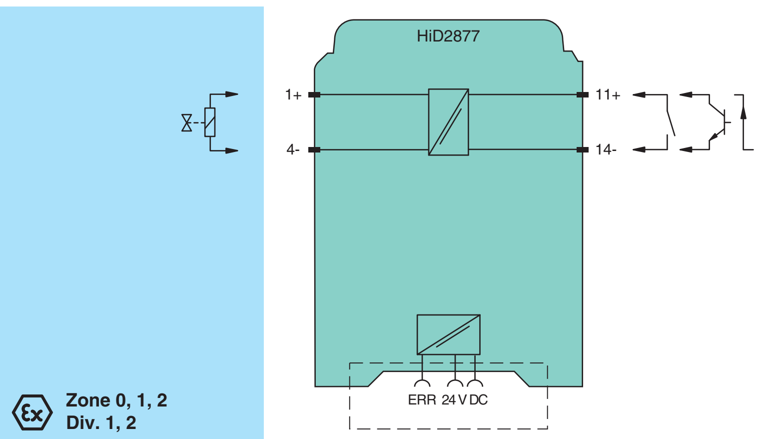
At full load, 11.2 V at 40 mA (with 52 mA current limit) is available for the hazardous area application.

This barrier has a low I_o/I_{sc} = 93 mA entity parameter.

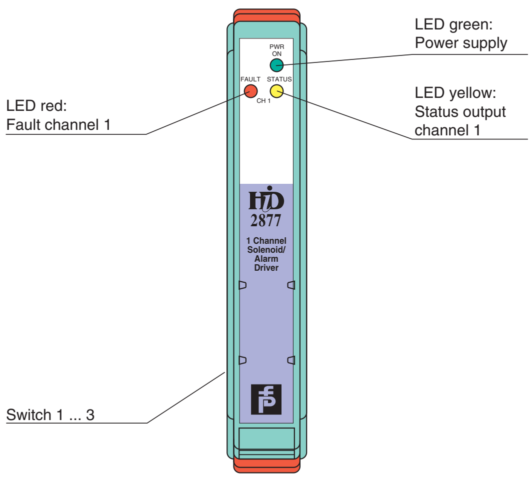
Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions are monitored via a Fault Indication Board.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Output 40 mA at 11.2 V DC, 52 mA current limit**
- **Contact or logic control input**
- **Entity parameter I_o/I_{sc} = 93 mA**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It is used to supply power to solenoid valves, audible alarms, or LED indicators in the hazardous area.

It is controlled with a switch contact, transistor, or logic-level signal.

At full load, 11.2 V at 40 mA (with 52 mA current limit) is available for the hazardous area application.

This barrier has a low I_o/I_{sc} = 93 mA entity parameter.

Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions are monitored via a Fault Indication Board.

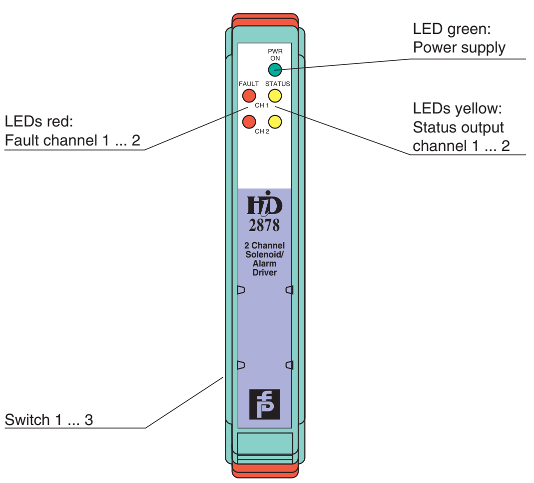
This module mounts on a HiD Termination Board.

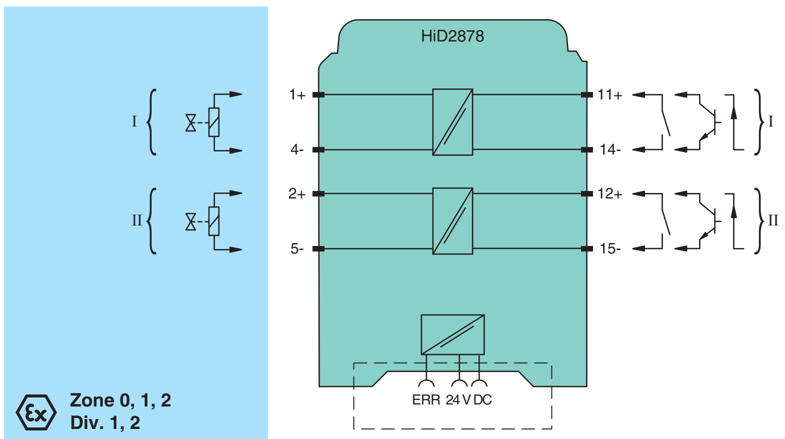
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1 W at 24 V, 300 Ω load (per channel)
Input	
Control input	external switch (dry contact or open collector) non isolated or logic level input fully floating
Operating mode	output on with contact close or transistor on or logic level > 4 V output off with contact open or transistor off or logic level < 1.5 V
Output	
Output characteristics	40 mA at 11.2 V DC, 52 mA current limit
Load	0.1 ... 5 kΩ
Switching frequency f	max. 250 Hz
Response time	turn-on time 1 ms, turn-off time 2 ms, at 300 Ω load
Fault level	lead short-circuit detection at < 25 Ω lead breakage detection at > 100 kΩ typical
Fault current	4 mA typical
Error message output	
Output type	open collector transistor (common to both channels)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board 21 ... 30 V DC loop powered, reverse polarity protected
Input	
Control input	external switch (dry contact or open collector) non isolated or logic level input fully floating
Input current	80 mA at 24 V, 300 Ω load
Power loss	1.3 W at 24 V, 300 Ω load
Inrush current	1 A, max. 2 ms, loop powered
Operating mode	output on with contact close or transistor on or logic level > 4 V output off with contact open or transistor off or logic level < 1.5 V
Output	
Output characteristics	60 mA at 13 V DC, 65 mA current limit
Load	0.1 ... 5 kΩ
Switching frequency f	max. 50 Hz
Response time	turn-on time 2 ms, turn-off time 8 ms, at 300 Ω load
Fault level	lead short-circuit detection at < 25 Ω lead breakage detection at > 100 kΩ typical
Fault current	4 mA typical
Error message output	
Output type	open collector transistor on common bus and optocoupledtransistor (rating 30 V, max. 50 mA)
Connection	terminals 12+, 15-
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIB [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus or loop powered)**
- **Output 60 mA at 13 V DC, 65 mA current limit**
- **Gas group IIB/group C**
- **Contact or logic control input**
- **Line fault detection (LFD) with separate output**
- **Up to SIL2 acc. to IEC 61508 (bus powered)**
- **Up to SIL3 acc. to IEC 61508 (loop powered)**

Function

This isolated barrier is used for intrinsic safety applications. t is used to supply power to solenoid valves, audible alarms, or LED indicators in the hazardous area.

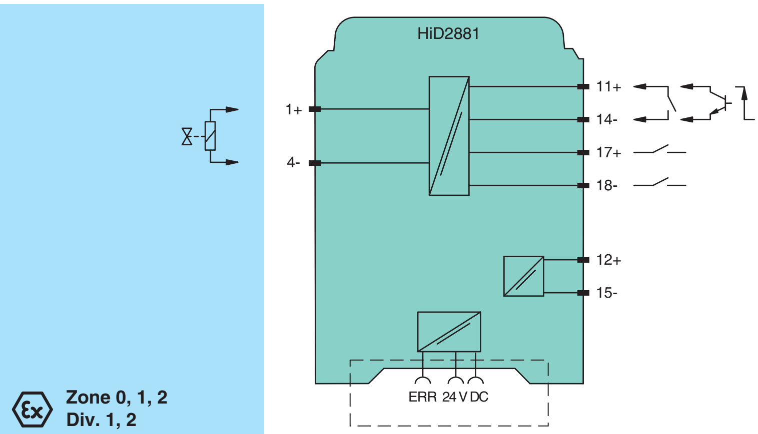
It is controlled with a loop-powered control signal, a switch contact, transistor, or logic-level signal.

At full load, 13 V at 60 mA (with 65 mA current limit) is available for the hazardous area application.

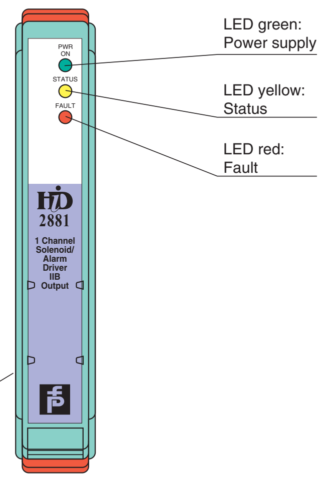
Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions are monitored via a Fault Indication Board.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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Features

- **2-channel isolated barrier**
- **24 V DC supply (bus or loop powered)**
- **Contact or logic control input**
- **Relay contact output to hazardous area**

Function

This isolated barrier is used for intrinsic safety applications. It is used to initiate control signals or to switch power from a protected supply to a load in a hazardous area.

The relay output is driven from a loop-powered safe area control signal or controlled by a safe area switch contact, transistor, or logic-level input.

These command signals can be combined to enable the interaction of DCS and ESD systems. Each channel can be loop-powered, ensuring high integrity operation. LEDs provide the relay status of each channel.

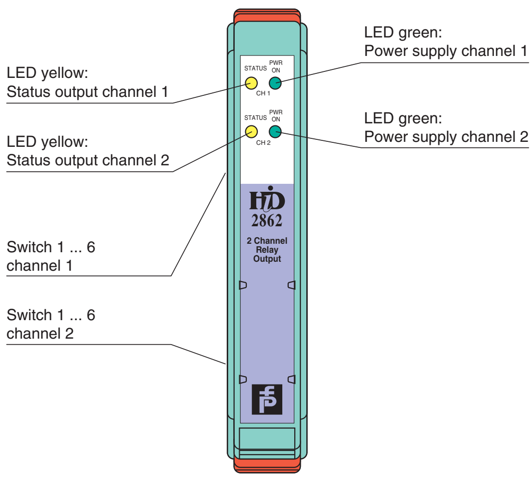
This module mounts on a HiD Termination Board.

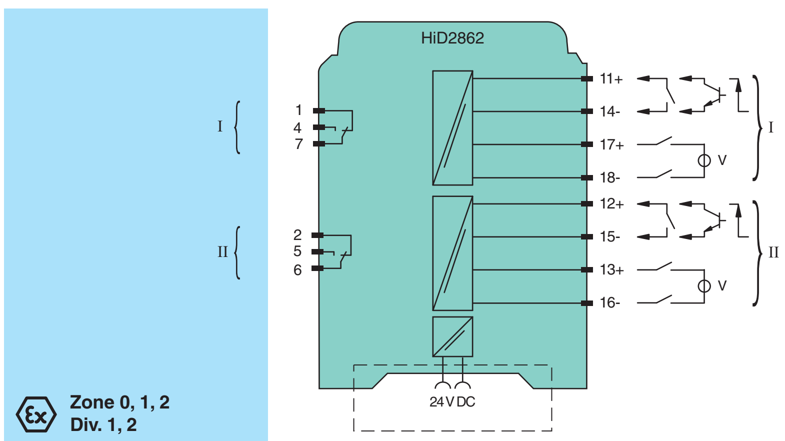
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board 21 ... 30 V DC loop powered
Power loss	loop powered 0.6 W at 24 V (per channel) bus powered 0.9 W at 24 V (per channel)
Input	
Control input	external switch (voltage free contact or open collector) or logic level signal
Input resistance	2.5 kΩ
Operating mode	relay energized with cntact closed, transistor on or logic level > 4 V relay de-energized with contact open, transistor off or logic level < 2 V
Output	
Contact loading	50 V DC/1 A
Transfer characteristics	
Switching frequency	10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 349 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]

Diagrams

Front view





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ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
HiC2871	1, 4	25.2	110	693
HiD2871	1, 4, 7	26	110	715
HiD2872	1, 4, 7; 2, 5, 6	26	110	715
HiD2873	1, 4	26	110	715
HiD2874	1, 4; 2, 5	26	110	715
HiD2875	1, 4, 7	26	93	605
HiD2876	1, 4, 7; 2, 5, 6	26	93	605
HiD2877	1, 4	26	93	605
HiD2878	1, 4; 2, 5	26	93	605
HiD2881	1, 4	26	184	1200

Model Number	Terminals	U_i (V)	I_i (mA)
HiD2862	1, 4, 7; 2, 5, 6	30	1000

CSA Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)
HiD2871	1, 4, 7	26	110
HiD2872	1, 4, 7; 2, 5, 6	26	110
HiD2873	1, 4	26	110
HiD2874	1, 4; 2, 5	26	110
HiD2875	1, 4, 7	26	93
HiD2876	1, 4, 7; 2, 5, 6	26	93
HiD2877	1, 4	26	93
HiD2878	1, 4; 2, 5	26	93
HiD2881	1, 4	26	184

FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
HiC2871	1, 4	25.2	110	–	–

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Transmitter Power Supplies

Model Number	Housing: HiC	Housing: HiD	Channels	Input (Field): 2-wire Transmitter	Input (Field): Current Source	Output (Control System): 0/4 mA ... 20 mA (Source)	Output (Control System): 0/4 mA ... 20 mA (Sink)	Output (Control System): 0/1 V ... 5 V	Specials: SMART	Specials: Signal Splitting (1 Input – 2 Outputs)	Supply: 24 V DC (Bus Powered)	Supply: 24 V DC (Loop Powered)	SIL	Zone 2/Division 2 Mounting	Page
HiC2025	■		1	■	■	■		■	■		■		2	■	353
HiD2025		■	1	■		■		■	■		■		2		354
HiD2026		■	2	■		■		■	■		■		2		355
HiD2025SK		■	1	■			■		■		■		2		356
HiD2026SK		■	2	■			■		■		■		2		357
HiD2029		■	1	■	■	■		■	■		■		2		358
HiD2030		■	2	■	■	■		■	■	■	■		2		359
HiD2029SK		■	1	■	■		■		■		■		2		360
HiD2030SK		■	2	■	■		■		■	■	■		2		361
HiD2024		■	4	■	■	■	■		■		■			■	362

Current Repeaters

Model Number	Housing: HiC	Housing: HiD	Channels	Input (Field): 0 mA ... 40 mA	Input (Field): 1.5 mA ... 50 mA	Input (Field): Fire Alarm	Output (Control System): 0 mA ... 20 mA	Output (Control System): 1.5 mA ... 50 mA	Output (Control System): SMART	Supply 24 V DC (Loop Powered)	SIL	Zone 2/Division 2 Mounting	Page
HiD2035		■	1		■	■		■		■			363
HiD2036		■	2		■	■		■		■			364

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Voltage Repeaters

Model Number	Housing		Channels	Input (Field)			Output (Control System)			Supply 24 V DC (Bus Powered)	SIL	Zone 2/Division 2 Mounting	Page
	HiC	HiD		0 mV ... ± 50 mV	0 mV ... ± 500 mV	0 V ... -20 V	0 mV ... ± 50 mV	0 mV ... ± 500 mV	0 V ... -20 V				
HiC2065	■		1	■			■			■		■	365
HiD2096		■	2			■			■	■		■	366
HiC2068	■		1		■			■		■		■	367
HiC2095	■		1			■			■	■		■	368

Current and Voltage Converters

Model Number	Housing		Channels	Input (Field)					Output (Control System)			SMART	Supply 24 V DC (Bus Powered)	SIL	Zone 2/Division 2 Mounting	Page
	HiC	HiD		0/0.2 V ... 1 V	0/1 V ... 5 V	0/2 V ... 10 V	0/4 mA ... 20 mA	0 Ohm ... 50 Ohm	0/1 V ... 5 V	0/2 V ... 10 V	0/4 mA ... 20 mA					
HiD2012		■	2	■	■	■	■	■	■	■	■	■	■			369

Temperature Converters

Model Number	Housing		Channels	Input (Field)				Output (Control System)		Supply		SIL	Zone 2/Division 2 Mounting	Page
	HiC	HiD		RTD	TC	Potentiometer	mV/V	4 mA ... 20 mA	1 V ... 5 V	24 V DC (Bus Powered)	24 V DC (Loop Powered)			
HiD2061		■	1		■		■	■		■				370
HiD2062		■	2		■		■	■		■				371
HiD2071		■	1	■		■		■		■				372
HiD2072		■	2	■		■		■		■				373
HiD2081		■	1	■	■	■	■	■	■	■				374
HiD2082		■	2	■	■	■	■	■	■	■				375

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Technical data

Supply	
Rated voltage	19 ... 30 V DC via Termination Board
Power loss	≤ 800 mW
Power consumption	≤ 1.1 W
Input	
Input signal	4 ... 20 mA limited to approx. 30 mA
Voltage drop U_d	approx. 5 V on SL2: 5a (+), 1b (-)
Available voltage	≥ 15 V at 20 mA on SL2: 5a (+), 5b (-)
Output	
Load	0 ... 300 Ω (source mode)
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt) 4 ... 20 mA (sink mode), operating voltage 15 ... 26 V
Ripple	20 mV_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ ± 0.1 % incl. non-linearity and hysteresis (source mode)
Influence of ambient temperature	< 2 µA/K (0 ... 60 °C (32 ... 140 °F)); < 4 µA/K (-20 ... 0 °C (-4 ... 32 °F))
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB)
Rise time	10 to 90 % ≤ 20 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 06 ATEX 017
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC, [Ex ia D] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X
FM approval	
Control drawing	16-534FM-12 (cFMus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire transmitters or current sources**
- **Output 4 mA ... 20 mA or 1 V ... 5 V**
- **Low power dissipation**
- **Up to SIL2 acc. to IEC 61508**

Function

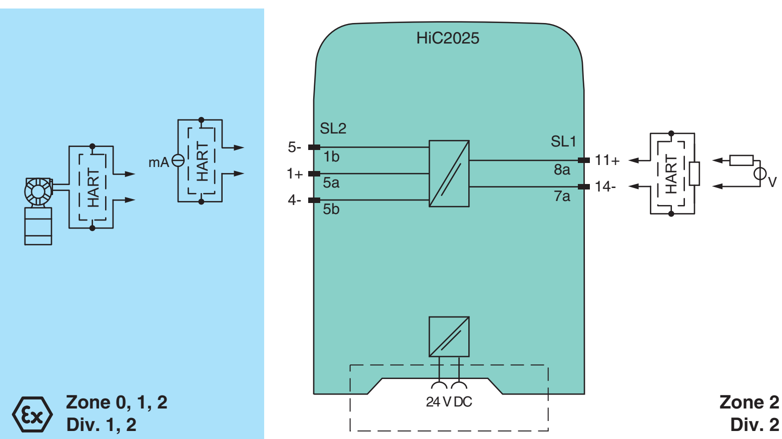
This isolated barrier is used for intrinsic safety applications. It provides 2-wire SMART transmitters with power in the hazardous area and transfers the analog values to the safe area. It is also used with 2-wire SMART current sources.

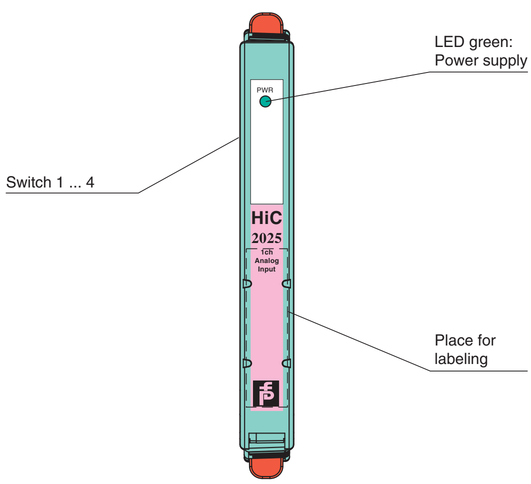
Bi-directional communication is supported for SMART transmitters that use current modulation to transmit data and voltage modulation to receive data.

The output is selected as a current source, current sink, or voltage source via DIP switches on the side of the unit.

This module mounts on a HiC Termination Board.

Diagrams





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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire SMART transmitter**
- **Output 4 mA ... 20 mA or 1 V ... 5 V**
- **Low power dissipation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It provides 2-wire SMART transmitters with power in the hazardous area, and repeats the current to drive a safe area load.

Bi-directional communication is supported for SMART transmitters that use current modulation to transmit data and voltage modulation to receive data.

The output is isolated from the input and are referenced to the power supply common.

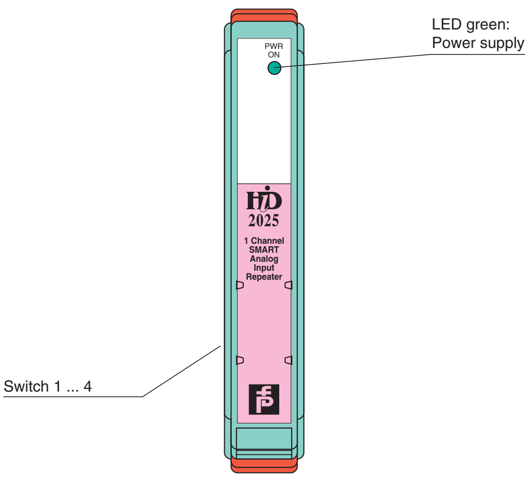
This module mounts on a HiD Termination Board.

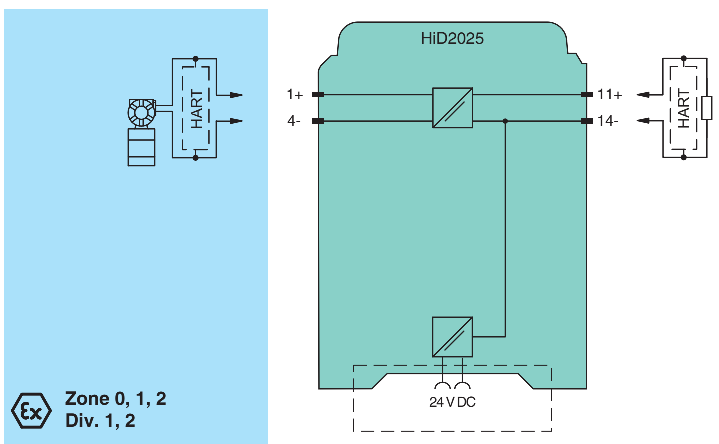
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.8 W at 24 V
Input	
Input current	4 ... 20 mA, current limit 26 mA
Ripple	10 mV_{rms}
Voltage	min. 15.5 V at 20 mA
Output	
Load	0 ... 650 Ω
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω internal shunt)
Ripple	10 mV_{rms} on a load of 250 Ω, reqired for communications
Response time	40 ms, 10 ... 90 % step change
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K
Frequency range	communication channel: 0.5 ... 40 kHz within 3 db, (-6 db at 100 kHz), Tx to output and output to Tx, suitable for use with SMART transmitters using HART or similar protocol
Influence of load	< 0.1 % of full-scale value from 0 ... 650 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.8 W at 24 V (per channel)
Input	
Input current	4 ... 20 mA, current limit 26 mA
Ripple	10 mV_{rms}
Voltage	min. 15.5 V at 20 mA
Output	
Load	0 ... 650 Ω
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω internal shunt)
Ripple	10 mV_{rms} on a load of 250 Ω, reqired for communications
Response time	40 ms, 10 ... 90 % step change
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K
Frequency range	communication channel: 0.5 ... 40 kHz within 3 db, (-6 db at 100 kHz), Tx to output and output to Tx, suitable for use with SMART transmitters using HART or similar protocol
Influence of load	< ± 0.1 % of full-scale value from 0 ... 650 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire SMART transmitter**
- **Output 4 mA ... 20 mA or 1 V ... 5 V**
- **Low power dissipation**
- **Up to SIL2 acc. to IEC 61508**

Function

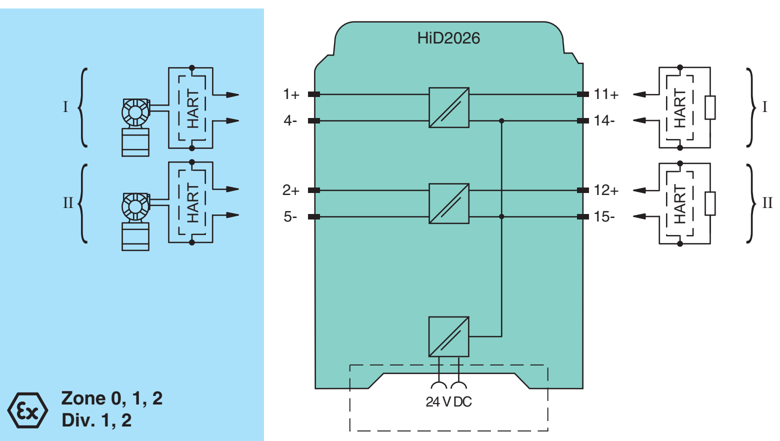
This isolated barrier is used for intrinsic safety applications. It provides 2-wire SMART transmitters with power in the hazardous area, and repeats the current to drive a safe area load.

Bi-directional communication is supported for SMART transmitters that use current modulation to transmit data and voltage modulation to receive data.

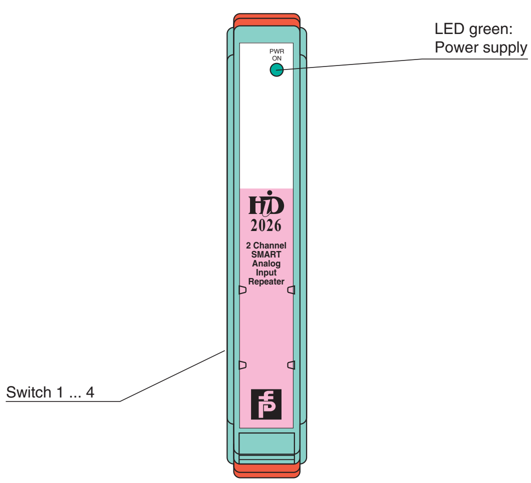
The outputs are isolated from the inputs and are referenced to the power supply common.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire SMART transmitter**
- **Output 4 mA ... 20 mA, current sink**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It provides 2-wire SMART transmitters with power in the hazardous area and transfers the signal to the safe area. It is designed to provide a sink mode output on the safe area terminals.

Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

The output is isolated from the input and are referenced to the power supply common.

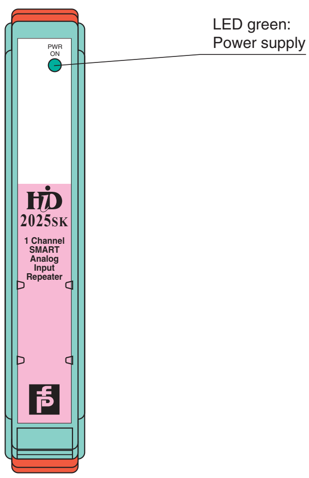
This module mounts on a HiD Termination Board.

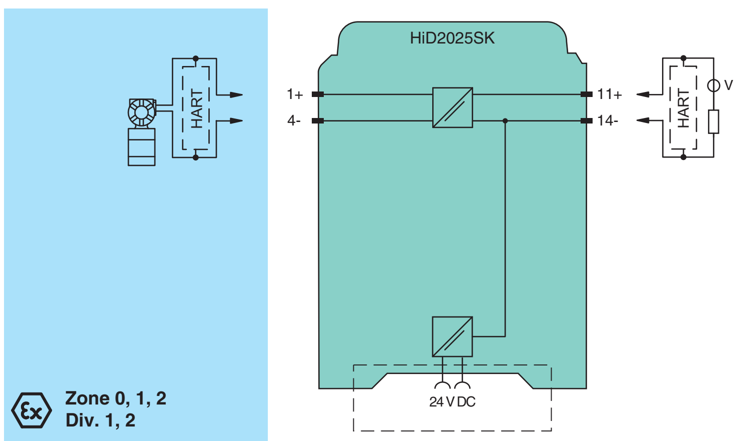
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.3 W at 20 mA and 24 V external from DCS or PLC
Input	
Input current	4 ... 20 mA, current limit 26 mA
Ripple	10 mV_{rms}
Voltage	min. 15.5 V at 20 mA
Output	
Output	sink mode from external supply
Output signal	4 ... 20 mA, current limit 26 mA
Voltage	working voltage 7 ... 30 V
Response time	40 ms, 10 ... 90 % step change
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K
Frequency range	communication channel: 0.5 ... 40 kHz within 3 db, (-6 db at 100 kHz), Tx to output and output to Tx, suitable for use with SMART transmitters using HART or similar protocol
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.3 W at 20 mA and 24 V external from DCS or PLC (per channel)
Input	
Input current	4 ... 20 mA, current limit 26 mA
Ripple	10 mV_{rms}
Voltage	min. 15.5 V at 20 mA
Output	
Output	sink mode from external supply
Output signal	4 ... 20 mA, current limit 26 mA
Voltage	working voltage 7 ... 30 V
Response time	40 ms, 10 ... 90 % step change
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K
Frequency range	communication channel: 0.5 ... 40 kHz within 3 db, (-6 db at 100 kHz), Tx to output and output to Tx, suitable for use with SMART transmitters using HART or similar protocol
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire SMART transmitter**
- **Output 4 mA ... 20 mA, current sink**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It provides 2-wire SMART transmitters with power in the hazardous area and transfers the signal to the safe area.

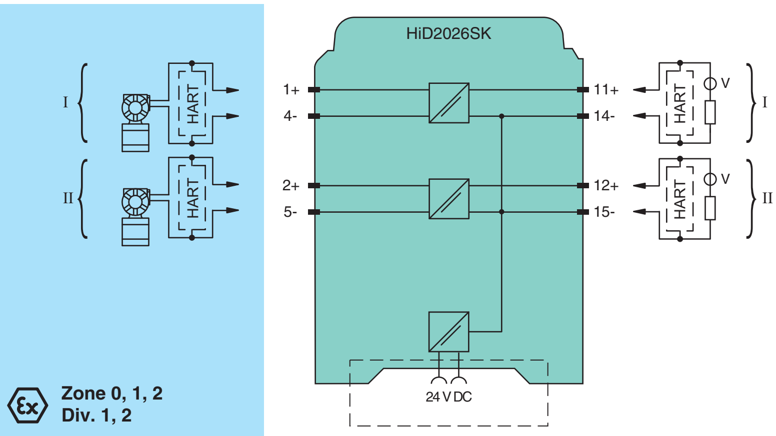
It is designed to provide a sink mode output on the safe area terminals.

Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

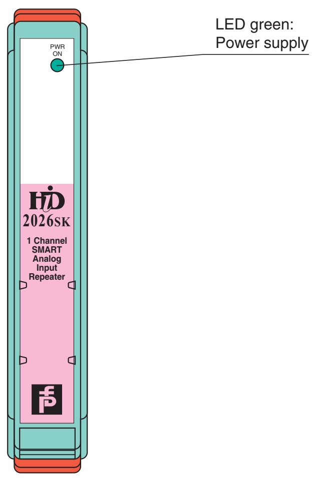
The outputs are isolated from the inputs and are referenced to the power supply common.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire SMART transmitters or current sources**
- **Output 4 mA ... 20 mA or 1 V ... 5 V**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It provides a fully floating supply to power 2-wire SMART transmitters in the hazardous area, and repeats the current to drive a safe area load. It is also used with 2-wire current sources.

Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

A separate fault output on the bus is signaled if the input signal is outside the range 0.2 mA ... 24 mA. The fault conditions can be monitored via a Fault Indication Board.

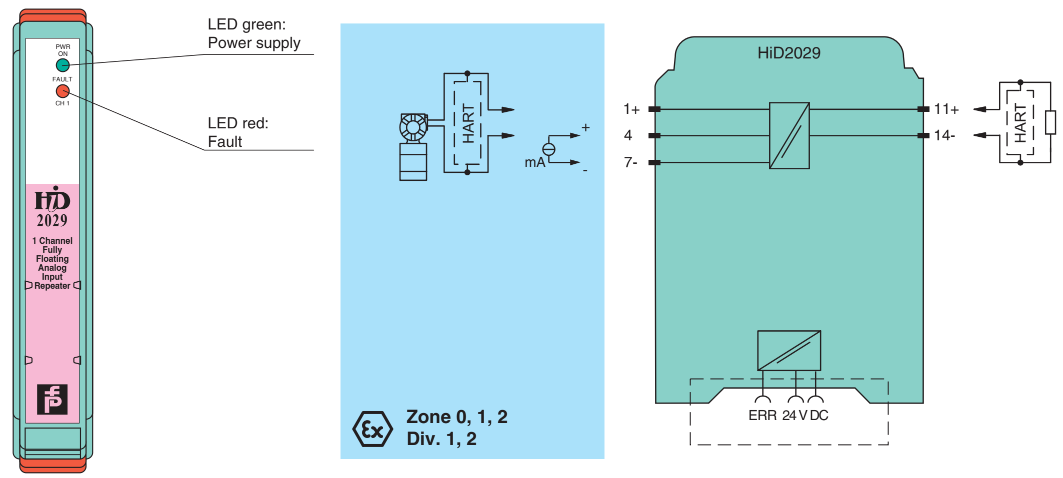
This module mounts on a HiD Termination Board.

Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.05 W at 24 V
Input	
Input current	4 ... 20 mA, current limit 26 mA
Input resistance	40 Ω, for current source
Ripple	10 mV_{rms}
Voltage	min. 15.5 V at 20 mA
Communication	pass-through of HART signal to safe area The current sink terminals 4 and 7 do not pass the HART signal to safe area.
Output	
Load	0 ... 650 Ω
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω internal shunt)
Ripple	10 mV_{rms} on a load of 250 Ω
Response time	70 ms, 10 ... 90 % step change
Signal level	no fault: 1 mA ... 23.5 mA input current fault detection: < 0.2 mA or > 24 mA input current
Error message output	
Output type	open collector transistor fault bus signal
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K
Influence of load	< ± 0.1 % of full-scale value from 0 ... 650 Ω
Linearity	< ± 0.05 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view



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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.05 W at 24 V (per channel)
Input	
Input current	4 ... 20 mA, current limit 26 mA
Input resistance	40 Ω, for current source
Ripple	10 mV_{rms}
Voltage	min. 15.5 V at 20 mA
Communication	pass-through of HART signal to safe area The current sink terminals 4, 7 and 5, 6 do not pass the HART signal to safe area.
Output	
Load	0 ... 650 Ω
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω internal shunt)
Ripple	10 mV_{rms} on a load of 250 Ω
Response time	70 ms, 10 ... 90 % step change
Signal level	no fault: 1 mA ... 23.5 mA input current fault detection: < 0.2 mA or > 24 mA input current
Error message output	
Output type	open collector transistor (common to both channels) fault bus signal, collective error message
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K
Influence of load	< ± 0.1 % of full-scale value from 0 ... 650 Ω
Linearity	< ± 0.05 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire SMART transmitters or current sources**
- **Output 4 mA ... 20 mA or 1 V ... 5 V**
- **Usable as signal splitter**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

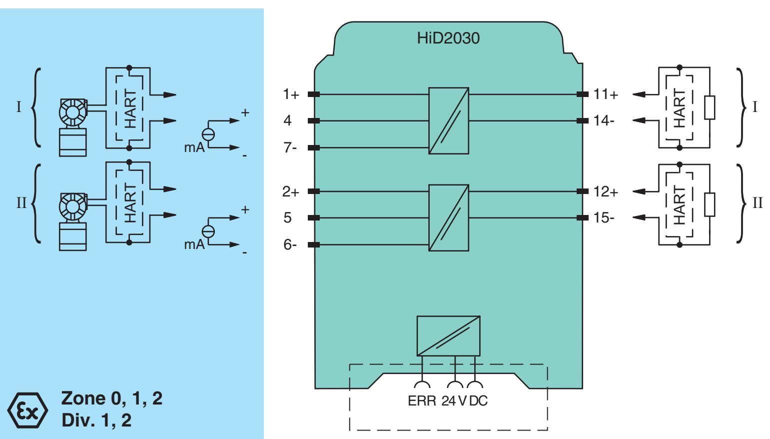
This isolated barrier is used for intrinsic safety applications. It provides a fully floating supply to power 2-wire SMART transmitters in the hazardous area, and repeats the current to drive a safe area load. It is also used with 2-wire current sources.

Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

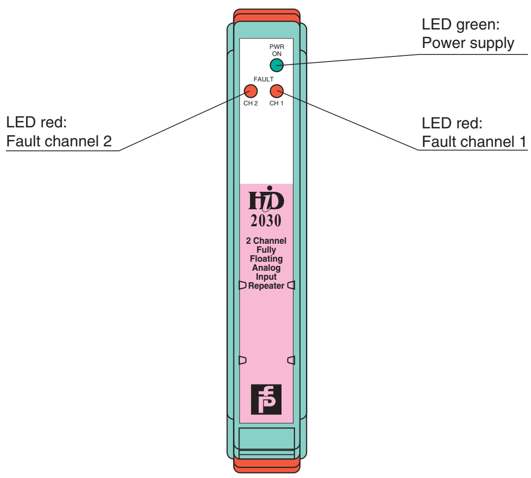
A separate fault output on the bus is signaled if the input signal is outside the range 0.2 mA ... 24 mA. The fault conditions can be monitored via a Fault Indication Board.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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HiD2029SK

SMART Transmitter Power Supply

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire SMART transmitters or current sources**
- **Output 4 mA ... 20 mA, current sink**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It provides a fully floating supply to power 2-wire SMART transmitters in the hazardous area, and repeats the current to drive a safe area load. It is also used with 2-wire current sources. It is designed to provide a sink mode output on the safe area terminals

Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

A separate fault output on the bus is signaled if the input signal is outside the range 0.2 mA ... 24 mA. The fault conditions can be monitored via a Fault Indication Board.

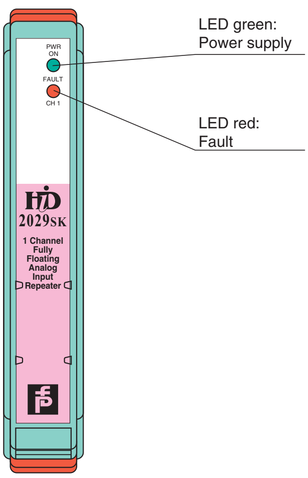
This module mounts on a HiD Termination Board.

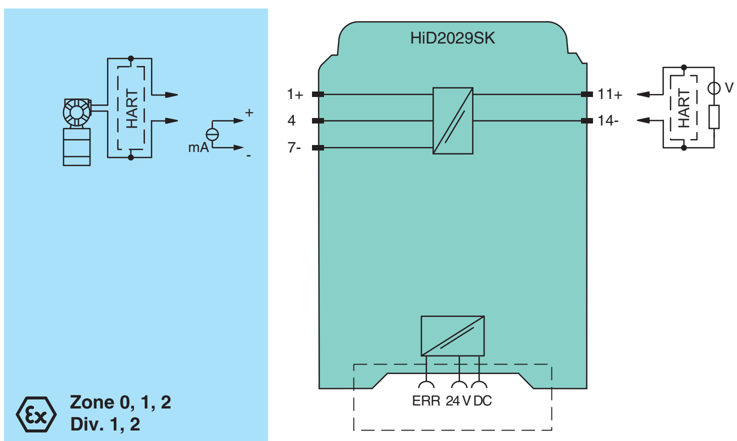
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.05 W at 20 mA and 24 V external from DCS or PLC
Input	
Input current	4 ... 20 mA, current limit 26 mA
Input resistance	40 Ω, for current source
Ripple	10 mV_{rms}
Voltage	min. 15.5 V at 20 mA
Communication	pass-through of HART signal to safe area The current sink terminals 4 and 7 do not pass the HART signal to safe area.
Output	
Output	sink mode from external supply
Output signal	4 ... 20 mA, current limit 24 mA
Voltage	working voltage 7 ... 30 V
Response time	70 ms, 10 ... 90 % step change
Signal level	no fault: 1 mA ... 23.5 mA input current fault detection: < 0.2 mA or > 24 mA input current
Error message output	
Output type	open collector transistor fault bus signal
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Linearity	< ± 0.05 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.05 W at 20 mA and 24 V external from DCS or PLC (per channel)
Input	
Input current	4 ... 20 mA, current limit 26 mA
Input resistance	40 Ω, for current source
Ripple	10 mV_{rms}
Voltage	min. 15.5 V at 20 mA
Communication	pass-through of HART signal to safe area The current sink terminals 4, 7 and 5, 6 do not pass the HART signal to safe area.
Output	
Output	sink mode from external supply
Output signal	4 ... 20 mA, current limit 24 mA
Voltage	working voltage 7 ... 30 V
Response time	70 ms, 10 ... 90 % step change
Signal level	no fault: 1 mA ... 23.5 mA input current fault detection: < 0.2 mA or > 24 mA input current
Error message output	
Output type	open collector transistor (common to both channels) fault bus signal, collective error message
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Linearity	< ± 0.05 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-wire SMART transmitters or current sources**
- **Output 4 mA ... 20 mA, current sink**
- **Usable as signal splitter**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It provides a fully floating supply to power 2-wire SMART transmitters in the hazardous area, and repeats the current to drive a safe area load. It is also used with 2-wire current sources. It is designed to provide a sink mode output on the safe area terminals

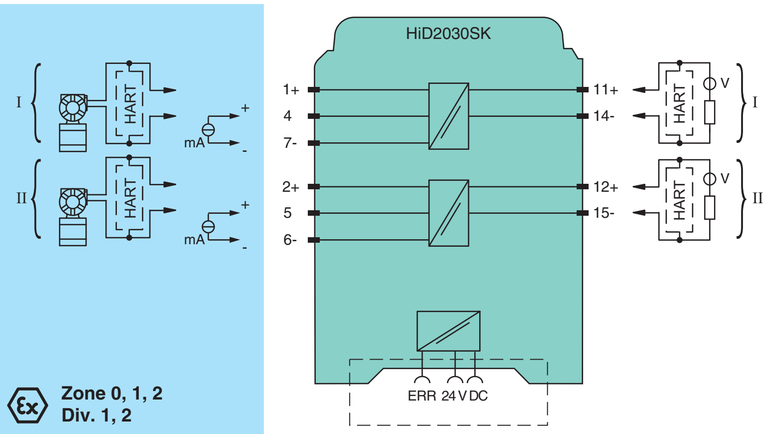
Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

A separate fault output on the bus is signaled if the input signal is outside the range 0.2 mA ... 24 mA. The fault conditions can be monitored via a Fault Indication Board.

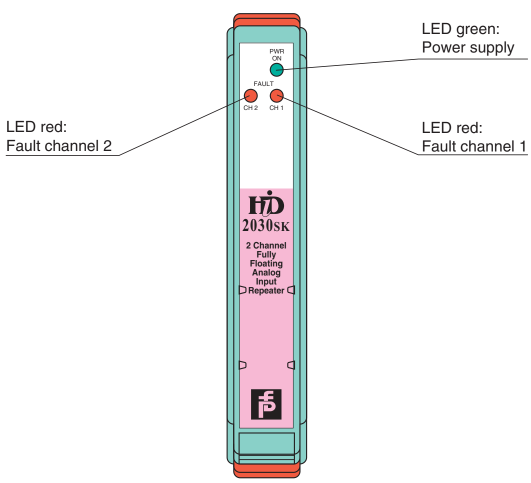
This module mounts on a HiD Termination Board.

H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Diagrams



Front view



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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Features

- **4-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Analog in or analog out signals**
- **Sink and source mode outputs**
- **SMART pass-through**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications. It operates as a SMART transmitter power supply or as a repeater.

Bi-directional communication is supported for SMART transmitters that use current modulation to transmit data and voltage modulation to receive data.

The outputs are fully isolated from the inputs, the power supply, and each other.

An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

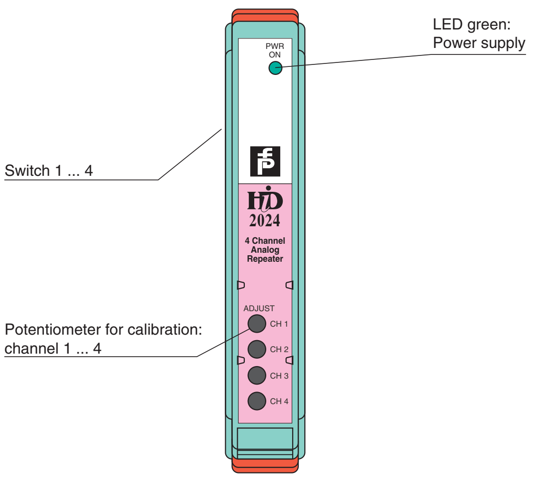
This module mounts on a HiD Termination Board.

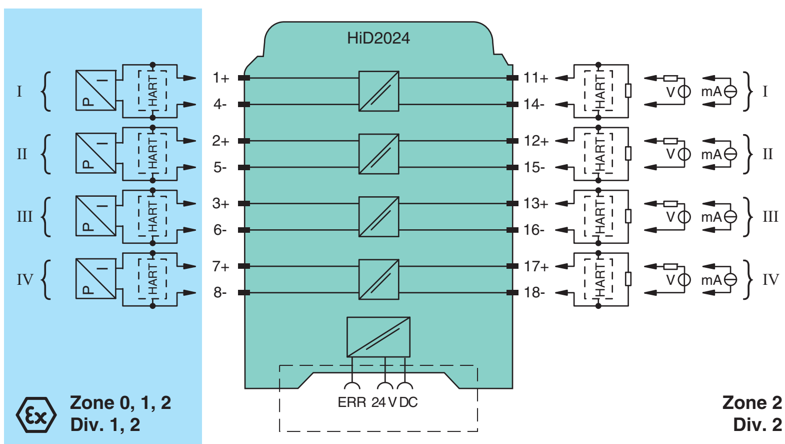
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	≤ 1.8 W at 20 mA
Power consumption	≤ 3.3 W at 20 mA
Hazardous area connection	
Input signal	4 ... 20 mA, limited to approx. 30 mA
Available voltage	≥ 15 V at 20 mA
Output signal	4 ... 20 mA
Output load	0 ... 650 Ω
Safe area connection	
Input signal	4 ... 20 mA
Input resistance	> 100 kΩ at max. 23 V, with field wiring open
Voltage drop	approx. 6 V or internal resistance 300 Ω at 20 mA
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt) 4 ... 20 mA (sink mode), operating voltage 15 ... 26 V
Output load	0 ... 300 Ω (source mode)
Ripple	20 mV_{rms}
Transfer characteristics	
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB)
Rise time	10 to 90 % ≤ 20 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC, [Ex iaD] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X

Diagrams

Front view





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Technical data

Supply	
Rated voltage	6 ... 30 V, loop powered, reverse polarity protected
Power loss	0.7 W at 40 mA, 24 V
Safe circuit	
Current consumption	< 0.6 mA at 24 V and open circuit
Current	1.5 ... 50 mA, loop powered
Signal level	voltage drop 9.6 V at 20 mA and 500 Ω load (4 V at 4 mA)
Field circuit	
Characteristics	for fire and smoke detectors U_{out} = (U_{in} - 1.6) - (0.4 x I_{out}) 6 V < U_{in} < 25 V U_{out} = (25 - 1.6) - (0.4 x I_{out}) 25 V < U_{in} < 30 V
Load	0 ... 750 Ω for I/P applications
Signal	1.5 ... 50 mA for fire and smoke detectors 4 ... 20 mA on a load of max. 750 Ω for I/P applications
Ripple	≤ 150 µA peak to peak for I/P applications
Response time	50 ms, 10 ... 90 % step change for I/P applications
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (range 4 ... 20 mA)
Influence of temperature	< ± 0.01 %/K
Repeat accuracy	< ± 300 µA, 6 V < U_{in} < 25 V/1.5 mA < I_{out} < 50 mA
Influence of load	< ± 0.3 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value (range 4 ... 20 mA)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 1.5 mA ... 50 mA**
- **Fire detector or I/P supply**
- **Accuracy 0.1 %**

Function

This isolated barrier is used for intrinsic safety applications.

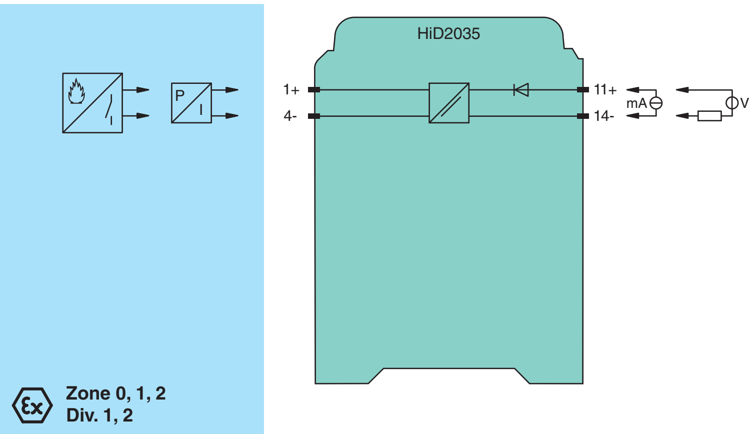
It is loop-powered and is primarily intended to interface with fire and smoke detectors or with similar switched resistor systems requiring a wide output current range (1.5 mA ... 50 mA) to operate correctly.

It is also used to drive a current to I/P converter.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

This module mounts on a HiD Termination Board.

Diagrams



Front view

H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 1.5 mA ... 50 mA**
- **Fire detector or I/P supply**
- **Accuracy 0.1 %**

Function

This isolated barrier is used for intrinsic safety applications.

It is loop-powered and is primarily intended to interface with fire and smoke detectors or with similar switched resistor systems requiring a wide output current range (1.5 mA ... 50 mA) to operate correctly.

It is also used to drive a current to I/P converter.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

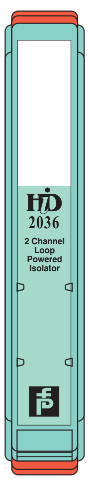
This module mounts on a HiD Termination Board.

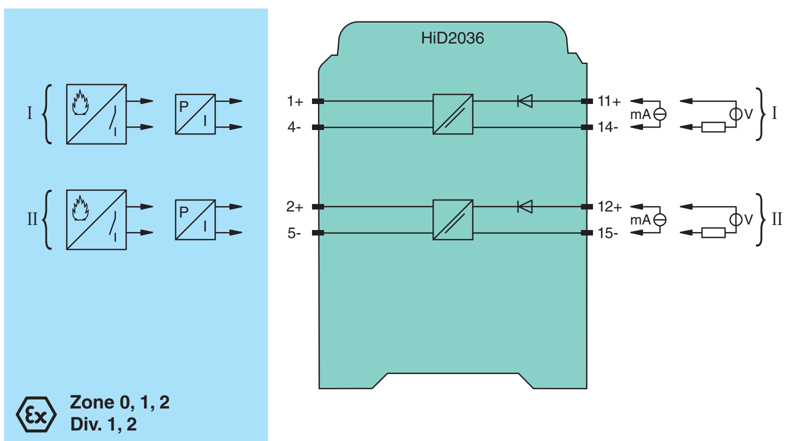
Technical data

Supply	
Rated voltage	6 ... 30 V, loop powered, reverse polarity protected
Power loss	0.7 W at 40 mA, 24 V (per channel)
Safe circuit	
Current consumption	< 0.6 mA at 24 V and open circuit
Current	1.5 ... 50 mA, loop powered
Signal level	voltage drop 9.6 V at 20 mA and 500 Ω load (4 V at 4 mA)
Field circuit	
Characteristics	for fire and smoke detectors $U_{out} = (U_{in} - 1.6) - (0.4 \times I_{out})$ 6 V < U_{in} < 25 V $U_{out} = (25 - 1.6) - (0.4 \times I_{out})$ 25 V < U_{in} < 30 V
Load	0 ... 750 Ω for I/P applications
Signal	1.5 ... 50 mA for fire and smoke detectors 4 ... 20 mA on a load of max. 750 Ω for I/P applications
Ripple	≤ 150 µA peak to peak for I/P applications
Response time	50 ms, 10 ... 90 % step change for I/P applications
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (range 4 ... 20 mA)
Influence of temperature	< ± 0.01 %/K
Repeat accuracy	< ± 300 µA, 6 V < U_{in} < 25 V/1.5 mA < I_{out} < 50 mA
Influence of load	< ± 0.3 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value (range 4 ... 20 mA)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	0.7 W max.
Input	
Input resistance	≥ 16 MΩ
Transmission range	0 ... ± 50 mV
Offset voltage/current	≤ 5 µV/≤ 5 nA
Output	
Load	Accuracy figures for infinite load impedance. Additional 0.03 % of span for a load resistance of 10 kΩ
Voltage	0 ... ± 50 mV
Output resistance	≤ 3 Ω
Fault voltage	open collector output: fault output shall be < V_{cc}/2 (when connected to V_{cc} via 10 kΩ pull up resistor)
Fault connection	via Termination Board
Line fault detection	input: ± 100 mV output: +200 mV, -115 mV
Transfer characteristics	
Bandwidth	DC to > 350 Hz (-3 dB)
Settling time	< 2 ms
Rise time/fall time	≤ 1 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	BASEEFA 10 ATEX 0031X
Group, category, type of protection	Ex II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 10 ATEX 0032X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4
UL approval	
Control drawing	116-0317 (cULus)
IECEx approval	IECEx BAS 10.0012X IECEx BAS 10.0013X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Voltage input 0 mV ... ± 50 mV**
- **Voltage output 0 mV ... ± 50 mV**
- **Selectable up/downscale burnout detection on Power Rail**
- **Fault output signal**

Function

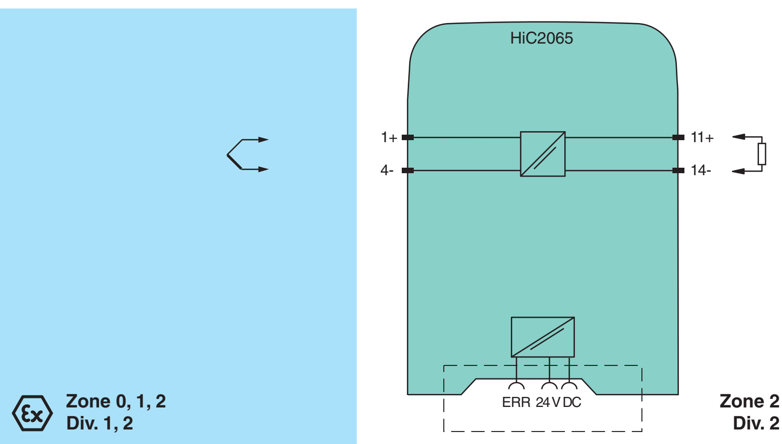
This isolated barrier is used for intrinsic safety applications. It transfers low voltage signals from thermocouples, load cells, strain gauges, operational amplifiers, and inductive oscillation sensors located in hazardous areas to safe areas.

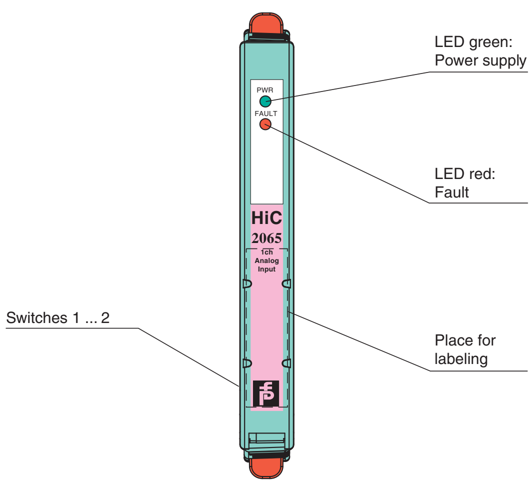
The input voltage of the terminals 1 and 4 is transferred to the terminals 11 and 14.

The input, output, and power supply are galvanically isolated from each other. Upscale or downscale lead breakage monitoring is selectable via switches located on the front panel of the device.

Note: This unit requires three minutes after power-up to reach the accuracy cited in the technical data.

Diagrams





H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

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Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Voltage input 0 V ... -20 V**
- **Vibration sensor inputs**
- **Voltage/current field supply**
- **Voltage output 0 V ... -20 V**

Function

This isolated barrier is used for intrinsic safety applications. It provides a floating output to power a vibration sensor (e. g., Bently Nevada) or accelerometer in a hazardous area and transfers the voltage signal from that sensor to the safe area.

The device is designed to provide a voltage or current supply to the vibration sensor. Depending on connection the barrier provides 3.7 mA, 5.3 mA, or 9.0 mA supply current for 2-wire sensors, or 18 V at 20 mA for 3-wire sensors.

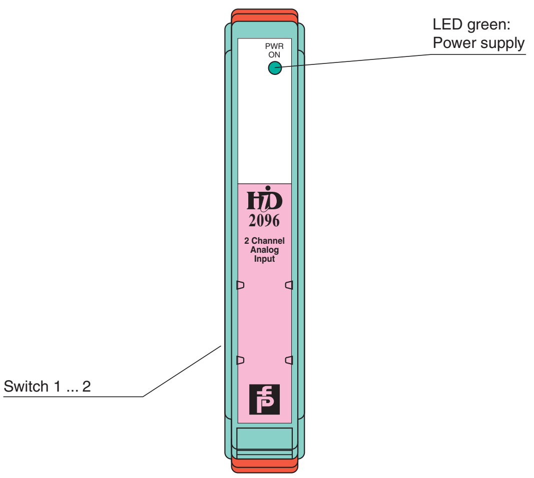
This barrier mounts on a HiD system termination board.

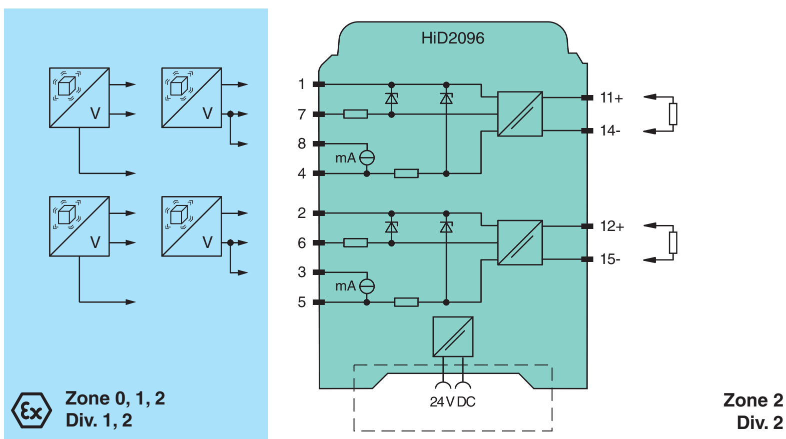
Technical data

Supply	
Rated voltage	20.4 ... 30 V DC
Power consumption	≤ 2.4 W
Input	
Input resistance	10 kΩ terminals 1 and 5
Output rated operating current	terminals 1 (common), 4: > 10 mA at -21 V or > 20 mA at -18 V terminals 2 (common), 5: > 10 mA at -21 V or > 20 mA at -18 V terminals 1 (common), 8: 3.7 ± 0.26 mA, 5.3 ± 0.34 mA or 9.0 ± 0.55 mA, dependent on switch settings (see configuration) terminals 2 (common), 3: 3.7 ± 0.26 mA, 5.3 ± 0.34 mA or 9.0 ± 0.55 mA, dependent on switch settings (see configuration)
Signal span	0 ... -20 V
Output	
Load	≥ 2 kΩ
Voltage	0 ... -20 V
Output resistance	approx. 24 Ω Since this is much less than the end-to-end resistance of a zener barrier, it may be necessary to specify a monitor intended for use without a barrier. Please follow the advice of the monitor manufacturer.
Transfer characteristics	
Bandwidth	-0.1 dB at 10 kHz; -1 dB at 20 kHz
Time delay relative to input	7.0 ± 0.3 µs
Ripple	in 200 kHz bandwidth < 20 mV_{rms} in 20 kHz bandwidth < 3 mV_{rms}
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	pending
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	pending
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	0.7 W max.
Input	
Input resistance	≥ 1.4 MΩ
Transmission range	0 ... ± 500 mV
Offset voltage/current	≤ 5 µV/≤ 5 nA
Output	
Load	Accuracy figures for infinite load impedance. Additional 0.03 % of span for a load resistance of 10 kΩ
Voltage	0 ... ± 500 mV
Output resistance	≤ 3 Ω
Fault voltage	open collector output: fault output shall be < $V_{cc}/2$ (when connected to V_{cc} via 10 kΩ pull up resistor)
Fault connection	via Termination Board
Line fault detection	input: ± 700 mV output: ± 1 V
Transfer characteristics	
Bandwidth	DC to > 350 Hz (-3 dB)
Settling time	< 1 ms
Rise time/fall time	< 100 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	BASEEFA 10 ATEX 0031X
Group, category, type of protection	Ⓔx II (1)GD, I (M1), [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	BASEEFA 10 ATEX 0032X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
UL approval	
Control drawing	116-0317 (cULus)
IECEx approval	IECEx BAS 10.0012X IECEx BAS 10.0013X
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I Ex nA II T4

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Voltage input 0 mV ... ± 500 mV**
- **Voltage output 0 mV ... ± 500 mV**
- **Selectable up/downscale burnout detection on Power Rail**
- **Fault output signal**

Function

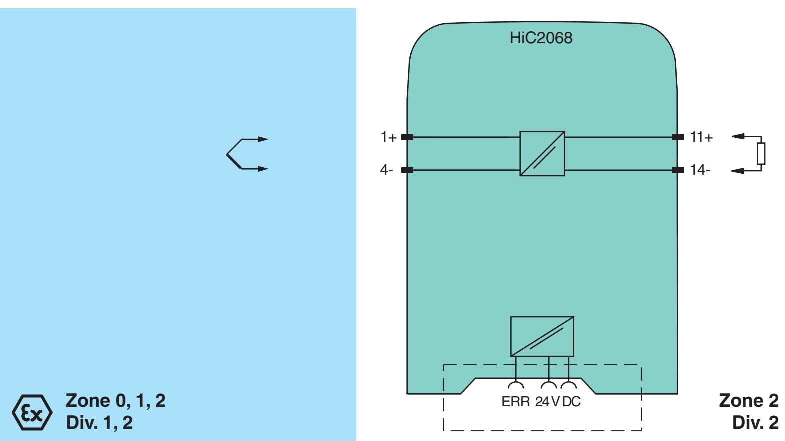
This isolated barrier is used for intrinsic safety applications. It transfers low voltage signals from thermocouples, load cells, strain gauges, operational amplifiers, and inductive oscillation sensors located in hazardous areas to safe areas.

The input voltage of the terminals 1 and 4 is transferred to the terminals 11 and 14.

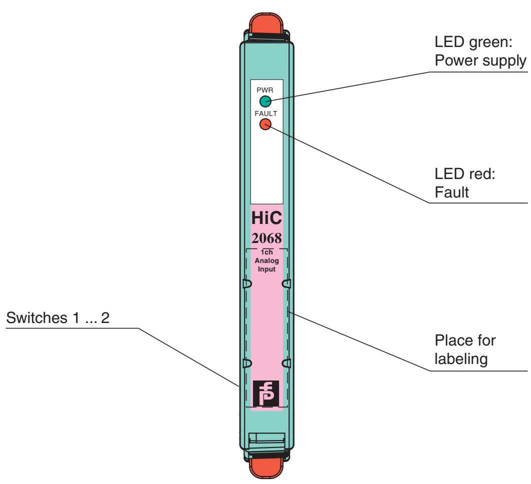
The input, output, and power supply are galvanically isolated from each other. Upscale or downscale lead breakage monitoring is selectable via switches located on the front panel of the device.

Note: This unit requires three minutes after power-up to reach the accuracy cited in the technical data.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Voltage input 0 V ... -20 V**
- **Vibration sensor inputs**
- **Voltage/current field supply**
- **Voltage output 0 V ... -20 V**

Function

This isolated barrier is used for intrinsic safety applications. It provides a floating output to power a vibration sensor (e. g., Bently Nevada) or accelerometer in a hazardous area and transfers the voltage signal from that sensor to the safe area.

The device is designed to provide a voltage or current supply to the vibration sensor. Depending on connection the barrier provides 3.7 mA, 5.3 mA, or 9.0 mA supply current for 2-wire sensors, or 18 V at 20 mA for 3-wire sensors.

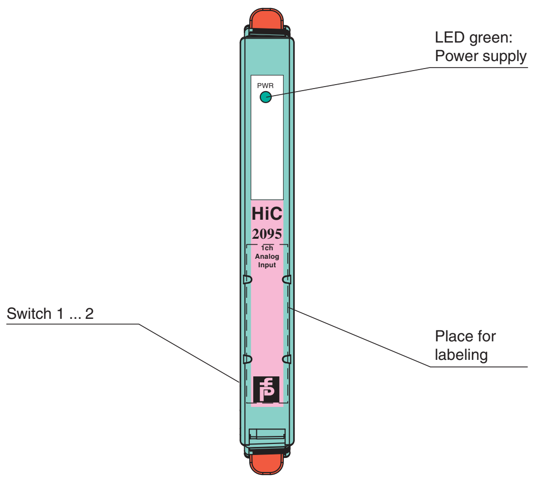
This barrier mounts on a HiC system termination board.

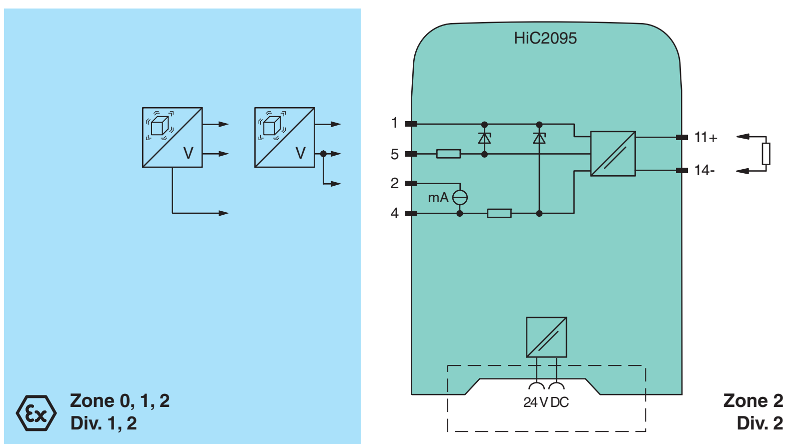
Technical data

Supply	
Rated voltage	20.4 ... 30 V DC
Power consumption	≤ 1.3 W
Input	
Input resistance	10 kΩ terminals 1 and 5
Output rated operating current	terminals 1 (common), 4: > 10 mA at -21 V or > 20 mA at -18 V terminals 1 (common), 2: 3.7 ± 0.26 mA, 5.3 ± 0.34 mA or 9.0 ± 0.55 mA, dependent on switch settings (see configuration)
Signal span	0 ... -20 V
Output	
Load	≥ 2 kΩ
Voltage	0 ... -20 V
Output resistance	approx. 24 Ω Since this is much less than the end-to-end resistance of a zener barrier, it may be necessary to specify a monitor intended for use without a barrier. Please follow the advice of the monitor manufacturer.
Transfer characteristics	
Deviation	DC transfer error (with 10 kΩ load) < 10mV
Bandwidth	-0.1 dB at 10 kHz; -1 dB at 20 kHz
Time delay relative to input	7.0 ± 0.3 µs
Ripple	in 200 kHz bandwidth < 20 mV_{rms} in 20 kHz bandwidth < 3 mV_{rms}
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	pending
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	pending
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	typ. 0.5 W (per channel)
Input	
Input current	0/4 ... 20 mA
Current range	0/4 ... 20 mA, with field selectable DC offset suppression
Voltage range	0/0.2 ... 1 V 0/1 ... 5 V 0/2 ... 10 V
Impedance	current input: 50 Ω (overcurrent protected) with field selectable 5 V level shift voltage input: 100 kΩ/U_{in}
Output	
Current range	0/4 ... 20 mA, source or sink mode
Voltage range	0 ... 5 V/1 ... 5 V (on 250 Ω internal shunt) 0 ... 10 V/2 ... 10 V (on 500 Ω internal shunt)
Ripple	≤ 15 mV_{rms}
Operating range	3 ... 30 V, sink mode
Output compliance	13 V (load 650 Ω at 20 mA), source mode
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K of full-scale value
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-022CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Current and voltage inputs**
- **Analog current and voltage output**
- **Sink and source mode outputs**
- **SMART pass-through**

Function

This isolated barrier is used for intrinsic safety applications. It accepts current or voltage input signals from a hazardous area and converts them to a proportional, analog value in the safe area.

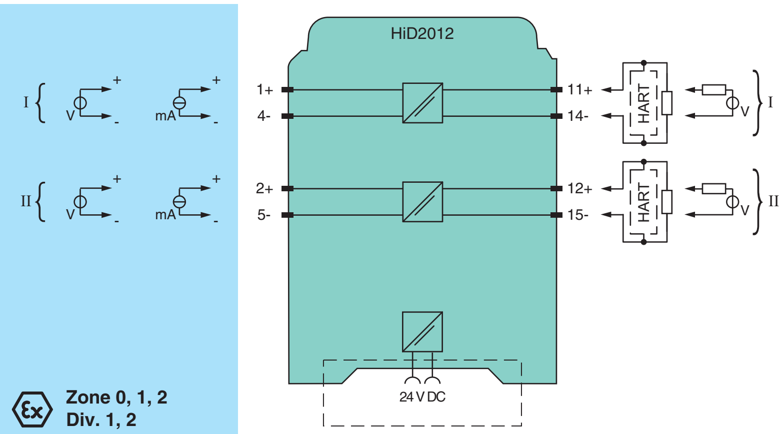
The outputs can be selected as current source, current sink, or voltage source.

The passive current input configuration supports a pass through for SMART communication signals.

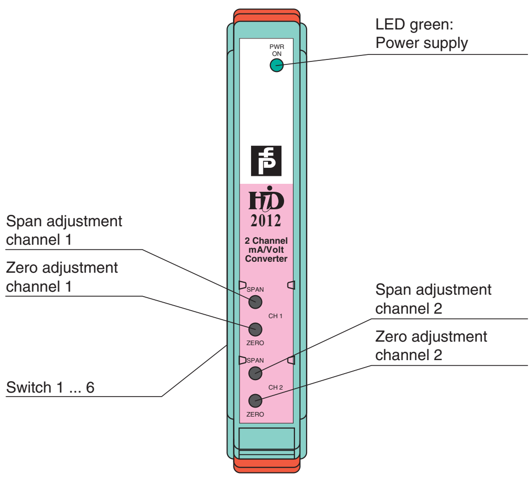
This unit has field programmable zero/span trimmers and input/output configuration by means of DIP switches. This feature allows simple field reconfiguration.

This module mounts on a HiD Termination Board.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Thermocouple or mV inputs**
- **Output 4 mA ... 20 mA**
- **Sensor breakage detection**
- **Simple span and zero selection**

Function

This isolated barrier is used for intrinsic safety applications. It is a temperature converter that accepts thermocouple or mV input signals from a hazardous area and converts them to an isolated analog current signal in the safe area.

Input type, range, and error handling parameters are configurable by DIP switches and potentiometers.

Each module is supplied with a cold junction compensator (CJC), which is mounted on the screw terminals of the Termination Board.

The output is isolated from the input and are referenced to the power supply common.

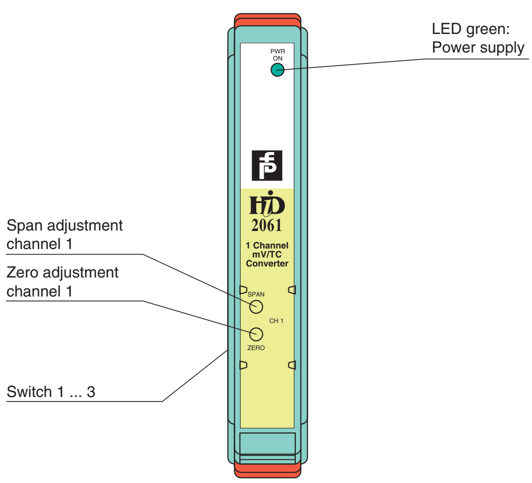
This module mounts on a HiD Termination Board.

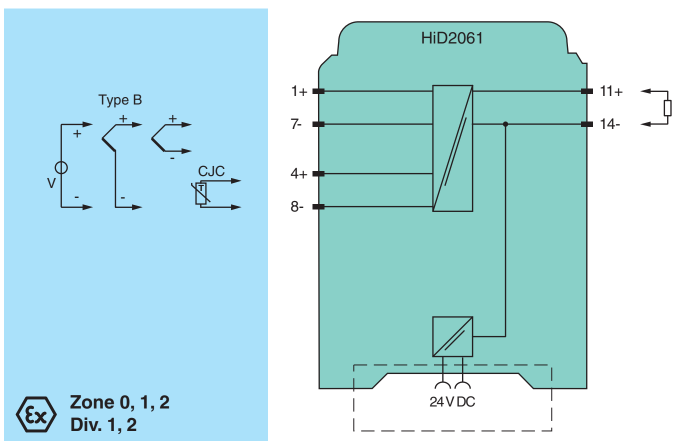
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.6 W at 24 V
Input	
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1), type L (GOST)
Cold junction compensation	at field terminals
Measurement range	-10 ... 100 mV
Span	2.6 ... 100 mV
Zero suppression	± 500 % of span
Lead monitoring	burnout 25 mA, upscale or downscale (selectable)
Output	
Load	0 ... 650 Ω
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt)
Ripple	10 mV_{rms} (at load 250 Ω)
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K on zero and span
Influence of load	< ± 0.1 % of full-scale value from 0 ... 650 Ω
Rise time/fall time	typ. 150 ms
Linearity	< ± 0.1 % of full-scale value (terminal based mV input to mA output of thermocouples)
Compensation error	± 0.5 K ± 0.05 K deviation from reference of 20 °C (68°F)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.6 W at 24 V (per channel)
Input	
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1), type L (GOST)
Cold junction compensation	at field terminals
Measurement range	-10 ... 100 mV
Span	2.6 ... 100 mV
Zero suppression	± 500 % of span
Lead monitoring	burnout 25 mA, upscale or downscale (selectable)
Output	
Load	0 ... 650 Ω
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt)
Ripple	10 mV_{rms} (at load 250 Ω)
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K on zero and span
Influence of load	< ± 0.1 % of full-scale value from 0 ... 650 Ω
Rise time/fall time	typ. 150 ms
Linearity	< ± 0.1 % of full-scale value (terminal based mV input to mA output of thermocouples)
Compensation error	± 0.5 K ± 0.05 K deviation from reference of 20 °C (68 °F)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Thermocouple or mV inputs**
- **Output 4 mA ... 20 mA**
- **Sensor breakage detection**
- **Simple span and zero selection**

Function

This isolated barrier is used for intrinsic safety applications. It is a temperature converter that accepts thermocouple or mV input signals from a hazardous area and converts them to an isolated analog current signal in the safe area.

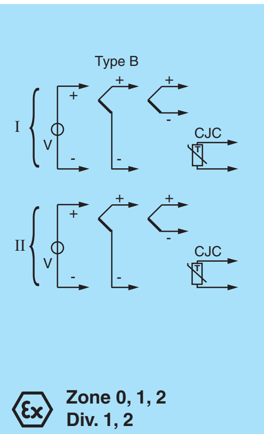
Input type, range, and error handling parameters are configurable by DIP switches and potentiometers.

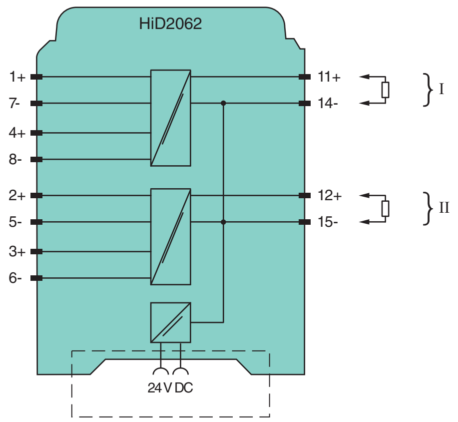
Each module is supplied with a cold junction compensator (CJC), which is mounted on the screw terminals of the Termination Board.

The outputs are isolated from the inputs and are referenced to the power supply common.

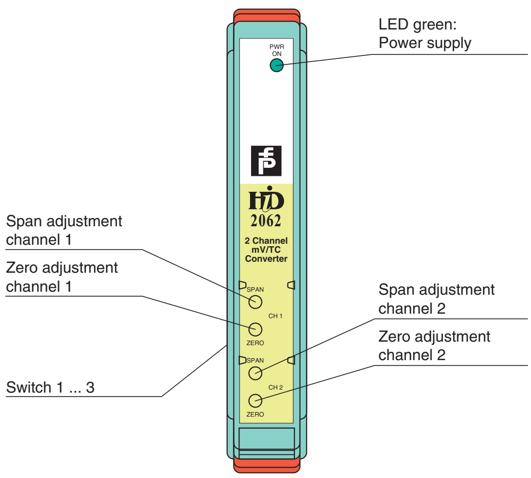
This module mounts on a HiD Termination Board.

Diagrams





Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-, 3-, and 4-wire RTDs or potentiometer**
- **Linearized output 4 mA ... 20 mA**
- **Sensor breakage detection**
- **Simple span and zero selection**

Function

This isolated barrier is used for intrinsic safety applications. It is a temperature converter that accepts input from resistance temperature detectors (RTD) or potentiometers from a hazardous area and converts them to an isolated analog current signal in the safe area.

Input type, range, and error handling parameters are configurable by DIP switches and potentiometers.

The output is isolated from the input and are referenced to the power supply common.

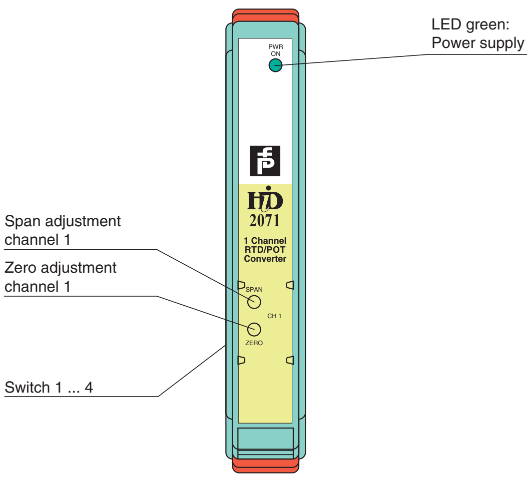
This module mounts on a HiD Termination Board.

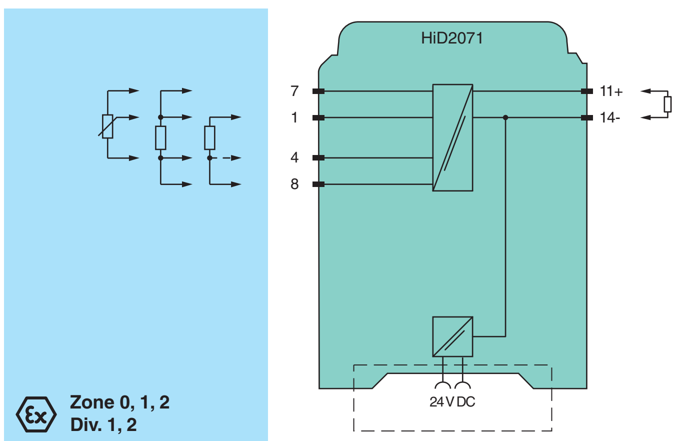
Technical data

Supply	
Power loss	0.6 W at 24 V
Input	
RTD	2-, 3- or 4-wire Pt100 acc. to DIN 43760
Measuring current	max. 0.4 mA
Measurement range	-200 ... 850 °C (-328 ... 1562 °F)
Span limits	40 ... 850 °C (104 ... 1562 °F)
Zero suppression	± 500 % of span
Potentiometer	3-wire
Measurement range	100 ... 300 Ω or 0.3 ... 100 kΩ with external shunt
Lead monitoring	burnout, upscale or downscale (selectable) (not on potentiometer and 4-wire RTD)
Output	
Load	0 ... 650 Ω
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt) Output signal is linear with temperature for Pt100.
Ripple	10 mV_{rms} (at load 250 Ω)
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K on zero and span
Influence of load	< ± 0.1 % of full-scale value from 0 ... 650 Ω
Rise time/fall time	typ. 150 ms
Linearity	< ± 0.1 % of full-scale value (terminal based °C or °F input to mA out for Pt100)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.6 W at 24 V (per channel)
Input	
RTD	2-, 3- or 4-wire Pt100 acc. to DIN 43760
Measuring current	max. 0.4 mA
Measurement range	-200 ... 850 °C (-328 ... 1562 °F)
Span limits	40 ... 850 °C (104 ... 1562 °F)
Zero suppression	± 500 % of span
Potentiometer	3-wire
Measurement range	100 ... 300 Ω or 0.3 ... 100 kΩ with external shunt
Lead monitoring	burnout, upscale or downscale (selectable) (not on potentiometer and 4-wire RTD)
Output	
Load	0 ... 650 Ω
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt) Output signal is linear with temperature for Pt100.
Ripple	10 mV_{rms} (at load 250 Ω)
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (current output)
Influence of temperature	< ± 0.01 %/K on zero and span
Influence of load	< ± 0.1 % of full-scale value from 0 ... 650 Ω
Rise time/fall time	typ. 150 ms
Linearity	< ± 0.1 % of full-scale value (terminal based °C or °F input to mA out for Pt100)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **2-, 3-, and 4-wire RTDs or potentiometer**
- **Linearized output 4 mA ... 20 mA**
- **Sensor breakage detection**
- **Simple span and zero selection**

Function

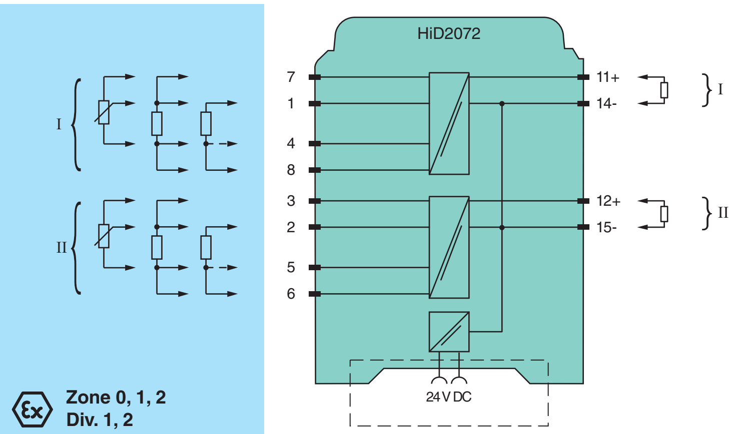
This isolated barrier is used for intrinsic safety applications. It is a temperature converter that accepts inputs from resistance temperature detectors (RTD) or potentiometers from a hazardous area and converts them to an isolated analog current signal in the safe area.

Input type, range, and error handling parameters are configurable by DIP switches and potentiometers.

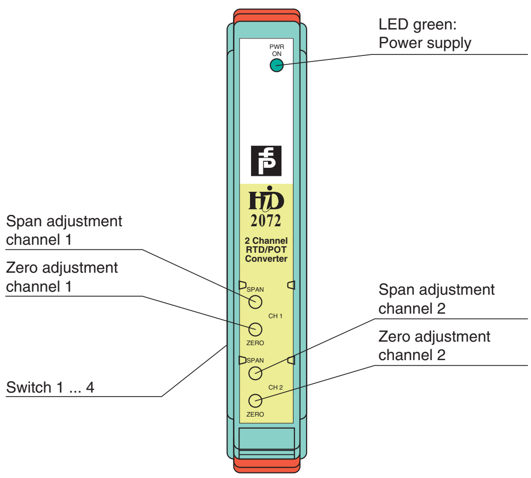
The outputs are isolated from the inputs and are referenced to the power supply common.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Thermocouple, RTD or potentiometer**
- **Linearized output 4 mA ... 20 mA, sink/source or 1 V ... 5 V**
- **Sensor breakage detection**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications.

This device accepts thermocouples (TC), millivolts, potentiometers, or resistance temperature detectors (RTD) from a hazardous area and converts them to an isolated, linearized analog output in the safe area.

The outputs can be selected as a current source, current sink, or voltage source with DIP switches on the side panel.

Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions are monitored via a Fault Indication Board.

The device is easily configured by the use of the PACTware configuration software.

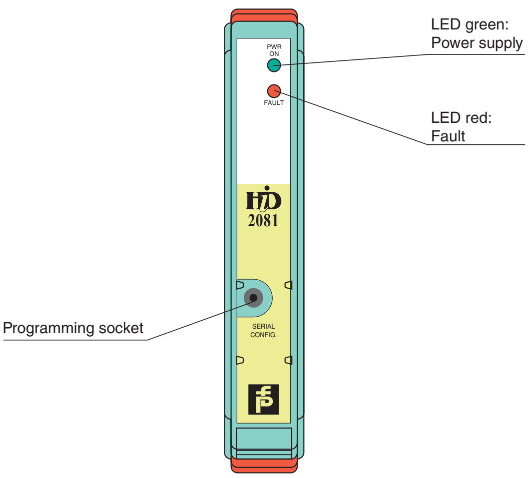
This device mounts on a HiD Termination Board.

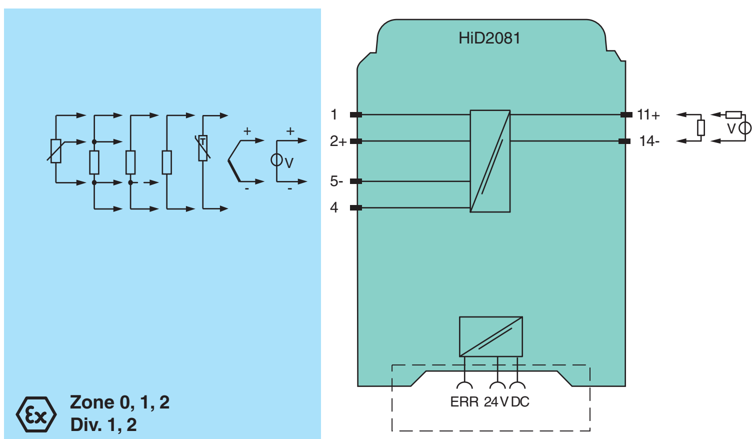
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.2 W
Input	
RTD	type Cu10, Cu50, Cu100, Pt10, Pt50, Pt100, Pt500, Pt1000, Ni100 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt50GOST, Pt1000GOST (P50353-92)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-, 4-wire connection
Lead resistance	≤ 50 Ω per lead
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	at field terminals
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Potentiometer	0.1 ... 20 kΩ
Types of measuring	3-wire connection
Input resistance	≥ 1 MΩ (-100 ... 100 mV)
Output	
Output I, II	analog, current or voltage output
Current range	0/4 ... 20 mA
Fault signal	downscale 0 or 2 mA, upscale 21.5 mA (acc. NAMUR NE43)
Source	load 0 ... 550 Ω, open-circuit voltage ≤ 18 V
Sink	0/4 ... 20 mA (sink mode), working voltage 7 ... 30 V
Voltage range	0 ... 5 V or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	1.2 W
Input	
RTD	type Cu10, Cu50, Cu100, Pt10, Pt50, Pt100, Pt500, Pt1000, Ni100 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt50GOST, Pt1000GOST (P50353-92)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-, 4-wire connection
Lead resistance	≤ 50 Ω per lead
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	at field terminals
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Potentiometer	0.1 ... 20 kΩ
Types of measuring	3-wire connection
Input resistance	≥ 1 MΩ (-100 ... 100 mV)
Output	
Output I, II	analog, current or voltage output
Current range	0/4 ... 20 mA
Fault signal	downscale 0 or 2 mA, upscale 21.5 mA (acc. NAMUR NE43)
Source	load 0 ... 550 Ω, open-circuit voltage ≤ 18 V
Sink	0/4 ... 20 mA (sink mode), working voltage 7 ... 30 V
Voltage range	0 ... 5 V or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 376 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Thermocouple, RTD or potentiometer**
- **Linearized output 4 mA ... 20 mA, sink/source or 1 V ... 5 V**
- **Sensor breakage detection**
- **Line fault detection (LFD)**

Function

This isolated barrier is used for intrinsic safety applications.

This device accepts thermocouples (TC), millivolts, potentiometers, or resistance temperature detectors (RTD) from a hazardous area and converts them to an isolated, linearized analog output in the safe area.

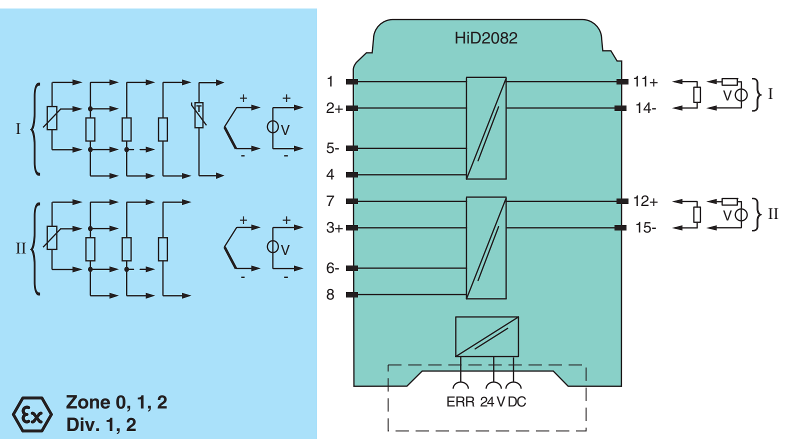
The outputs can be selected as a current source, current sink, or voltage source with DIP switches on the side panel.

Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions are monitored via a Fault Indication Board.

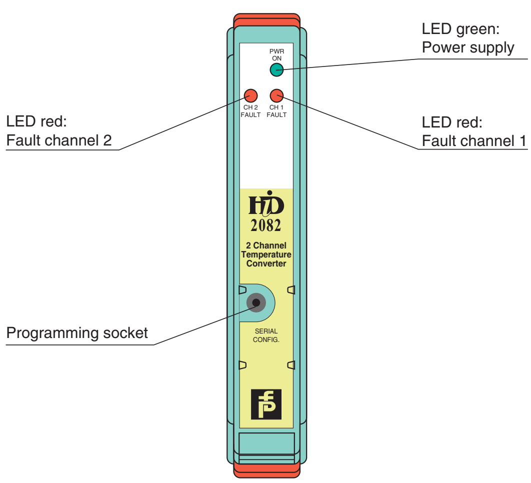
The device is easily configured by the use of the PACTware configuration software.

This device mounts on a HiD Termination Board.

Diagrams



Front view



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ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
HiC2025	1, 4 1, 5	25.2 7.2	100 100	630 25
HiC2065	1, 4	5.5	2.4	3.3
HiC2068	1, 4	5.5	2.4	3.3
HiD2012	1, 4; 2, 5	1.7	45	20
HiD2024	1, 4; 2, 5; 3, 6; 7, 8	25.2	93	586
HiD2025	1, 4	26	93	605
HiD2026	1, 4; 2, 5	26	93	605
HiD2025SK	1, 4	26	93	605
HiD2026SK	1, 4; 2, 5	26	93	605
HiD2029	1, 4 4, 7	26 1.2	93 50	605 15
HiD2030	1, 4; 2, 5 4, 7; 5, 6	26 1.2	93 50	605 15
HiD2029SK	1, 4 4, 7	26 1.2	93 50	605 15
HiD2030SK	1, 4; 2, 5 4, 7; 5, 6	26 1.2	93 50	605 15
HiD2035	1, 4	26	93	605
HiD2036	1, 4; 2, 5	26	93	605
HiD2061	1, 4; 7, 8	13.2	20	66
HiD2062	1, 4, 7, 8; 2, 5, 3, 6	13.2	20	66
HiD2071	1, 4; 7, 8	13.2	20	66
HiD2072	1, 4, 7, 8; 2, 5, 3, 6	13.2	20	66
HiD2081	1, 2; 4, 5	10	15	38
HiD2082	1, 4; 2, 5; 3, 6; 7, 8	10	15	38

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CSA Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)
HiD2012	1, 4; 2, 5	1.7	45
HiD2025	1, 4	26	93
HiD2026	1, 4; 2, 5	26	93
HiD2025SK	1, 4	26	93
HiD2026SK	1, 4; 2, 5	26	93
HiD2029	1, 4 4, 7 1, 4, 7	26 1.2 27.2	93 50 143
HiD2030	1, 4; 2, 5 4, 7; 5, 6 1, 4, 7; 2, 5, 6	26 1.2 27.2	93 50 143
HiD2029SK	1, 4 4, 7 1, 4, 7	26 1.2 27.2	93 50 143
HiD2030SK	1, 4; 2, 5 4, 7; 5, 6 1, 4, 7; 2, 5, 6	26 1.2 27.2	93 50 143
HiD2035	1, 4	26	93
HiD2036	1, 4; 2, 5	26	93
HiD2061	1, 4; 7, 8	13.2	20
HiD2062	1, 4, 7, 8; 2, 5, 3, 6	13.2	20
HiD2071	1, 4; 7, 8	13.2	20
HiD2072	1, 4, 7, 8; 2, 5, 3, 6	13.2	20
HiD2081	1, 2; 5, 4	10	15
HiD2082	1, 4; 2, 5; 3, 6; 7, 8	10	15

FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
HiC2025	1, 4 1, 5	25.2 7.2	100 100	– –	– –

UL Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
HiC2065	1, 4	5.5	2.4	–	–
HiC2068	1, 4	5.5	2.4	–	–

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Current Drivers

Model Number	Housing		Channels	Input (Control System)		Output (Field)			SMART	Supply		SIL	Zone 2/Division 2 Mounting	Page
	HiC	HiD		0/4 mA ... 20 mA	1.5 mA ... 50 mA	0/4 mA ... 20 mA	1.5 mA ... 50 mA	Line Fault Detection		24 V DC (Bus Powered)	24 V DC (Loop Powered)			
HiC2031	■		1	■		■		■	■	■		2	■	380
HiD2031		■	1	■		■		■		■				381
HiD2032		■	2	■		■		■		■				382
HiD2033		■	1	■		■		■			■	2		383
HiD2034		■	2	■		■		■			■	2		384
HiD2035		■	1		■		■				■			385
HiD2036		■	2		■		■				■			386
HiD2037		■	1	■		■		■	■	■		2		387
HiD2038		■	2	■		■		■	■	■		2		388
HiD2038Y		■	2	■		■		■	■	■		2		389

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Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Current output up to 650 Ω load**
- **Low power dissipation**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It repeats a 4 mA ... 20 mA input signal from a control system to drive HART I/P converters, valve actuators, and displays located in a hazardous area.

Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

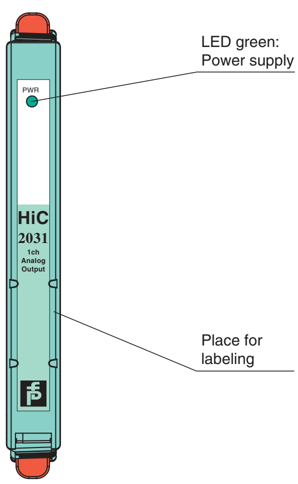
This module mounts on a HiC Termination Board.

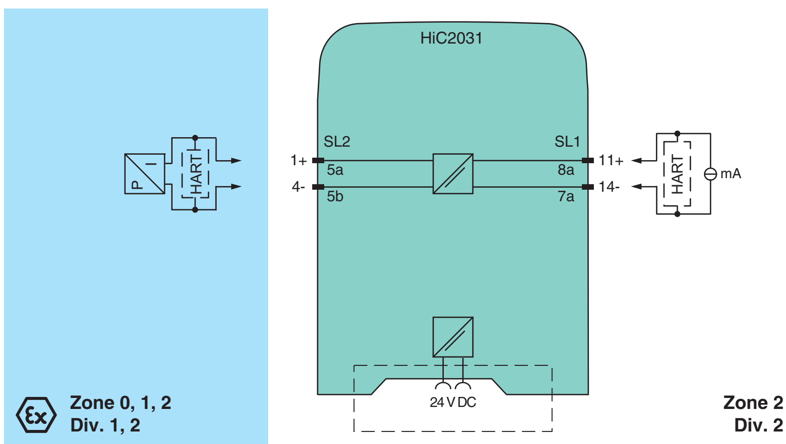
Technical data

Supply	
Rated voltage	19 ... 30 V DC via Termination Board
Power loss	≤ 600 mW
Power consumption	≤ 700 mW
Input	
Input signal	4 ... 20 mA limited to approx. 30 mA
Voltage drop U_d	approx. 6 V or internal resistance 300 Ω at 20 mA
Input resistance	> 100 kΩ at max. 23 V, with field wiring open
Output	
Current	4 ... 20 mA
Load	0 ... 650 Ω
Voltage	≥ 13 V at 20 mA
Ripple	20 mV_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ ± 0.1 % incl. non-linearity and hysteresis
Influence of ambient temperature	< 2 µA/K (0 ... 60 °C (32 ... 140 °F)); < 4 µA/K (-20 ... 0 °C (-4 ... 32 °F))
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0 ... 3 kHz (-3 dB)
Rise time	10 to 90 % ≤ 100 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 06 ATEX 017
Group, category, type of protection	Ⓔx II (1)GD [EEx ia] IIC, [Ex ia D] [circuit(s) in zone 0/1/2/20/21/22]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X
FM approval	
Control drawing	16-534FM-12 (cFMus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.75 W at 24 V
Input	
Input current	4 ... 20 mA, reverse polarity protected
Signal level	input voltage drop < 4 V with field wiring intact input current < 1.2 mA with field wiring open
Output	
Rated current	4 ... 20 mA on a load of max. 750 Ω
Load	0 ... 750 Ω
Output signal	4 ... 20 mA
Ripple	15 mV_{rms}
Response time	50 ms, 10 ... 90 % step change
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Influence of load	< ± 0.1 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Current output up to 750 Ω load**
- **Low power dissipation**

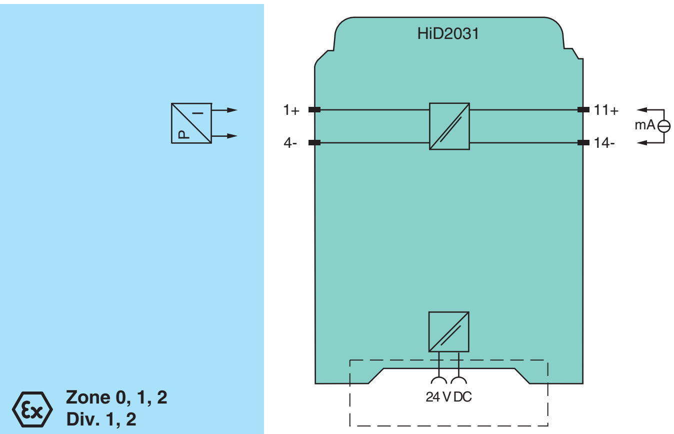
Function

This isolated barrier is used for intrinsic safety applications. It repeats a 4 mA ... 20 mA input signal from a control system to drive I/P converters, valve actuators, and displays located in a hazardous area.

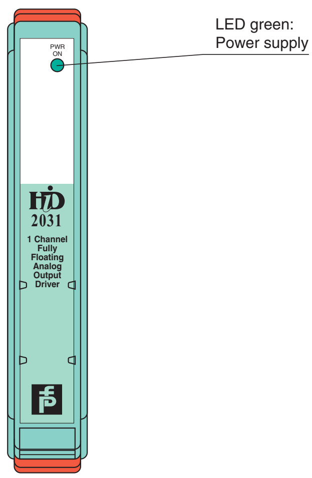
An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Current output up to 750 Ω load**
- **Low power dissipation**

Function

This isolated barrier is used for intrinsic safety applications. It repeats a 4 mA ... 20 mA input signal from a control system to drive I/P converters, valve actuators, and displays located in a hazardous area.

An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

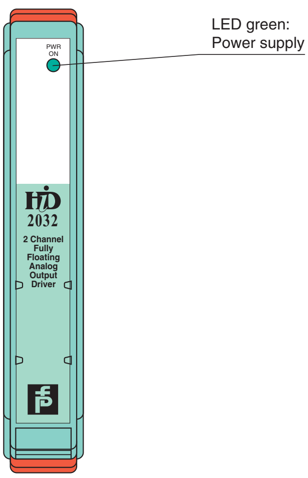
This module mounts on a HiD Termination Board.

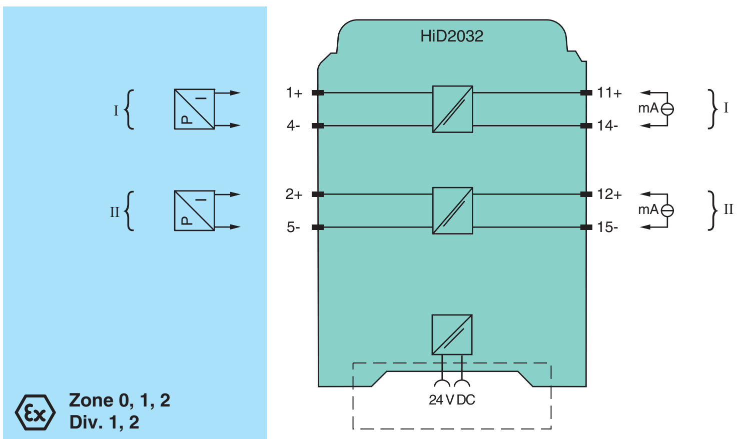
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.75 W at 24 V (per channel)
Input	
Input current	4 ... 20 mA, reverse polarity protected
Signal level	input voltage drop < 4 V with field wiring intact input current < 1.2 mA with field wiring open
Output	
Rated current	4 ... 20 mA on a load of max. 750 Ω
Load	0 ... 750 Ω
Output signal	4 ... 20 mA
Ripple	15 mV_{rms}
Response time	50 ms, 10 ... 90 % step change
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Influence of load	< ± 0.1 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	7 ... 30 V, loop powered, reverse polarity protected
Power loss	0.14 W at 20 mA
Input	
Input current	4 ... 20 mA, loop powered open circuit consumption < 0.8 mA at 24 V
Signal level	voltage drop 7 V at 20 mA and 500 Ω load
Output	
Rated current	4 ... 20 mA on a load of max. 500 Ω
Load	0 ... 500 Ω
Output signal	4 ... 20 mA
Ripple	≤ 40 µA peak to peak
Response time	50 ms, 10 ... 90 % step change
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Influence of load	< ± 0.2 % of full-scale value from 0 ... 500 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current output up to 500 Ω load**
- **Low voltage drop**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It repeats a 4 mA ... 20 mA input signal from a control system to drive I/P converters, valve actuators, and displays located in a hazardous area.

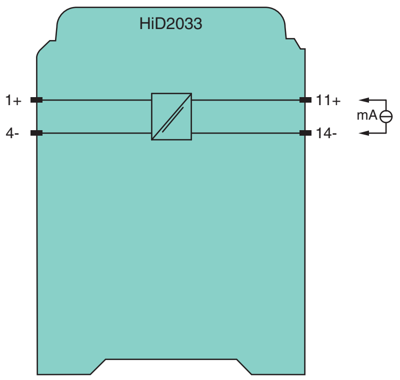
The barrier is loop powered with a low voltage drop and permits detection of line faults by the control system.

An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

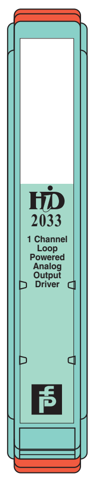
This module mounts on a HiD Termination Board.

Diagrams

Zone 0, 1, 2
Div. 1, 2



Front view



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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current output up to 500 Ω load**
- **Low voltage drop**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It repeats a 4 mA ... 20 mA input signal from a control system to drive I/P converters, valve actuators, and displays located in a hazardous area.

The barrier is loop powered with a low voltage drop and permits detection of line faults by the control system.

An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

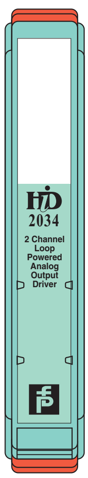
This module mounts on a HiD Termination Board.

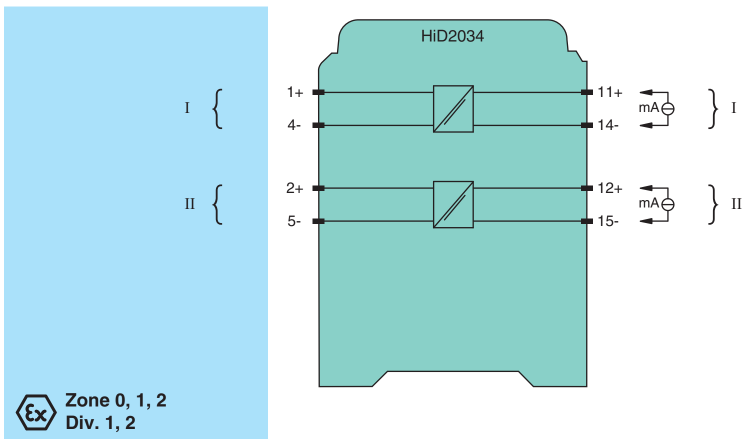
Technical data

Supply	
Rated voltage	7 ... 30 V, loop powered, reverse polarity protected
Power loss	0.14 W at 20 mA (per channel)
Input	
Input current	4 ... 20 mA, loop powered open circuit consumption < 0.8 mA at 24 V
Signal level	voltage drop 7 V at 20 mA and 500 Ω load
Output	
Rated current	4 ... 20 mA on a load of max. 500 Ω
Load	0 ... 500 Ω
Output signal	4 ... 20 mA
Ripple	≤ 40 µA peak to peak
Response time	50 ms, 10 ... 90 % step change
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Influence of load	< ± 0.2 % of full-scale value from 0 ... 500 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	6 ... 30 V, loop powered, reverse polarity protected
Power loss	0.7 W at 40 mA, 24 V
Safe circuit	
Current consumption	< 0.6 mA at 24 V and open circuit
Current	1.5 ... 50 mA, loop powered
Signal level	voltage drop 9.6 V at 20 mA and 500 Ω load (4 V at 4 mA)
Field circuit	
Characteristics	for fire and smoke detectors U_{out} = (U_{in} - 1.6) - (0.4 x I_{out}) 6 V < U_{in} < 25 V U_{out} = (25 - 1.6) - (0.4 x I_{out}) 25 V < U_{in} < 30 V
Load	0 ... 750 Ω for I/P applications
Signal	1.5 ... 50 mA for fire and smoke detectors 4 ... 20 mA on a load of max. 750 Ω for I/P applications
Ripple	≤ 150 µA peak to peak for I/P applications
Response time	50 ms, 10 ... 90 % step change for I/P applications
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (range 4 ... 20 mA)
Influence of temperature	< ± 0.01 %/K
Repeat accuracy	< ± 300 µA, 6 V < U_{in} < 25 V/1.5 mA < I_{out} < 50 mA
Influence of load	< ± 0.3 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value (range 4 ... 20 mA)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 1.5 mA ... 50 mA**
- **Fire detector or I/P supply**
- **Accuracy 0.1 %**

Function

This isolated barrier is used for intrinsic safety applications.

It is loop-powered and is primarily intended to interface with fire and smoke detectors or with similar switched resistor systems requiring a wide output current range (1.5 mA ... 50 mA) to operate correctly.

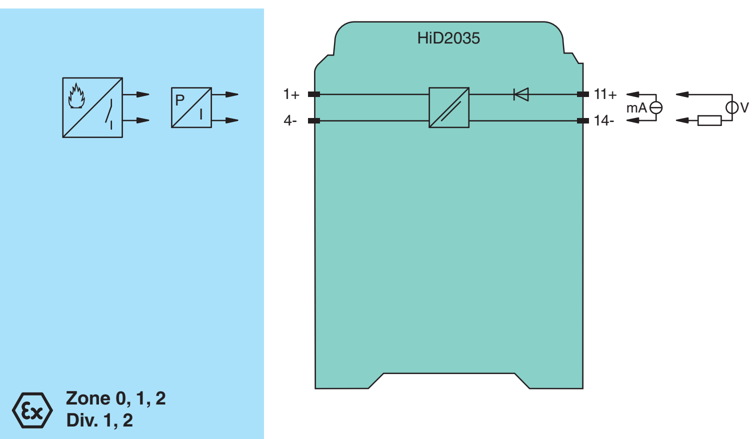
It is also used to drive a current to I/P converter.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

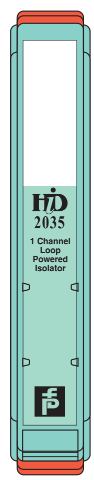
This module mounts on a HiD Termination Board.

H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Diagrams



Front view



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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Features

- **2-channel isolated barrier**
- **24 V DC supply (loop powered)**
- **Current input/output 1.5 mA ... 50 mA**
- **Fire detector or I/P supply**
- **Accuracy 0.1 %**

Function

This isolated barrier is used for intrinsic safety applications.

It is loop-powered and is primarily intended to interface with fire and smoke detectors or with similar switched resistor systems requiring a wide output current range (1.5 mA ... 50 mA) to operate correctly.

It is also used to drive a current to I/P converter.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

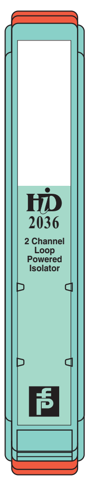
This module mounts on a HiD Termination Board.

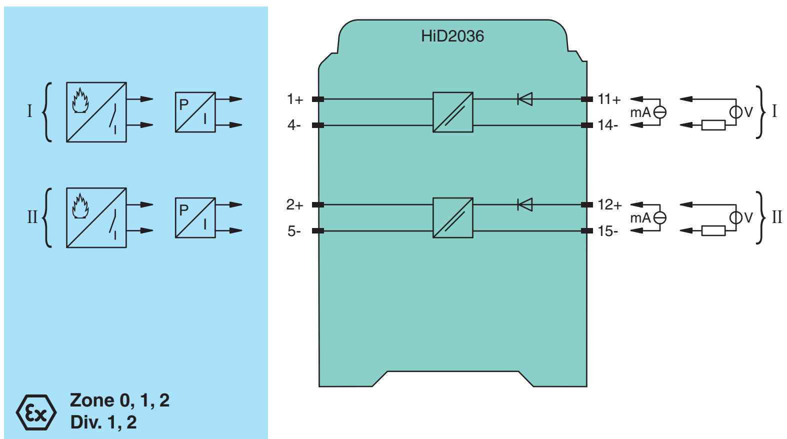
Technical data

Supply	
Rated voltage	6 ... 30 V, loop powered, reverse polarity protected
Power loss	0.7 W at 40 mA, 24 V (per channel)
Safe circuit	
Current consumption	< 0.6 mA at 24 V and open circuit
Current	1.5 ... 50 mA, loop powered
Signal level	voltage drop 9.6 V at 20 mA and 500 Ω load (4 V at 4 mA)
Field circuit	
Characteristics	for fire and smoke detectors $U_{out} = (U_{in} - 1.6) - (0.4 \times I_{out})$ $6 V < U_{in} < 25 V$ $U_{out} = (25 - 1.6) - (0.4 \times I_{out})$ $25 V < U_{in} < 30 V$
Load	0 ... 750 Ω for I/P applications
Signal	1.5 ... 50 mA for fire and smoke detectors 4 ... 20 mA on a load of max. 750 Ω for I/P applications
Ripple	≤ 150 µA peak to peak for I/P applications
Response time	50 ms, 10 ... 90 % step change for I/P applications
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value (range 4 ... 20 mA)
Influence of temperature	< ± 0.01 %/K
Repeat accuracy	< ± 300 µA, $6 V < U_{in} < 25 V$/$1.5 mA < I_{out} < 50 mA$
Influence of load	< ± 0.3 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value (range 4 ... 20 mA)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.85 W at 24 V
Input	
Input current	4 ... 20 mA, reverse polarity protected
Signal level	input voltage drop < 4 V with field wiring intact input current < 1.2 mA with field wiring open
Output	
Load	0 ... 750 Ω
Output signal	4 ... 20 mA
Ripple	15 mV_{rms}
Response time	50 ms, 10 ... 90 % step change
Line fault detection	breakage, load > 100 kΩ, short-circuit, load < 70 Ω
Error message output	
Output type	open collector transistor
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Frequency range	0.5 ... 40 kHz within 3 db, (-6 db at 100 kHz) for use with SMART positioners using HART protocol
Influence of load	< ± 0.1 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **1-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Current output up to 750 Ω load**
- **SMART I/P and valve positioners**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It repeats a 4 mA ... 20 mA input signal from a control system to drive SMART I/P converters, valve actuators, and displays located in a hazardous area.

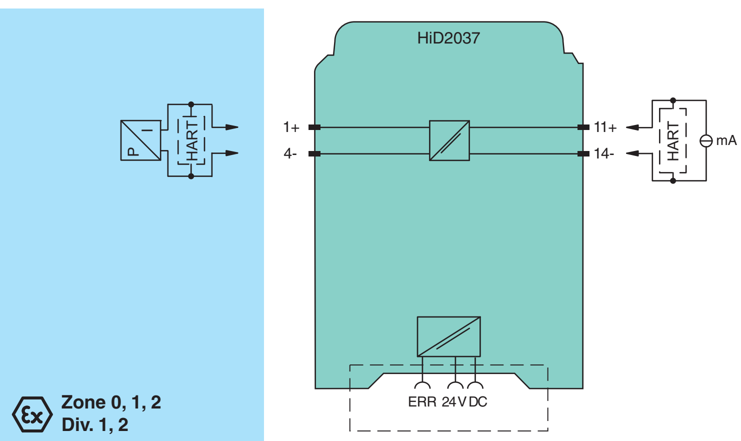
Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

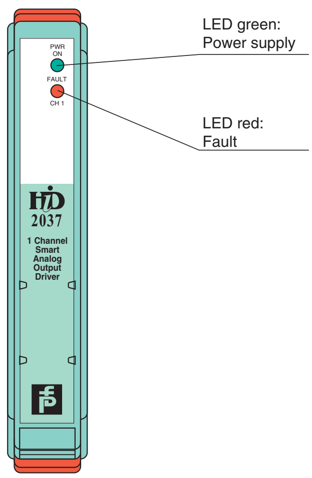
Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions can be monitored via a Fault Indication Board.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Current output up to 750 Ω load**
- **SMART I/P and valve positioners**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It repeats a 4 mA ... 20 mA input signal from a control system to drive SMART I/P converters, valve actuators, and displays located in a hazardous area.

Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

Line fault detection of the field circuit is indicated by a red LED and an output on the fault bus. The fault conditions can be monitored via a Fault Indication Board.

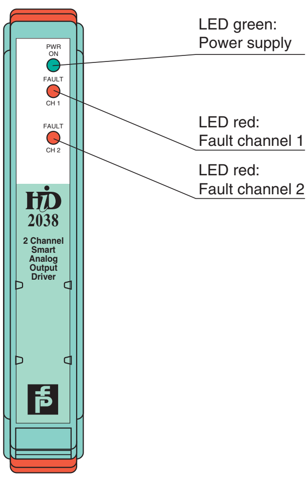
This module mounts on a HiD Termination Board.

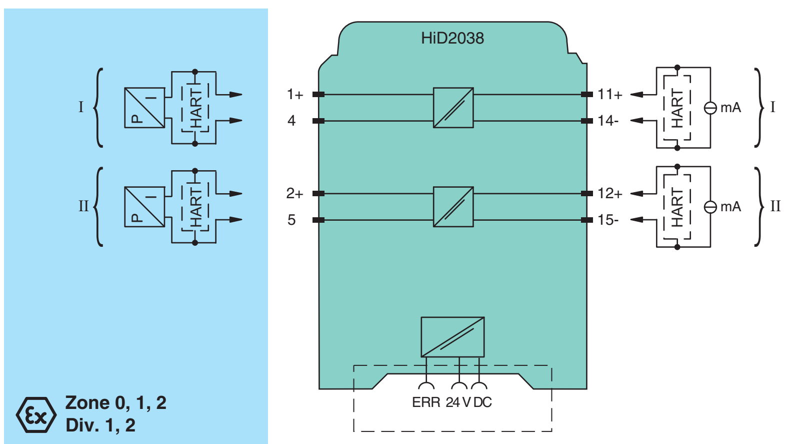
Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.85 W at 24 V (per channel)
Input	
Input current	4 ... 20 mA, reverse polarity protected
Signal level	input voltage drop < 4 V with field wiring intact input current < 1.2 mA with field wiring open
Output	
Load	0 ... 750 Ω
Output signal	4 ... 20 mA
Ripple	15 mV_{rms}
Response time	50 ms, 10 ... 90 % step change
Line fault detection	breakage, load > 100 kΩ, short-circuit, load < 70 Ω
Error message output	
Output type	open collector transistor (common to both channels)
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Frequency range	0.5 ... 40 kHz within 3 db, (-6 db at 100 kHz) for use with SMART positioners using HART protocol
Influence of load	< ± 0.1 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20.4 ... 30 V via Termination Board
Power loss	0.85 W at 24 V (per channel)
Input	
Input current	4 ... 20 mA, reverse polarity protected
Signal level	input voltage drop < 4 V with field wiring intact input current < 0.6 mA (47 kΩ) with field wiring open
Output	
Load	0 ... 750 Ω
Output signal	4 ... 20 mA
Ripple	15 mV_{rms}
Response time	50 ms, 10 ... 90 % step change
Line fault detection	breakage, load > 100 kΩ
Transfer characteristics	
Calibrated accuracy	< ± 0.1 % of full-scale value
Influence of temperature	< ± 0.01 %/K
Frequency range	0.5 ... 40 kHz within 3 db, (-6 db at 100 kHz) for use with SMART positioners using HART protocol
Influence of load	< ± 0.1 % of full-scale value from 0 ... 750 Ω
Linearity	< ± 0.1 % of full-scale value
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	see page 390 for entity parameters
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
CSA approval	
Control drawing	366-005CS-12B (cCSAus)

Features

- **2-channel isolated barrier**
- **24 V DC supply (bus powered)**
- **Current output up to 750 Ω load**
- **SMART I/P and valve positioners**
- **Suitable for Yokogawa DCS system**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This isolated barrier is used for intrinsic safety applications. It repeats a 4 mA ... 20 mA input signal from a control system to drive SMART I/P converters, valve actuators, and displays located in a hazardous area.

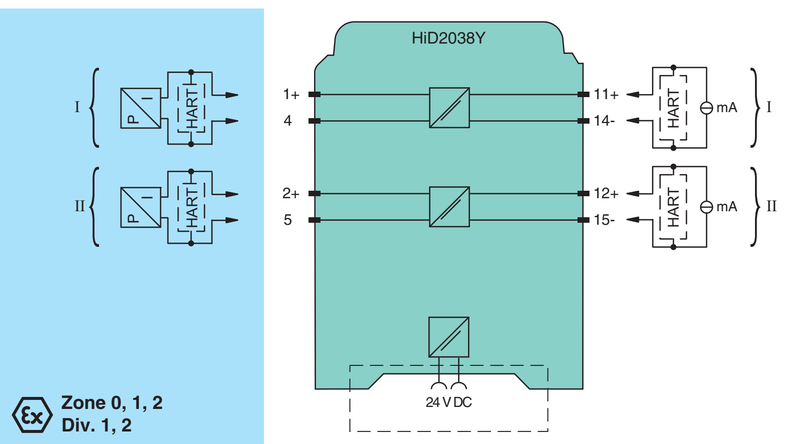
Digital signals may be superimposed on the analog values in the hazardous or safe area, which are transferred bi-directionally.

An open field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by control systems.

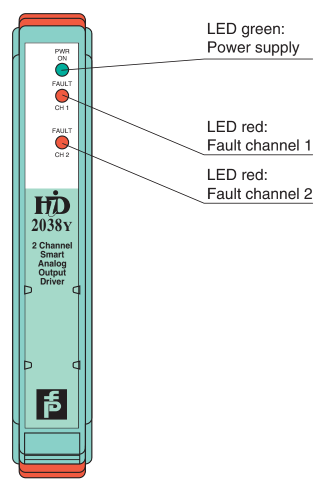
Line fault detection of the field circuit is indicated by a red LED.

This module mounts on a HiD Termination Board.

Diagrams



Front view



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ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
HiC2031	1, 4	25.2	100	630
HiD2031	1, 4	26	93	605
HiD2032	1, 4; 2, 5	26	93	605
HiD2033	1, 4	26	93	605
HiD2034	1, 4; 2, 5	26	93	605
HiD2035	1, 4	26	93	605
HiD2036	1, 4; 2, 5	26	93	605
HiD2037	1, 4	26	93	605
HiD2038	1, 4; 2, 5	26	93	605
HiD2038Y	1, 4; 2, 5	26	93	605

CSA Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)
HiD2031	1, 4	26	93
HiD2032	1, 4; 2, 5	26	93
HiD2033	1, 4	26	93
HiD2034	1, 4; 2, 5	26	93
HiD2035	1, 4	26	93
HiD2036	1, 4; 2, 5	26	93
HiD2037	1, 4	26	93
HiD2038	1, 4; 2, 5	26	93
HiD2038Y	1, 4; 2, 5	26	93

FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
HiC2031	1, 4	25.2	100	–	–

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Termination Boards

Model Number	Housing: HiC	Housing: HiD	Modules per Board	Connections – Control System: Screw Terminal	Connections – Control System: Sub-D (37-pin)	Connections – Field: Screw Terminal	Channels per Module: 1 ... 2 Channels	Channels per Module: 1 ... 4 Channels	Channels per Module: 4 Channel HART	HART Communication Channels	Supply 24 V DC	Line Fault Detection	Zone 2/Division 2 Mounting	Page
HiCTB08-UNI-SC-SC	■		8	■		■	■			1	■	■	■	392
HiCTB16-UNI-SC-SC	■		16	■		■	■			1	■	■	■	393
HiCTB08-UNI-SD37-SC	■		8		■	■	■			1	■	■	■	394
HiCTB16-UNI-SD37-SC	■		16		■	■	■			1	■	■	■	395
HiCTB16-UNI-SD37R-SC	■		16		■	■	■			1	■	■	■	396
HiDTB08-UNI-SC-SC		■	8	■		■		■		2	■	■	■	397
HiDTB16-UNI-SC-SC		■	16	■		■		■		2	■	■	■	398
HiDTB08-UNI-DA16-SD37-SC		■	8		■	■		■		2	■	■	■	399
HiDTB08-UNI-DA32-SD37-SC		■	8		■	■			■	4	■	■	■	400
HiDTB16-UNI-DA32-SD37-SC		■	16		■	■		■		2	■	■	■	401
HiDTB16-UNI-DA64-SD37-SC		■	16		■	■			■	4	■	■	■	402

Model Number	Accessory for: HiCTB...	Accessory for: HiDTB...	Channels	Supply 24 V DC	Zone 2/Division 2 Mounting	Page
HiATB01-FAULT-01	■	■	1	■	■	403
HiATB01-HART-2X16	■	■	32	■	■	404
HiATB01-HART-4X8	■	■	32	■	■	405

Accessories

Model Number	Description	Page
HiC2000 Blank	Place Holder Barrier, HiC Module	406
HiD2000 Blank	Place Holder Barrier, HiD Module	407
HiALC-HiCTB-SET-108	Label Carrier	408
HiALC-HiDTB-SET-150	Label Carrier	408
HiACA-UNI-FLK34-FLK34-0M5	HART Interface Cable	408
HiACA-UNI-FLK34-FLK34-2M0	HART Interface Cable	408
HiACA-UNI-FLK34-FLK34-3M0	HART Interface Cable	408
HiACA-UNI-FLK34-FLK34-6M0	HART Interface Cable	408

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Features

- **8 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: screw terminals**

Function

This Termination Board has 8 plug-in slots. Any HiC module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for both the hazardous and safe areas along with a plug-in HART connector for interconnection to a separate HART Communication Board.

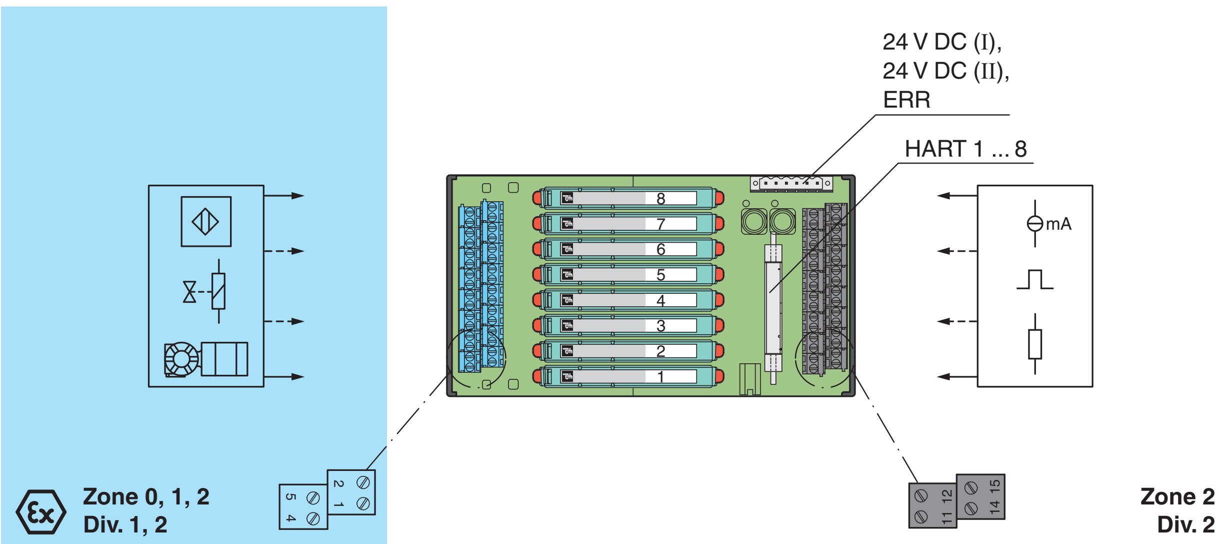
The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	2 A, in each case for 8 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue connection safe area (process side): screw terminals
Mass	approx. 420 g
Dimensions	108 x 200 x 163 mm (4.25 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 06 ATEX 022
Group, category, type of protection	Ex II (1) GD [Ex ia] IIC; [Ex iaD] 20 Ex I (M1) [Ex ia] I
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-4X8 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Diagrams



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Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	4 A, in each case for 16 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue connection safe area (process side): screw terminals
Mass	approx. 840 g
Dimensions	216 x 200 x 163 mm (8.5 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 06 ATEX 022
Group, category, type of protection	Ex II (1) GD [Ex ia] IIC; [Ex iaD] 20 Ex I (M1) [Ex ia] I
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-2X16 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Features

- **16 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: screw terminals**

Function

This Termination Board has 16 plug-in slots. Any HiC module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

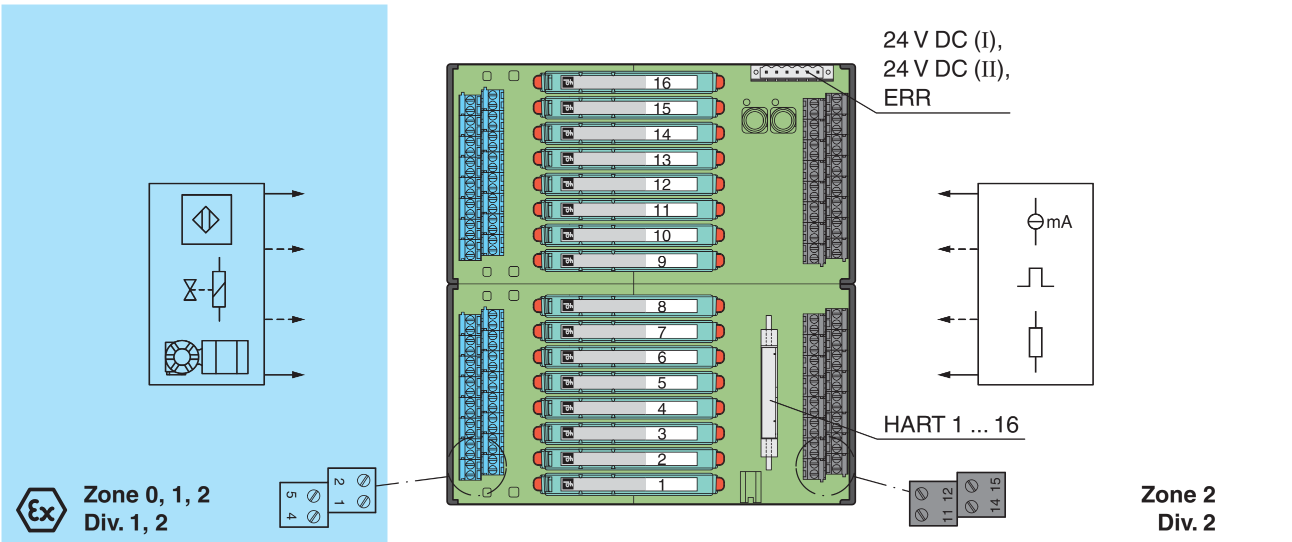
The Termination Board features fixed screw terminals for both the hazardous and safe areas along with a plug-in HART connector for interconnection to a separate HART Communication Board.

The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Diagrams



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HiCTB08-UNI-SD37-SC

Features

- **8 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: Sub-D connector (male), 37-pin**

Function

This Termination Board has 8 plug-in slots. Any HiC module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for the hazardous and a 37-pin Sub-D connector for the safe area along with a plug-in HART connector for interconnection to a separate HART Communication Board.

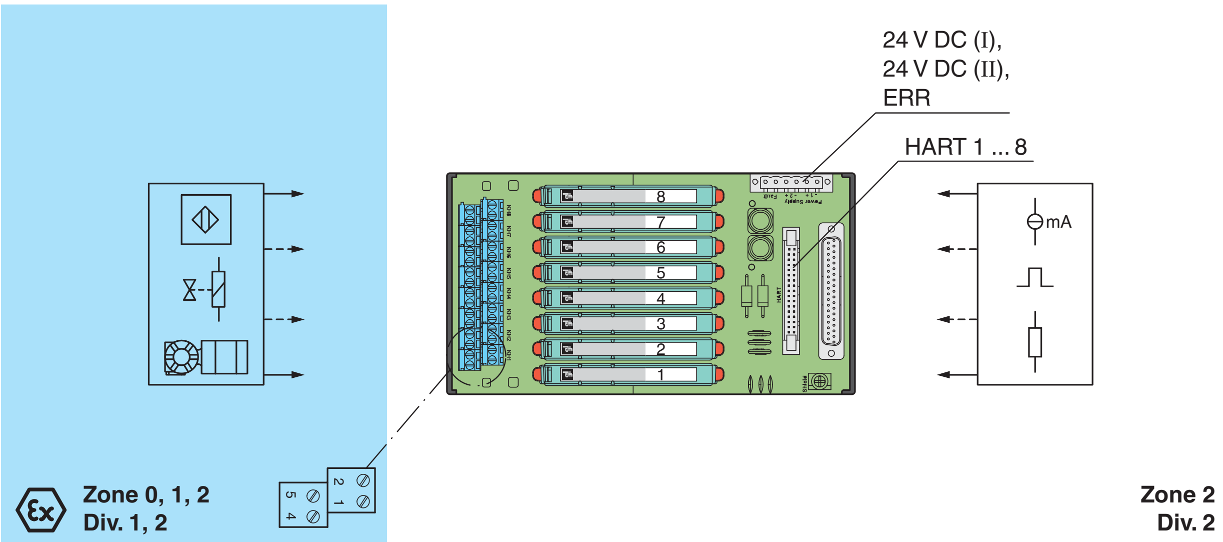
The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	2 A, in each case for 8 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue safe area connection (process side): 37-pin Sub-D connector (male)
Mass	approx. 420 g
Dimensions	108 x 200 x 163 mm (4.25 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 06 ATEX 022
Group, category, type of protection	Ex II (1) GD [Ex ia] IIC; [Ex iaD] 20 Ex I (M1) [Ex ia] I
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-4X8 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Diagrams



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Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	4 A, in each case for 16 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue safe area connection (process side): 37-pin Sub-D connector (male)
Mass	approx. 840 g
Dimensions	216 x 200 x 163 mm (8.5 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 06 ATEX 022
Group, category, type of protection	Ex II (1) GD [Ex ia] IIC; [Ex iaD] 20 Ex I (M1) [Ex ia] I
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-2X16 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Features

- **16 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: Sub-D connector (male), 37-pin**

Function

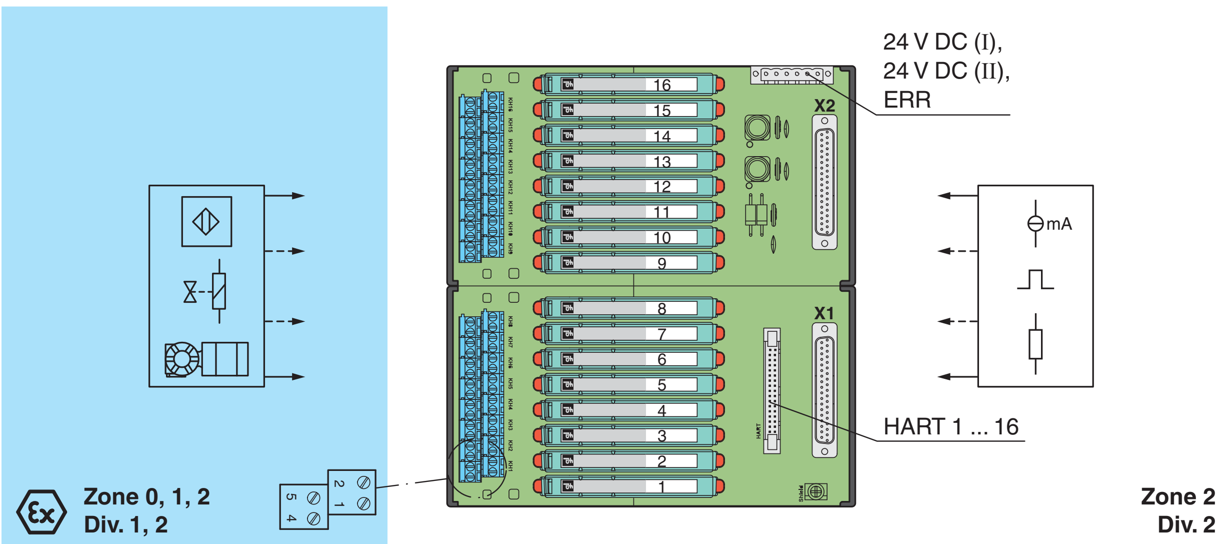
This Termination Board has 16 plug-in slots. Any HiC module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for the hazardous and a 37-pin Sub-D connector for the safe area along with a plug-in HART connector for interconnection to a separate HART Communication Board.

The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Diagrams



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H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

HiCTB16-UNI-SD37R-SC

Features

- **16 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: Sub-D connector (male), 37-pin**

Function

This Termination Board has 16 plug-in slots. Any HiC module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for the hazardous and a 37-pin Sub-D connector for the safe area along with a plug-in HART connector for interconnection to a separate HART Communication Board.

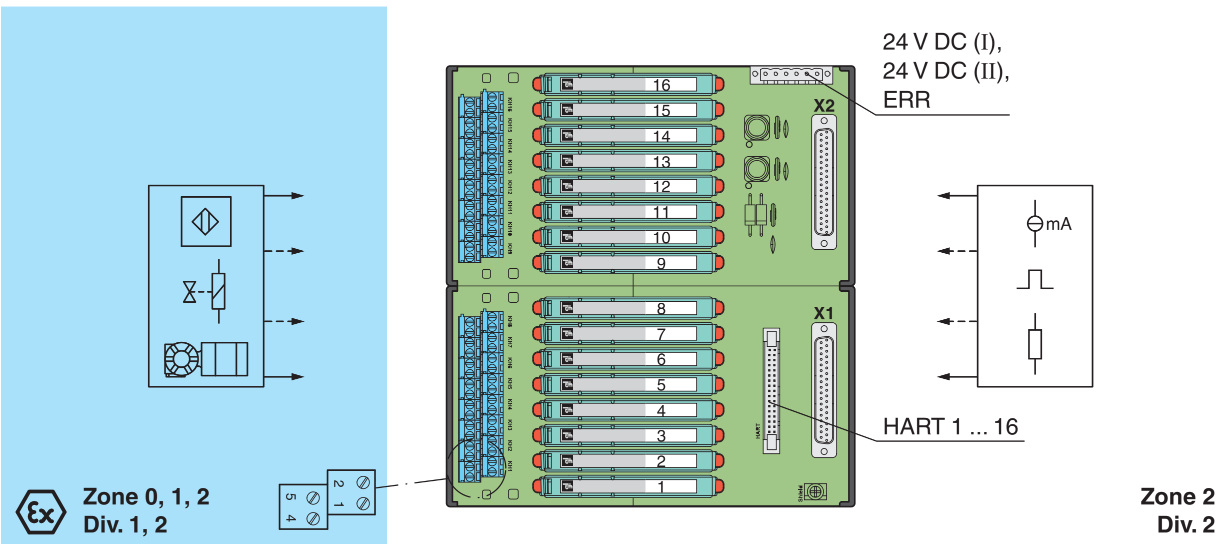
The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	4 A, in each case for 16 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue safe area connection (process side): 37-pin Sub-D connector (male)
Mass	approx. 840 g
Dimensions	216 x 200 x 163 mm (8.5 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 06 ATEX 022
Group, category, type of protection	Ex II (1) GD [Ex ia] IIC; [Ex iaD] 20 Ex I (M1) [Ex ia] I
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-2X16 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Diagrams



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Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	2 A, in each case for 8 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue connection safe area (process side): screw terminals
Mass	approx. 600 g
Dimensions	150 x 200 x 163 mm (5.9 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1) GD [Ex ia] IIC; [Ex iaD]
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-4X8 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Features

- **8 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: screw terminals**

Function

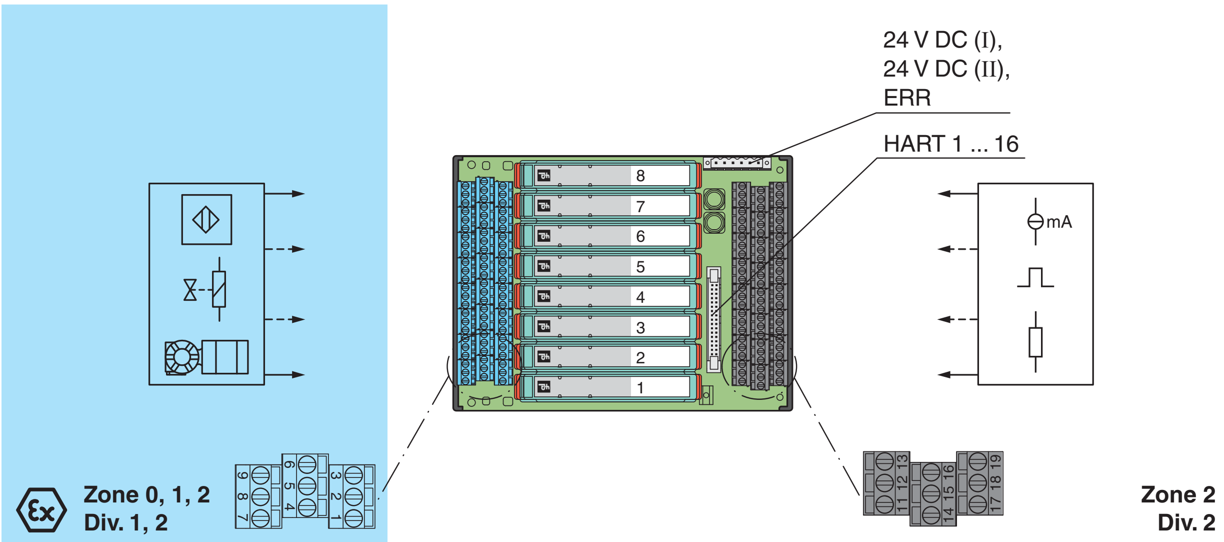
This Termination Board has 8 plug-in slots. Any HiD module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for both the hazardous and safe areas along with a plug-in HART connector for interconnection to a separate HART Communication Board.

The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Diagrams



Edition 908837 (US) / 208599 (EU) 11/2010

HiDTB16-UNI-SC-SC

Features

- **16 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: screw terminals**

Function

This Termination Board has 16 plug-in slots. Any HiD module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for both the hazardous and safe areas along with a plug-in HART connector for interconnection to a separate HART Communication Board.

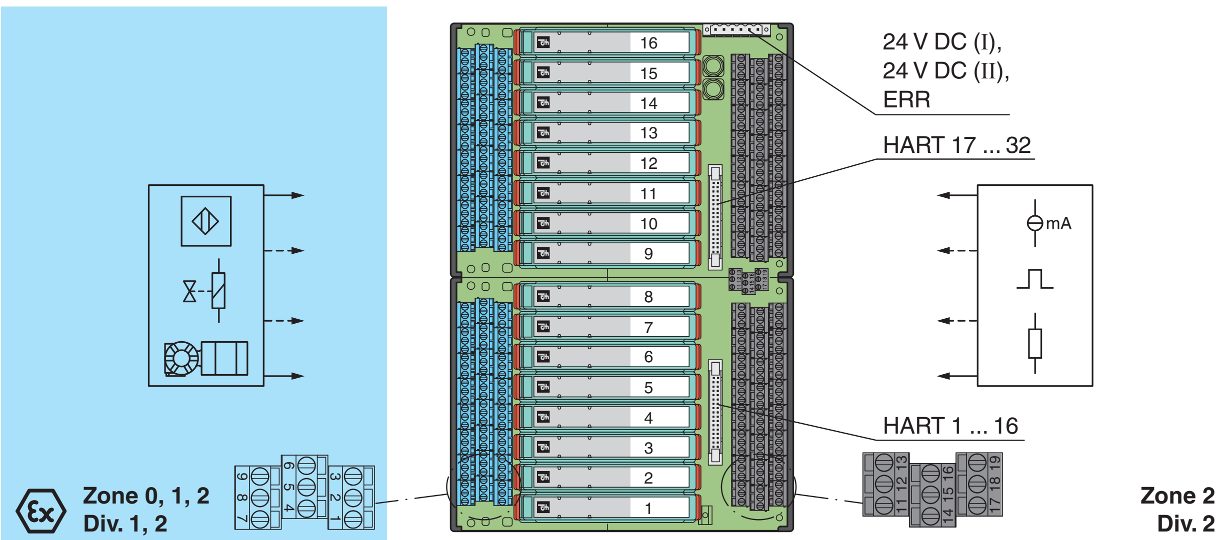
The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	4 A, in each case for 16 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue connection safe area (process side): screw terminals
Mass	approx. 1200 g
Dimensions	300 x 200 x 163 mm (11.8 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1) GD [Ex ia] IIC; [Ex iaD]
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-2X16 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Diagrams



Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	2 A, in each case for 8 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue safe area connection (process side): 37-pin Sub-D connector (male)
Mass	approx. 600 g
Dimensions	150 x 200 x 163 mm (5.9 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1) GD [Ex ia] IIC; [Ex iaD]
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-2X16 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Features

- **8 plug-in positions**
- **24 V DC supply voltage**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: Sub-D connector (male), 37-pin**

Function

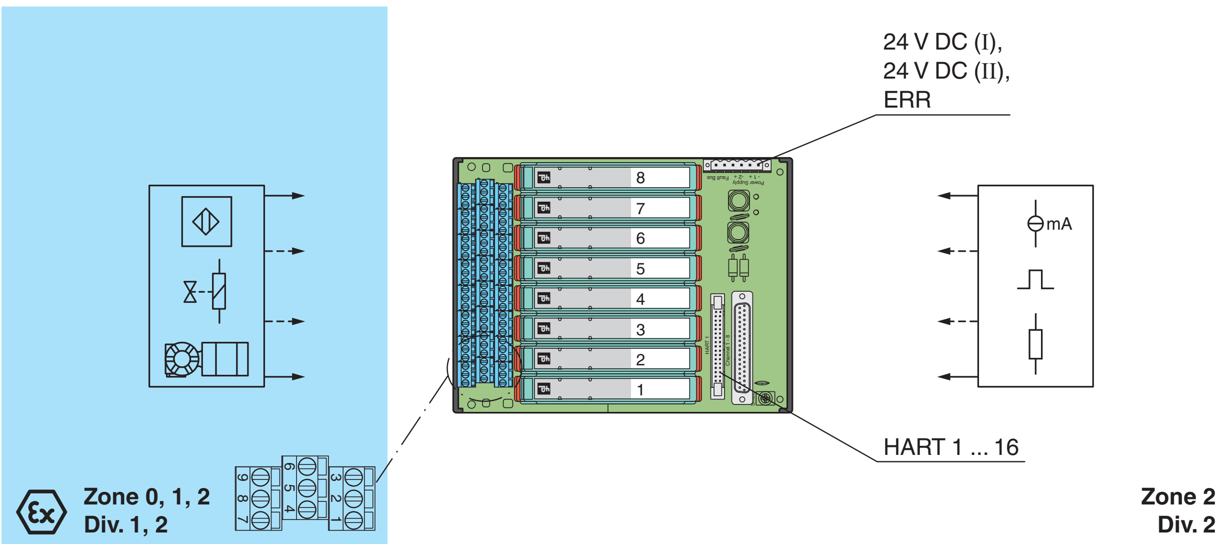
This Termination Board has 8 plug-in slots. Any HiD module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for the hazardous and a 37-pin Sub-D connector for the safe area along with a plug-in HART connector for interconnection to a separate HART Communication Board.

The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Diagrams



H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **8 plug-in positions**
- **24 V DC supply voltage**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: Sub-D connector (male), 37-pin**

Function

This Termination Board has 8 plug-in slots. Any HiD module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for the hazardous and a 37-pin Sub-D connector for the safe area along with a plug-in HART connector for interconnection to a separate HART Communication Board.

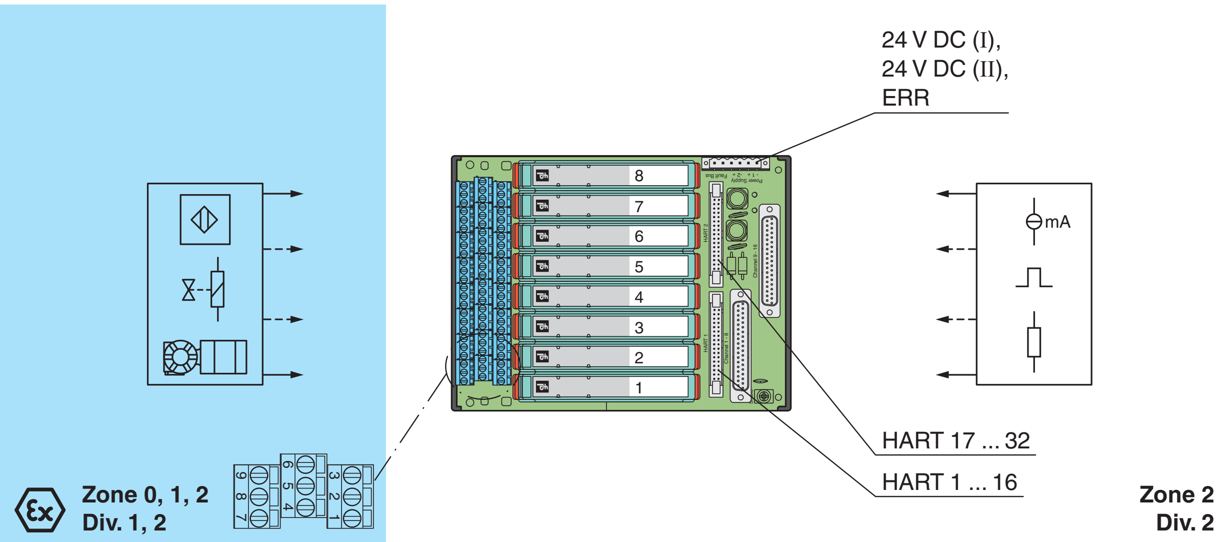
The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	2 A, in each case for 8 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue safe area connection (process side): 37-pin Sub-D connector (male)
Mass	approx. 600 g
Dimensions	150 x 200 x 163 mm (5.9 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ex II (1) GD [Ex ia] IIC; [Ex iaD]
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-2X16 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Diagrams



Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	4 A, in each case for 16 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue safe area connection (process side): 37-pin Sub-D connector (male)
Mass	approx. 1200 g
Dimensions	300 x 200 x 163 mm (11.8 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1) GD [Ex ia] IIC; [Ex iaD]
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-2X16 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Features

- **16 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: Sub-D connector (male), 37-pin**

Function

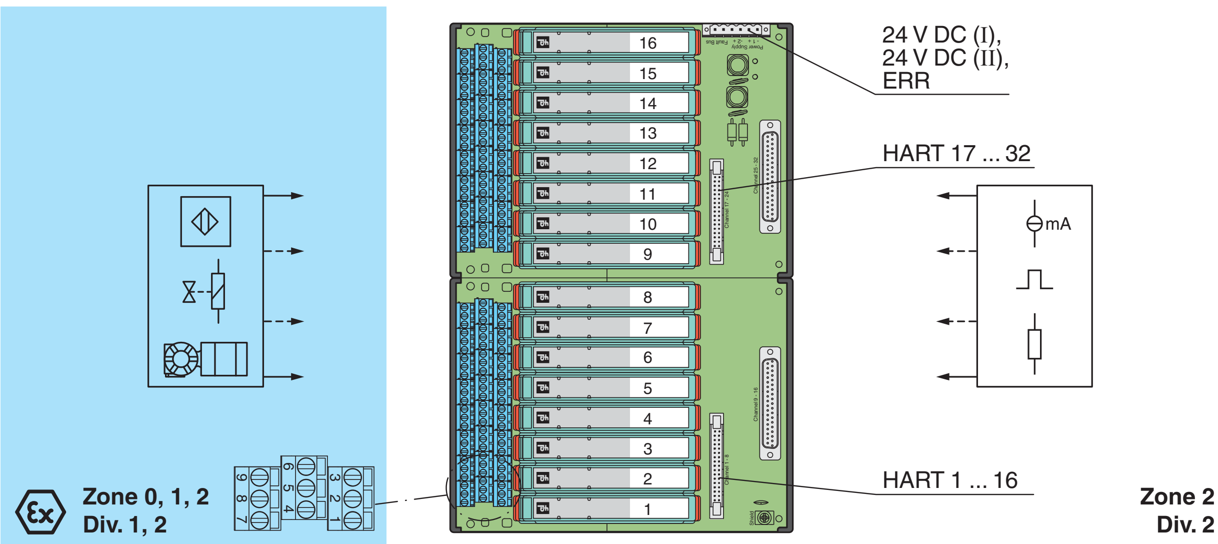
This Termination Board has 16 plug-in slots. Any HiD module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for the hazardous and 37-pin Sub-D connectors for the safe area along with a plug-in HART connector for interconnection to a separate HART Communication Board.

The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Diagrams



Edition 908837 (US) / 208599 (EU) 11/2010

HiDTB16-UNI-DA64-SD37-SC

Features

- **16 plug-in positions**
- **24 V DC supply**
- **Universal use**
- **Hazardous area: screw terminals, blue**
- **Safe area: Sub-D connector (male), 37-pin**

Function

This Termination Board has 16 plug-in slots. Any HiD module can be inserted into any slot, enabling a mixture of I/O types on one Termination Board.

The Termination Board features fixed screw terminals for the hazardous and 37-pin Sub-D connectors for the safe area along with a plug-in HART connector for interconnection to a separate HART Communication Board.

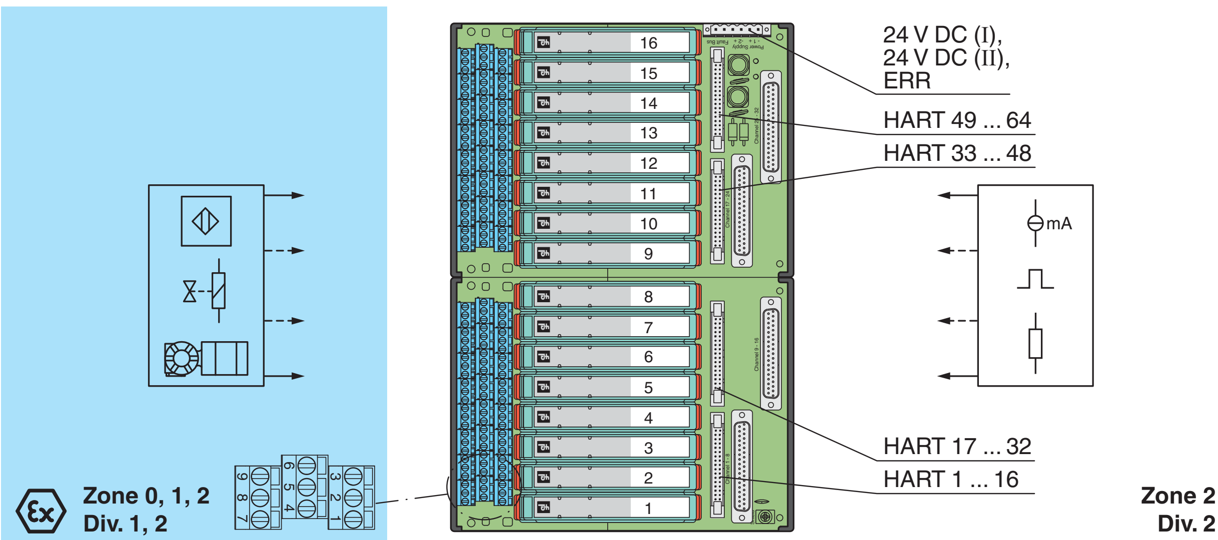
The Termination Board has a fault bus that is available at the redundant power supply terminals. The fault bus can be daisy chained and monitored by the optional Fault Indication Board. The fault bus signals are then available to the control system as a potential-free contact.

Termination Boards are supplied with a rugged fiberglass reinforced plastic housing. This design permits a fast and reliable installation in the marshalling cabinet.

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Fusing	4 A, in each case for 16 modules
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. The supply for the modules is decoupled, monitored and fused.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	connection hazardous area (field side): screw terminals, blue safe area connection (process side): 37-pin Sub-D connector (male)
Mass	approx. 1200 g
Dimensions	300 x 200 x 163 mm (11.8 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
EC-Type Examination Certificate	CESI 02 ATEX 086
Group, category, type of protection	Ⓔx II (1) GD [Ex ia] IIC; [Ex iaD]
Accessories	
Designation	optional accessories: - Fault Indication Board HiATB01-FAULT-01 - HART Communication Board HiATB01-HART-2X16 - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-... - Label Carrier HiALC-...

Diagrams



Edition 908837 (US) / 208599 (EU) 11/2010

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Technical data

Supply	
Rated voltage	19.6 ... 30 V DC
Ripple	≤ 10 %
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Electrical specifications	
Potential free fault signal contact	max. 30 V AC, 40 V DC, 2 A
Redundancy	
Supply	Redundancy available. Each supply is decoupled.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	screw terminal for max. 2.5 mm^2, fixed
Mass	approx. 150 g
Dimensions	50 x 200 x 60 mm (1.97 x 7.9 x 2.36 in), height including module assembly
Mounting	DIN rail mounting

Features

- **1-channel**
- **24 V DC supply**
- **Monitors HiD/HiC Termination Boards**
- **Relay contact output**
- **LEDs for supply and fault status**

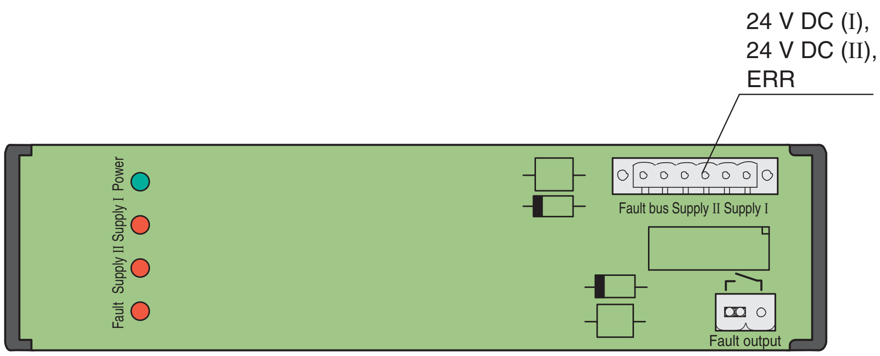
Function

This Fault Indication Board is designed to monitor an unlimited number of H-System Termination Boards.

The fault bus signal can be wired in a ring (daisy chain) or redundant in a star.

A failed power supply or line faults in the field are displayed on the Fault Indication Board via an LED and are made available through a potential-free contact.

Diagrams



Zone 2
Div. 2

H-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Termination Boards

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- 2 x 16-channel
- 24 V DC supply
- Suitable for HART communication
- Dual RS 485 connections
- Used with HiD/HiC Termination Boards
- LED indicator for supply status

Function

This HART Communication Board can interface with two, 16-channel H-System Termination Boards.

It contains one slot to mount the 32-channel HART Multiplexer Master type HiD Mux2700.

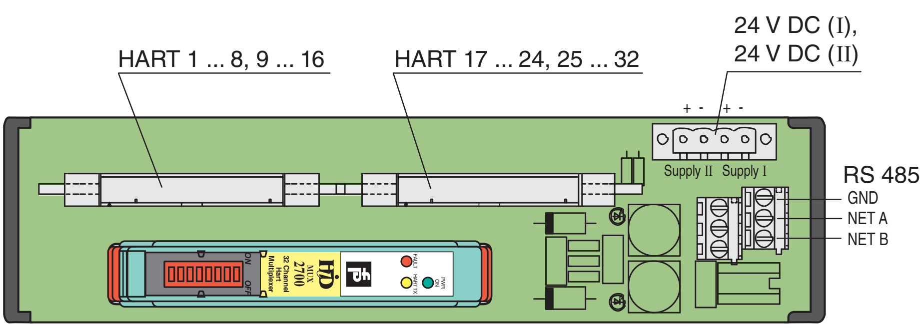
HART interface cables provide easy connection between the HiD/HiC Termination Boards and the HART Communication Board.

It offers fused redundant power supply connections with LED indication. RS 485 terminals are redundant and can be daisy chained.

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. Each supply is decoupled and fused (500 mA).
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	screw terminal for max. 2.5 mm^2, fixed
Mass	approx. 150 g
Dimensions	50 x 200 x 163 mm (1.97 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Accessories	
Designation	optional accessories: - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-...

Diagrams



Zone 2
Div. 2

Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. Each supply is decoupled and fused (500 mA).
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	screw terminal for max. 2.5 mm^2, fixed
Mass	approx. 150 g
Dimensions	50 x 200 x 163 mm (1.97 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Accessories	
Designation	optional accessories: - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-...

Features

- **4 x 8-channel**
- **24 V DC supply**
- **Suitable for HART communication**
- **Dual RS 485 connections**
- **Used with HiD/HiC Termination Boards**
- **LED for supply status**

Function

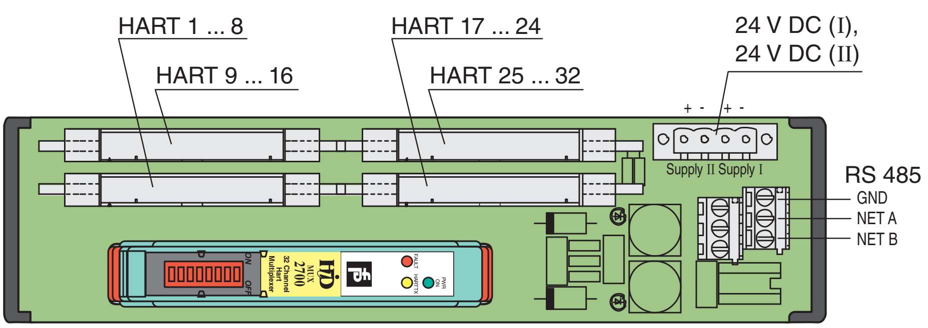
This HART Communication Board can interface with four, 8-channel H-System Termination Boards.

It contains one slot to mount the 32-channel HART Multiplexer type HiD Mux2700.

The HART interface cable provides easy connection between the HiD/HiC Termination Boards and the HART Communication Board.

It offers fused redundant power supply connections with LED indication. RS 485 terminals are redundant and can be daisy chained.

Diagrams



Zone 2
Div. 2

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **H-System place holder module**
- **Housing width 12.5 mm**
- **Blank module, non-functional**

Function

This barrier is a non functioning HiD module designed to be a place holder for system expansions.

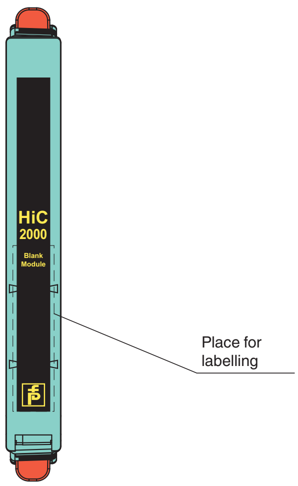
This barrier mounts on a HiC termination board.

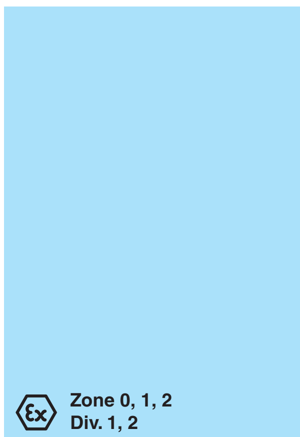
Technical data

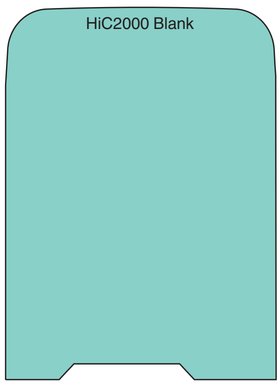
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Material	Polycarbonate
Mass	approx. 100 g
Dimensions	12.5 x 128 x 106 mm (0.5 x 5.1 x 4.2 in)

Diagrams

Front view







Zone 2
Div. 2

Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Material	Polycarbonate
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)

Features

- **H-System place holder module**
- **Housing width 18 mm**
- **Blank module, non-functional**

Function

This barrier is a non functioning HiD module designed to be a place holder for system expansions.

This barrier mounts on a HiD termination board.

H-System

Digital Inputs

Digital Outputs

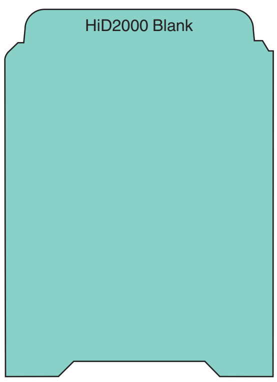
Analog Inputs

Analog Outputs

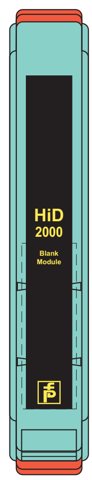
Accessories

Diagrams

Zone 0, 1, 2
Div. 1, 2



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Label Carrier HiALC-HiCTB-SET-108

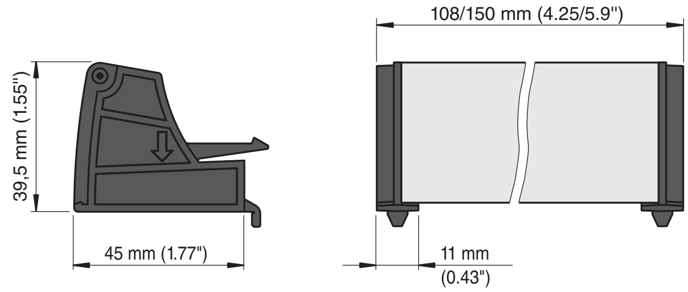
Features

- For HiC Termination Boards
- 1 piece for 8-position Termination Board
- 2 pieces for 16-position Termination Board

HiALC-HiDTB-SET-150

Features

- For HiD Termination Boards
- 1 piece for 8-position Termination Board
- 2 pieces for 16-position Termination Board



Technical data

Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Mass	HiALC-HiCTB-SET-108: approx. 100 g HiALC-HiDTB-SET-150: approx. 140 g
Dimensions	HiALC-HiCTB-SET-108: 39.5 x 45 x 108 mm (1.55 x 1.77 x 4.25 in) HiALC-HiDTB-SET-150: 39.5 x 45 x 150 mm (1.55 x 1.77 x 5.9 in)

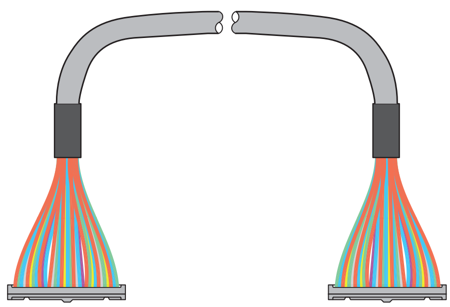
HART Interface Cables HiACA-UNI-FLK34-FLK34-0M5 HiACA-UNI-FLK34-FLK34-2M0 HiACA-UNI-FLK34-FLK34-3M0 HiACA-UNI-FLK34-FLK34-6M0

Features

- H-System accessory
- Connection cable between HART Communication Board and Termination Board
- 34-pin cable

Function

The HART connection cable is used for connection of a HART Communication Board to a H-System Termination Board.



Technical data

Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Connection	34-pin FLK connector (female)
Mass	HiACA-UNI-FLK34-FLK34-0M5: approx. 150 g HiACA-UNI-FLK34-FLK34-2M0: approx. 600 g HiACA-UNI-FLK34-FLK34-3M0: approx. 900 g HiACA-UNI-FLK34-FLK34-6M0: approx. 1800 g
Cable length	HiACA-UNI-FLK34-FLK34-0M5: 0.5 m HiACA-UNI-FLK34-FLK34-2M0: 2 m HiACA-UNI-FLK34-FLK34-3M0: 3 m HiACA-UNI-FLK34-FLK34-6M0: 6 m

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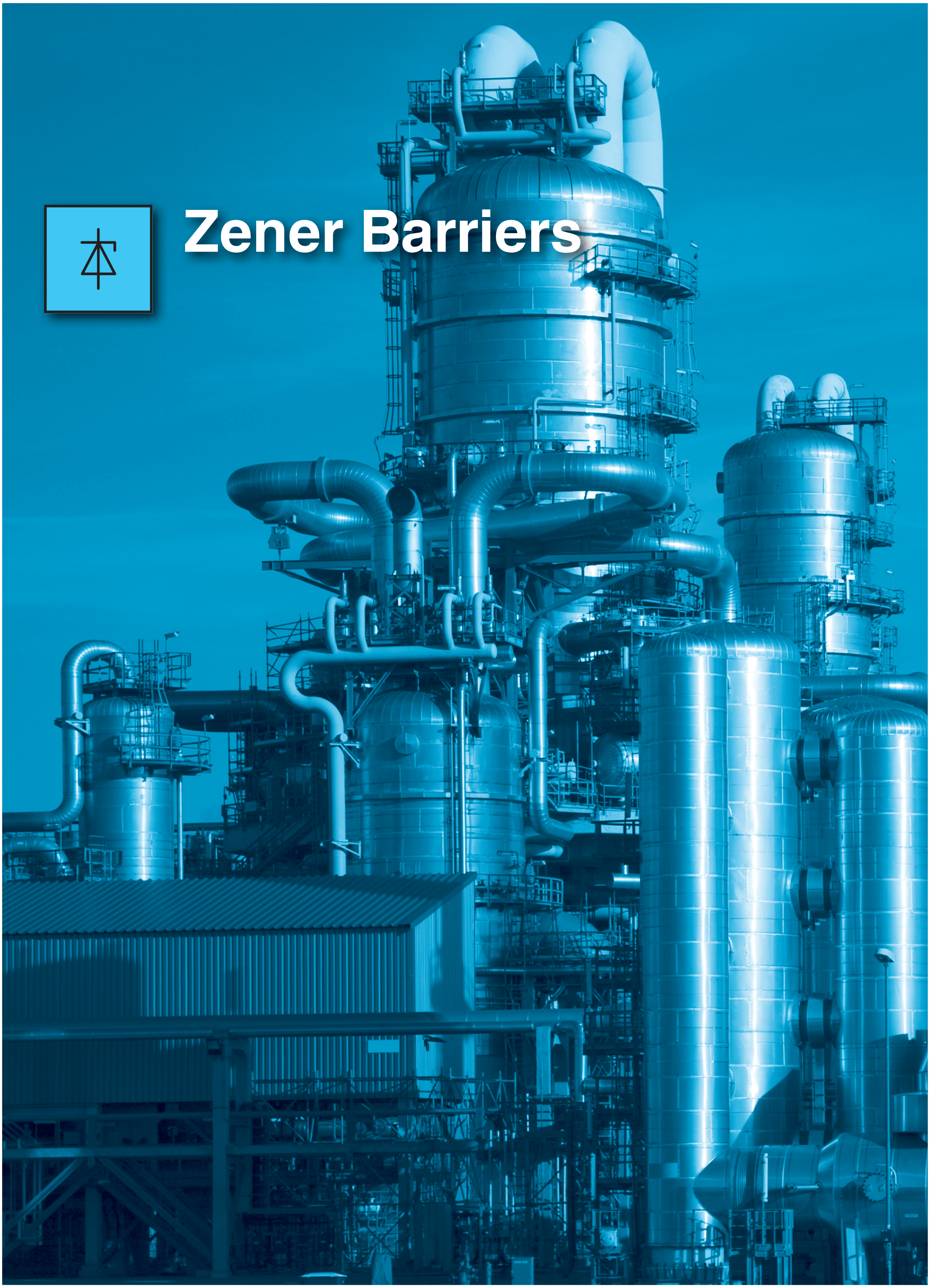
Zener Barriers



Edition 908837 (US) / 208599 (EU) 11/2010

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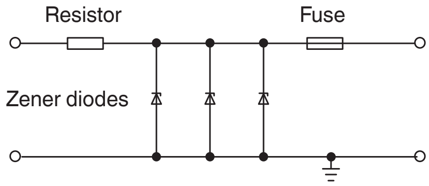
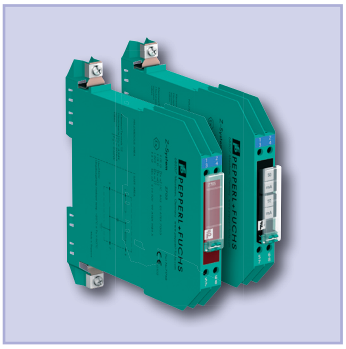
Zener Barriers have long been a cost-effective solution for providing an intrinsically safe interface with field devices located in the hazardous area. Pepperl+Fuchs offers two distinct Zener Barrier products. The Z-System barriers are 12.5 mm wide and mount and ground directly to standard 35 mm DIN rail, while the SB-System barriers are the only termination board-based solution with plug-in modules.

Operating principle

Zener Barriers provide a cost-effective solution because of their simple design, which consists of zener diodes, a current limiting resistor, a fuse, and the intrinsic safety ground. Each plays an important part interfacing with equipment in the hazardous area. The zener diode clamps when there is an overvoltage on the safe area side, diverting excessive current to the intrinsic safety ground, and the fuse opens to prevent the transfer of unacceptably high energy into the hazardous area. The current limiting resistor limits the current in the event of a short circuit in the hazardous area, while the dedicated intrinsic safety ground provides the necessary low resistance path for zener diode fault current.



Z-System 412



- Quick and easy installation on DIN mounting rail
- Full range for AC and DC applications, 75 modules
- 1-, 2- and 3-channel versions
- Snap-on DIN rail ground/earth connection
- Replaceable fuse facilitates circuit loop checks and reduces installation cost and space
- World-wide approvals

SB-System 452

- Plug-in Zener Barriers, 1- and 2-channel
- Replaceable pre-fuse
- Termination Boards for 1, 6, or 10 barrier modules
- Common potential equalization with multiple barrier boards
- Comprehensive module portfolio
- World-wide approvals

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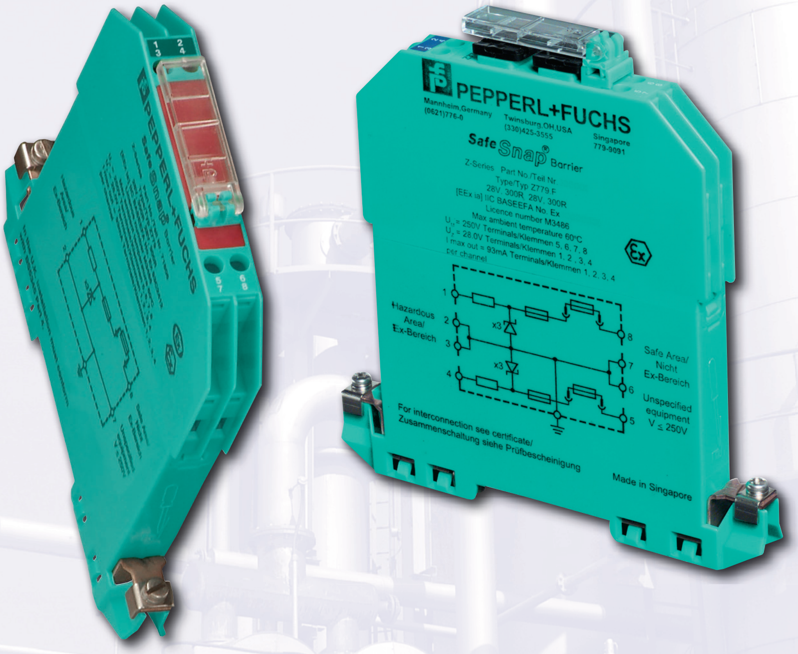
Z-System



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Introduction

The Z-System Zener Barriers have a full range of products for AC and DC intrinsic safety applications with over 75 different models. Single-, dual- and 3-channel versions are available for quick and easy installation. These Zener Barriers conveniently mount on standard 35 mm DIN rail. The process of mounting each barrier on the DIN rail makes an electrical connection to the internal earth/ground network necessary to maintain the intrinsic safety rating of the barrier. Replaceable fuse versions are also available to help facilitate circuit loop checks and reduce installation cost and space.

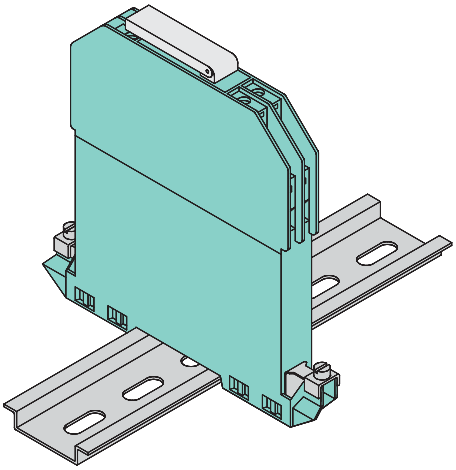

Figure 1 Zener Barrier Z-System

Housing

Z-System is a modular product range that features a space saving 12.5 mm wide housing and can incorporate up to 3 channels. The Z-System barriers are epoxy filled, and constructed to a protection classification of IP20, and are equipped with cage clamp terminals, that accept wire up to 2.5 mm^2 (14 AWG).

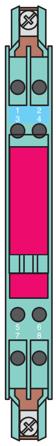

Figure 2 12.5 mm housing

Mounting

The Z-System barriers snap on standard 35 mm DIN rail and are ideal for racks or control cabinets. They can also be located in Class I Division 2 and Zone 2 hazardous areas when installed in enclosures with the appropriate protection category.

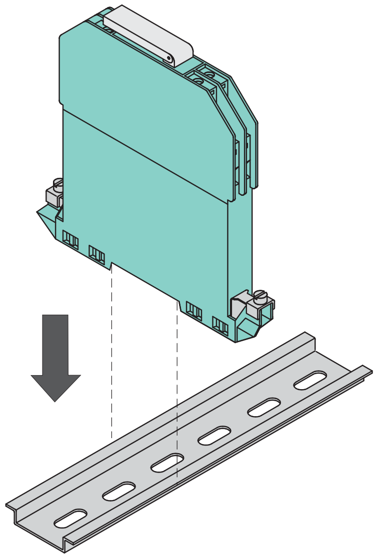

Figure 3 Mounting Zener Barrier Z-System

Operating principle

The Zener diodes within the barriers are connected in the reversed biased direction. In normal operation the barrier will remain virtually transparent to the control loop.

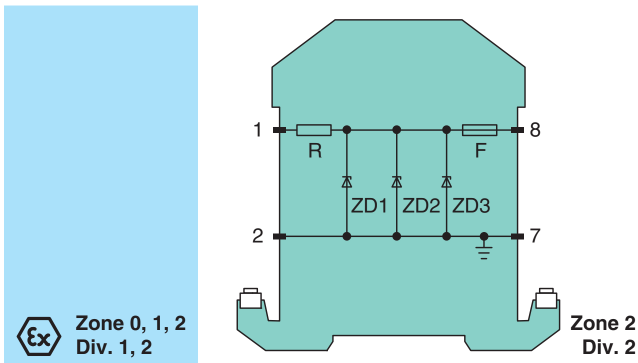

Figure 4 Circuit diagram (example)

If the diode breakdown voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to open, thus preventing the transfer of unacceptably high energy into the hazardous area.

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Terminals 7 and 8 are typically connected to a control circuit in the safe area. The single condition that the control circuitry must satisfy, is that it must not contain a source whose potential relative to earth is greater than 250 V AC or 250 V DC.

Terminals 1 and 2 are connected to the intrinsically safe circuits (field device) in the hazardous area. These types of devices are referred to as the intrinsically safe apparatus and must be certificated unless the electrical values do not exceed any of the following values: 1.5 V, 0.1 A, 25 mW. Pepperl+Fuchs Zener Barriers are identified in terms of voltage, resistance and polarity, e. g., 10 V, 50 Ω, positive polarity.

These figures correspond to the zener voltage U_Z and the total resistance of all barrier components. They therefore represent the safety values. The values stated on the type identification label correspond to the "worst case" data for U_Z (U_o, V_{oc}) and I_k (I_o, I_{sc}) determined during certification; I_k is obtained by dividing U_Z by the resistance R. It should be noted once again, however, that these values do not correspond to the operating range of the Zener Barrier.

Ideally, Zener diodes would not allow any current in the reverse direction until the zener voltage has been attained.

In practice, Zener diodes do allow a small leakage current, the value of which increases as the applied voltage is increased.

The operating range of a Zener Barrier must therefore be such that it is below the zener voltage, so that the leakage current is restricted to a minimum. Zener Barriers are normally tested to ensure that at the prescribed voltage the leakage current is smaller than 10 μA.

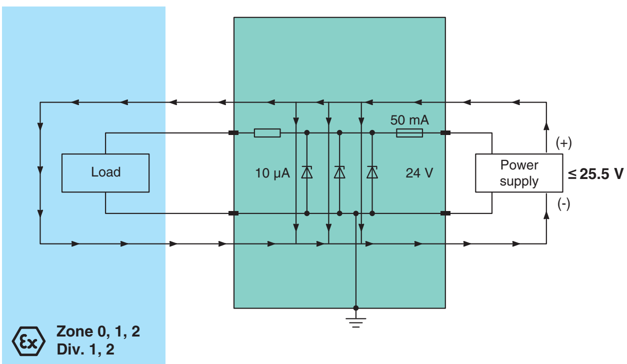

Figure 5 Leakage current through the Zener diodes

Figure 5 shows the flow of leakage current through the Zener diodes under normal circumstances. The Zener Barrier conducts a maximum of 10 μA (1 μA) leakage current so long as the supply voltage is less than 25.5 V. This is normal and has very little effect on the load. If the voltage exceeds 25.5 V, the Zener diodes start to conduct more current. This can have an effect on the operating current and the accuracy. It is recommended that a regulated voltage source be used, which maintains the voltage under the value at which the diodes will start to conduct. (A 24 V, 300 Ω barrier is represented here as an example.)

These voltages are stated in the data sheet for a given barrier, together with the leakage current. If the leakage current for a given voltage differs from 10 μA, this is specifically stated.

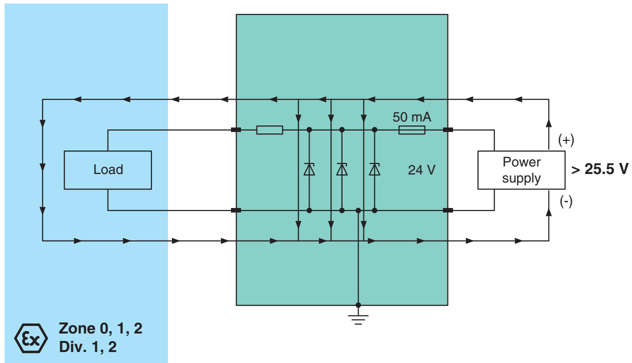

Figure 6 Total current drains through the Zener diodes

Figure 6 shows that if the maximum permissible input (supply) voltage is exceeded, the total current drains through the Zener diodes, without reaching the hazardous area.

Pepperl+Fuchs Zener Barriers have a low series resistance, given by the sum of the resistance R and the resistance value of the fuse F (see Figure 4). Due to the low series resistance, an inadvertent short-circuiting of terminals 1 and 2 can cause the fuse to open.

If the Zener Barriers are provided with a resistance, this limits the short-circuit current to a safe value in the event of a short circuit of the connecting wiring in the hazardous area or a connection to earth of the wiring attached to terminal 1.

Some barriers are available with a resistance connected between the output terminals. These are used in 4 mA to 20 mA transmitter circuits. The resistance converts the current in the intrinsically safe circuit into a voltage that can be measured in the safe area.

Pepperl+Fuchs Zener Barriers can be used in many applications. In the simplest case, a single channel barrier with a ground connection is used. But in many applications it is not desirable that the intrinsically safe circuit is connected directly to ground. If the circuit in the safe area is grounded, under some circumstances grounding of the intrinsically safe circuit can lead to faults within the system. In this case, quasi-ground-free intrinsically safe circuits can be constructed with two or more Zener Barrier channels. Pepperl+Fuchs offers 2- and 3-channel barriers in the same housing as the single channel barriers.

Double grounding of intrinsically safe circuits is not permitted. The insulation voltage of the wiring and field devices, measured with respect to ground, must be greater than 500 V AC. The permissible ambient temperature of the Zener Barriers is between -20 °C to 60 °C (-4 °F to 140 °F).

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Grounding of Zener Barriers

Intrinsically safe circuits with Zener Barriers without galvanic isolation must be grounded. The cross-section of the ground connection, using a copper conductor, must be at least 4 mm^2 (12 AWG) (for further details see NEC 504-50 and EN 60079-14). The maintenance of these requirements prevents the occurrence of a dangerous potential with respect to ground.

A fault of the type illustrated in Figure 7 can cause a dangerous spark if the Zener Barrier is not grounded. If a fault occurs (see Figure 8), the Zener diodes conducts and the current is shunted to ground. The fuse opens.

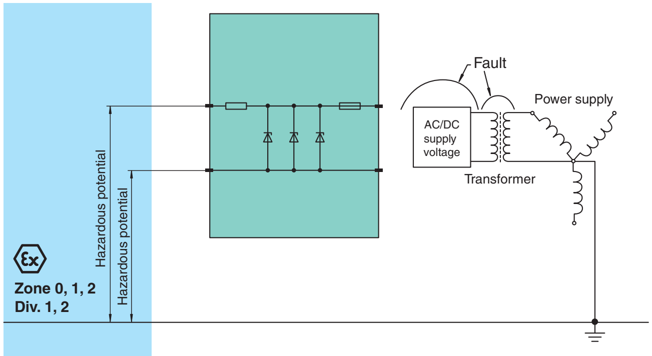

Figure 7 Non-grounded Zener Barrier

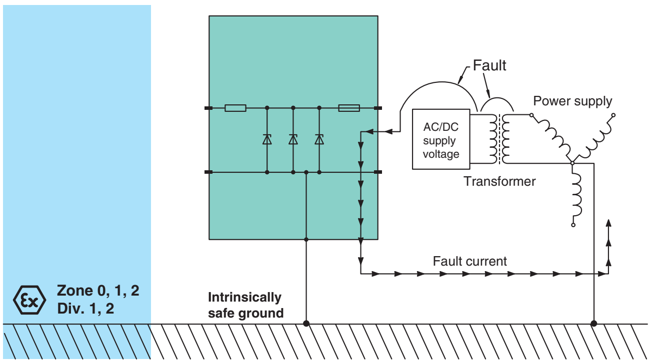

Figure 8 Grounded Zener Barriers

The system must have its own independent ground conductor, through which no supply system current flows.

Grounding with Z-System

The Z-system grounding is made simple by an integrated IS ground connection in the base of each Z-system barrier. By simply connecting each Z-System barrier to a standard 35 mm DIN rail, the total system can be grounded via a single point. Figure 9 to Figure 11 illustrate several grounding schemes. In summary, grounding may be achieved in 3 different arrangements: equipotential bonding via standard rail, group grounding through insulated mounting or individual grounding through insulated mounting.

Each installation method can be done with the appropriate accessories.

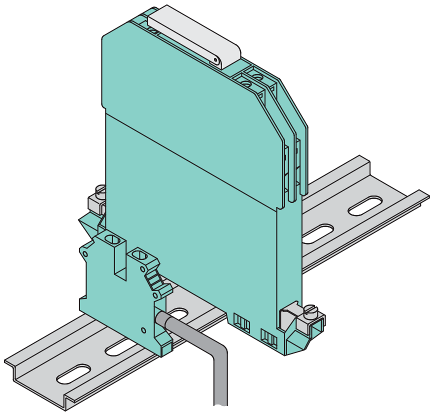

Figure 9 Equipotential bonding via DIN rail

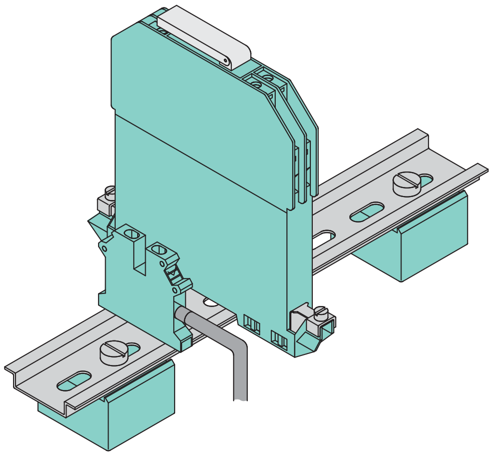

Figure 10 Insulated mounting (group grounding)

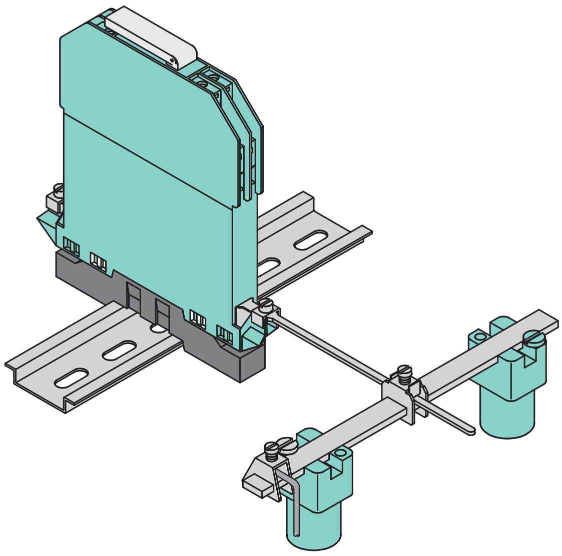

Figure 11 Insulated mounting (individual grounding)

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Multi-channel barriers

Analog circuits are often connected to two-channel barriers (see Figure 13). Since there is no grounding on this type of circuit, the system is a quasi-floating one. It is termed "quasi-floating", because it is "one zener voltage" above the ground potential. Although it does not actually float, the signal-to-noise ratio is improved.

A further advantage of multi-channel Zener Barriers is that a higher packing density can be achieved.

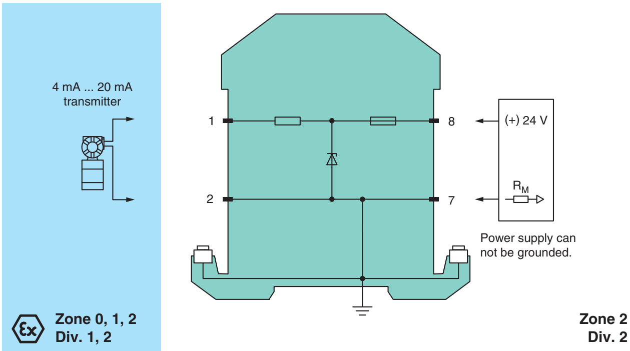

Figure 12 Single-channel Zener Barrier

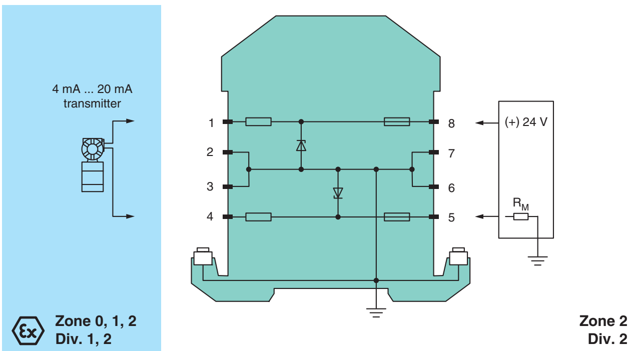

Figure 13 Two-channel Zener Barrier

Z-System specifications

The following are typical data used in the description of a barrier.

Working voltage at 10 µA

The maximum voltage that can be applied between the contacts in the safe area and ground at a defined leakage current. This is the upper value of the recommended operating range.

Maximum series resistance (Ω)

This is the maximum resistance that can be measured between the two end terminals of a barrier channel. It is obtained from the sum of any resistors and the resistance value of the fuse at an ambient temperature of 20 °C (68 °F).

Fuse rating (mA)

The function of the fuse is to create an open circuit in the event of a power supply fault. It also protects the Zener diodes from damage in the event of an abnormal operating condition.

Maximum supply voltage

The maximum voltage that can be supplied between the terminals in the safe area and ground without the fuse responding. This value is determined for an intrinsically safe circuit and an ambient temperature of 20 °C (68 °F).

Polarity

Zener Barriers are available in various versions. On Zener Barriers for positive polarity the anodes of the Zener diodes are grounded. On barriers for negative polarity the cathodes are grounded. On barriers for alternating polarity (AC), interconnected Zener diodes are employed and one side is grounded. These barriers can be used for both alternating voltage signals and direct voltage signals.

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Safety information

The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

Devices that have intrinsically safe control circuits are used to operate field devices within hazardous areas.

Zener Barriers are not suitable for the isolation of signals in power engineering unless specified in the respective data sheet.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Intrinsic safety circuits that were operated with circuits of other types of protection may not be used as intrinsically safe circuits afterwards.

Installation and commissioning

Commissioning and installation must by carried out by specially trained qualified personnel only.

Installation of the interface devices in the safe area

The devices are constructed to satisfy the IP20 protection classification and must be protected accordingly from adverse environmental conditions such as water spray or dirt exceeding the pollution degree 2.

The devices must be installed outside the hazardous area!

Depending on the level of protection, the intrinsically safe circuits of the devices (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that the intrinsically safe circuits are safely separated from all non-intrinsically safe circuits.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of Zener Barriers (demonstration of intrinsic safety). EN 60079-14/ IEC 60079-14 or NEC and CEC electrical codes for US and Canada respectively must be observed (where appropriate). If available, also the product certification control drawing must be observed.

If more channels of one device are to be connected in parallel, it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety, the maximum values of the parallel connection are to be regarded.

The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Installation and commissioning of the interface devices within Zone 2/Div. 2 of the hazardous area

Only devices with the corresponding manufacturer's Declaration of Conformity or separate certificate of conformity can be installed in Zone 2/Div. 2.

The individual data sheets indicate whether these conditions are met.

For US and Canada installations, in Zone 2/Div. 2 follow the NEC and CEC wiring methods. The enclosure must be able to accept Zone 2/Div. 2 wiring methods. The referenced product certification control drawing must be observed.

For all other applications, the devices should be installed in a switch or junction box that:

- meets at least IP54 in accordance to EN 60529.
- meets the requirements of resistance to light and resistance to impact according to EN 60079-0/ IEC 60079-0.
- meets the requirements of thermal endurance according to EN 60079-15/IEC 60079-15.
- must not cause ignition danger by electrostatic charge during intended use, maintenance and cleaning.

Depending on the level of protection, the intrinsically safe circuits of the devices (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that the intrinsically safe circuits are safely separated from all non-intrinsically safe circuits.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of Zener Barriers (demonstration of intrinsic safety). EN 60079-14/ IEC 60079-14 or NEC and CEC electrical codes for US and Canada respectively must be observed (where appropriate). If available, also the product certification control drawing must be observed.

If more channels of one device are to be connected in parallel, it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety, the maximum values of the parallel connection are to be regarded.

The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

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Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are also not allowed.

Isolation coordinates for devices with Ex-certificate according to EN 50020 and EN 60079-11

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

For additional details, see data sheets.

Technical data

Electrical data

Directive conformity

Directive 94/9/EC, associated standards see valid EC-Type Examination Certificates and/or EU statements of conformity or other appropriate certificates.

For additional details, see data sheets.

Mechanical data

Mounting

Snap-on 35 mm standard DIN rail acc. to EN 60715

Protection degree

IP20 acc. to EN 60529

Housing material

Polycarbonate (PC)

Connection options

Self-opening terminals, max. core cross section 2 x 2.5 mm^2 (2 x 14 AWG)

The barriers are usually installed in racks or control cabinets.

They can be built into housings under production conditions, with the provision that the housing must allow for adequate protection. They can also be employed in hazardous areas, when it has been ascertained that the housing has been certified for this purpose.

The installation must be carried out in such a way that the intrinsic safety is not compromised by the following factors:

- Danger of mechanical damage
- Non-authorized changes or influence exerted by external personnel
- Humidity, dust or foreign bodies
- Ambient temperature exceeding the permissible level
- The connection of non-intrinsically safe circuits to intrinsically safe circuits

Grounding of the mounting rail is of the normal type, i. e. where both ends are connected to the intrinsically safe ground. This also simplifies checking the grounding.

Many installations provide the option of subsequent expansion.

Replacement cable for this spare cable can be connected to the Z799 dummy barrier and unused cable can be connected to the intrinsically safe ground.

Ambient conditions

Ambient temperature

-20 °C to 60 °C (-4 °F to 140 °F)

Storage temperature

-25 °C to 70 °C (-13 °F to 158 °F)

Relative humidity

max. 75 % without moisture condensation

Terminal designations

For additional details, see data sheets.

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DC Versions, positive polarity

Model Number	Channels	Electrical Data: Working Voltage at 10 µA (V)	Max. Series Resistance (Ω)	Fuse Rating (mA)	Max. Supply Voltage (V)	Features: Asymmetrical Version	High Power Version	Increased Nominal Resistance	Internal Measuring Resistor	Replaceable Fuse	Diode Return	Page
Z705	1	0.9 (1 µA)	18.18	250	4.8							425
Z710	1	6.5	56	100	8.9							425
Z713	1	13.7	29	160	14.6							425
Z715	1	13	107	100	13.6							425
Z715.1K	1	13	1025	100	13.6			■				425
Z715.F	1	13	121	63	13.8					■		426
Z722	1	19	166	50	20.1							425
Z728	1	26.5	327	50	28							425
Z728.F	1	26.5	341	50	28					■		426
Z728.H	1	26.5	250	80	28		■					425
Z728.H.F	1	26.5	273	50	28		■			■		426
Z755	2	0.9 (1 µA)	18.18	250	4.8							427
Z757	2	6	15.5	200	6.9							427
Z764	2	10	1033	50	11							427
Z765	2	13	107	100	13.6							427
Z765.F	2	13	121	63	13.9					■		431
Z772	2	19	166	50	20.1							427
Z778	2	26.5	646	50	28							427
Z779	2	26.5	327	50	28							427
Z779.F	2	26.5	341	50	28					■		431
Z779.H	2	26.5	250	80	28		■					428
Z779.H.F	2	26.5	273	50	28		■			■		431
Z786	2	26.5	36 + 0.9 V	50	28						■	427
Z787	2	26.5	327	50	28						■	428
Z787.F	2	26.5	341	50	28					■	■	432
Z787.H	2	26.5	250	80	28		■				■	428
Z787.H.F	2	26.5	273	50	28		■			■	■	432
Z788	2	26.5/6.5	327/64	50/50	28/9.1	■						428
Z788.H	2	26.5/6.5	250/64	80/80	28/9.1	■	■					428
Z788.R	2	26.5/6.5	327/64	50/50	28/9.1	■			■			429
Z789	2	26.5	640	50	27.5						■	430
Z796	2	24/18	340/437	50/50	25.1/19.5	■						428

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DC Versions, negative polarity

Model Number	Channels	Working Voltage at 10 µA (V)	Max. Series Resistance (Ω)	Fuse Rating (mA)	Max. Supply Voltage (V)	Asymmetrical Version	High Power Version	Replaceable Fuse	Diode Return	Page
		Electrical Data				Features				
Z810	1	6.5	56	100	8.9					433
Z813	1	13.7	29	160	14.6					433
Z815	1	13	107	100	13.6					433
Z822	1	19	166	50	20.1					433
Z828	1	26.5	327	50	28					433
Z828.H	1	26.5	250	80	28		■			433
Z857	2	6	15.5	200	6.9					434
Z864	2	10	1033	50	11					434
Z865	2	13	107	100	13.6					434
Z865.F	2	13	121	63	13.9			■		436
Z872	2	19	166	50	20.1					434
Z878	2	26.5	646	50	28					434
Z879.H.F	2	26.5	273	50	28		■	■		436
Z886	2	26.5	36 + 0.9 V	50	28				■	434
Z887	2	26.5	327	50	28				■	434
Z887.H.F	2	26.5	273	50	28		■	■	■	436
Z888	2	26.5/6.5	327/64	50	28/9.1	■				435
Z888.H	2	26.5/6.5	250/64	80	28/9.1	■	■			435
Z896	2	24/18	340/437	50	25.1/19.5	■				435

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AC Versions

Model Number	Channels	Electrical Data: Working Voltage at 10 µA (V)	Max. Series resistance (Ω)	Fuse Rating (mA)	Max. Supply Voltage (V)	Features: High Power Version	Increased Nominal Resistance	Replaceable Fuse	Page
Z905	1	0.9 (1 µA)	18.18	250	4.7				437
Z910	1	6.5	56	100	9.3				437
Z915	1	13	107	100	14				437
Z915.1K	1	13	1025	100	14		■		437
Z928	1	26	327	50	27.6				437
Z954	3	0.6 (1 µA)	27.27	50	4.2				442
Z955	2	0.9 (1 µA)	18.18	250	4.7				438
Z960	2	6.5	64	50	9.5				439
Z960.F	2	6.5	79	50	9.7			■	440
Z961	2	6.5	106	100	8.1				438
Z961.F	2	6.5	113	100	8			■	441
Z961.H	2	6.5	380	50	8.1	■			438
Z964	2	10	1033	50	11.7				438
Z965	2	13	115	50	14.2				439
Z966	2	10	166	50	11.7				438
Z966.F	2	10	169	63	11.9			■	441
Z966.H	2	10	82	100	11.7	■			438
Z967	2	15	136	50	16.2				439
Z972	2	19	327	50	20.9				439
Z978	2	26	646	50	27.6				439

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Accessories

Model Number	Description	Page
NS 35/7.5	35 mm DIN Rail	451
USLKG5	Terminal Block	451
Z799	Place Holder Barrier	450
ZH-ES/LB	Insertion Strip	451
ZH-Z.AB/NS	Mounting Block	451
ZH-Z.AB/SS	Mounting Block	451
ZH-Z.AK16	Connector	451
ZH-Z.AR.125	Spacing Roller	451
ZH-Z.BT	Label Carrier	451
ZH-Z.ES	Single Socket	451
ZH-Z.LL	Ground Rail Feed	451
ZH-Z.NLS-Cu3/10	Grounding Rail	451

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Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z705	0.9 (1 µA)	18.18	250	4.8
Z710	6.5	56	100	8.9
Z713	13.7	29	160	14.6
Z715	13	107	100	13.6
Z715.1K	13	1025	100	13.6
Z722	19	166	50	20.1
Z728	26.5	327	50	28
Z728.H	26.5	250	80	28

Hazardous area connection	
Connection	terminals 1, 2
Safe area connection	
Connection	terminals 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm²
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7005
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
UL approval	
Control drawing	116-0139
CSA approval	
Control drawing	116-0119
IECEx approval	IECEx BAS 09.0142
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **1-channel**
- **DC version, positive polarity**
- **DIN rail mounting**
- **Increased nominal resistance 1 kΩ (Z***.1K)**
- **High power version (Z***.H)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

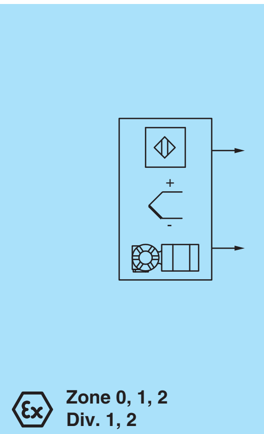
The high power version has a smaller serial resistance; therefore, it produces higher voltage to the field device.

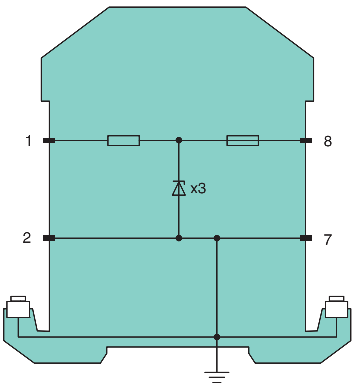
The Zener Barrier has an increased nominal resistance of 1 kΩ.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

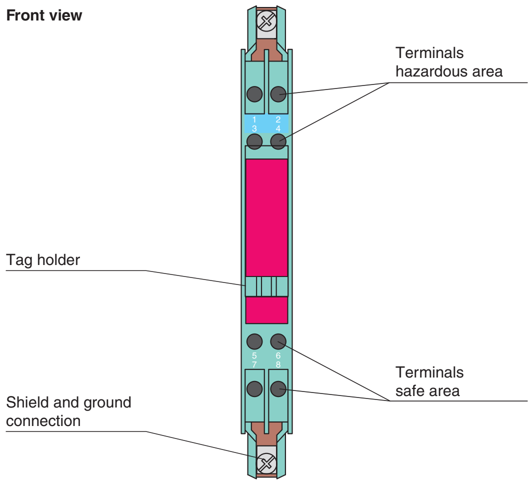
Z-System
Barriers
Accessories

Diagrams





Zone 2
Div. 2



Edition 908837 (US) / 208599 (EU) 11/2010

1-Channel DC Version, Positive Polarity

Features

- **1-channel**
- **DC version, positive polarity**
- **DIN rail mounting**
- **Replaceable fuse**
- **High power version (Z***.H.*)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable fuse.

The high power version has a smaller serial resistance; therefore, it produces higher voltage to the field device.

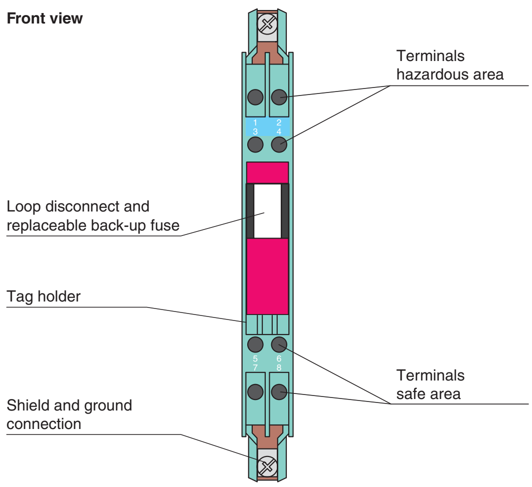
These barriers simply snap onto a standard DIN rail for easy installation and grounding.

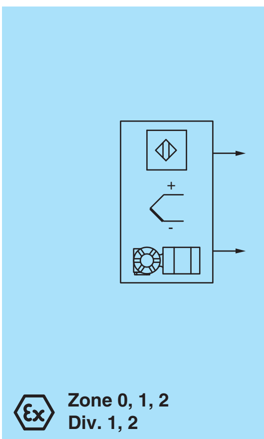
Technical data

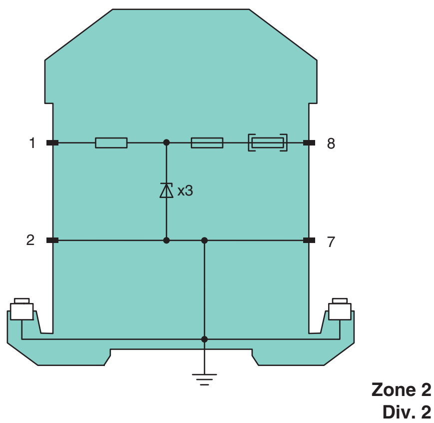
Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z715.F	13	121	63	13.8
Z728.F	26.5	341	50	28
Z728.H.F	26.5	273	50	28

Hazardous area connection	
Connection	terminals 1, 2
Safe area connection	
Connection	terminals 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7096
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C $\leq T_{amb} \leq$ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
CSA approval	
Control drawing	116-0119

Diagrams







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Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z755	0.9 (1 µA)	18.18	250	4.8
Z757	6	15.5	200	6.9
Z764	10	1033	50	11
Z765	13	107	100	13.6
Z772	19	166	50	20.1
Z778	26.5	646	50	28
Z779	26.5	327	50	28
Z786	26.5	36 + 0.9 V	50	28

Hazardous area connection	
Connection	terminals 1, 2; 3, 4
Safe area connection	
Connection	terminals 5, 6; 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7005
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C $\leq T_{amb} \leq$ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
UL approval	
Control drawing	116-0139
CSA approval	
Control drawing	116-0119
IECEx approval	IECEx BAS 09.0142
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **2-channel**
- **DC version, positive polarity**
- **DIN rail mounting**
- **With diode return (Z786)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

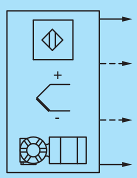
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

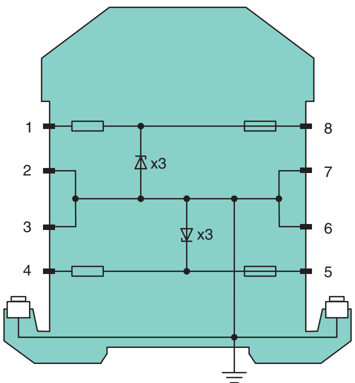
The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

Diagrams

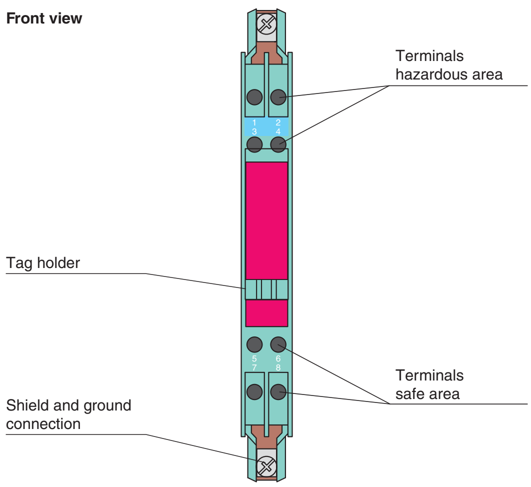


Ex Zone 0, 1, 2
Div. 1, 2



Zone 2
Div. 2

Front view



Z-System
Barriers
Accessories

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Features

- **2-channel**
- **DC version, positive polarity**
- **DIN rail mounting**
- **High power version (Z ***.H)**
- **Asymmetrical version (Z **8.*, Z *96)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

The high power version has a smaller serial resistance and therefore provides higher voltage to the field device.

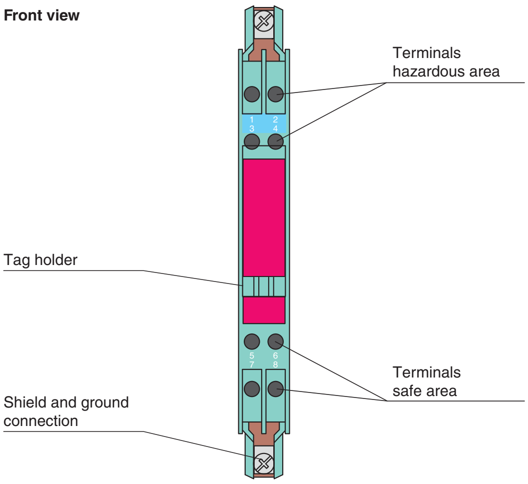
Asymmetrical Zener Barriers are for optimization of applications which have different voltage levels regarding to ground potential.

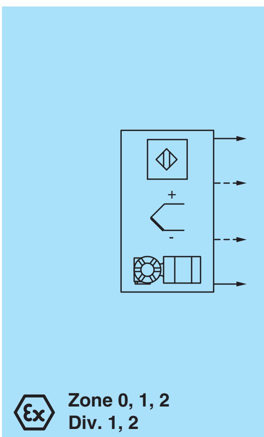
These barriers simply snap onto a standard DIN rail for easy installation and grounding.

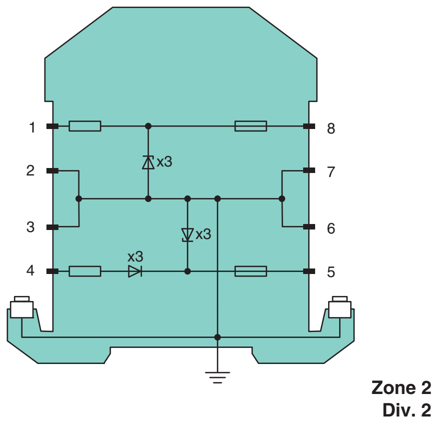
Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z779.H	26.5	250	80	28
Z787	26,5	327	50	28
Z787.H	26,5	250	80	28
Z788	26.5/6.5	327/64	50	28/9.1
Z788.H	26.5/6.5	250/64	80	28/9.1
Z796	24/18	340/437	50	25.1/19.5
Hazardous area connection				
Connection	terminals 1, 2; 3, 4			
Safe area connection				
Connection	terminals 5, 6; 7, 8			
Ambient conditions				
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)			
Mechanical specifications				
Protection degree	IP20			
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2			
Mass	approx. 150 g			
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)			
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715			
Data for application in conjunction with hazardous areas	see page 443 for entity parameters			
EC-Type Examination Certificate	BAS 01 ATEX 7005			
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]			
Statement of conformity	TÜV 99 ATEX 1484 X			
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]			
FM approval				
Control drawing	116-0118			
UL approval				
Control drawing	116-0139			
CSA approval				
Control drawing	116-0119			
IECEx approval	IECEx BAS 09.0142			
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I			

Diagrams







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Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z788.R	26.5/6.5	327/64	50	28/9.1

Hazardous area connection	
Connection	terminals 1, 2; 3, 4
Measuring resistor	terminals 2, 3 to 4: internal resistor 250 Ω for 5 V signal on terminals 6, 7 to 5
Safe area connection	
Connection	terminals 5, 6; 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7005
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
UL approval	
Control drawing	116-0139
CSA approval	
Control drawing	116-0119
IECEx approval	IECEx BAS 09.0142
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **2-channel**
- **DC version, positive polarity**
- **DIN rail mounting**
- **Asymmetrical version**
- **Internal measuring resistor**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

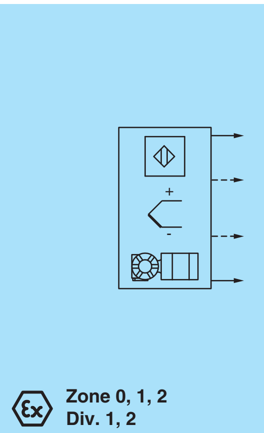
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

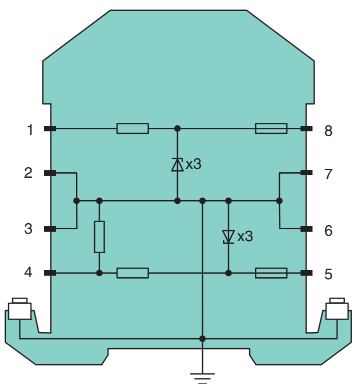
The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Asymmetrical Zener Barriers are for optimization of applications which have different voltage levels regarding to ground potential.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

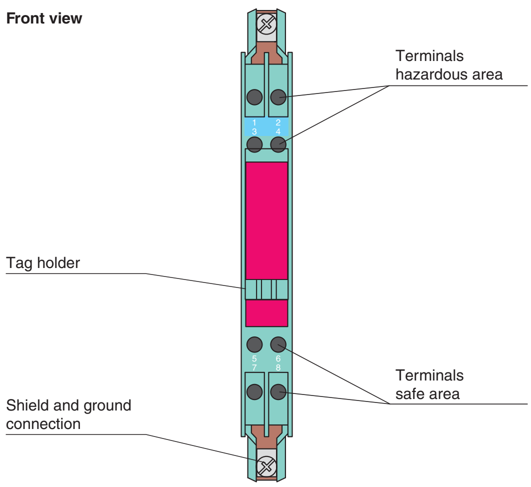
Diagrams





Zone 2
Div. 2

Front view



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Features

- **2-channel**
- **DC version, positive polarity**
- **DIN rail mounting**
- **With diode return**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

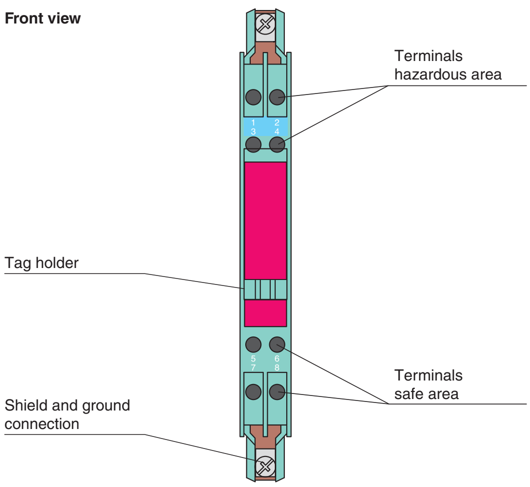
These barriers simply snap onto a standard DIN rail for easy installation and grounding.

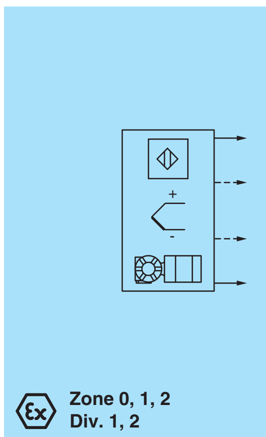
Technical data

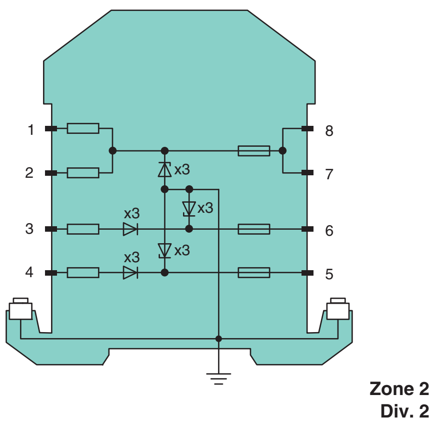
Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z789	26.5	640	50	27.5

Hazardous area connection	
Connection	terminals 1, 2; 3, 4
Safe area connection	
Connection	terminals 5, 6; 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7005
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
IECEx approval	IECEx BAS 09.0142
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Diagrams







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Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z765.F	13	121	63	13.9
Z779.F	26.5	341	50	28
Z779.H.F	26.5	273	50	28

Hazardous area connection	
Connection	terminals 1, 2; 3, 4
Safe area connection	
Connection	terminals 5, 6; 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7096
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C $\leq T_{amb} \leq$ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
CSA approval	
Control drawing	116-0119

Features

- **2-channel**
- **DC version, positive polarity**
- **DIN rail mounting**
- **Replaceable fuse**
- **High power version (Z ***.H.*)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

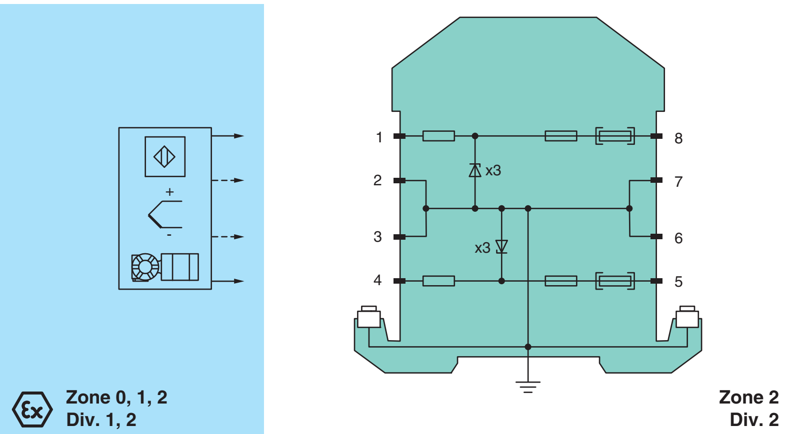
The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

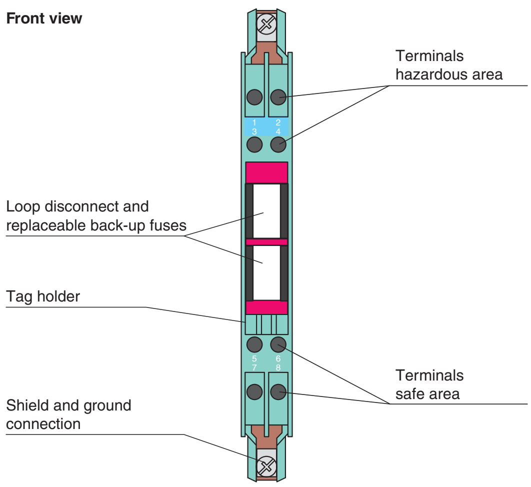
Additionally this Zener Barrier is equipped with a replaceable fuse.

The high power version has a smaller serial resistance; therefore, it produces higher voltage to the field device.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

Diagrams





Z-System | Barriers | Accessories

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Features

- **2-channel**
- **DC version, positive polarity**
- **DIN rail mounting**
- **Replaceable fuse**
- **With diode return**
- **High power version (Z ***.H.*)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable fuse.

The high power version has a smaller serial resistance and therefore provides higher voltage to the field device.

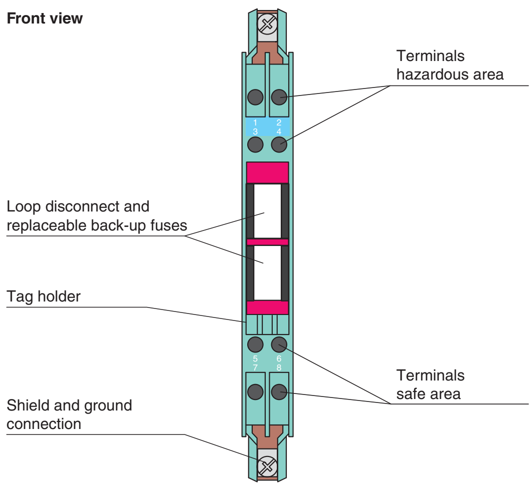
The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

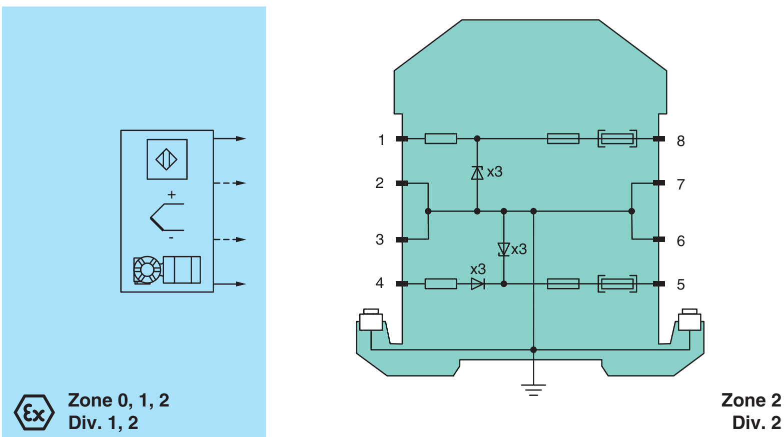
These barriers simply snap onto a standard DIN rail for easy installation and grounding.

Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z787.F	26.5	341	50	28
Z787.H.F	26.5	273	50	28
Hazardous area connection				
Connection	terminals 1, 2; 3, 4			
Safe area connection				
Connection	terminals 5, 6; 7, 8			
Ambient conditions				
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)			
Mechanical specifications				
Protection degree	IP20			
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2			
Mass	approx. 150 g			
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)			
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715			
Data for application in conjunction with hazardous areas	see page 443 for entity parameters			
EC-Type Examination Certificate	BAS 00 ATEX 7096			
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C $\leq T_{amb} \leq$ 60 °C) [circuit(s) in zone 0/1/2]			
Statement of conformity	TÜV 99 ATEX 1484 X			
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]			
FM approval				
Control drawing	116-0118			
CSA approval				
Control drawing	116-0119			

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

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Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z810	6.5	56	100	8.9
Z813	13.7	29	160	14.6
Z815	13	107	100	13.6
Z822	19	166	50	20.1
Z828	26.5	327	50	28
Z828.H	26.5	250	80	28
Hazardous area connection				
Connection	terminals 1, 2			
Safe area connection				
Connection	terminals 7, 8			
Ambient conditions				
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)			
Mechanical specifications				
Protection degree	IP20			
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2			
Mass	approx. 150 g			
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)			
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715			
Data for application in conjunction with hazardous areas	see page 443 for entity parameters			
EC-Type Examination Certificate	BAS 01 ATEX 7005			
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]			
Statement of conformity	TÜV 99 ATEX 1484 X			
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]			
FM approval				
Control drawing	116-0118			
UL approval				
Control drawing	116-0139			
CSA approval				
Control drawing	116-0119			
IECEx approval	IECEx BAS 09.0142			
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I			

Features

- **1-channel**
- **DC version, negative polarity**
- **DIN rail mounting**
- **Increased nominal resistance 1 kΩ (Z***.1K)**
- **High power version (Z***.H)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

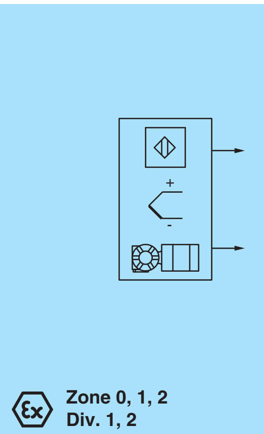
The Zener Barrier has a negative polarity, i. e. the cathodes of the Zener diodes are grounded.

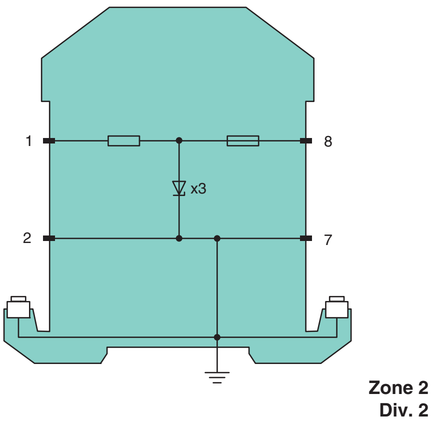
The high power version has a smaller serial resistance; therefore, it produces higher voltage to the field device.

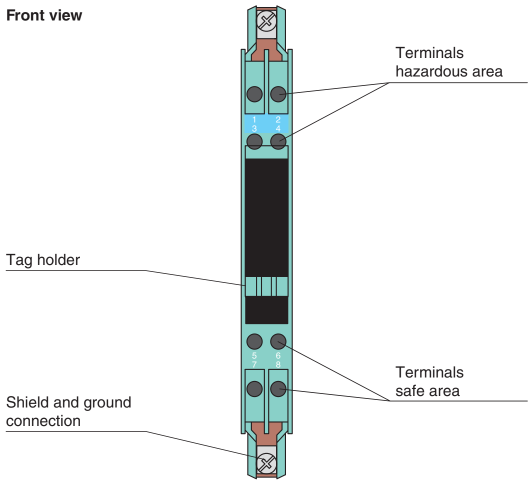
The Zener Barrier has an increased nominal resistance of 1 kΩ.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

Diagrams







Z-System
Barriers
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

2-Channel DC Version, Negative Polarity

Z-System
Barriers
Accessories

Features

- **2-channel**
- **DC version, negative polarity**
- **DIN rail mounting**
- **With diode return (Z886, Z887)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a negative polarity, i. e. the cathodes of the Zener diodes are grounded.

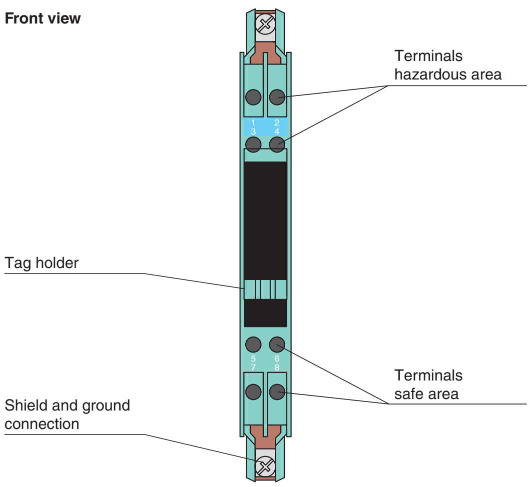
The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

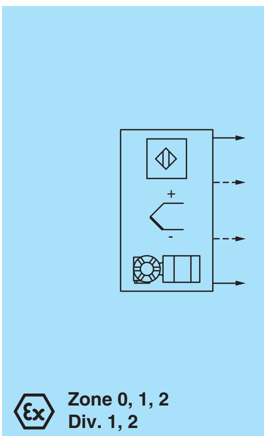
These barriers simply snap onto a standard DIN rail for easy installation and grounding.

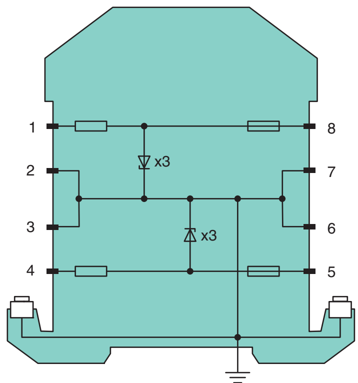
Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z857	6	15.5	200	6.9
Z864	10	1033	50	11
Z865	13	107	100	13.6
Z872	19	166	50	20.1
Z878	26.5	646	50	28
Z886	26.5	36 + 0.9 V	50	28
Z887	26.5	327	50	28
Hazardous area connection				
Connection	terminals 1, 2; 3, 4			
Safe area connection				
Connection	terminals 5, 6; 7, 8			
Ambient conditions				
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)			
Mechanical specifications				
Protection degree	IP20			
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2			
Mass	approx. 150 g			
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)			
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715			
Data for application in conjunction with hazardous areas	see page 443 for entity parameters			
EC-Type Examination Certificate	BAS 01 ATEX 7005			
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C $\leq T_{amb} \leq$ 60 °C) [circuit(s) in zone 0/1/2]			
Statement of conformity	TÜV 99 ATEX 1484 X			
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]			
FM approval				
Control drawing	116-0118			
UL approval				
Control drawing	116-0139			
CSA approval				
Control drawing	116-0119			
IECEx approval	IECEx BAS 09.0142			
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I			

Diagrams







Zone 2
Div. 2

Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z888	26.5/6.5	327/64	50/50	28/9.1
Z888.H	26.5/6.5	250/64	80/80	28/9.1
Z896	24/18	340/437	50/50	25.1/19.5

Hazardous area connection	
Connection	terminals 1, 2; 3, 4
Safe area connection	
Connection	terminals 5, 6; 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7005
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
UL approval	
Control drawing	116-0139
CSA approval	
Control drawing	116-0119
IECEx approval	IECEx BAS 09.0142
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **2-channel**
- **DC version, negative polarity**
- **DIN rail mounting**
- **High power version (Z ***.H)**
- **Asymmetrical version**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

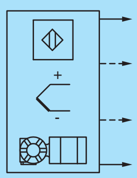
The Zener Barrier has a negative polarity, i. e. the cathodes of the Zener diodes are grounded.

The high power version has a smaller serial resistance and therefore provides higher voltage to the field device.

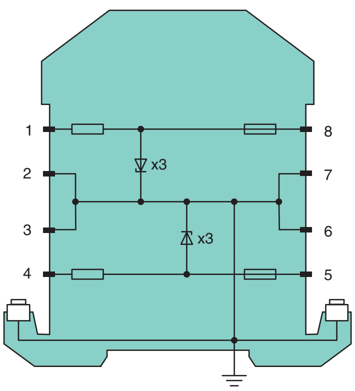
Asymmetrical Zener Barriers are for optimization of applications which have different voltage levels regarding to ground potential.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

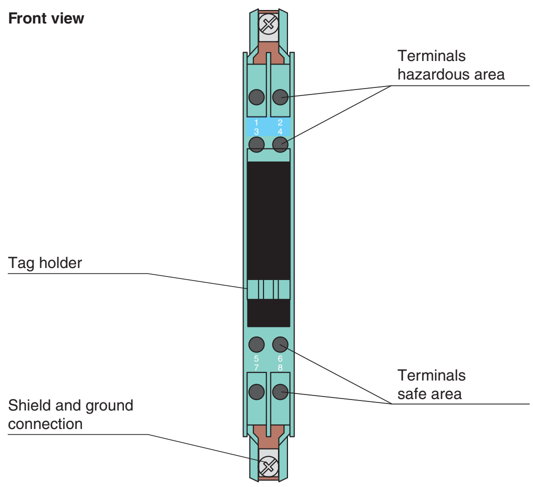
Diagrams



Zone 0, 1, 2
Div. 1, 2



Zone 2
Div. 2



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Features

- **2-channel**
- **DC version, negative polarity**
- **DIN rail mounting**
- **Replaceable fuse**
- **High power version (Z ***.H.*)**
- **With diode return (Z887.H.F)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a negative polarity, i. e. the cathodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable fuse.

The high power version has a smaller serial resistance and therefore provides higher voltage to the field device.

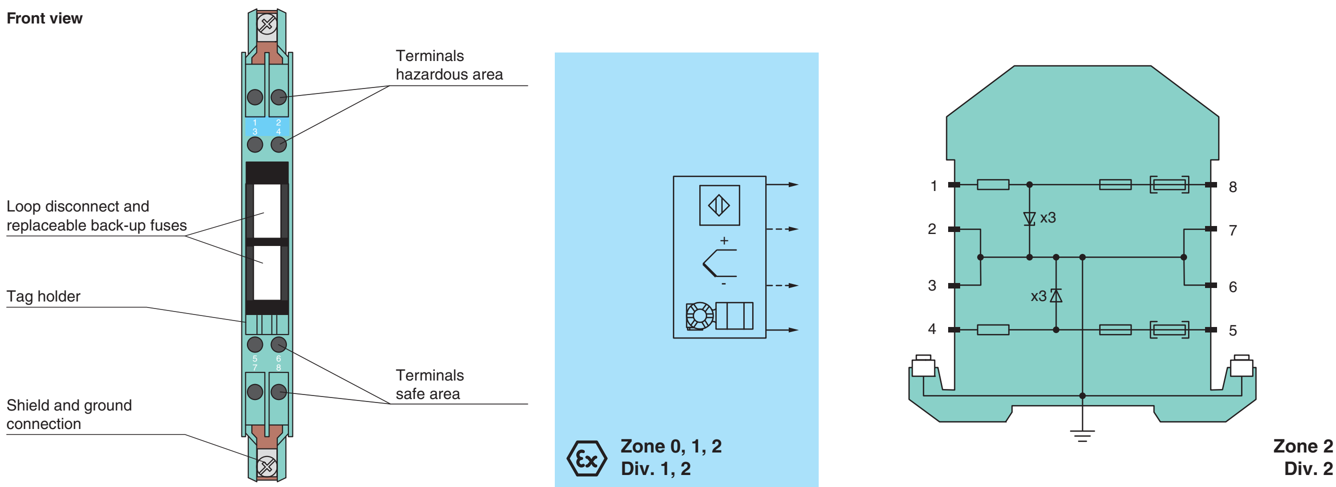
The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z865.F	13	121	63	13.9
Z879.H.F	26.5	273	50	28
Z887.H.F	26.5	273	50	28
Hazardous area connection				
Connection	terminals 1, 2; 3, 4			
Safe area connection				
Connection	terminals 5, 6; 7, 8			
Ambient conditions				
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)			
Mechanical specifications				
Protection degree	IP20			
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2			
Mass	approx. 150 g			
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)			
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715			
Data for application in conjunction with hazardous areas	see page 443 for entity parameters			
EC-Type Examination Certificate	BAS 00 ATEX 7096			
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]			
Statement of conformity	TÜV 99 ATEX 1484 X			
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]			
FM approval				
Control drawing	116-0118			
CSA approval				
Control drawing	116-0119			

Diagrams



Edition 908837 (US) / 208599 (EU) 11/2010

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Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z905	0.9 (1 µA)	18.18	250	4.7
Z910	6.5	56	100	9.3
Z915	13	107	100	14
Z915.1K	13	1025	100	14
Z928	26	327	50	27.6

Hazardous area connection	
Connection	terminals 1, 2
Safe area connection	
Connection	terminals 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7005
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
UL approval	
Control drawing	116-0139
CSA approval	
Control drawing	116-0119
IECEx approval	IECEx BAS 09.0142
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Features

- **1-channel**
- **AC version**
- **DIN rail mounting**
- **Increased nominal resistance 1 kΩ (Z ***.1K)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

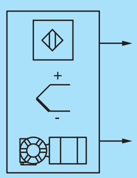
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

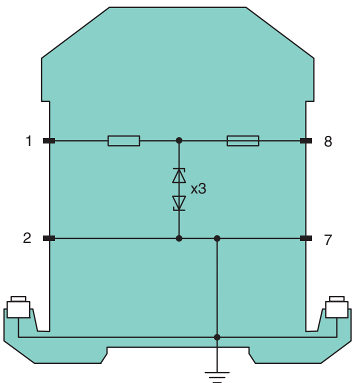
The Zener Barrier has an increased nominal resistance of 1 kΩ .

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

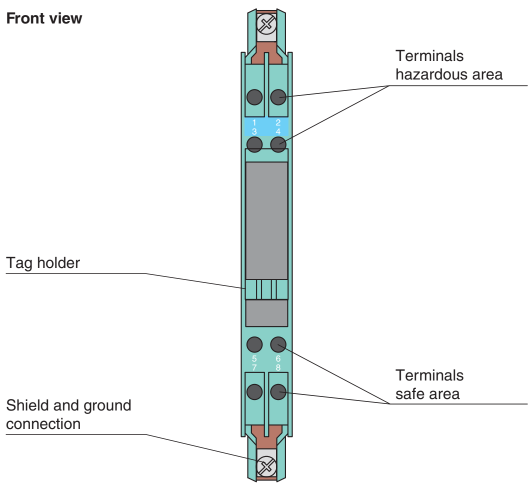
Diagrams



Zone 0, 1, 2
Div. 1, 2



Zone 2
Div. 2



Z-System
Barriers
Accessories

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Features

- **2-channel**
- **AC version**
- **DIN rail mounting**
- **High power version (Z ***.H)**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

The high power version has a smaller serial resistance and therefore provides higher voltage to the field device.

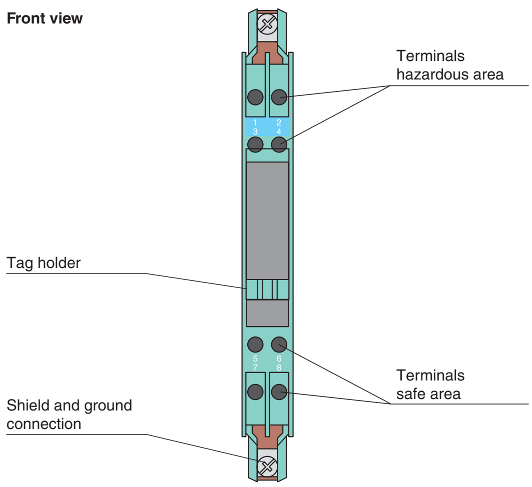
These barriers simply snap onto a standard DIN rail for easy installation and grounding.

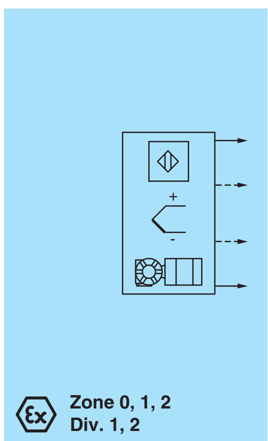
Technical data

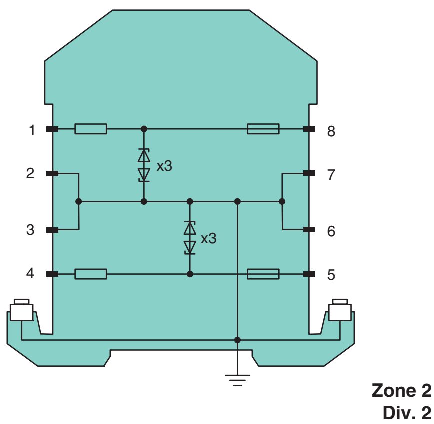
Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z955	0.9 (1 µA)	18.18	250	4.7
Z961	6.5	106	100	8.1
Z961.H	6.5	380	50	8.1
Z964	10	1033	50	11.7
Z966	10	166	50	11.7
Z966.H	10	82	100	11.7

Hazardous area connection	
Connection	terminals 1, 2; 3, 4
Safe area connection	
Connection	terminals 5, 6; 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 01 ATEX 7005
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
UL approval	
Control drawing	116-0139
CSA approval	
Control drawing	116-0119
IECEx approval	IECEx BAS 09.0142
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I

Diagrams







Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z960	6.5	64	50	9.5
Z965	13	115	50	14.2
Z967	15	136	50	16.2
Z972	19	327	50	20.9
Z978	26	646	50	27.6
Hazardous area connection				
Connection	terminals 1, 2; 3, 4			
Safe area connection				
Connection	terminals 5, 6; 7, 8			
Ambient conditions				
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)			
Mechanical specifications				
Protection degree	IP20			
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2			
Mass	approx. 150 g			
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)			
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715			
Data for application in conjunction with hazardous areas	see page 443 for entity parameters			
EC-Type Examination Certificate	BAS 01 ATEX 7005			
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]			
Statement of conformity	TÜV 99 ATEX 1484 X			
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]			
FM approval				
Control drawing	116-0118			
UL approval				
Control drawing	116-0139			
CSA approval				
Control drawing	116-0119			
IECEx approval	IECEx BAS 09.0142			
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I			

Features

- **2-channel**
- **AC version**
- **DIN rail mounting**
- **Star connection**

Function

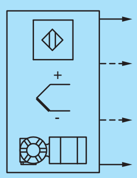
The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

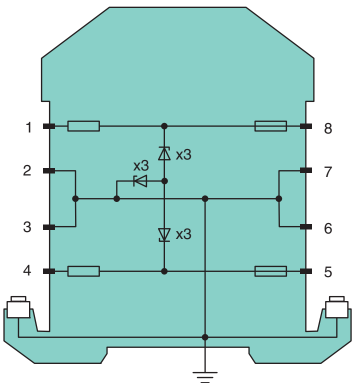
The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

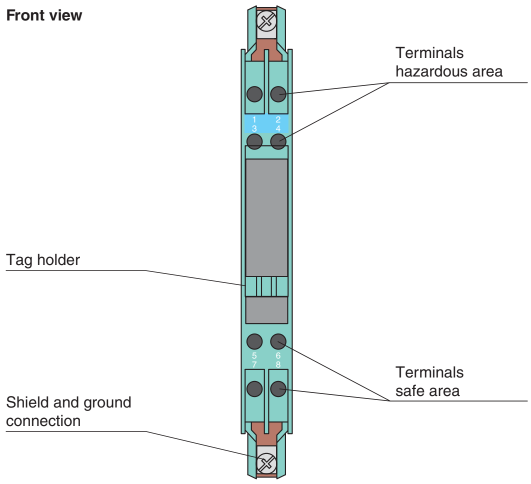
Diagrams



Zone 0, 1, 2
Div. 1, 2



Zone 2
Div. 2



Edition 908837 (US) / 208599 (EU) 11/2010

Z-System
Barriers
Accessories

Features

- **2-channel**
- **AC version**
- **DIN rail mounting**
- **Replaceable fuse**
- **Star connection**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

Additionally this Zener Barrier is equipped with a replaceable fuse.

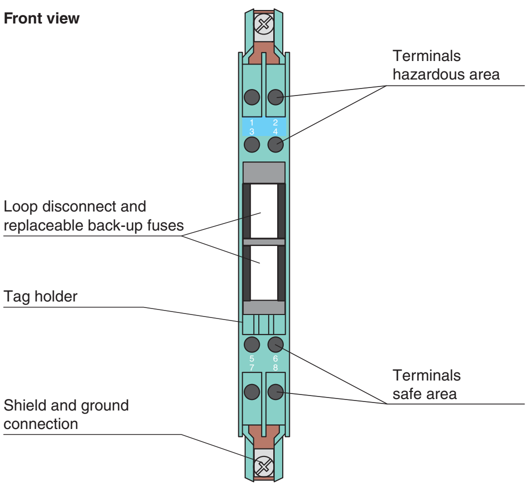
These barriers simply snap onto a standard DIN rail for easy installation and grounding.

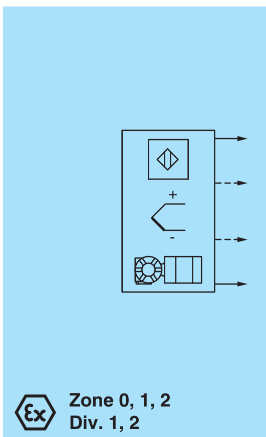
Technical data

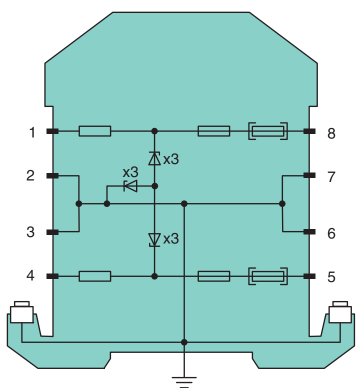
Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z960.F	6.5	79	50	9.7

Hazardous area connection	
Connection	terminals 1, 2; 3, 4
Safe area connection	
Connection	terminals 5, 6; 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7096
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
CSA approval	
Control drawing	116-0119

Diagrams







Zone 2
Div. 2

Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z961.F	6.5	113	100	8
Z966.F	10	169	63	11.9

Hazardous area connection	
Connection	terminals 1, 2; 3, 4
Safe area connection	
Connection	terminals 5, 6; 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 443 for entity parameters
EC-Type Examination Certificate	BAS 00 ATEX 7096
Group, category, type of protection	Ex II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Statement of conformity	TÜV 99 ATEX 1484 X
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 [device in zone 2]
FM approval	
Control drawing	116-0118
CSA approval	
Control drawing	116-0119

Features

- **2-channel**
- **AC version**
- **DIN rail mounting**
- **Replaceable fuse**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

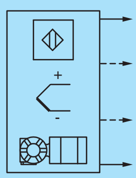
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

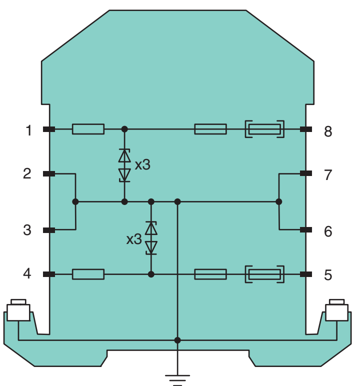
Additionally this Zener Barrier is equipped with a replaceable fuse.

These barriers simply snap onto a standard DIN rail for easy installation and grounding.

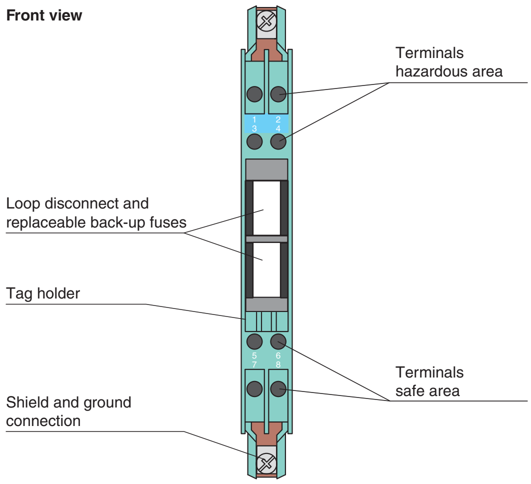
Diagrams



Ex Zone 0, 1, 2
Div. 1, 2



Zone 2
Div. 2



Z-System
Barriers
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **3-channel**
- **AC version**
- **DIN rail mounting**

Function

The Z-System Zener Barriers provide protection for electrical signals within hazardous areas and feature a narrow profile of just 12.5 mm to maximize control panel space.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

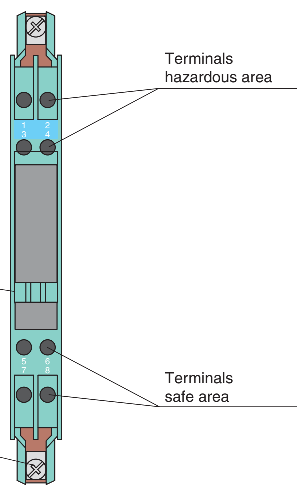
These barriers simply snap onto a standard DIN rail for easy installation and grounding.

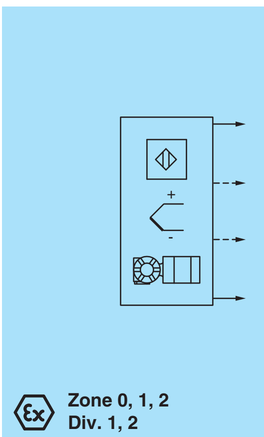
Technical data

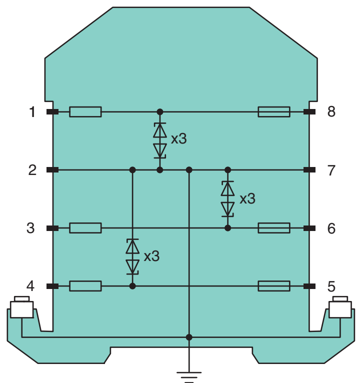
Model number	Working voltage at 10 µA (V)	Max. series resistance (Ω)	Fuse rating (mA)	Max. supply voltage (V)
Z954	0.6 (1 µA)	27.27	50	4.2
Hazardous area connection				
Connection	terminals 1, 2; 2, 3; 2, 4			
Safe area connection				
Connection	terminals 5, 7; 6, 7; 7, 8			
Ambient conditions				
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)			
Mechanical specifications				
Protection degree	IP20			
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2			
Mass	approx. 150 g			
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)			
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715			
Data for application in conjunction with hazardous areas	see page 443 for entity parameters			
EC-Type Examination Certificate	BAS 01 ATEX 7005			
Group, category, type of protection	Ⓔx II (1)GD, I (M1) [Ex ia] IIC, [Ex iaD], [Ex ia] I (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]			
Statement of conformity	TÜV 99 ATEX 1484 X			
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 [device in zone 2]			
FM approval				
Control drawing	116-0118			
UL approval				
Control drawing	116-0139			
CSA approval				
Control drawing	116-0119			
IECEx approval	IECEx BAS 09.0142			
Approved for	[zone 0] [Ex ia] IIC, [Ex iaD], [Ex ia] I			

Diagrams

Front view







Zone 2
Div. 2

Edition 908837 (US) / 208599 (EU) 11/2010

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ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
Zener Barriers				
Z705	1, 2	4.94	504	620
Z710/Z810	1, 2	9.56	195	470
Z713/Z813	1, 2	15.75	723	2840
Z715/Z815	1, 2	14.7	150	550
Z715.1K	1, 2	14.7	15	60
Z722/Z822	1, 2	22	150	820
Z728/Z828	1, 2	28	93	650
Z728.H/Z828.H	1, 2	28	119	830
Z755	1, 2, 3, 4	4.94	504	620
Z757/Z857	1, 2, 3, 4	7.14	729	1300
Z764/Z864	1, 2, 3, 4	11.6	12	30
Z765/Z865	1, 2, 3, 4	14.7	150	550
Z772/Z872	1, 2, 3, 4	22	150	820
Z778/Z878	1, 2, 3, 4	28	46	320
Z779	1, 2, 3, 4	28	93	650
Z779.H	1, 2, 3, 4	28	119	830
Z786/Z886	1, 2, 3, 4	28	-	-
Z787/Z887	1, 2, 3, 4	28	93	650
Z787.H	1, 2, 3, 4	28	119	830
Z788/Z888	1, 2; 3, 4	1, 2: 28; 3, 4: 9.56	1, 2: 93; 3, 4: 195	1, 2: 650; 3, 4: 470
Z788.H/Z888.H	1, 2; 3, 4	1, 2: 28; 3, 4: 9.56	1, 2: 119; 3, 4: 195	1, 2: 830; 3, 4: 470
Z788.R	1, 2; 3, 4	1, 2: 28; 3, 4: 9.56	1, 2: 93; 3, 4: 195	1, 2: 650; 3, 4: 470
Z789	1, 2, 3, 4	28	91.2	638
Z796/Z896	1, 2; 3, 4	1, 2: 26.6; 3, 4: 20.5	1, 2: 85; 3, 4: 50	1, 2: 560; 3, 4: 260
Z905	1, 2	4.89	499	610
Z910	1, 2	9.94	203	500
Z915	1, 2	15	153	570
Z915.1K	1, 2	15	15	60
Z928	1, 2	28	93	650
Z954	1, 2, 3, 4	4.5	383	430
Z955	1, 2, 3, 4	4.89	499	610
Z960	1, 2, 3, 4	9.94	203	500
Z961	1, 2, 3, 4	8.7	89	190
Z961.H	1, 2, 3, 4	8.7	25	50
Z964	1, 2, 3, 4	12	12	40
Z965	1, 2, 3, 4	15	153	570
Z966	1, 2, 3, 4	12	82	240
Z966.H	1, 2, 3, 4	12	164	490
Z967	1, 2, 3, 4	16.8	143	600
Z972	1, 2, 3, 4	22	73	400
Z978	1, 2, 3, 4	28	46	320
Zener Barriers with replaceable fuse				
Z715.F	1, 2	14.7	150	550
Z728.F	1, 2	28	93	650
Z728.H.F	1, 2	28	120	830
Z765.F/Z865.F	1, 2, 3, 4	14.7	150	550
Z779.F	1, 2, 3, 4	28	93	650
Z779.H.F/Z879.H.F	1, 2, 3, 4	28	120	830
Z787.F	1, 2, 3, 4	28	93	650
Z787.H.F/Z887.H.F	1, 2, 3, 4	28	120	830
Z960.F	1, 2, 3, 4	9.94	203	510
Z961.F	1, 2, 3, 4	8.7	89	192
Z966.F	1, 2, 3, 4	12	82	240

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CSA Entity Parameters

Model Number	Terminals	V_{max} (V)	Resistance (Ω)	V_{oc} (V)	I_{sc} (mA)
Zener Barriers					
Z705	1, 2	4.7	10	4.97/-4.97	507
Z710/Z810	1, 2	9.1	50	9.97/-9.97	200
Z713/Z813	1, 2	15	22	15.75/-15.75	724
Z715/Z815	1, 2	14	100	15.2/-15.2	155
Z715.1K	1, 2	14	1000	15.2/-15.2	15.5
Z722/Z822	1, 2	22	150	22.7/-22.7	155
Z728/Z828	1, 2	28	307	28.0/-28.0	93
Z728.H/Z828.H	1, 2	28	240	28.0/-28.0	119.2
Z755	1, 2; 3, 4	4.7	10	4.97/-4.97	507
	1, 4	–	–	5.97	1014
Z757/Z857	1, 2; 3, 4	6.8	10	7.30/-7.30	745
	1, 4	–	–	8.3	1489
Z764/Z864	1, 2; 3, 4	11	1000	11.9/-11.9	12.1
	1, 4	–	–	12.9	24.3
Z765/Z865	1, 2; 3, 4	14	100	15.2/-15.2	155
	1, 4	–	–	16.2	309
Z772/Z872	1, 2; 3, 4	22	150	22.7/-22.7	155
	1, 4	–	–	24.7	309
Z778/Z878	1, 2; 3, 4	28	620	28.0/-28.0	46
	1, 4	–	–	30	93
Z779	1, 2; 3, 4	28	307	28.0/-28.0	93
	1, 4	–	–	30	186
Z779.H	1, 2; 3, 4	28	240	28.0/-28.0	119.2
	1, 4	–	–	30	235.5
Z786/Z886	1, 2; 3, 4	28	Diode	28.0/-28.0	0
	1, 4	–	–	30	0
Z787/Z887	1, 2	28	307	28.0/-28.0	93
	3, 4	28	Diode	28.0/-28.0	0
	1, 4	–	–	30	93
Z787.H	1, 2	28	240	28.0/-28.0	119.2
	3, 4	28	Diode	28.0/-28.0	0
	1, 4	–	–	30	119.2
Z788/Z888	1, 2	28	307	28.0/-28.0	93
	3, 4	9.1	50	9.77/-9.77	200
	1, 4	–	–	29	293
Z788.H/Z888.H	1, 2	28	240	28.0/-28.0	119.2
	3, 4	9.1	50	9.77/-9.77	200
	1, 4	–	–	30	319
Z788.R	1, 2	28	307	28.0/-28.0	93
	3, 4	9.1	50	9.77/-9.77	200
	1, 4	–	–	29	293
Z796/Z896	1, 2	26.6	320	27.5/-27.5	87.7
	3, 4	20.5	415	20.8/-20.8	51
	1, 4	–	–	29.5	139
Z905	1, 2	4.9	10	5.1	520
Z910	1, 2	9.7	50	10.3	210
Z915	1, 2	15	100	15.5	158
Z915.1K	1, 2	15	1000	15.5	15.8
Z928	1, 2	28	307	28	93
Z954	1, 2; 2, 3; 2, 4	4.9	12	5.1	433
	1, 2; 3, 4	–	–	10.2	1300
Z955	1, 2; 3, 4	4.9	10	5.1	520
	1, 4	–	–	10.2	1040

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Model Number	Terminals	V_{max} (V)	Resistance (Ω)	V_{oc} (V)	I_{sc} (mA)
Z960	1, 2; 3, 4	9.7	50	10.3	210
	1, 4	–	–	10.3	419
Z961	1, 2; 3, 4	8.5	100	9	91.8
	1, 4	–	–	18	184
Z961.H	1, 2; 3, 4	8.5	360	9.63	26.3
	1, 4	–	–	18.5	52.5
Z964	1, 2; 3, 4	12	1000	12.4	12.6
	1, 4	–	–	24.7	25.2
Z965	1, 2; 3, 4	15	100	15.5	158
	1, 4	–	–	15.5	316
Z966	1, 2; 3, 4	12	150	12.4	84
	1, 4	–	–	24.7	168
Z966.H	1, 2; 3, 4	12	75	12.31	167.6
	1, 4	–	–	24.63	335.1
Z967	1, 2; 3, 4	16.8	120	17.3	147
	1, 4	–	–	17.3	294
Z972	1, 2; 3, 4	22	307	22.7	75.5
	1, 4	–	–	22.7	151
Z978	1, 2; 3, 4	28	620	28	46
	1, 4			28	93
Zener Barriers with replaceable fuse					
Z715.F	1, 2	14	100	15.2	155
Z728.F	1, 2	28	307	28	93
Z728.H.F	1, 2	28	240	28	119.2
Z765.F/Z865.F	1, 2; 3, 4	14	100	15.2	155
	1, 4	–	–	16.2	305
Z779.F	1, 2; 3, 4	28	307	28	93
	1, 4	–	–	30	186
Z779.H.F/Z879.H.F	1, 2; 3, 4	28	240	28	119.2
	1, 4	–	–	30	235.5
Z787.F	1, 2	28	307	28	93
	3, 4	28	Diode	28	0
	1, 4	–	–	30	93
Z787.H.F/Z887.H.F	1, 2	28	240	28	119.2
	3, 4	28	Diode	28	0
	1, 4	–	–	30	119.2
Z960.F	1, 2; 3, 4	9.7	50	10.3	210
	1, 4	–	–	10.3	419
Z961.F	1, 2; 3, 4	8.5	100	9	91.8
	1, 4	–	–	18	184
Z966.F	1, 2; 3, 4	12	150	12.4	84
	1, 4	–	–	24.7	168

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FM Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
Zener Barriers					
Z705	1, 2	4.97/-4.97	507	–	–
Z710/Z810	1, 2	9.97/-9.97	200	–	–
Z713/Z813	1, 2	15.75/-15.75	724	–	–
Z715/Z815	1, 2	15.2/-15.2	155	–	–
Z715.1K	1, 2	15.2/-15.2	15.5	–	–
Z722/Z822	1, 2	22.7/-22.7	155	–	–
Z728/Z828	1, 2	28.0/-28.0	93	–	–
Z728.H/Z828.H	1, 2	28.0/-28.0	119.2	–	–
Z755	1, 2; 3, 4	4.97/-4.97	507	–	–
	1, 4	–	–	5.97	1014
Z757/Z857	1, 2; 3, 4	7.30/-7.30	745	–	–
	1, 4	–	–	8.3	1489
Z764/Z864	1, 2; 3, 4	11.9/-11.9	12.1	–	–
	1, 4	–	–	12.9	24.3
Z765/Z865	1, 2; 3, 4	15.2/-15.2	155	–	–
	1, 4	–	–	16.2	309
Z772/Z872	1, 2; 3, 4	22.7/-22.7	155	–	–
	1, 4	–	–	24.7	309
Z778/Z878	1, 2; 3, 4	28.0/-28.0	46	–	–
	1, 4	–	–	30	93
Z779	1, 2; 3, 4	28.0/-28.0	93	–	–
Z779.H	1, 2; 3, 4	28.0/-28.0	119.2	–	–
	1, 4	–	–	30	235.5
Z786/Z886	1, 2; 3, 4	28.0/-28.0	0	–	–
	1, 4	–	–	30	0
Z787/Z887	1, 2	28.0/-28.0	93	–	–
	3, 4	28.0/-28.0	0	–	–
	1, 4	–	–	30	93
Z787.H	1, 2	28.0/-28.0	119.2	–	–
	3, 4	28.0/-28.0	0	–	–
	1, 4	–	–	30	119.2
Z788/Z888	1, 2	28.0/-28.0	93	–	–
	3, 4	9.77/-9.77	200	–	–
	1, 4	–	–	29	293
Z788.H/Z888.H	1, 2	28.0/-28.0	119.2	–	–
	3, 4	9.78/-9.78	199.6	–	–
	1, 4	–	–	30	321.8
Z788.R	1, 2	28.0/-28.0	93	–	–
	3, 4	9.77/-9.77	200	–	–
	1, 4	–	–	29	293
Z796/Z896	1, 2	27.5/-27.5	87.7	–	–
	3, 4	20.8/-20.8	51	–	–
	1, 4	–	–	29.5	139
Z905	1, 2	5.1	520	–	–
Z910	1, 2	10.3	210	–	–
Z915	1, 2	15.5	158	–	–
Z915.1K	1, 2	15.5	15.8	–	–
Z928	1, 2	28	93	–	–
Z954	1, 2; 2, 3; 2, 4	5.1	433	–	–
	1, 2; 3, 4	–	–	10.2	1300
Z955	1, 2; 3, 4	5.1	520	–	–
	1, 4	–	–	10.2	1040
Z960	1, 2; 3, 4	10.3	210	–	–
	1, 4	–	–	10.3	419

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Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
Z961	1, 2; 3, 4	9	91.8	–	–
	1, 4	–	–	18	184
Z961.H	1, 2; 3, 4	9.63	26.3	–	–
	1, 4	–	–	18.5	52.5
Z964	1, 2; 3, 4	12.4	12.6	–	–
	1, 4	–	–	24.7	25.2
Z965	1, 2; 3, 4	15.5	158	–	–
	1, 4	–	–	15.5	316
Z966	1, 2; 3, 4	12.4	84	–	–
	1, 4	–	–	24.7	168
Z966.H	1, 2; 3, 4	12.31	167.6	–	–
	1, 4	–	–	24.63	335.1
Z967	1, 2; 3, 4	17.3	147	–	–
	1, 4	–	–	17.3	294
Z972	1, 2; 3, 4	22.7	75.5	–	–
	1, 4	–	–	22.7	151
Z978	1, 2; 3, 4	28	46	–	–
	1, 4	–	–	28	93
Zener Barriers with replaceable fuse					
Z715.F	1, 2	15.2	155	–	–
Z728.F	1, 2	28	93	–	–
Z728.H.F	1, 2	28	119.2	–	–
Z765.F/Z865.F	1, 2; 3, 4	15.2	155	–	–
	1, 4	–	–	16.2	309
Z779.F	1, 2; 3, 4	28	93	–	–
	1, 4	–	–	30	186
Z779.H.F/Z879.H.F	1, 2; 3, 4	28	119.2	–	–
	1, 4	–	–	30	235.5
Z787.F	1, 2	28	93	–	–
	3, 4	28	0	–	–
	1, 4	–	–	30	93
Z787.H.F/Z887.H.F	1, 2	28	119.2	–	–
	3, 4	28	0	–	–
	1, 4	28	–	30	119.2
Z960.F	1, 4	–	–	10.3	419
Z961.F	1, 2; 3, 4	9	91.8	–	–
	1, 4	–	–	18	184
Z966.F	1, 2; 3, 4	12.4	84	–	–
	1, 4	–	–	24.7	168

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UL Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
Z705	1, 2	4.94	504	–	–
Z710/Z810	1, 2	9.56	195	–	–
Z713/Z813	1, 2	15.75	723	–	–
Z715/Z815	1, 2	14.7	150	–	–
Z715.1K	1, 2	14.7	15	–	–
Z722/Z822	1, 2	22	150	–	–
Z728/Z828	1, 2	28	93	–	–
Z728.H/Z828.H	1, 2	28	119	–	–
Z755	1, 2; 3, 4	4.94	504	–	–
	1, 4	–	–	4.94	1008
Z757/Z857	1, 2; 3, 4	7.14	729	–	–
	1, 4	–	–	7.14	1457
Z764/Z864	1, 2; 3, 4	11.16	12	–	–
	1, 4	–	–	11.6	24
Z765/Z865	1, 2; 3, 4	14.7	150	–	–
	1, 4	–	–	14.7	300
Z772/Z872	1, 2; 3, 4	22	150	–	–
	1, 4	–	–	22	300
Z778/Z878	1, 2; 3, 4	28	46	–	–
	1, 4	–	–	28	93
Z779	1, 2; 3, 4	28	93	–	–
	1, 4	–	–	28	186
Z779.H	1, 2; 3, 4	28	119	–	–
	1, 4	–	–	28	238
Z786/Z886	1, 2; 3, 4	28	0	–	–
	1, 4	–	–	28	0
Z787/Z887	1, 2	28	93	–	–
	3, 4	28	0	–	–
	1, 4	–	–	28	93
Z787.H	1, 2	28	119	–	–
	3, 4	28	0	–	–
	1, 4	–	–	28	119
Z788/Z888	1, 2	28	93	–	–
	3, 4	9.56	195	–	–
	1, 4	–	–	28	288
Z788.H/Z888.H	1, 2	28	119	–	–
	3, 4	9.56	195	–	–
	1, 4	–	–	28	314
Z788.R	1, 2	28	93	–	–
	3, 4	9.56	195	–	–
	1, 4	–	–	28	288
Z796/Z896	1, 2	26.6	85	–	–
	3, 4	20.5	50	–	–
	1, 4	–	–	26.6	135
Z905	1, 2	4.89	499	–	–
Z910	1, 2	9.94	203	–	–
Z915	1, 2	15	153	–	–
Z915.1K	1, 2	15	15	–	–
Z928	1, 2	28	93	–	–
Z954	1, 2; 2, 3; 2, 4	4.5	383	–	–
	1, 2, 3; 2, 3, 4	9	765	–	–
	1, 2, 3, 4	–	–	9	1150
Z955	1, 2; 3, 4	4.89	499	–	–
	1, 4	–	–	9.78	998

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Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
Z960	1, 2; 3, 4	9.94	203	–	–
	1, 4	–	–	9.94	406
Z961	1, 2; 3, 4	8.7	89	–	–
	1, 4	–	–	17.4	178
Z961.H	1, 2; 3, 4	8.7	25	–	–
	1, 4	–	–	17.4	49
Z964	1, 2; 3, 4	12	12	–	–
	1, 4	–	–	24	24
Z965	1, 2; 3, 4	15	153	–	–
	1, 4	–	–	15	306
Z966	1, 2; 3, 4	12	82	–	–
	1, 4	–	–	24	164
Z966.H	1, 2; 3, 4	12	164	–	–
	1, 4	–	–	24	328
Z967	1, 2; 3, 4	16.8	143		
	1, 4	–	–	16.8	286
Z972	1, 2; 3, 4	22	73		
	1, 4	–	–	22	146
Z978	1, 2; 3, 4	28	46		
	1, 4	–	–	28	93

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Features

- **Z-System place holder module**
- **No electrical function: empty housing**
- **DIN rail mounting**

Function

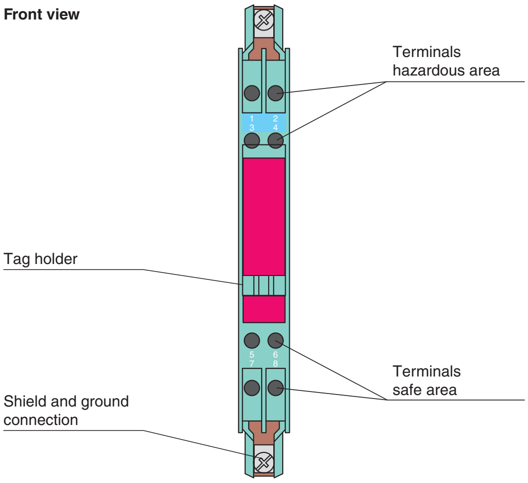
The Zener barrier is an empty housing. This device will be used as a dummy, to reserve place and wiring for future expansions.

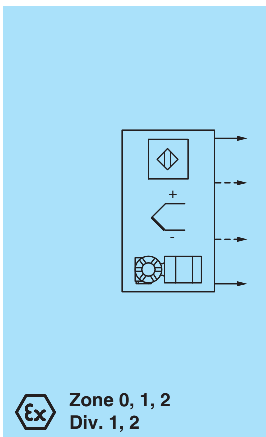
Technical data

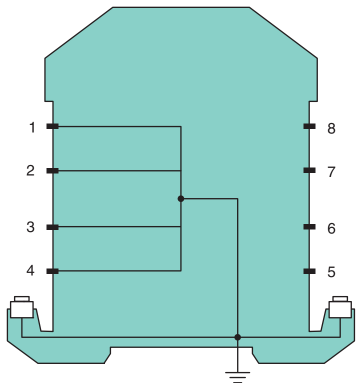
Model number	
Z799	
Hazardous area connection	
Connection	terminals 1, 2, 3, 4
Safe area connection	
Connection	terminals 5, 6, 7, 8
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Mass	approx. 150 g
Dimensions	12.5 x 115 x 110 mm (0.5 x 4.5 x 4.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715

Diagrams

Front view







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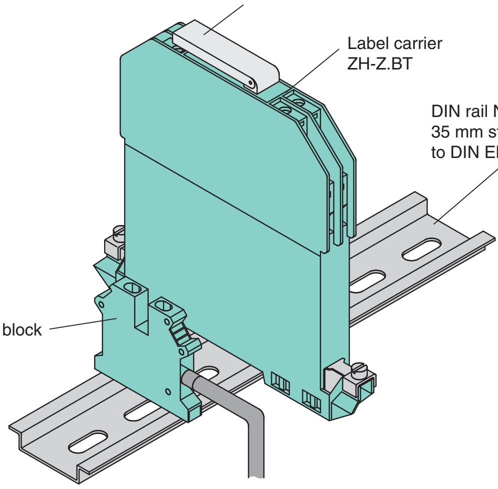
35 mm DIN Rail
NS 35/7.5
Insertion Strip
ZH-ES/LB
Label Carrier
ZH-Z.BT
Terminal Block
USLKG5

Function

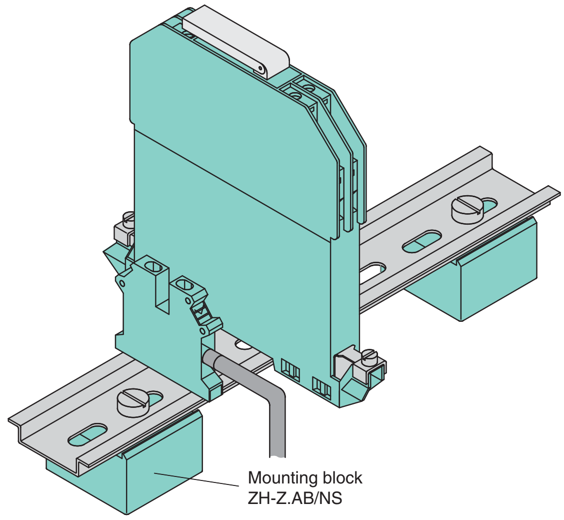
Equipotential bonding via DIN rail



Mounting Block
ZH-Z.AB/NS

Function

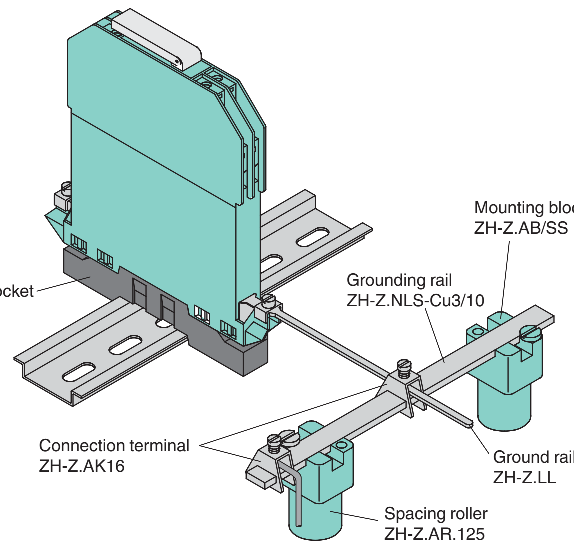
Group grounding through insulated mounting



Single Socket
ZH-Z.ES
Ground Rail Feed
ZH-Z.LL
Spacing Roller
ZH-Z.AR.125
Mounting Block
ZH-Z.AB/SS
Connector
ZH-Z.AK16
N-Combined Rail
ZH-Z.NLS-Cu3/10

Function

Individual grounding through insulated mounting



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SB-System

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Introduction

The SB-System barriers have a full range for AC and DC intrinsic safety applications with over 100 different models to choose from. They are available in plug-in single and dual channel versions, 1, 6, or 10 position Termination Boards, and a common grounding point for multiple barrier boards. With simple DIN rail installation, replaceable fuses, and very low weight, the SB-System barriers can provide the solution for you intrinsic safety installation.

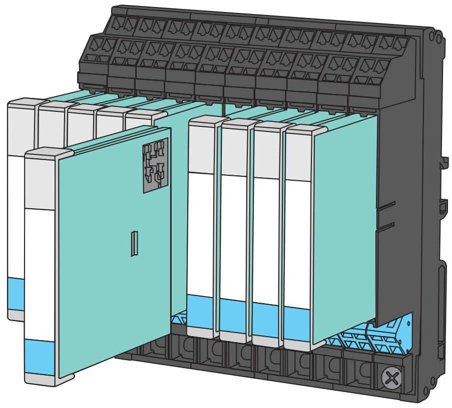

Figure 1 Zener Barrier SB-System

Housing

The SB-System as seen in Figure 2, is a unique single or dual channel plug-in Zener Barrier, with separate Termination Board available in 1, 6 or 10 positions. The SB-System barriers have a very low profile of 9.6 mm. The SB-System barriers special design does not require an epoxy fill and therefore it has an extremely low weight, which is critical for weight sensitive applications. It is constructed to a protection classification of IP20 and is equipped with cage clamp terminals, that will accept wire up to 2.5 mm^2 (14 AWG).

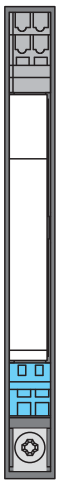

Figure 2 SB barrier in single Terminal Base

Mounting

The SB-System barrier snap on standard 35 mm DIN rail and are ideal for racks or control cabinets. They can also be located in Class I Division 2 and Zone 2 hazardous areas when installed in enclosures with the appropriate protection category.

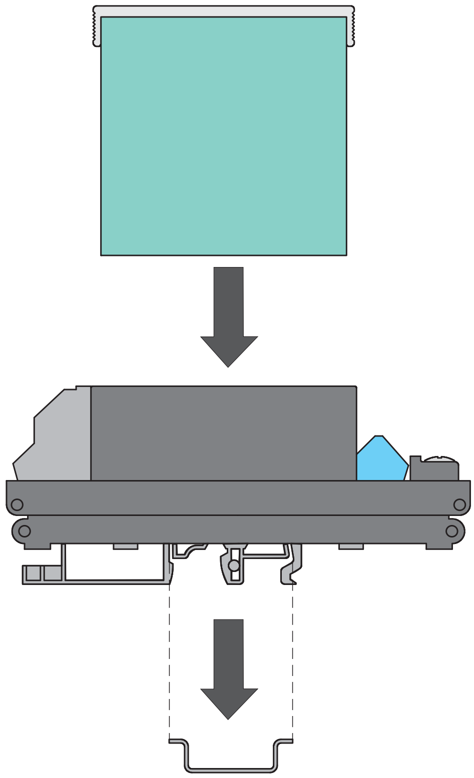

Figure 3 Mounting Zener Barrier SB-System

Operating principle

The zener diodes within the barriers are connected in the reversed biased direction. In normal operation the barrier will remain virtually transparent to the control loop.

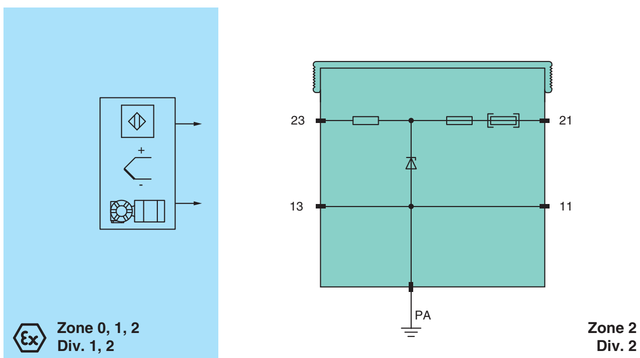

Figure 4 Circuit diagram (example)

If the diode breakdown voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to open, thus preventing the transfer of unacceptably high energy into the hazardous area.

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Terminals 11 and 21 are typically connected to a control circuit in the safe area. The single condition that the control circuitry must satisfy, is that it must not contain a source whose potential relative to earth is greater than 250 V AC or 250 V DC.

Terminals 13 and 23 are connected to the intrinsically safe circuits (field device) in the hazardous area. These types of devices are referred to as the intrinsically safe apparatus and must be certificated unless the electrical values do not exceed any of the following values: 1.5 V, 0.1 A, 25 mW. Pepperl+Fuchs Zener Barriers are identified in terms of voltage, resistance and polarity, e. g., 10 V, 50 Ω, positive polarity.

These figures correspond to the zener voltage U_z and the total resistance of all barrier components. They therefore represent the safety values. The values stated on the type identification label correspond to the "worst case" data for U_z (U_o, V_{oc}) and I_k (I_o, I_{sc}) determined during certification; I_k is obtained by dividing U_z by the resistance R. It should be noted once again, however, that these values do not correspond to the operating range of the Zener Barrier.

Ideally, zener diodes would not allow any current in the reverse direction until the zener voltage has been attained.

In practice, zener diodes do allow a small leakage current, the value of which increases as the applied voltage is increased.

The operating range of a Zener Barrier must therefore be such that it is below the zener voltage, so that the leakage current is restricted to a minimum. Zener Barriers are normally tested to ensure that at the prescribed voltage the leakage current is smaller than 2 μA.

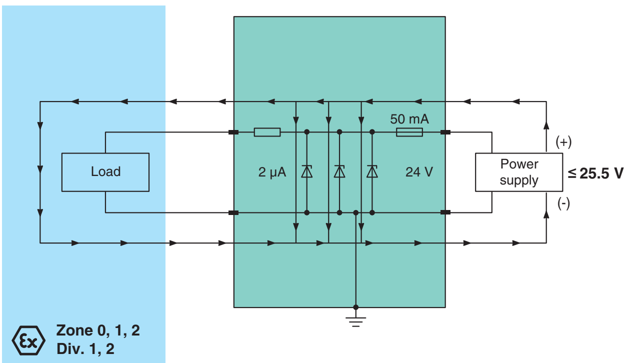

Figure 5 Leakage current through the zener diodes

Figure 5 shows the flow of leakage current through the zener diodes under normal circumstances. The Zener Barrier conducts a maximum of 2 μA leakage current so long as the supply voltage is less than 25.5 V. This is normal and has very little effect on the load. If the voltage exceeds 25.5 V, the zener diodes start to conduct more current. This can have an effect on the operating current and the accuracy. It is recommended that a regulated voltage source be used, which maintains the voltage under the value at which the diodes will start to conduct (a 24 V, 300 Ω barrier is represented here as an example).

These voltages are stated in the data sheet for a given barrier, together with the leakage current. If the leakage current for a given voltage differs from 2 μA, this is specifically stated.

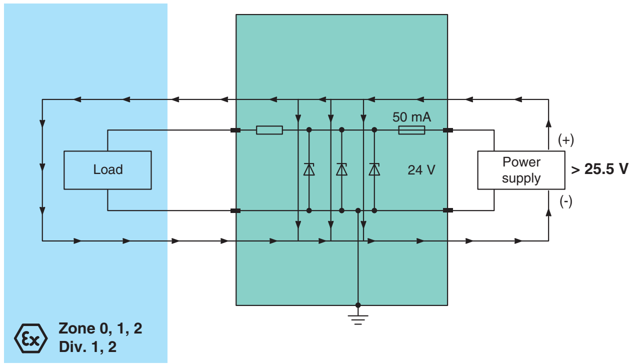

Figure 6 Total current drains through the zener diodes

Figure 6 shows that if the maximum permissible input (supply) voltage is exceeded, the total current drains through the zener diodes, without reaching the hazardous area.

Pepperl+Fuchs Zener Barriers have a low series resistance, given by the sum of the resistance R and the resistance value of the fuse F (see Figure 4). Due to the low series resistance, an inadvertent short-circuiting of terminals 13 and 23 can cause the fuse to open.

If the Zener Barriers are provided with a resistance, this limits the short-circuit current to a safe value in the event of a short circuit of the connecting wiring in the hazardous area or a connection to earth of the wiring attached to terminal 23.

Some barriers are available with a resistance connected between the output terminals. These are used in 4 mA to 20 mA transmitter circuits. The resistance converts the current in the intrinsically safe circuit into a voltage that can be measured in the safe area.

Pepperl+Fuchs Zener Barriers can be used in many applications. In the simplest case, a single channel barrier with a ground connection is used.

But in many applications it is not desirable that the intrinsically safe circuit is connected directly to ground. If the circuit in the safe area is grounded, under some circumstances grounding of the intrinsically safe circuit can lead to faults within the system. In this case, quasi-ground-free intrinsically safe circuits can be constructed with two or more Zener Barrier channels. Pepperl+Fuchs offers 2- and 3-channel barriers in the same housing as the single channel barriers.

Double grounding of intrinsically safe circuits is not permitted. The insulation voltage of the wiring and field devices, measured with respect to ground, must be greater than 500 V AC. The permissible ambient temperature of the Zener Barriers is between -20 °C to 60 °C (-4 °F to 140 °F).

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Grounding of Zener Barriers

Intrinsically safe circuits with Zener Barriers without galvanic isolation must be grounded. The cross-section of the ground connection, using a copper conductor, must be at least 4 mm^2 (12 AWG) (for further details see NEC 504-50 and EN 60079-14). The maintenance of these requirements prevents the occurrence of a dangerous potential with respect to ground.

A fault of the type illustrated in Figure 7 can cause a dangerous spark if the Zener Barrier is not grounded. If a fault occurs (see Figure 8), the zener diodes conducts and the current is shunted to ground. The fuse opens.

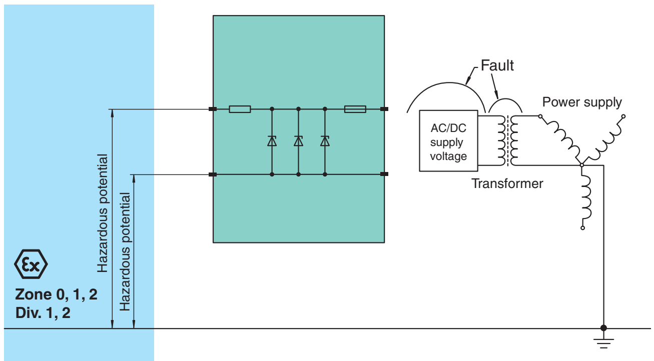

Figure 7 Non-grounded Zener Barrier

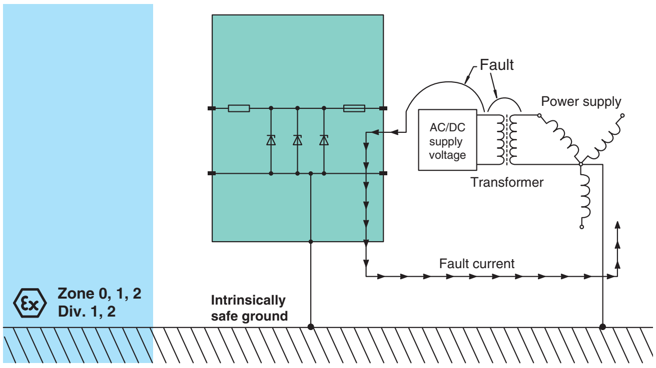

Figure 8 Grounded Zener Barriers

The system must have its own independent ground conductor, through which no supply system current flows.

Grounding with SB-System

The SB-system Termination Boards provide a common grounding point by utilizing its internal backplane and bringing the earth ground to a single terminating point on the board. The Termination Board is not required to be isolated from the backplane of the enclosure.

Multi-channel barriers

Analog circuits are often connected to two-channel barriers (see Figure 10). Since there is no grounding on this type of circuit, the system is a quasi-floating one. It is termed "quasi-floating", because it is "one zener voltage" above the ground potential. Although it does not actually float, the signal-to-noise ratio is improved.

A further advantage of multi-channel Zener Barriers is that a higher packing density can be achieved.

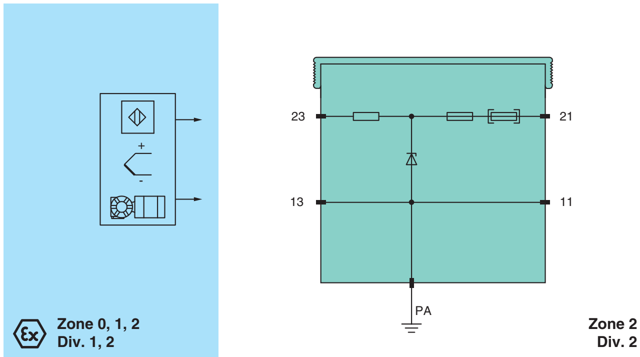

Figure 9 Single-channel Zener Barrier

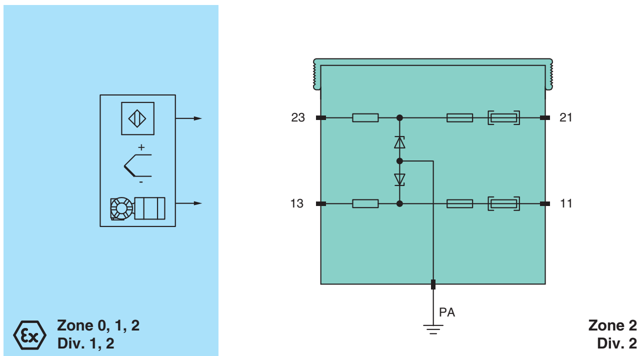

Figure 10 Two-channel Zener Barrier

SB-System specifications

The following are typical data used in the description of a barrier.

Working voltage at 2 µA

The maximum voltage that can be applied between the contacts in the safe area and ground at a defined leakage current. This is the upper value of the recommended operating range.

Maximum series resistance (Ω)

This is the maximum resistance that can be measured between the two end terminals of a barrier channel. It is obtained from the sum of any resistors and the resistance value of the fuse at an ambient temperature of 20 °C (68 °F).

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Fuse rating (mA)

The function of the fuse is to create an open circuit in the event of a power supply fault. It also protects the zener diodes from damage in the event of an abnormal operating condition.

Polarity

Zener Barriers are available in various versions. On Zener Barriers for positive polarity the anodes of the zener diodes are grounded. On barriers for negative polarity the cathodes are grounded. On barriers for alternating polarity (AC), interconnected zener diodes are employed and one side is grounded. These barriers can be used for both alternating voltage signals and direct voltage signals.

Safety information

The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

Devices that have intrinsically safe control circuits are used to operate field devices within hazardous areas.

Zener Barriers are not suitable for the isolation of signals in power engineering unless specified in the respective data sheet.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Intrinsic safety circuits that were operated with circuits of other types of protection may not be used as intrinsically safe circuits afterwards.

Installation and commissioning

Commissioning and installation must by carried out by specially trained qualified personnel only.

Installation of the interface devices in the safe area

The devices are constructed to satisfy the IP20 protection classification and must be protected accordingly from adverse environmental conditions such as water spray or dirt exceeding the pollution degree 2.

The devices must be installed outside the hazardous area!

Depending on the level of protection, the intrinsically safe circuits of the devices (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that the intrinsically safe circuits are safely separated from all non-intrinsically safe circuits.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of Zener Barriers (demonstration of intrinsic safety). EN 60079-14/ IEC 60079-14 or NEC and CEC electrical codes for US and Canada respectively must be observed (where appropriate). If available, also the product certification control drawing must be observed.

If more channels of one device are to be connected in parallel, it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety, the maximum values of the parallel connection are to be regarded.

The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Installation and commissioning of the interface devices within Zone 2/Div. 2 of the hazardous area

Only devices with the corresponding manufacturer's Declaration of Conformity or separate certificate of conformity can be installed in Zone 2/Div. 2.

The individual data sheets indicate whether these conditions are met.

For US and Canada installations, in Zone 2/Div. 2 follow the NEC and CEC wiring methods. The enclosure must be able to accept Zone 2/Div. 2 wiring methods. The referenced product certification control drawing must be observed.

For all other applications, the devices should be installed in a switch or junction box that:

- meets at least IP54 in accordance to EN 60529.
- meets the requirements of resistance to light and resistance to impact according to EN 60079-0/ IEC 60079-0.
- meets the requirements of thermal endurance according to EN 60079-15/IEC 60079-15.
- must not cause ignition danger by electrostatic charge during intended use, maintenance and cleaning.

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Depending on the level of protection, the intrinsically safe circuits of the devices (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that the intrinsically safe circuits are safely separated from all non-intrinsically safe circuits.

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The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of Zener Barriers (demonstration of intrinsic safety). EN 60079-14/ IEC 60079-14 or NEC and CEC electrical codes for US and Canada respectively must be observed (where appropriate). If available, also the product certification control drawing must be observed.

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The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are also not allowed.

Isolation coordinates for devices with Ex-certificate according to EN 50020 and EN 60079-11

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

For additional details, see data sheets.

Technical data

Electrical data

Directive conformity

Directive 94/9/EC, associated standards see valid EC-Type Examination Certificates and/or EU statements of conformity or other appropriate certificates.

Please refer to data sheets.

Mechanical data

Mounting

Termination Board: snap-on 35 mm standard DIN rail acc. to EN 60715

Module: plug-in to Termination Board

Protection degree

IP20 acc. to EN 60529

Housing material

Polycarbonate (PC)

The devices are assessed for pollution degree 2 according to EN 50178.

Connection options

Self-opening terminals, max. core cross section 2 x 2.5 mm^2 (2 x 14 AWG)

The barriers are usually installed in racks or control cabinets.

They can be built into housings under production conditions, with the provision that the housing must allow for adequate protection. They can also be employed in hazardous areas, when it has been ascertained that the housing has been certified for this purpose.

The installation must be carried out in such a way that the intrinsic safety is not compromised by the following factors:

- Danger of mechanical damage
- Non-authorized changes or influence exerted by external personnel
- Humidity, dust or foreign bodies
- Ambient temperature exceeding the permissible level
- The connection of non-intrinsically safe circuits to intrinsically safe circuits

Grounding of the mounting rail is of the normal type, i. e. where both ends are connected to the intrinsically safe ground. This also simplifies checking the grounding.

Many installations provide the option of subsequent expansion.

Ambient conditions

Ambient temperature

-20 °C to 60 °C (-4 °F to 140 °F)

Storage temperature

-40 °C to 80 °C (-40 °F to 176 °F)

Relative humidity

max. 95 % without moisture condensation

Terminal designations

For additional details, see data sheets.

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DC Versions, positive polarity

Model Number	Channels	Electrical Data: Working Voltage at 2 µA (V)	Electrical Data: Max. Series Resistance (Ω)	Electrical Data: Fuse Rating (mA)	Features: Asymmetrical Version	Features: Replaceable Fuse	Features: LED	Page
SB0017	2	3	579	125		■		467
SB0018	1	7	119.5	80		■		464
SB0020	2	12	109	63		■		467
SB0027	1	15	597	50		■		464
SB0030	2	5	112	125		■		467
SB0031	2	6	600.5	80		■		467
SB0035	2	5	1021.5	100		■		467
SB0040	2	5	54	125		■		467
SB0041	2	7	2039	80		■		467
SB0042	2	5	213	125		■		467
SB0043	1	8	70.5	125		■		464
SB0613	1	6	36	80		■		464
SB0614	1	6	103	80		■		464
SB0710	1	6	105	32		■		464
SB0715	1	12	161	80		■	■	465
SB0722	1	18	212.5	32		■		464
SB0728	1	24	353.5	32		■	■	465
SB0764	2	10	1046	32		■		467
SB0767	2	12	178.5	63		■	■	468
SB0768	2	19	221	32		■		467
SB0779	2	24	353.5	32		■	■	468
SB0788	2	ch 1: 6 ch 2: 24	ch. 1: 112 ch. 2: 354	32	■	■	■	468
SB0796	2	ch 1: 23 ch 2: 17	ch. 1: 366.5 ch. 2: 462.5	32	■	■		467
SB1206	1	12	300.5	63		■		464
SB1250	1	12	59.5	80		■		464
SB1350	2	10	ch. 1: 91.5 ch. 2: 498.5	80	■	■		467
SB1351	2	10	498.5	80		■		467
SB2420	1	24	177.5	32		■	■	465
SB2424	1	24	1250.5	32		■		464
SB3250	2	12	63.5	63		■	■	468
SB3710	1	8	49	125		■		464
SB3715	1	12	71.5	80		■	■	465
SB3722	1	18	136	50		■		464

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Model Number	Channels	Electrical Data: Working Voltage at 2 µA (V)	Electrical Data: Max. Series Resistance (Ω)	Electrical Data: Fuse Rating (mA)	Features: Asymmetrical Version	Features: Replaceable Fuse	Features: LED	Page
SB3728	1	24	282	32		■	■	465
SB3729	1	24	214	32		■	■	465
SB4410	2	24	233.5	32		■	■	468
SB4420	2	24	177.5	32		■	■	468

DC Versions, negative polarity

Model Number	Channels	Electrical Data: Working Voltage at 2 µA (V)	Electrical Data: Max. Series Resistance (Ω)	Electrical Data: Fuse Rating (mA)	Features: Asymmetrical Version	Features: Replaceable Fuse	Features: LED	Page
SB1613	1	6	36	80		■		472
SB1710	1	6	105	32		■		472
SB1715	1	12	161	80		■	■	473
SB1728	1	24	353.5	32		■	■	473
SB1767	2	12	178	63		■	■	474
SB2206	1	12	300.5	63		■		472
SB2250	1	12	59.5	80		■		472
SB3420	1	24	177.5	32		■	■	473
SB4250	2	12	63.5	63		■	■	474
SB4710	1	8	49	125		■		472
SB4715	1	12	71.5	80		■	■	473
SB4722	1	18	136	50		■		472
SB5410	2	24	221	63		■	■	474
SB5420	2	24	165.5	63		■	■	474

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DC Versions, floating

Model Number	Channels	Electrical Data: Working Voltage at 2 µA (V)	Electrical Data: Max. Series Resistance (Ω)	Electrical Data: Fuse Rating (mA)	Features: Replaceable Fuse	Features: Floating	Page
SB0021	2	7/-7	67.5	63	■	■	475
SB0023	2	7/-7	456	63	■	■	475
SB0033	2	5/-5	43	80	■	■	475
SB0601	2	3/-3	48	100	■	■	475
SB1301	2	6/-6	42	80	■	■	475
SB1302	2	9/-9	604	32	■	■	475
SB1303	2	12/-12	100	32	■	■	475
SB2401	2	12/-12	312	32	■	■	475

DC Versions with Diode Return

Model Number	Channels	Electrical Data: Working Voltage at 2 µA (V)	Electrical Data: Max. Series Resistance (Ω)	Electrical Data: Fuse Rating (mA)	Features: Asymmetrical Version	Features: Replaceable Fuse	Features: Diode Return	Features: LED	Page
SB0019	2	12	ch. 1: 32.5 + 1.2 V ch. 2: 207	63	■	■	■		470
SB0786	2	24	58.5 + 1.2 V	32		■	■		471
SB1502	1	12	41 + 1.2 V	32		■	■		466
SB1787	2	24	ch. 1: 58 + 1.2 V ch. 2: 353.5	32	■	■	■	■	469
SB2427	2	24	ch. 1: 48.5 + 1.2 V ch. 2: 305.5	32	■	■	■	■	469
SB2787	2	24	ch. 1: 48.5 + 1.2 V ch. 2: 282	32	■	■	■	■	469

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AC Versions

Model Number	Channels	Electrical Data: Working Voltage at 2 µA (V)	Electrical Data: Max. Series Resistance (Ω)	Electrical Data: Fuse Rating (mA)	Features: Increased Nominal Resistance	Features: Replaceable Fuse	Features: Star Connection	Page
SB0014	2	6.5	1776.5	80		■		477
SB0015	2	5	75	100		■		477
SB0016	2	6	106	80		■		477
SB0022	2	2.5	804	125		■		477
SB0024	1	12	181.5	63		■		476
SB0026	1	1	39	125		■		476
SB0028	1	15	110	63		■		476
SB0029	1	15	234	63		■		476
SB0036	2	5	3400	32	■	■	■	478
SB0037	1	6	179	80		■		476
SB0044	2	8.5	174.5	63		■		477
SB0045	2	8.5	1029.5	63		■		477
SB0201	2	2	40	125		■		477
SB0305	2	1.25	405	125		■		477
SB0751	2	2	14.1	125		■		477
SB0760	2	6	112	32		■	■	478
SB0761	2	6	149	80		■		477
SB0765	2	12	167.5	32		■	■	478
SB0766	2	10	208	32		■		477
SB0772	2	18	383.5	32		■	■	478
SB0778	2	24	709	32		■	■	478
SB1203	1	18	495	32		■		476
SB1602	1	12	71.5	63		■		476
SB1761	2	7	405	32		■		477
SB1766	2	9.8	110	32		■		477
SB2710	1	6	105	32		■		476
SB2764	2	10	1096	32		■		477

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Power Supply

Model Number	Channels	Electrical Data: Max. Series Resistance (Ω)	Electrical Data: Fuse Rating (mA)	Features: Replaceable Fuse	Features: Output Voltage 12 V DC	Features: Input Voltage 24 V DC	Page
SB0604	1	107	50	■	■	■	479

Accessories

Model Number	Description	Page
SB9100	Termination Board for 10 SB Zener Barriers	484
SB9101	Terminal Base for 1 SB Zener Barrier	484
SB9106	Termination Board for 6 SB Zener Barriers	484
SB9220	Grounding Rail for 20 SB Zener Barriers	484
SB9221	Grounding Rail for 10 SB Zener Barriers	484
SB9222	Grounding Rail for 6 SB Zener Barriers	484

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Features

- **1-channel**
- **DC version, positive polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

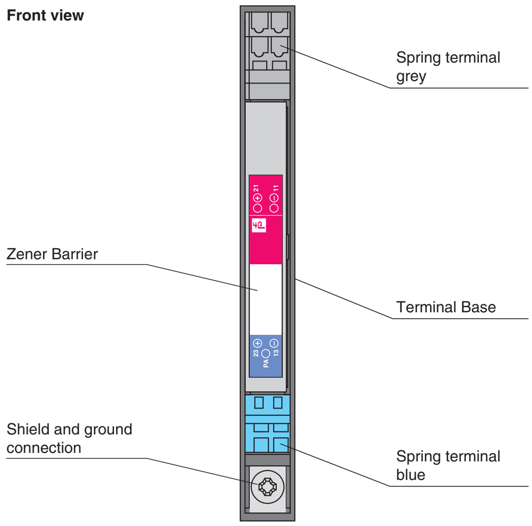
Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

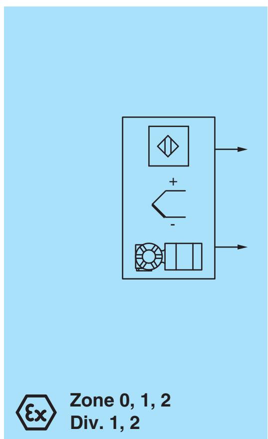
Technical data

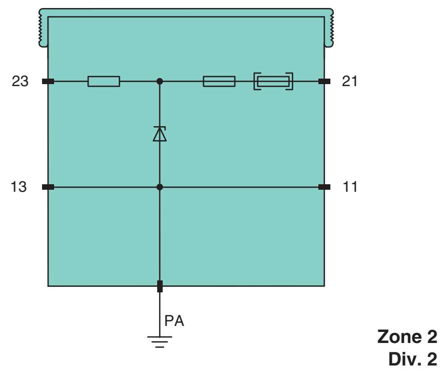
Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0018	7	111/119.5	80/80
SB0027	15	581/597	50/50
SB0043	8	66.5/70.5	125/125
SB0613	6	29/36	100/80
SB0614	6	96/103	100/80
SB0710	6	85.5/105	50/32
SB0722	18	192.5/212.5	50/32
SB1206	12	290/300.5	63/63
SB1250	12	51.5/59.5	80/80
SB2424	24	1230.5/1250.5	32/32
SB3710	8	45/49	125/125
SB3722	18	120/136	50/50

Hazardous area connection	
Connection	terminals 13, 23
Safe area connection	
Connection	terminals 11, 21
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ⓔx II (1)G [Ex ia] IIC Ⓔx II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Diagrams







Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0715	12	153/161	80/80
SB0728	24	334/353.5	50/32
SB2420	24	157.5/177.5	32/32
SB3715	12	63/71.5	100/80
SB3728	24	262/282	50/32
SB3729	24	194/214	32/32
Hazardous area connection			
Connection	terminals 13, 23		
Safe area connection			
Connection	terminals 11, 21, 22		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)		
Mechanical specifications			
Protection degree	IP20 (installed on Terminal Base or Termination Board)		
Connection	wiring via Terminal Base or Termination Board		
Mass	approx. 70 g		
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)		
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715		
Data for application in conjunction with hazardous areas	see page 480 for entity parameters		
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X		
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]		
UL approval			
Control drawing	16-557UL-12 (cULus)		

Features

- **1-channel**
- **DC version, positive polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **With LED**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

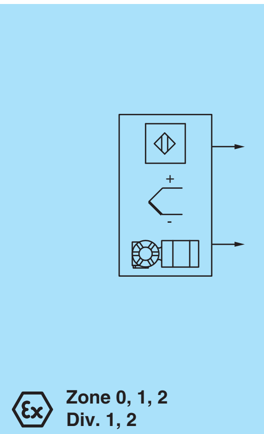
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

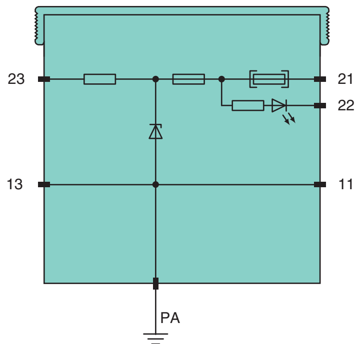
The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

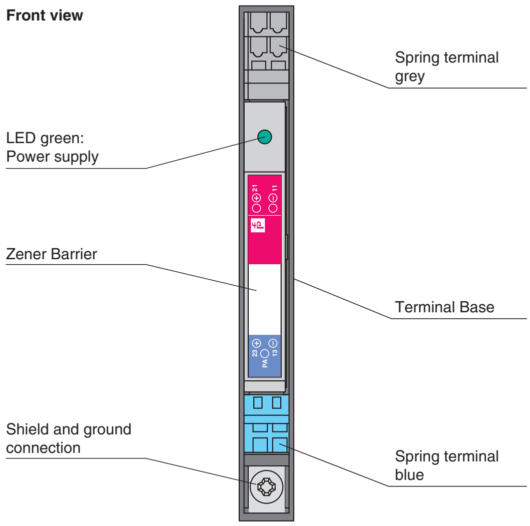
Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Diagrams





Zone 2
Div. 2



SB-System
Barriers
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

1-Channel DC Version, Positive Polarity

Features

- **1-channel**
- **DC version, positive polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **With diode return**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

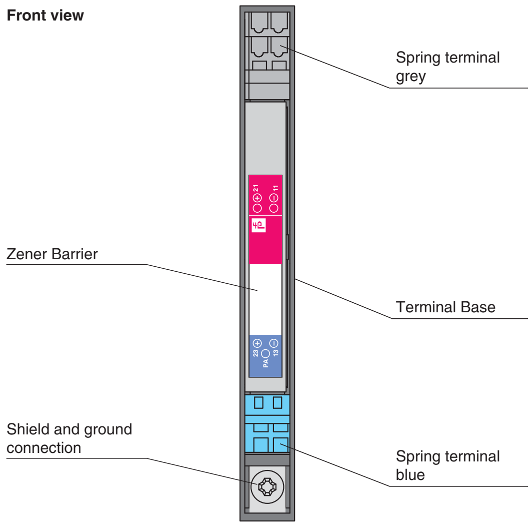
The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

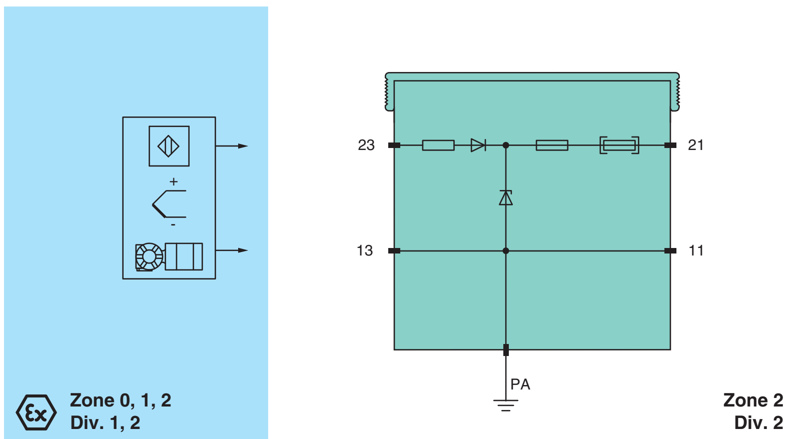
Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB1502	12	21/41 Ω + 1.2 V	50/32
Hazardous area connection			
Connection	terminals 13, 23		
Safe area connection			
Connection	terminals 11, 21		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)		
Mechanical specifications			
Protection degree	IP20 (installed on Terminal Base or Termination Board)		
Connection	wiring via Terminal Base or Termination Board		
Mass	approx. 70 g		
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)		
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715		
Data for application in conjunction with hazardous areas	see page 480 for entity parameters		
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X		
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]		
UL approval			
Control drawing	16-557UL-12 (cULus)		

Diagrams





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Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0017	3	574.5/579	125/125
SB0020	12	98/109	63/63
SB0030	5	108/112	125/125
SB0031	6	592/600.5	80/80
SB0035	5	1017/1021.5	125/100
SB0040	5	50/54	160/125
SB0041	7	2030.5/2039	80/80
SB0042	5	209/213	125/125
SB0764	10	1026.5/1046	50/32
SB0768	19	201/221	32/32
SB0796	23/17	ch. 1: 346.5/366.5 ch. 2: 442.5/462.5	32/32
SB1350	10	ch. 1: 83/91.5 ch. 2: 490/498.5	80/80
SB1351	10	490/498.5	80/80
Hazardous area connection			
Connection	terminals 13; 23		
Safe area connection			
Connection	terminals 11; 21		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)		
Mechanical specifications			
Protection degree	IP20 (installed on Terminal Base or Termination Board)		
Connection	wiring via Terminal Base or Termination Board		
Mass	approx. 70 g		
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)		
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715		
Data for application in conjunction with hazardous areas	see page 480 for entity parameters		
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X		
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]		
UL approval			
Control drawing	16-557UL-12 (cULus)		

Features

- **2-channel**
- **DC version, positive polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **Asymmetrical version (SB0796, SB1350)**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

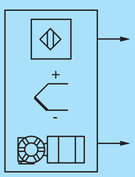
The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

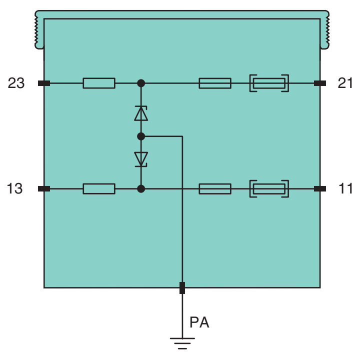
Depending on the application, increased or decreased intrinsic safety parameters apply for serial or parallel connection. For the detailed parameters refer to the Zener Barrier certificate. Application examples can be found in the system description of the Zener Barriers.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Diagrams

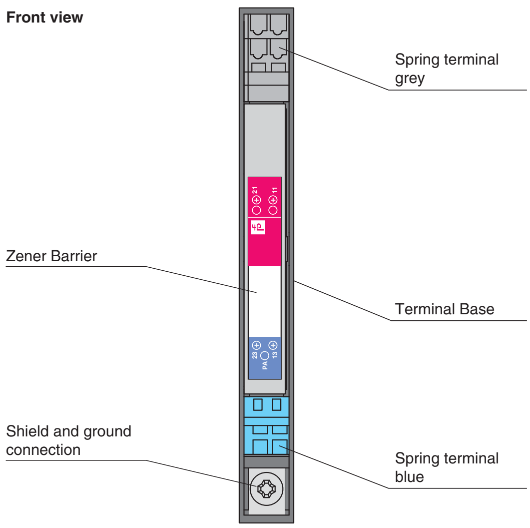


Zone 0, 1, 2
Div. 1, 2



Zone 2
Div. 2

Front view



SB-System
Barriers
Accessories

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Features

- **2-channel**
- **DC version, positive polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **Asymmetrical version (SB0788)**
- **With LED**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

Depending on the application, increased or decreased intrinsic safety parameters apply for serial or parallel connection. For the detailed parameters refer to the Zener Barrier certificate. Application examples can be found in the system description of the Zener Barriers.

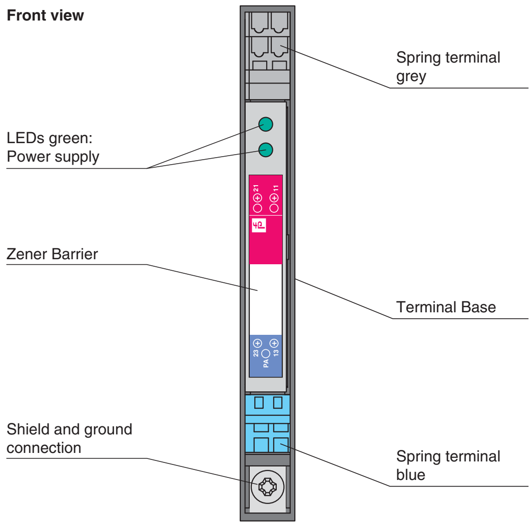
Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

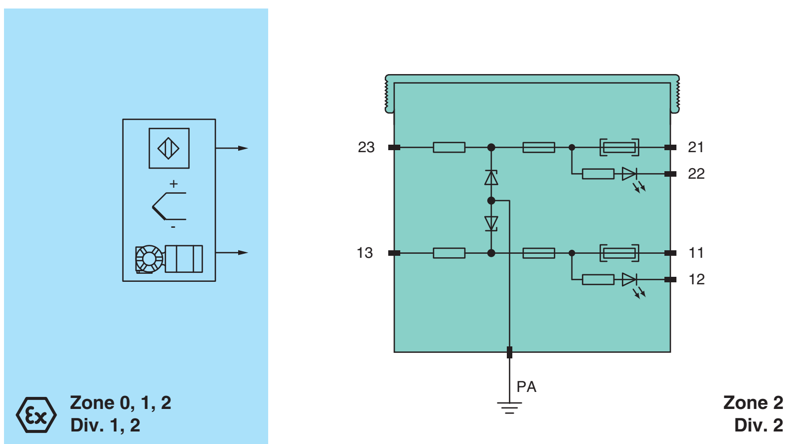
Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0767	12	167.5/178.5	63/63
SB0779	24	334/353.5	50/32
SB0788	6/24	ch. 1: 92.5/112 ch. 2: 334.5/354	32/32
SB3250	12	52.5/63.5	63/63
SB4410	24	213.5/233.5	32/32
SB4420	24	157.5/177.5	32/32

Hazardous area connection	
Connection	terminals 13; 23
Safe area connection	
Connection	terminals 11, 12; 21, 22
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ⓔx II (1)G [Ex ia] IIC Ⓔx II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB1787	24	ch. 1: 38.5/ 58 + 1.2 V ch. 2: 334/353.5	32/32
SB2427	24	ch. 1: 28.5/ 48.5 + 1.2 V ch. 2: 286/305.5	32/32
SB2787	24	ch. 1: 28.5/ 48.5 + 1.2 V ch. 2: 262/282	32/32

Hazardous area connection	
Connection	terminals 13; 23
Safe area connection	
Connection	terminals 11, 12; 21
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Features

- **2-channel**
- **DC version, positive polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **With diode return**
- **Asymmetrical version**
- **With LED**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

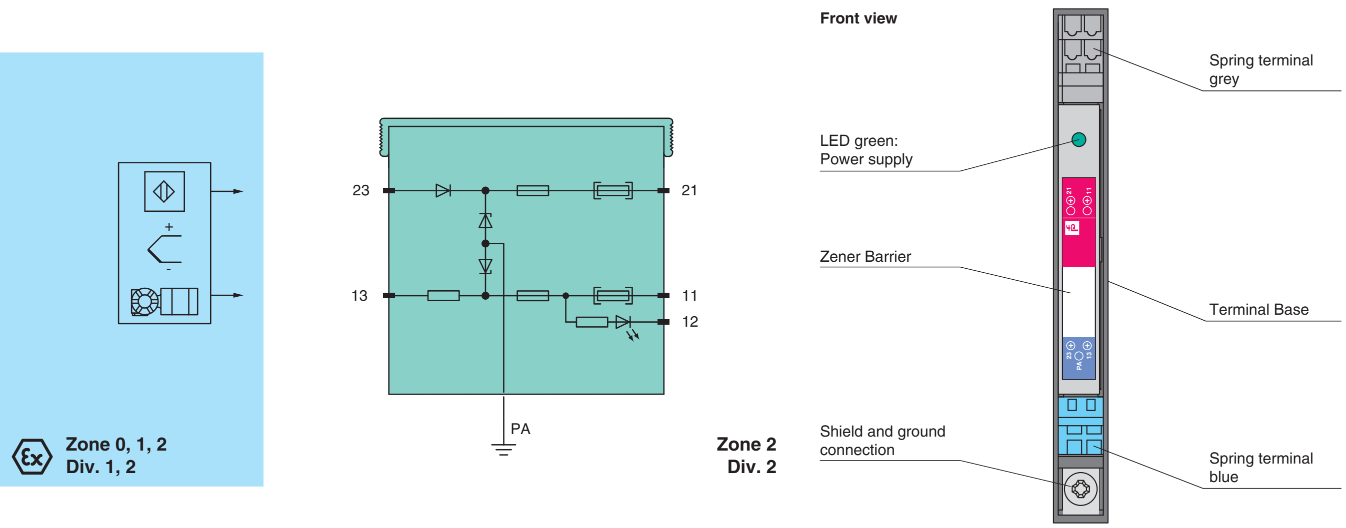
The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Diagrams



SB-System
Barriers
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

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Features

- **2-channel**
- **DC version, positive polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **With diode return**
- **Asymmetrical version**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

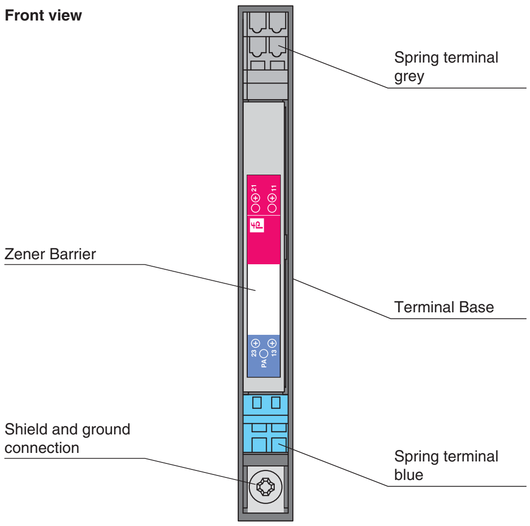
The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

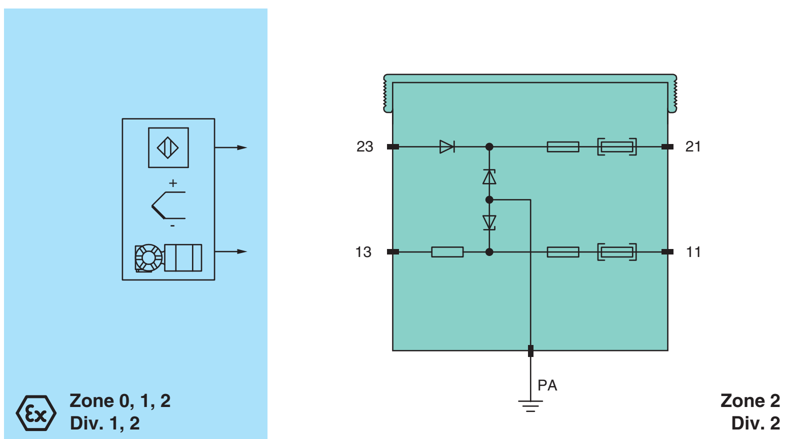
Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0019	12	ch. 1: 21.5/ 32.5 + 1.2 V ch. 2: 196/207	63/63
Hazardous area connection			
Connection	terminals 13; 23		
Safe area connection			
Connection	terminals 11; 21		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)		
Mechanical specifications			
Protection degree	IP20 (installed on Terminal Base or Termination Board)		
Connection	wiring via Terminal Base or Termination Board		
Mass	approx. 70 g		
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)		
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715		
Data for application in conjunction with hazardous areas	see page 480 for entity parameters		
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X		
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]		
UL approval			
Control drawing	16-557UL-12 (cULus)		

Diagrams





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0786	24	38.5/58.5 + 1.2 V	32/32
Hazardous area connection			
Connection	terminals 13; 23		
Safe area connection			
Connection	terminals 11; 21		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)		
Mechanical specifications			
Protection degree	IP20 (installed on Terminal Base or Termination Board)		
Connection	wiring via Terminal Base or Termination Board		
Mass	approx. 70 g		
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)		
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715		
Data for application in conjunction with hazardous areas	see page 480 for entity parameters		
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X		
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]		
UL approval			
Control drawing	16-557UL-12 (cULus)		

Features

- **2-channel**
- **DC version, positive polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **With diode return**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

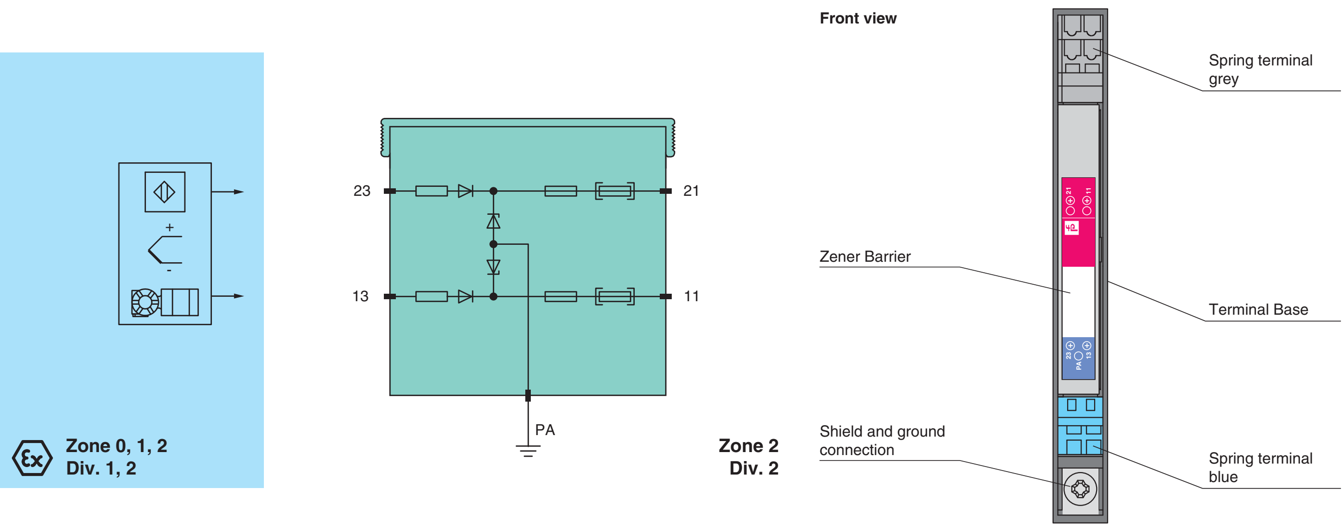
The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

The Zener Barrier is for evaluation of signals from the hazardous area. The diodes of diode return prevent a current into the hazardous area, therefore the current assumption for intrinsic safety calculations is zero.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Diagrams



SB-System
Barriers
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel**
- **DC version, negative polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a negative polarity, i. e. the cathodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

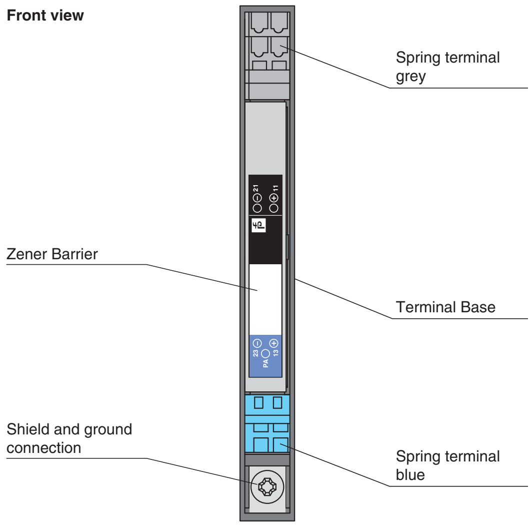
Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

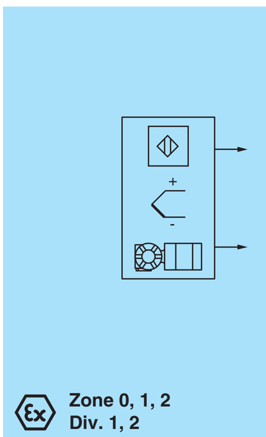
Technical data

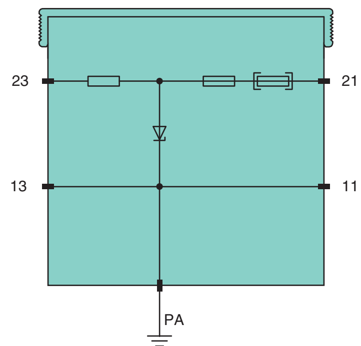
Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB1613	6	29/36	100/80
SB1710	6	85/105	50/32
SB2206	12	289.5/300.5	63/63
SB2250	12	51.5/59.5	80/80
SB4710	8	45/49	125/125
SB4722	18	120/136	50/50

Hazardous area connection	
Connection	terminals 13, 23
Safe area connection	
Connection	terminals 11, 21
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ⓔx II (1)G [Ex ia] IIC Ⓔx II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Diagrams







Zone 2
Div. 2

Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB1715	12	152.5/161	80/80
SB1728	24	334/353.5	32/32
SB3420	24	157.5/177.5	32/32
SB4715	12	63/71.5	80/80
Hazardous area connection			
Connection	terminals 13, 23		
Safe area connection			
Connection	terminals 11, 21, 22		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)		
Mechanical specifications			
Protection degree	IP20 (installed on Terminal Base or Termination Board)		
Connection	wiring via Terminal Base or Termination Board		
Mass	approx. 70 g		
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)		
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715		
Data for application in conjunction with hazardous areas	see page 480 for entity parameters		
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X		
Group, category, type of protection	Ⓔx II (1)G [Ex ia] IIC Ⓔx II (1)D [Ex iaD]		
UL approval			
Control drawing	16-557UL-12 (cULus)		

Features

- **1-channel**
- **DC version, negative polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **With LED**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

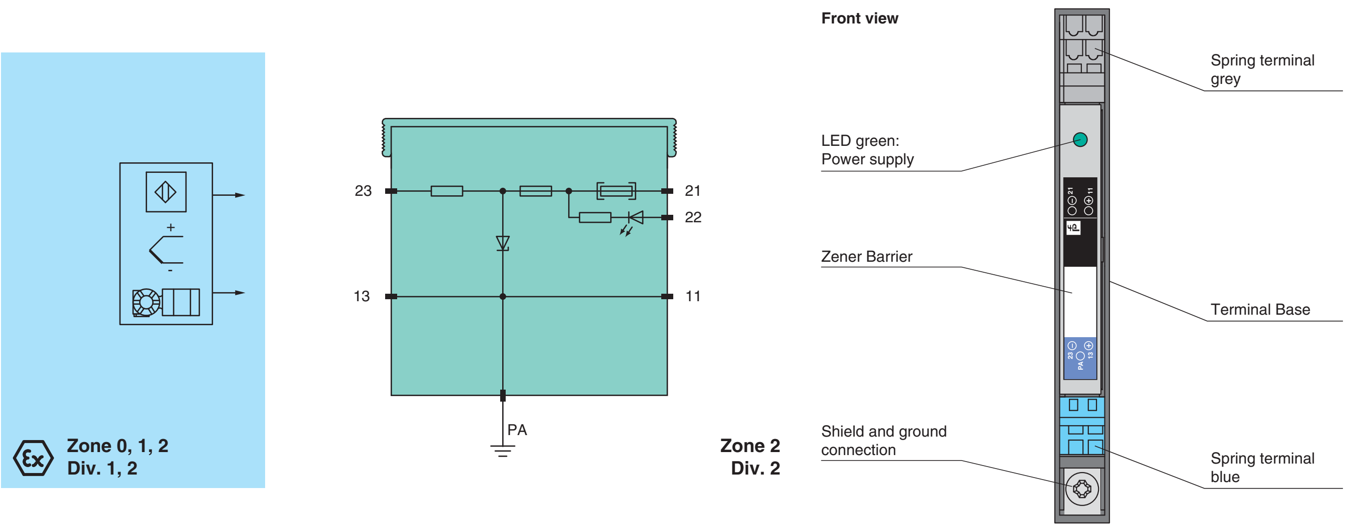
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a negative polarity, i. e. the cathodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Diagrams



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel**
- **DC version, negative polarity**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **With LED**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has a negative polarity, i. e. the cathodes of the Zener diodes are grounded.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

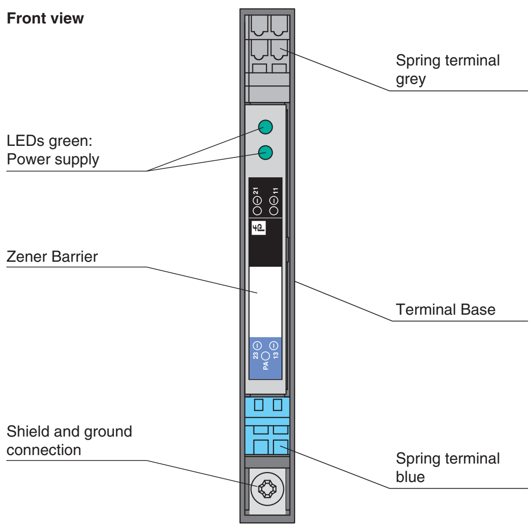
Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

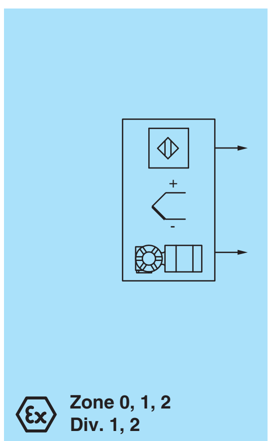
Technical data

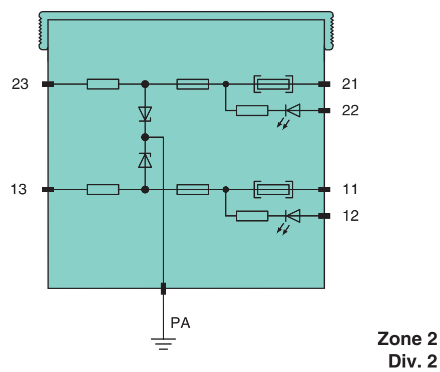
Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB1767	12	167/178	63/63
SB4250	12	52.5/63.5	63/63
SB5410	24	205/221	50/50
SB5420	24	149/165.5	50/50

Hazardous area connection	
Connection	terminals 13; 23
Safe area connection	
Connection	terminals 11, 12; 21, 22 (11; 21 for SB1767)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Diagrams







Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0021	7/-7	58/67.5	80/63
SB0023	7/-7	446.5/456	80/63
SB0033	5/-5	36/43	100/80
SB0601	3/-3	43.5/48	125/100
SB1301	6/-6	34/42	80/80
SB1302	9/-9	584/604	50/32
SB1303	12/-12	80/100	50/32
SB2401	12/-12	292/312	32/32

Hazardous area connection	
Connection	terminals 13; 23
Safe area connection	
Connection	terminals 11; 21
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Features

- **2-channel**
- **DC version, floating**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

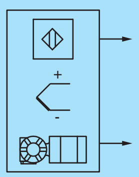
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

This dual channel Zener Barrier has a negative and positive polarity channel.

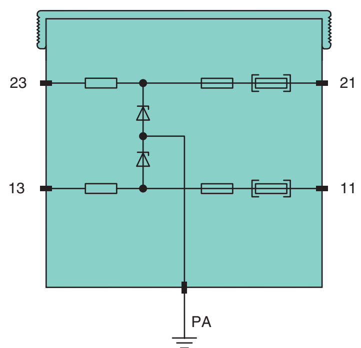
Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Diagrams

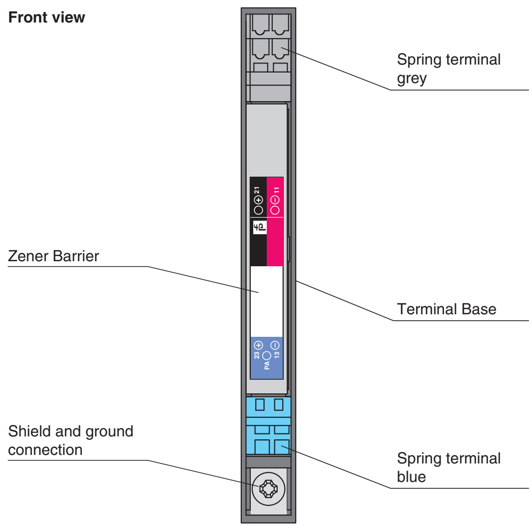


Zone 0, 1, 2
Div. 1, 2



Zone 2
Div. 2

Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel**
- **AC version**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

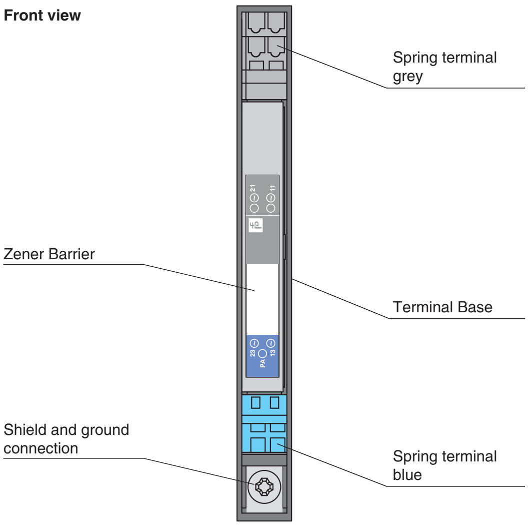
Technical data

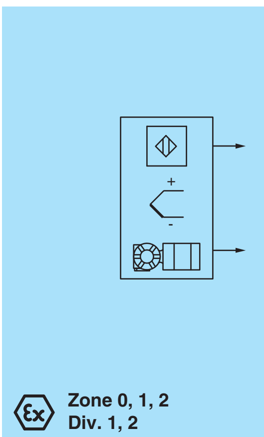
Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0024	12	170.5/181.5	63/63
SB0026	1	35.5/39	160/125
SB0028	15	99/110	63/63
SB0029	15	223/234	63/63
SB0037	6	171.5/179	100/80
SB1203	18	475/495	32/32
SB1602	12	60.5/71.5	63/63
SB2710	6	85/105	50/32

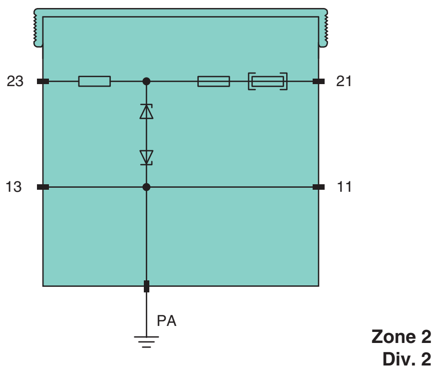
Hazardous area connection	
Connection	terminals 13, 23
Safe area connection	
Connection	terminals 11, 21
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ⓔx II (1)G [Ex ia] IIC Ⓔx II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Diagrams

Front view







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Technical data

Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0014	6.5	1768.5/1776.5	80/80
SB0015	5	71/75	125/100
SB0016	6	100/106	100/80
SB0022	2.5	801/804	160/125
SB0044	8.5	165.5/174.5	80/63
SB0045	8.5	1020.5/1029.5	80/63
SB0201	2	36.5/40	160/125
SB0305	1.25	402/405	160/125
SB0751	2	10.8/14.1	160/125
SB0761	6	142.5/149	100/80
SB0766	10	188.5/208	50/32
SB1761	7	385/405	50/32
SB1766	9.8	90.5/110	50/32
SB2764	10	1077/1096	50/32

Hazardous area connection	
Connection	terminals 13; 23
Safe area connection	
Connection	terminals 11; 21
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Features

- **2-channel**
- **AC version**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

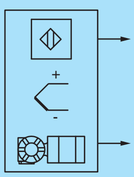
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

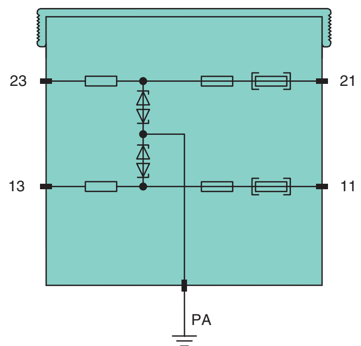
Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

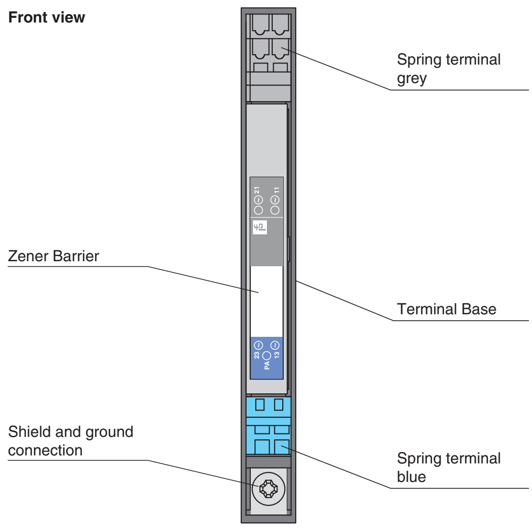
Diagrams



Zone 0, 1, 2
Div. 1, 2



Zone 2
Div. 2



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel**
- **AC version**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**
- **Star connection**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

The Zener Barrier has alternating polarities, i. e. interconnected Zener diodes are employed and one side is grounded. The Zener Barrier can be used for both alternating voltage signals and direct voltage signals.

Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

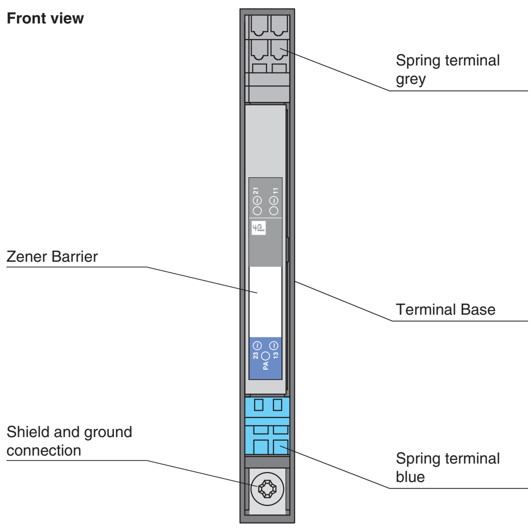
Technical data

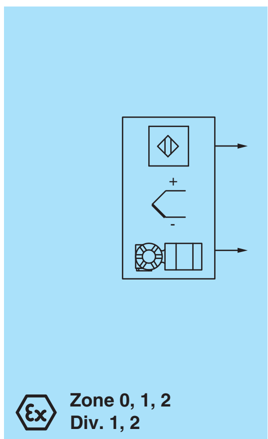
Model number	Working voltage at 2 µA (V)	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0036	5	3400/3400	32/32
SB0760	6	92.5/112	32/32
SB0765	12	147.5/167.5	32/32
SB0772	18	363.5/383.5	32/32
SB0778	24	689/709	32/32

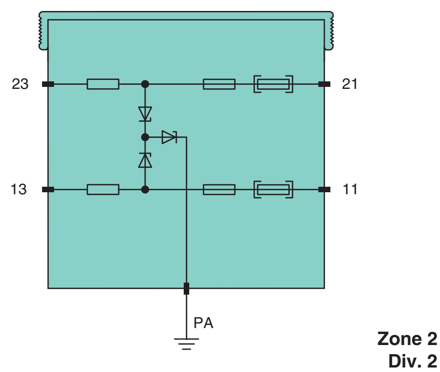
Hazardous area connection	
Connection	terminals 13; 23
Safe area connection	
Connection	terminals 11; 21
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20 (installed on Terminal Base or Termination Board)
Connection	wiring via Terminal Base or Termination Board
Mass	approx. 70 g
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715
Data for application in conjunction with hazardous areas	see page 480 for entity parameters
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]
UL approval	
Control drawing	16-557UL-12 (cULus)

Diagrams

Front view







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PROTECTING YOUR PROCESS

Technical data

Model number	Max. series resistance (Ω) without back-up fuse/with back-up fuse	Fuse rating (mA) internal fuse/back-up fuse
SB0604	90.5/107	50/50
Hazardous area connection		
Connection	terminals 13, 23	
Output voltage	12 V DC, stabilized	
Safe area connection		
Connection	terminals 11, 21	
Input voltage	24 V DC	
Ambient conditions		
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)	
Mechanical specifications		
Protection degree	IP20 (installed on Terminal Base or Termination Board)	
Connection	wiring via Terminal Base or Termination Board	
Mass	approx. 70 g	
Dimensions	9.7 x 70.4 x 68.2 mm (0.4 x 2.8 x 2.7 in)	
Mounting	Terminal Base or Termination Board mounting on 35 mm DIN rail acc. to DIN EN 60715	
Data for application in conjunction with hazardous areas	see page 480 for entity parameters	
EC-Type Examination Certificate	TÜV 99 ATEX 1449 X	
Group, category, type of protection	Ex II (1)G [Ex ia] IIC Ex II (1)D [Ex iaD]	
UL approval		
Control drawing	16-557UL-12 (cULus)	

Features

- **1-channel**
- **DC version, positive polarity**
- **12 V DC supply**
- **Input voltage 24 V at 2 µA**
- **Output voltage 12 V at 2 µA**
- **Terminal Base or Termination Board mounting, pluggable**
- **Replaceable fuse**

Function

The SB-System Zener Barriers provide protection for electrical signals within hazardous areas.

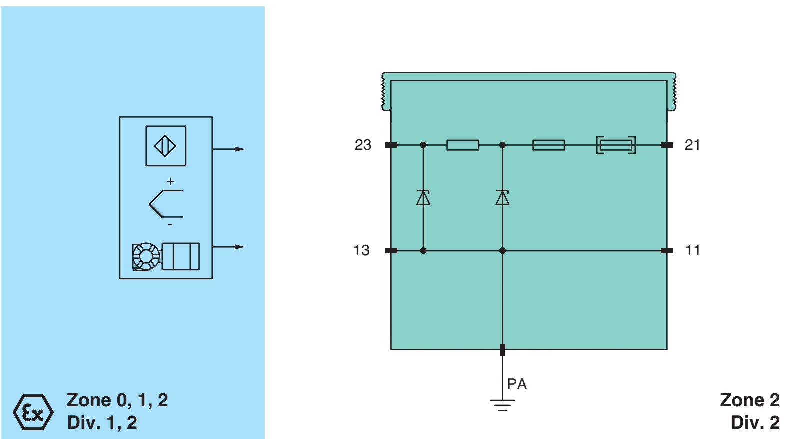
The Zener diodes in the Zener Barriers are connected in the reverse direction. The breakdown voltage of the diodes is not exceeded in normal operation. If this voltage is exceeded, due to a fault in the safe area, the diodes start to conduct, causing the fuse to blow.

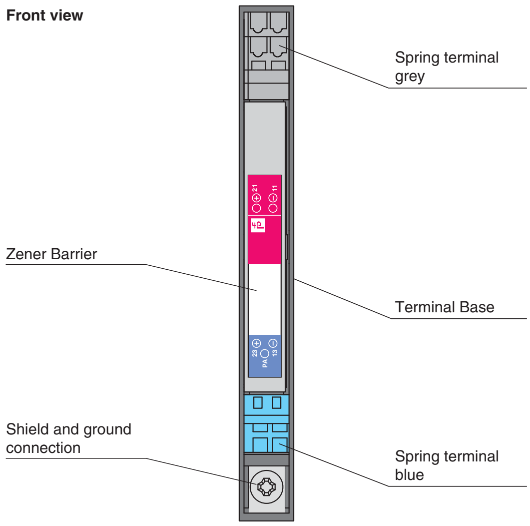
The Zener Barrier has a positive polarity, i. e. the anodes of the Zener diodes are grounded.

It supplies field devices with 12 V DC. Additionally this Zener Barrier is equipped with a replaceable back-up fuse.

Zener Barriers will be supplied without Terminal Base or Termination Board. Please order separately.

Diagrams





SB-System
Barriers
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

ATEX Entity Parameters

Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
SB0014	13, 23, PA	9.5/9.5	6/6	14/14
SB0015	13, 23, PA	7.4/7.4	118/118	220/220
SB0016	13, 23, PA	8.8/8.8	98/98	215/215
SB0017	13, 23, PA	5.4/5.4	10/10	13/13
SB0018	13, 23, PA	9.6	97	230
SB0019	13, 23, PA	15.8/15.8	190/88	73/345
SB0020	13, 23, PA	15.8/15.8	190/190	750/750
SB0021	13, 23, PA	19.1	203	970
SB0022	13, 23, PA	4.4/4.4	6/6	6/6
SB0023	13, 23, PA	19.1	22	106
SB0024	13, 23, PA	16.8	118	495
SB0026	13, 23, PA	6.3	225	355
SB0027	13, 23, PA	20	36	180
SB0028	13, 23, PA	20.1	258	1300
SB0029	13, 23, PA	20.1	106	532
SB0030	13, 23, PA	5.9/5.9	59/59	87/87
SB0031	13, 23, PA	8.6/8.6	15/15	33/33
SB0033	13, 23, PA	14.3	291	1040
SB0035	13, 23, PA	6.3/6.3	6.4/6.4	10/10
SB0036	13, 23, PA	9.6/9.6	3/3	7/7
SB0037	13, 23, PA	8.8	57	126
SB0040	13, 23, PA	5.9/5.9	140/140	207/207
SB0041	13, 23, PA	8.6/8.6	4.4/4.4	9.4/9.4
SB0042	13, 23, PA	5.9/5.9	30/30	44/44
SB0043	13, 23, PA	9.9	170	420
SB0044	13, 23, PA	10.5/10.5	69/69	180/180
SB0045	13, 23, PA	10.5/10.5	11/11	29/29
SB0201	13, 23, PA	5.3/5.3	178/178	236/236
SB0305	13, 23, PA	4.4/4.4	11/11	12/12
SB0601	13, 23, PA	13.1	182	596
SB0604	13, 23, PA	6.5	246	1040
SB0613	13, 23, PA	8.6	414	891
SB0614	13, 23, PA	8.6	100	215
SB0710	13, 23, PA	10	200	500
SB0715	13, 23, PA	15	150	562
SB0722	13, 23, PA	22	150	825
SB0728	13, 23, PA	28	93	651
SB0751	13, 23, PA	5/5	990/990	1240/1240
SB0760	13, 23, PA	10/10	200/200	500/500
SB0761	13, 23, PA	9/9	100/100	225/225
SB0764	13, 23, PA	12/12	12/12	36/36
SB0765	13, 23, PA	15/15	150/150	563/563
SB0766	13, 23, PA	12/12	80/80	240/240
SB0767	13, 23, PA	15/15	150/150	562/562
SB0768	13, 23, PA	22/22	147/147	808/808
SB0772	13, 23, PA	22/22	73/73	402/402
SB0778	13, 23, PA	28/28	47/47	329/329
SB0779	13, 23, PA	28/28	93/93	651/651
SB0786	13, 23, PA	28/28	100/100	40/40
SB0788	13, 23, PA	10/28	200/93	500/651
SB0796	13, 23, PA	26/20	87/51	565/255
SB1203	13, 23, PA	27.1	66	449
SB1206	13, 23, PA	16.8	62	260
SB1250	13, 23, PA	15	403	1510
SB1301	13, 23, PA	17.2	414	1612

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Model Number	Terminals	U_o (V)	I_o (mA)	P_o (mW)
SB1302	13, 23, PA	25.2	25	143
SB1303	13, 23, PA	29.4	248	1723
SB1350	13, 23, PA	11.7/11.7	174/25	506/73
SB1351	13, 23, PA	11.7/11.7	25/25	73/73
SB1502	13, 23, PA	16.8	330	130
SB1602	13, 23, PA	16.8	390	1638
SB1613	13, 23, PA	8.6	414	891
SB1710	13, 23, PA	10	200	500
SB1715	13, 23, PA	15	150	562
SB1728	13, 23, PA	28	93	651
SB1761	13, 23, PA	9/9	25/25	56/56
SB1766	13, 23, PA	12/12	160/160	480/480
SB1767	13, 23, PA	15/15	150/150	562/562
SB1787	13, 23, PA	28/28	93/100	651/40
SB2206	13, 23, PA	16.8	62	260
SB2250	13, 23, PA	15	403	1510
SB2401	13, 23, PA	33.6	67	535
SB2420	13, 23, PA	27.3	208	1420
SB2424	13, 23, PA	28.4	24	170
SB2427	13, 23, PA	26.3/26.3	300/102	115/671
SB2710	13, 23, PA	10	200	500
SB2764	13, 23, PA	12/12	12/12	36/36
SB2787	13, 23, PA	28/28	300/120	115/840
SB3250	13, 23, PA	15/15	387/387	1450/1450
SB3420	13, 23, PA	27.3	208	1420
SB3710	13, 23, PA	10	300	750
SB3715	13, 23, PA	15	291	1091
SB3722	13, 23, PA	22	213	1172
SB3728	13, 23, PA	28	120	840
SB3729	13, 23, PA	28	171	1197
SB4250	13, 23, PA	15/15	387/387	1450/1450
SB4410	13, 23, PA	27.3/27.3	147/147	1000/1000
SB4420	13, 23, PA	27.3/27.3	208/208	1420/1420
SB4710	13, 23, PA	10	300	750
SB4715	13, 23, PA	15	291	1091
SB4722	13, 23, PA	22	213	1172
SB5410	13, 23, PA	27.3/27.3	147/147	1000/1000
SB5420	13, 23, PA	27.3/27.3	208/208	1420/1420

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SB-System
Barriers
Accessories

UL Entity Parameters

Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
SB0014	13, 23, PA	–	–	19	12
	13, PA	9.5	6	–	–
	23, PA	9.5	6	–	–
	13, 23	19	6	–	–
SB0015	13, 23, PA	–	–	14.8	236
	13, PA	7.4	118	–	–
	23, PA	7.4	118	–	–
	13, 23	14.8	118	–	–
SB0016	13, 23, PA	–	–	17.6	196
	13, PA	8.8	98	–	–
	23, PA	8.8	98	–	–
	13, 23	17.6	98	–	–
SB0017	13, 23, PA	–	–	6.3	20
	13, PA	5.4	10	–	–
	23, PA	5.4	10	–	–
	13, 23	6.3	6	–	–
SB0018	13, 23, PA	9.6	97	–	–
SB0019	13, 23, PA	–	–	17.6	88
	13, PA	15.8	88	–	–
	23, PA	15.8	190	–	–
	13, 23	17.6	88	–	–
SB0020	13, 23, PA	–	–	17.6	380
	13, PA	15.8	190	–	–
	23, PA	15.8	190	–	–
	13, 23	17.6	106	–	–
SB0021	13, 23	19.1	203	–	–
SB0022	13, 23, PA	–	–	8.8	12
	13, PA	4.4	6	–	–
	23, PA	4.4	6	–	–
	13, 23	8.8	6	–	–
SB0023	13, 23	19.1	22	–	–
SB0026	13, 23, PA	6.3	225	–	–
SB0027	13, 23, PA	20	36	–	–
SB0201	13, 23	5.3/5.3	178/178	–	–
SB0601	13, 23	13.1	182	–	–
SB0604	13, 23, PA	6.5	246	–	–
SB0710	13, 23	10	200	–	–
SB0715	13, 23	15	150	–	–
SB0722	13, 23	22	150	–	–
SB0728	13, 23	28	93	–	–
SB0751	13, 23, PA	–	–	10	1980
	13, PA	5	990	–	–
	23, PA	5	990	–	–
	13, 23	10	990	–	–
SB0760	13, 23	10/10	200/200	–	–
SB0761	13, 23	9/9	100/100	–	–
SB0764	13, 23	12/12	12/12	–	–
SB0765	13, 23	15/15	150/150	–	–
SB0766	13, 23	12/12	80/80	–	–
SB0767	13, 23	15/15	150/150	–	–
SB0768	13, 23	22/22	147/147	–	–
SB0772	13, 23	22/22	73/73	–	–
SB0778	13, 23	28/28	47/47	–	–
SB0779	13, 23	28/28	93/93	–	–
SB0786	13, 23	28/28	100/100	–	–
SB0788	13, 23	10/28	200/93	–	–
SB0796	13, 23	26/20	87/51	–	–

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Model Number	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)
SB1301	13, 23	17.2	414	–	–
SB1302	13, 23	25.2	25	–	–
SB1303	13, 23	29.4	248	–	–
SB1350	13, 23	11.7/11.7	174/25	–	–
SB1351	13, 23	11.7/11.7	25/25	–	–
SB1502	13, 23	16.8	330	–	–
SB1602	13, 23	16.8	390	–	–
SB1710	13, 23	10	200	–	–
SB1715	13, 23	15	150	–	–
SB1722	13, 23	22	150	–	–
SB1728	13, 23	28	93	–	–
SB1761	13, 23	9/9	25/25	–	–
SB1764	13, 23	12/12	12/12	–	–
SB1766	13, 23	12/12	160/160	–	–
SB1767	13, 23	15/15	150/150	–	–
SB1768	13, 23	22/22	147/147	–	–
SB1787	13, 23	28/28	93/100	–	–
SB1788	13, 23	10/28	200/93	–	–
SB1796	13, 23	26/20	87/51	–	–
SB2350	13, 23	11.7/11.7	174/25	–	–
SB2351	13, 23	11.7/11.7	25/25	–	–
SB2420	13, 23, PA	27.3	208	–	–
SB2427	13, 23	26.3/26.3	300/102	–	–
SB2710	13, 23	10	200	–	–
SB2764	13, 23	12/12	12/12	–	–
SB2787	13, 23	28/28	300/120	–	–
SB3250	13, 23, PA	–	–	16.9	774
	13, PA	15	387	–	–
	23, PA	15	387	–	–
	13, 23	16.9	217	–	–
SB3420	13, 23, PA	27.3	208	–	–
SB3710	13, 23	10	300	–	–
SB3715	13, 23	15	291	–	–
SB3722	13, 23	22	213	–	–
SB3728	13, 23	28	120	–	–
SB3729	13, 23	28	171	–	–
SB4410	13, 23, PA	–	–	29.1	294
	13, PA	27.3	147	–	–
	23, PA	27.3	147	–	–
	13, 23	29.1	79	–	–
SB4420	13, PA	27.3	208	–	–
	23, PA	27.3	208	–	–
	13, 23	29.1	111	–	–
SB4250	13, 23, PA	–	–	16.9	774
	13, PA	15	387	–	–
	23, PA	15	387	–	–
	13, 23	16.9	217	–	–
SB4710	13, 23	10	300	–	–
SB4715	13, 23	15	291	–	–
SB4722	13, 23	22	213	–	–
SB4728	13, 23	28	120	–	–
SB5410	13, 23, PA	–	–	29.1	294
	13, PA	27.3	147	–	–
	23, PA	27.3	147	–	–
	13, 23	29.1	79	–	–
SB5420	13, PA	27.3	208	–	–
	23, PA	27.3	208	–	–
	13, 23	19	111	–	–

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Terminal Base
SB9101

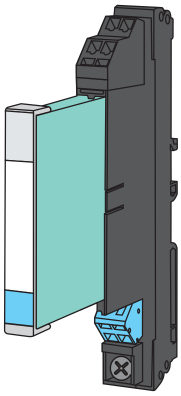
Features
- For 1 SB Zener Barrier

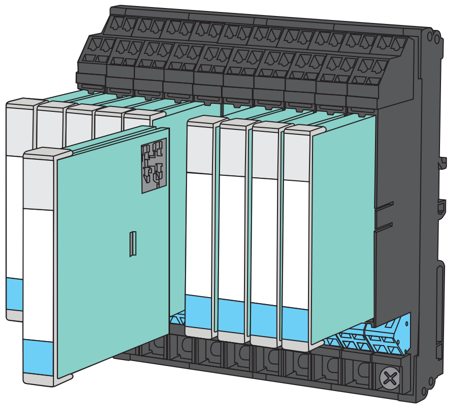
Termination Board
SB9106

Features
- For 6 SB Zener Barriers

Termination Board
SB9100

Features
- For 10 SB Zener Barriers

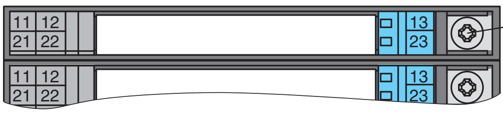

Terminal Base
SB9101


Termination Board
SB9100

Technical data

Mechanical specifications	
Dimensions	SB9101: 13 x 125 x 96.5 mm (0.5 x 4.9 x 3.8 in) SB9106: 73 x 125 x 96.5 mm (2.9 x 4.9 x 3.8 in) SB9100: 119.5 x 125 x 96.5 mm (4.7 x 4.9 x 3.8 in) height including module assembly

Electrical connection



Terminals 11, 21	Connection safe area (control side)
Terminals 12, 22	Activation of the LED by connecting the terminals 12, 22 with (-)
Terminals 13, 23	Connection hazardous area (field side)

Grounding Rail
SB9220

Features
- For 20 SB Zener Barriers

SB9221

Features
- For 10 SB Zener Barriers

SB9222

Features
- For 6 SB Zener Barriers

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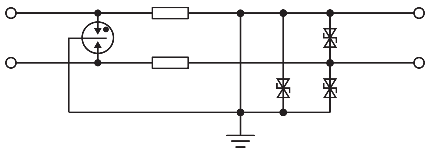
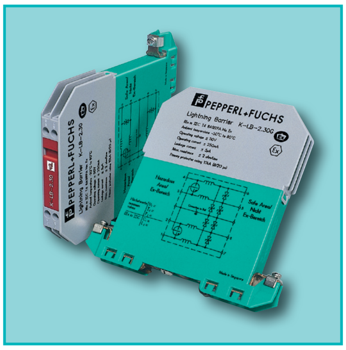
Surge Protection Barriers provide protection for today's sensitive electronic instrumentation – protection from the destructive effects of lightning and the transient surges that accompany this phenomenon. Surge Protection Barriers are used in a wide range of applications including measurement and control, instrumentation, power, and communication. The undesired consequences of surges include both equipment damage and equipment malfunction or lockup. Damage occurs when excessive surge voltage flashes over or punctures semiconductor junctions. Semiconductors are also sensitive to accumulated over-voltage stress. Successive surges chip away at the insulating layers in a process often referred to as "electronic rust". When the equipment finally fails it is often not attributed to surges because the accumulative minor events actually caused the failure rather than a recent catastrophic event such as a localized lightning strike.

Operating principle



The Surge Protection Barrier incorporates line-to-line (differential mode) and line-to-earth (common mode) protection. This is achieved by integrating suitable "switching" elements into the Surge Protection Barrier and guaranteeing proper connection to ground. Gas discharge tubes are used in the first switching stage of a Surge Protection Barrier. They are able to clamp high voltages and divert high currents, but their slow response time still allows dangerously high energy levels to pass through. Therefore, a second element must be implemented to control the remaining energy. This silicon avalanche **T**ransient **V**oltage **S**uppressor (TVS) diode type responds to lower voltage and current levels extremely fast, clamps the voltages to non-damaging levels, and diverts the surge currents to ground. Both protection stages are decoupled with inductance elements.

Surge Protection 488



- Surge Protection Barriers for standard and hazardous area applications
- Protection for instrumentation, power, and communications
- Plug-in designs for terminal wiring reduction
- Hybrid design incorporates protection for power surge and lightning transient protection

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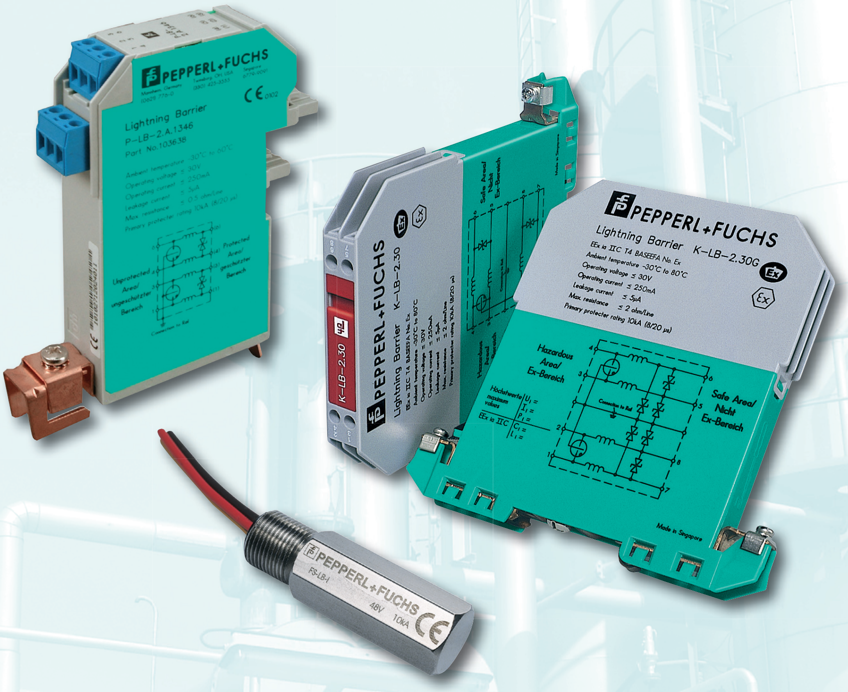
Surge Protection



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Edition 908837 (US) / 208599 (EU) 11/2010

Introduction

To protect the signal lines of field devices and systems in the cabinet against lightning. Pepperl+Fuchs covers the complete range of Surge Protection Barriers.

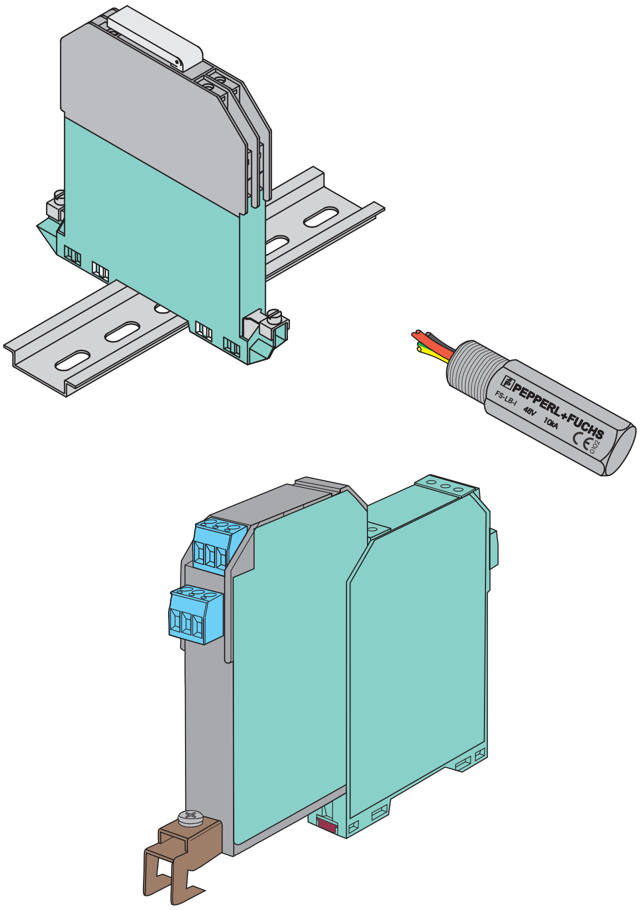

Figure 1 Various Surge Protection Barriers

Housing types

Depending on the location you have to protect, we offer 3 different versions of Surge Protection Barriers.

DIN rail mount modules (K-LB-*.**)

- Compact housing, 12.5 mm wide
- Protection of field devices and control devices
- Single and dual channel versions
- Grounded versions for Zener Barrier applications

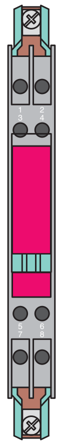

Figure 2 Surge protection K-LB-.***

Field mount modules (F*-LB-I)

- Screw in type for field devices
- Protection of field devices
- ½ NPT, M20 and PG13.5 thread versions
- Floating versions

Figure 3 Surge protection F-LB-I*

Plug-in modules (P-LB-*.*.*)

- Plug-in version for the 20 mm devices of the K-System
- Protection of K-System inputs
- For isolated barriers and signal conditioners
- Single and dual channel versions

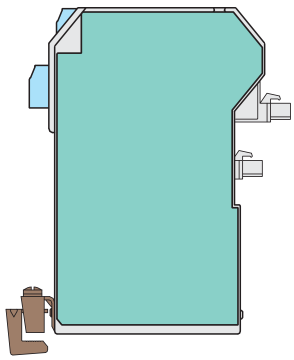

Figure 4 Surge protection P-LB-.*.**

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Mounting and grounding

The correct installation of the Surge Protection Barrier is very important. It must be ensured that the unprotected wiring does not influence the wiring on the protected side. Proper cable routing should ensure a sufficient cable distance between wires of the unprotected, earth connected and protected side. Depending on the mounting place, there are different possibilities for mounting and earthing.

Topology

To protect the electrical equipment in both the control room and the hazardous area, two Surge Protection Barriers must be integrated into the intrinsically safe circuit loop. Following the international standard EN 60079-14, intrinsically safe circuits can either be connected "at one point to the equipotential bonding system if this exists over the whole area in which the intrinsically safe circuits are installed" or "isolated from earth". International Standard EN 60079-14 states "if intrinsically safe apparatus (field devices, Surge Protection Barriers and intrinsically safe barriers) do not withstand the electrical strength test with at least 500 V from earth, a connection to earth at the apparatus is to be assumed".

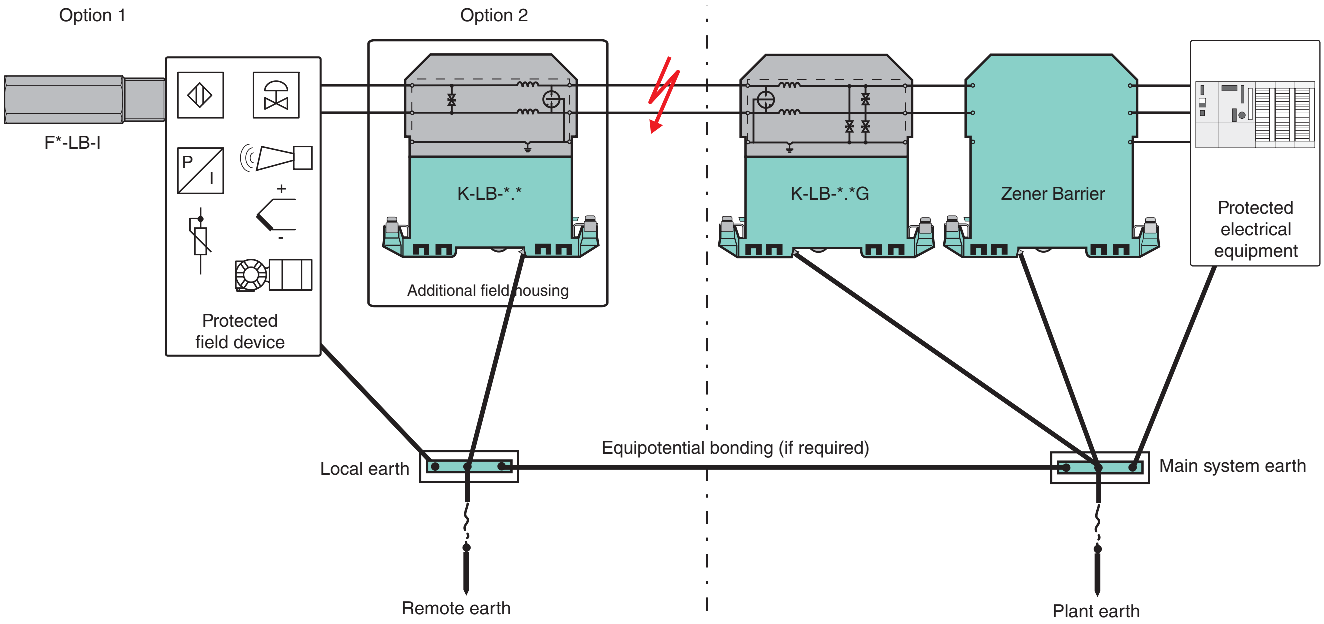

Figure 5 One point ground connection

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Surge Protection
DIN Rail Mount Modules
Field Mount Modules
Plug-In Modules
Accessories

DIN rail mount modules (K-LB-*.**)

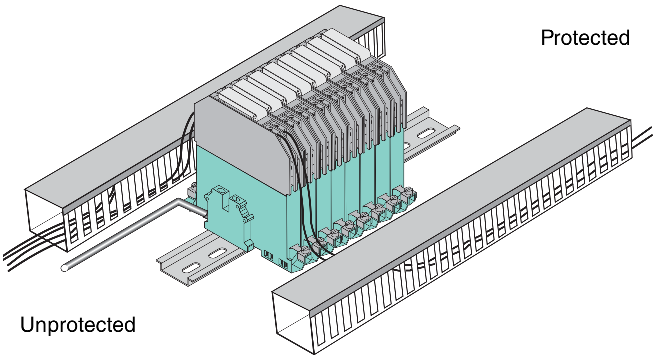

Figure 6 DIN rail mount module grounding

Field mount modules (F*-LB-I)

The screw-in F*-LB-I is screwed directly into the field device using the spare cable entry. Three wires are connected in parallel to the field device's signals and earth line.

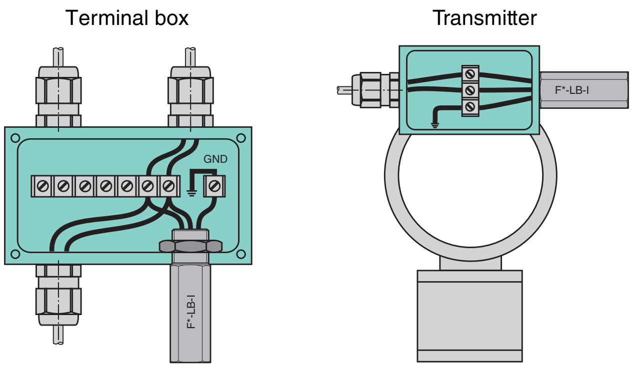

Figure 7 Field mount module grounding

Plug-in modules (P-LB-*.*.*)

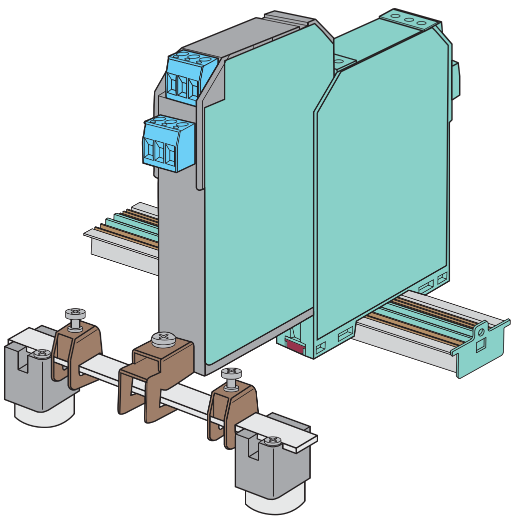

Figure 8 Plug-in module grounding

Protection

Unprotected signal loop

Since lightning-induced signals show pulse characteristics, standard circuit breakers or fuses are not able to sufficiently protect the electrical equipment. It can also be used for protection against other sources causing transient voltages like devices changing voltages or currents during switching events or exhibiting a non-linear behavior. These other sources are energy storing inductive loads, such as transformers, motors and drives. They can induce high transient voltages and surge currents on conductors that can damage connected equipment. Each electronic device in the loop should be protected with a Surge Protection Barrier.

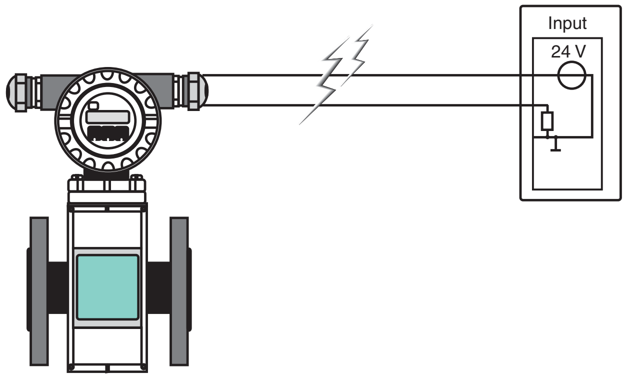

Figure 9 Unprotected signal loop

Protection of the field device

Two options are available for the protection of the field device:

Option 1

The standard DIN Rail mounted K-LB-*.** is located close to the field device. It should be placed within a field enclosure and mounted on a grounded rail. The Surge Protection Barrier must be locally bonded to control the local potential between the signal cables and the structure.

Option 2

The screw-in F*-LB-I is screwed directly into the field device using the spare cable entry. Three wires are connected in parallel to the field device's signals and earth line. This will ensure a line-to-line and line-to-earth protection.

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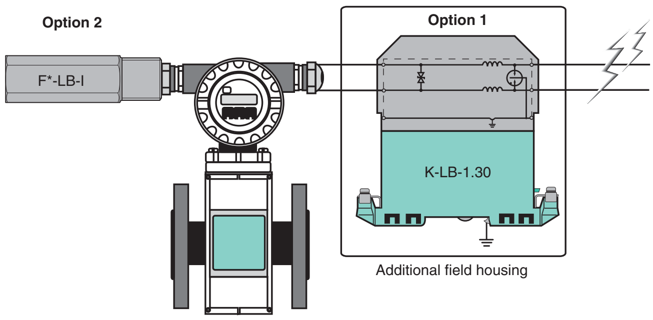

Figure 10 Protection of the field device

Protection of control side (cabinet)

Protection without isolation

To protect the Zener Barrier, a non-isolated, separately mounted Surge Protection Barrier must be installed and connected to the intrinsically safe side of the Zener Barrier. The barrier's earth connection is made, following the described guidelines, to the main system earth in parallel to the equipment and Zener Barrier earth cable.

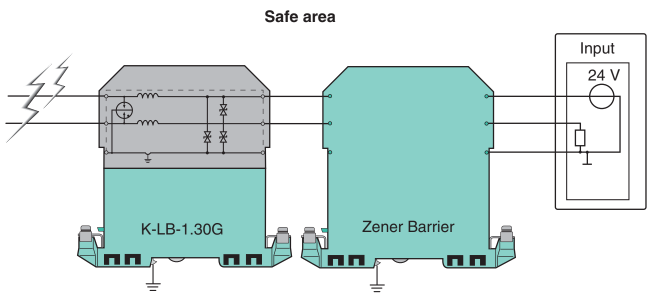

Figure 11 Protection without isolation

Protection with isolation

The entire intrinsically safe circuit is isolated from earth. The intrinsically safe barrier is an isolated barrier and no connection to the main system earth is necessary. To maintain the intrinsically safe measurement loop galvanically isolated from earth, an isolated Surge Protection Barrier must be installed at both ends of the loop. This must be close to the isolated barrier, connected to its intrinsically safe side in the safe area and close to the field device in the hazardous area, but outside Zone 0.

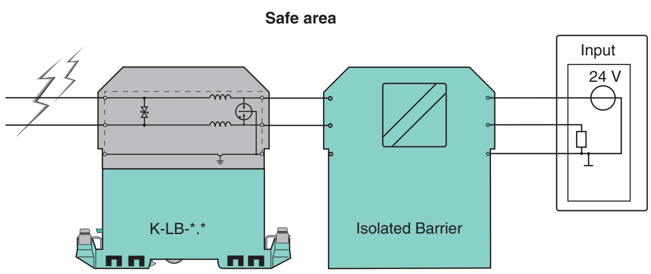

Figure 12 Protection with isolation

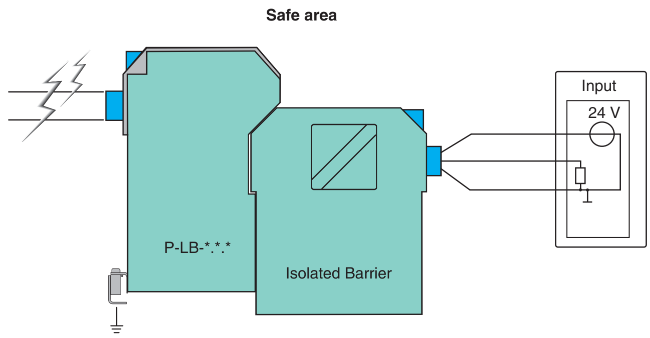

Figure 13 Protection with isolation

Model number description

DIN rail mount modules

	–		–		.		

- **G** Grounded
- **6** Rated voltage 6 V
- **30** Rated voltage 30 V
- **1** 1-channel (2-wire protection)
- **2** 2-channel (4-wire protection)
- **LB** Lightning barrier
- **K** DIN rail mount modules

Field mount modules

	–		–	I

- **Intrinsic safety Ex i**
- **LB** Lightning barrier
- **FN** Field mount modules with ½ NPT thread
- **FP** Field mount modules with PG13.5 thread
- **FS** Field mount modules with M20 x 1.5 thread

Plug-in modules

	–		–		.		.	

- **Protected terminals**
- **1** 1-channel
- **2** 2-channel
- **LB** Lightning barrier
- **P** Plug-in modules

Surge Protection
DIN Rail Mount Modules
Field Mount Modules
Plug-In Modules
Accessories

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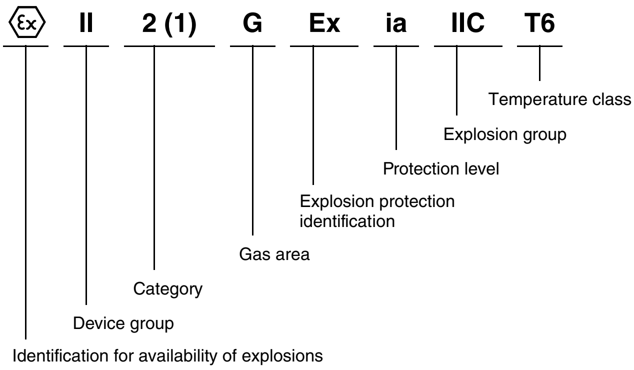
Safety Information for K-LB-*.** DIN rail mount modules

The highest ignition protection class to be reached is



The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

Surge Protection Barriers are used as modules positioned upstream in the circuit from the corresponding electrical equipment. They make it possible to protect against overvoltages originating from various causes (lightning strikes, switching processes, etc.). This is achieved by diverting the transient current and limiting the voltage throughout the duration of the overvoltage surge. Various modules are available for protecting 2 or 4 conductors.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Intrinsic safety circuits that were operated with circuits of other types of protection may not be used as intrinsically safe circuits afterwards.

Application

Surge Protection Barriers themselves can be installed within the hazardous area of Zone 1. They can be used for intrinsically safe circuits up to Ex ia IIC. The ignition protection class is determined by the connected intrinsically safe circuit of the corresponding electrical equipment.

Surge Protection Barriers are **not** used to separate intrinsically safe circuits from non-intrinsically safe circuits.

Surge Protection Barriers must **not** be installed in dust Ex-zones.

Installation and commissioning in connection with hazardous areas

Commissioning and installation must be performed only by specialists who are trained specifically for this purpose.

The quality of the ground is a significant precondition for problem-free overvoltage protection. Short connections and large cable cross-sections are basic requirements for effective protection. These requirements can be fulfilled through the use of appropriate accessories (see data sheets).

Potential compensation must be set up for Surge Protection Barriers of types K-LB-*.*G along the intrinsically safe circuits inside and outside of the hazardous area

Surge Protection Barriers modules are designed in the IP20 protection class in accordance with EN 60529 and must be protected against adverse environmental conditions such as splashed water or dirt beyond pollution degree 2.

Depending on the ignition protection class, the circuits of Surge Protection Barriers may be directed in Zone 1 or 0. Special attention must be paid to a secure separation from all non-intrinsically safe circuits in this context. A shortest path distance of at least 50 mm must be maintained between intrinsically safe and non-intrinsically safe conducting terminal blocks during assembly. The ignition protection class is determined by the connected intrinsically safe circuit of the corresponding electrical equipment.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective maximum values of the field device, the Surge Protection Barriers and the corresponding electrical equipment as defined by explosion protection must be observed for interconnecting with intrinsically safe electrical equipment (proof of intrinsic safety). EN 60079-14/ IEC 60079-14 must be observed (where appropriate).

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The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

The use of this device must not change the ignition protection category of the supplying circuit. Thus, for example, ib circuits must not enter Zone 0, even if they are controlled via this device – unless otherwise stated in the related approval.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are not allowed.

Isolation coordinates for devices with Ex-certificate in accordance with EN 50020 and EN 60079-11

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

For additional details, see data sheets.

Ambient conditions

Ambient temperature

-30 °C to 60 °C (-22 °F to 140 °F) for Ex application, please observe EC-Type Examination Certificate

Storage temperature

-30 °C to 80 °C (-22 °F to 176 °F)

Relative humidity

max. 75 % without moisture condensation

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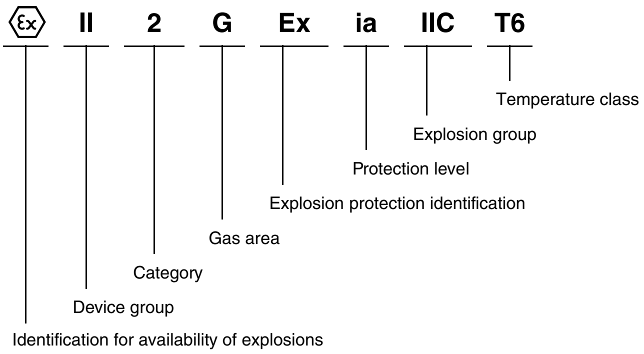
Safety Information for F*-LB-I field mount modules

The highest ignition protection class to be reached is



The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

Surge Protection Barriers are used as protective modules for intrinsically safe field devices and the corresponding electrical equipment. They make it possible to protect against overvoltages originating from various causes (lightning strikes, switching processes, etc.). This is achieved by diverting the transient current and limiting the voltage throughout the duration of the overvoltage surge.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Intrinsic safety circuits that were operated with circuits of other types of protection may not be used as intrinsically safe circuits afterwards.

Application

Surge Protection Barriers themselves can be installed within the hazardous area of Zone 1. They can be used for intrinsically safe circuits up to Ex ia IIC. The ignition protection class is determined by the connected intrinsically safe circuit of the corresponding electrical equipment.

Surge Protection Barriers must **not** be installed in dust Ex-zones.

Installation and commissioning in connection with hazardous areas

Commissioning and installation must be performed only by specialists who are trained specifically for this purpose.

The quality of the ground is a significant precondition for problem-free overvoltage protection. Short connections and large cable cross-sections are basic requirements for effective protection.

Depending on the ignition protection class, the circuits of Surge Protection Barriers may be directed in Zone 1 or 0. Special attention must be paid to a secure separation from all non-intrinsically safe circuits in this context. A shortest path distance of at least 50 mm must be maintained between intrinsically safe and non-intrinsically safe conducting terminal blocks during assembly. The ignition protection class is determined by the connected intrinsically safe circuit of the corresponding electrical equipment.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective maximum values of the field device, the Surge Protection Barriers and the corresponding electrical equipment as defined by explosion protection must be observed for interconnecting with intrinsically safe electrical equipment (proof of intrinsic safety). EN 60079-14/ IEC 60079-14 must be observed (where appropriate).

The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

The use of this device must not change the ignition protection category of the supplying circuit. Thus, for example, ib circuits must not enter Zone 0, even if they are controlled via this device – unless otherwise stated in the related approval.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are not allowed.

Ambient conditions

Ambient temperature

-30 °C to 60 °C (-22 °F to 140 °F) for Ex application, please observe EC-Type Examination Certificate

Storage temperature

-30 °C to 80 °C (-22 °F to 176 °F)

Relative humidity

max. 75 % without moisture condensation

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Safety Information for P-LB-*.*.* plug-in modules

The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

Plug-in terminal modules are used as modules positioned upstream in the circuit from the corresponding electrical equipment. They make it possible to protect against overvoltages originating from various causes (lightning strikes, switching processes, etc.). This is achieved by diverting the transient current and limiting the voltage throughout the duration of the overvoltage surge. Various modules are available for protecting 2, 3, 4 or 6 conductors. The assignment of input connections of plug-in terminal modules/intrinsically safe equipment (binary or analog signals) corresponds to that of the following related equipment (see the corresponding data sheets). Plug-in terminal modules should only be used in combination with a device of the K-System.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Intrinsic safety circuits that were operated with circuits of other types of protection may not be used as intrinsically safe circuits afterwards.

Application

Plug-in terminal modules can be installed within the hazardous area of Zone 2/Div. 2. They can be used for intrinsically safe circuits up to Ex ia IIC. The ignition protection class is determined by the connected intrinsically safe circuit of the corresponding electrical equipment.

Plug-in terminal modules are **not** used to separate intrinsically safe circuits from non-intrinsically safe circuits.

Plug-in terminal modules must **not** be installed in dust Ex-zones.

Installation and commissioning in connection with hazardous areas

Commissioning and installation must be performed only by specialists who are trained specifically for this purpose.

The quality of the ground is a significant precondition for problem-free overvoltage protection. Short connections and large cable cross-sections are basic requirements for effective protection. These requirements can be fulfilled through the use of appropriate accessories (see data sheets).

Plug-in terminal modules are designed in the IP20 protection class in accordance with EN 60529 and must be accordingly protected against adverse environmental conditions such as splashed water or dirt beyond pollution degree 2.

Plug-in terminal modules can be installed inside the hazardous area of Zone 2/Div. 2. Since plug-in terminal modules are always used in combination with devices of the K-System, the devices of the K-System must, in this case, be suitable for use in Zone 2/Div. 2. The devices of the K-System must then be installed only in Zone 2/Div. 2 if a corresponding Declaration of Conformity for a named location or a manufacturer's Declaration of Conformity is present. For information on whether this condition has been met, please refer to the data sheets for the devices of the K-System. The instruction manual, the Declaration of Conformity of a named location or the manufacturer's Declaration of Conformity of devices of the K-System and the information in them must be followed.

Depending on the ignition protection class, the circuits of plug-in terminal modules may be directed in Zone 1 or 0. Special attention must be paid to a secure separation from all non-intrinsically safe circuits in this context. A shortest path distance of at least 50 mm must be maintained between intrinsically safe and non-intrinsically safe conducting terminal blocks during assembly. The ignition protection class is determined by the connected intrinsically safe circuit of the corresponding electrical equipment.

The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.

The respective maximum values of the field device, the plug-in terminal modules and the corresponding electrical equipment as defined by explosion protection must be observed for interconnecting with intrinsically safe electrical equipment (proof of intrinsic safety). EN 60079-14/ IEC 60079-14 must be observed (where appropriate).

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The EC-Type Examination Certificates or standard certificates/approvals should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

The terminal modules must be installed in such a way that they are protected from electrostatic charge.

The use of this device must not change the ignition protection category of the supplying circuit. Thus, for example, ib circuits must not enter Zone 0, even if they are controlled via this device – unless otherwise stated in the related approval.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are not allowed.

Isolation coordinates for devices with Ex-certificate in accordance with EN 50020 and EN 60079-11

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Ambient conditions

Ambient temperature

-20 °C to 60 °C (-4 °F to 140 °F)

Storage temperature

-30 °C to 80 °C (-22 °F to 176 °F)

Relative humidity

max. 75 % without moisture condensation

Technical data

For additional details, see data sheets.

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DIN Rail Mount Modules

Model Number	Channels	Rated Voltage (V)	Grounded	Page
K-LB-1.30	1	30		501
K-LB-2.30	2	30		502
K-LB-1.6	1	6		503
K-LB-2.6	2	6		504
K-LB-1.30G	1	30	■	505
K-LB-2.30G	2	30	■	506
K-LB-1.6G	1	6	■	507
K-LB-2.6G	2	6	■	508

Field Mount Modules

Model Number	Channels	Rated Voltage (V)	Thread	Page
FN-LB-I	1	48	½ NPT	509
FS-LB-I	1	48	M20 x 1.5	510
FP-LB-I	1	48	PG13.5	511

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Plug-In Modules

Model Number	Channels	Rated Voltage (V)	For Terminals	Page
P-LB-1.A.13	1	30	1, 3	512
P-LB-2.A.1346	2	30	1, 3; 4, 6	513
P-LB-1.B.12	1	30	1, 2	514
P-LB-2.B.1245	2	30	1, 2; 4, 5	515
P-LB-1.C.123	1	30	1, 2, 3	516
P-LB-2.D.123456	2	30	1, 2, 3; 4, 5, 6	517
P-LB-1.E.23	1	30	2, 3	518
P-LB-2.C.2356	2	30	2, 3; 5, 6	519
P-LB-1.D.1234	1	30	1, 2, 3, 4	520
P-LB-1.F.1236	1	30	1, 2, 3, 6	521

Accessories for DIN Rail Mount Modules

Model Number	Description	Page
NS 35/7.5	35 mm DIN Rail	523
USLKG5	Terminal Block	523
ZH-ES/LB	Insertion Strip	523
ZH-Z.BT	Label Carrier	523

Accessories for Plug-in Modules

Model Number	Description	Page
ZH-Z.AB/SS	Mounting Block	523
ZH-Z.AK16	Connector	523
ZH-Z.AR.85	Spacing Roller	523
ZH-Z.NLS-Cu3/10	Grounding Rail	523

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Technical data

Supply	
Connection	terminals 7, 8; 1, 2
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	500 V breakdown voltage
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2176X
Group, category, type of protection, temperature classification	Ex II 2(1)G Ex ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **1-channel**
- **DIN rail mount module**
- **For 30 V IS or Non-IS applications**
- **Protects field or control circuit inputs**
- **Surge protection up to 10 kA**
- **Provides 500 V DC of isolation**
- **Uninterruptable operation (auto reset)**

Function

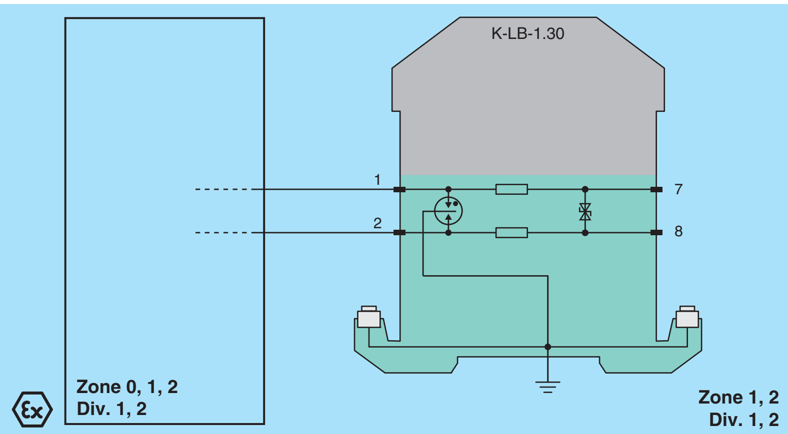
This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

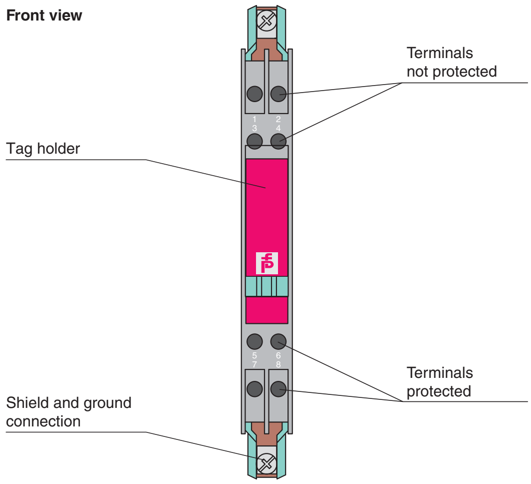
This barrier provides low 45 V line-to-line and 500 V line-to-ground clamping voltage for the protected instruments. It also protects instruments that have more than 500 V isolation-to-ground, such as intrinsic safety isolated barriers, signal conditioners and most field instruments.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams





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Features

- **2-channel**
- **DIN rail mount module**
- **For 30 V IS or Non-IS applications**
- **Protects field or control circuit inputs**
- **Surge protection up to 10 kA**
- **Provides 500 V DC of isolation**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

This barrier provides low 45 V line-to-line and 500 V line-to-ground clamping voltage for the protected instruments. It also protects instruments that have more than 500 V isolation-to-ground, such as intrinsic safety isolated barriers, signal conditioners and most field instruments.

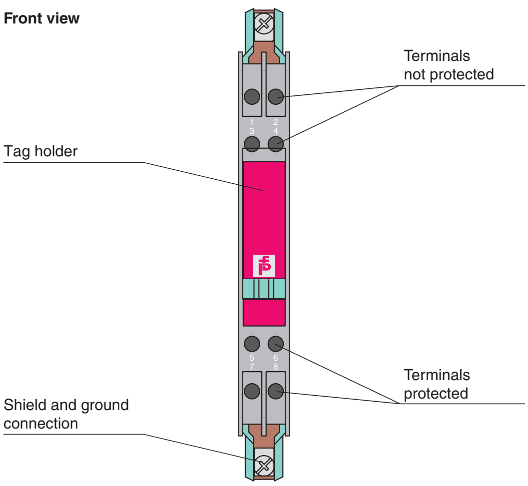
For additional information, refer to the manual and www.pepperl-fuchs.com.

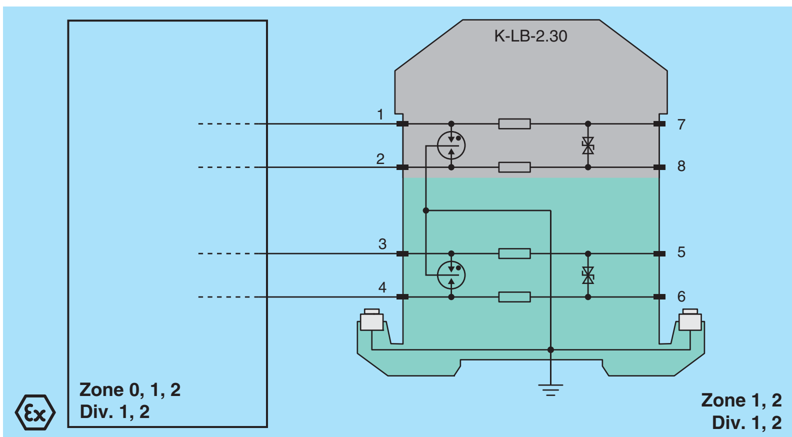
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Technical data

Supply	
Connection	terminals 1, 2; 7, 8/3, 4; 5, 6
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	500 V breakdown voltage
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2176X
Group, category, type of protection, temperature classification	Ⓔx II 2(1)G Ex ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams





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Technical data

Supply	
Connection	terminals 7, 8; 1, 2
Rated voltage	≤ 6 V
Rated current	≤ 250 mA
Leakage current	≤ 10 µA
On-state voltage	≤ 12 V
Ground insulation	500 V breakdown voltage
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2176X
Group, category, type of protection, temperature classification	Ⓔx II 2(1)G Ex ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **1-channel**
- **DIN rail mount module**
- **For 6 V IS or Non-IS applications**
- **Protects field or control circuit inputs**
- **Surge protection up to 10 kA**
- **Provides 500 V DC of isolation**
- **Uninterruptable operation (auto reset)**

Function

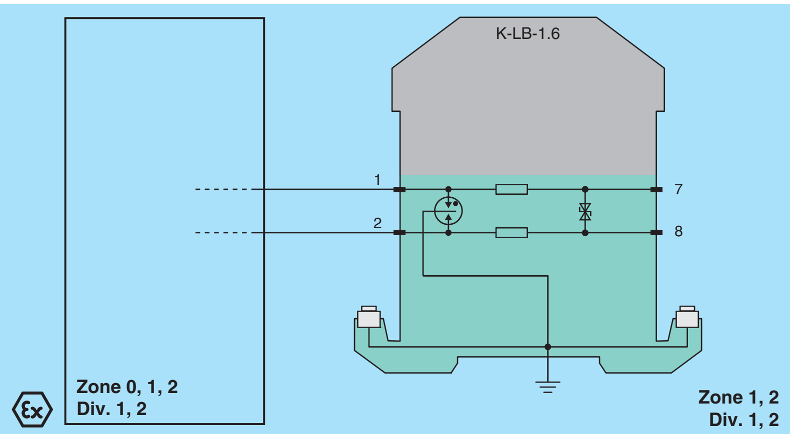
This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

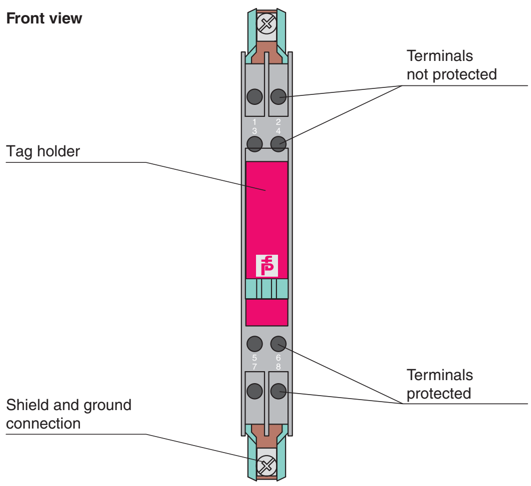
This barrier provides low 12 V line-to-line and 500 V line-to-ground clamping voltage for the protected instruments. It also protects instruments that have more than 500 V isolation-to-ground, such as intrinsic safety isolated barriers, signal conditioners and most field instruments.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams





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Features

- **2-channel**
- **DIN rail mount module**
- **For 6 V IS or Non-IS applications**
- **Protects field or control circuit inputs**
- **Surge protection up to 10 kA**
- **Provides 500 V DC of isolation**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

This barrier provides low 12 V line-to-line and 500 V line-to-ground clamping voltage for the protected instruments. It also protects instruments that have more than 500 V isolation-to-ground, such as intrinsic safety isolated barriers, signal conditioners and most field instruments.

For additional information, refer to the manual and www.pepperl-fuchs.com.

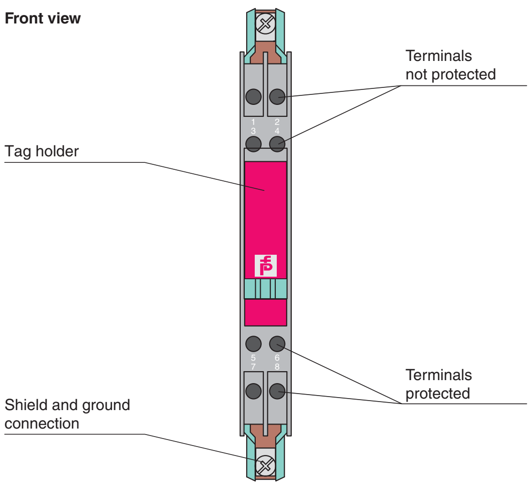
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

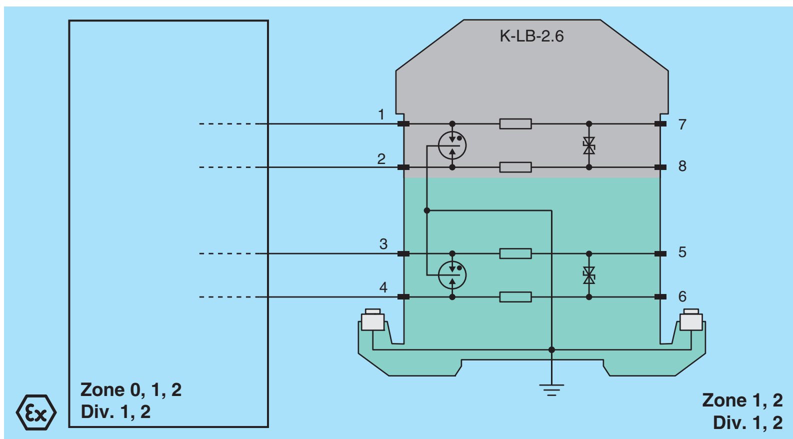
Technical data

Supply	
Connection	terminals 1, 2; 7, 8/3, 4; 5, 6
Rated voltage	≤ 6 V
Rated current	≤ 250 mA
Leakage current	≤ 10 µA
On-state voltage	≤ 12 V
Ground insulation	500 V breakdown voltage
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2176X
Group, category, type of protection, temperature classification	Ex II 2(1)G Ex ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Connection	terminals 7, 8; 1, 2
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2176X
Group, category, type of protection, temperature classification	Ex II 2(1)G Ex ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **1-channel**
- **DIN rail mount module**
- **For 30 V IS or Non-IS applications**
- **Protects field or control circuit inputs**
- **Surge protection up to 10 kA**
- **Uninterruptable operation (auto reset)**

Function

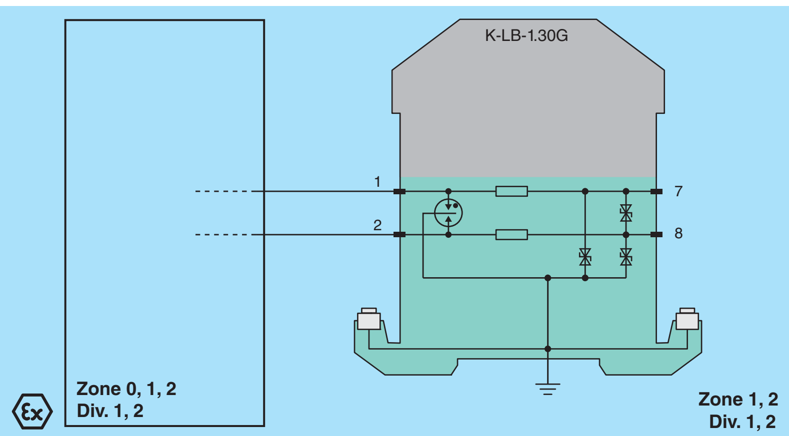
This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

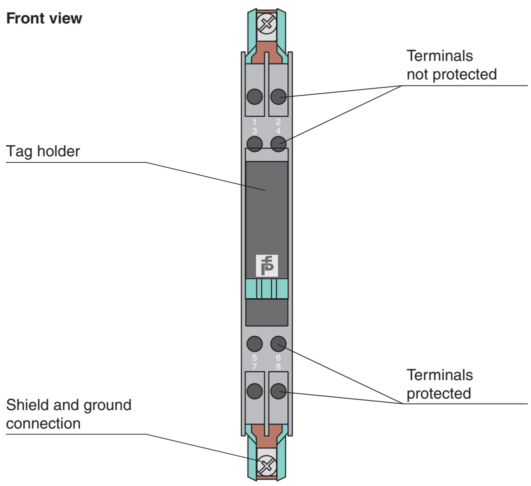
This barrier provides a low line-to-line and line-to-ground clamping voltage for the protected instrument. It also protects instruments that have less than 500 V isolation-to-ground, such as Zener Barriers, standard I/O cards, and some field instruments.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams





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Surge Protection
DIN Rail Mount Modules
Field Mount Modules
Plug-In Modules
Accessories

Features

- **2-channel**
- **DIN rail mount module**
- **For 30 V IS or Non-IS applications**
- **Protects field or control circuit inputs**
- **Surge protection up to 10 kA**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

This barrier provides a low line-to-line and line-to-ground clamping voltage for the protected instrument. It also protects instruments that have less than 500 V isolation-to-ground, such as Zener Barriers, standard I/O cards, and some field instruments.

For additional information, refer to the manual and www.pepperl-fuchs.com.

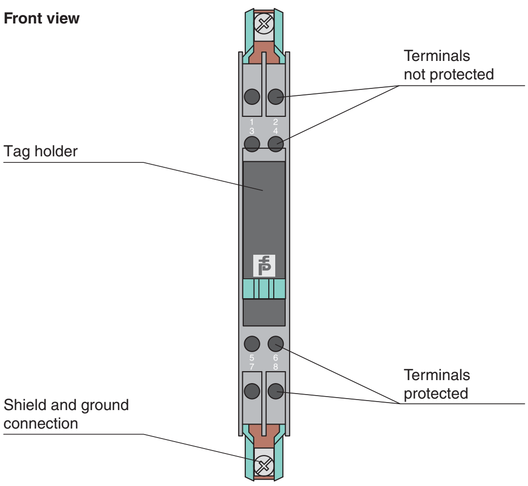
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

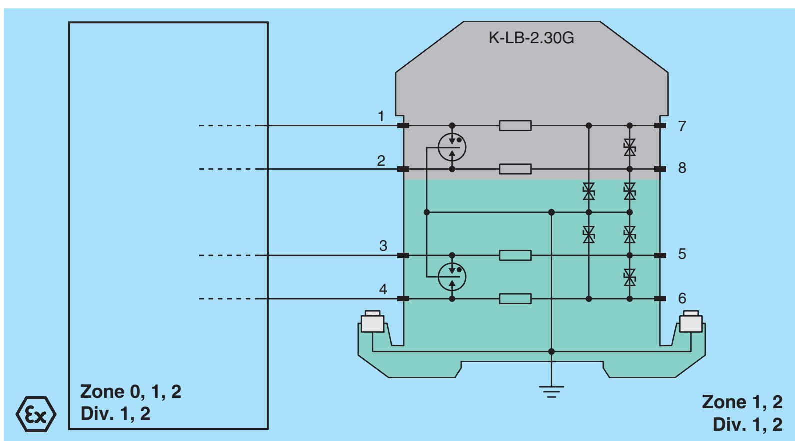
Technical data

Supply	
Connection	terminals 1, 2; 7, 8/3, 4; 5, 6
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2176X
Group, category, type of protection, temperature classification	Ⓔx II 2(1)G Ex ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams

Front view





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Technical data

Supply	
Connection	terminals 7, 8; 1, 2
Rated voltage	≤ 6 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 12 V
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2176X
Group, category, type of protection, temperature classification	Ⓔx II 2(1)G Ex ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **1-channel**
- **DIN rail mount module**
- **For 6 V IS or Non-IS applications**
- **Protects field or control circuit inputs**
- **Surge protection up to 10 kA**
- **Uninterruptable operation (auto reset)**

Function

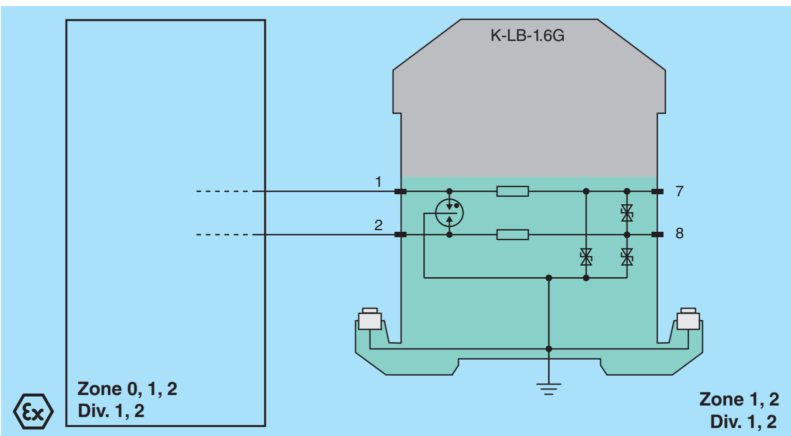
This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

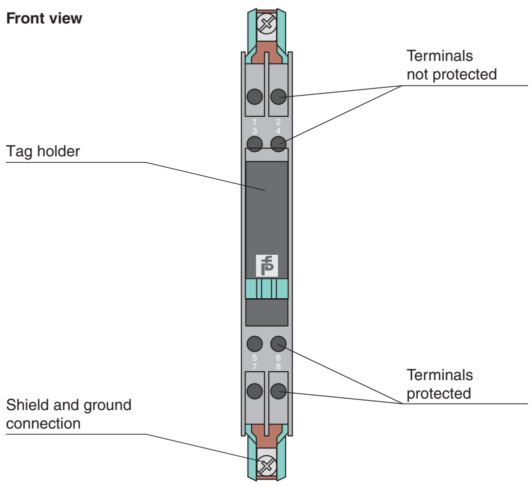
This barrier provides a low line-to-line and line-to-ground clamping voltage for the protected instrument. It also protects instruments that have less than 500 V isolation-to-ground, such as Zener Barriers, standard I/O cards, and some field instruments.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams





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Features

- **2-channel**
- **DIN rail mount module**
- **For 6 V IS or Non-IS applications**
- **Protects field or control circuit inputs**
- **Surge protection up to 10 kA**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

This barrier provides a low line-to-line and line-to-ground clamping voltage for the protected instrument. It also protects instruments that have less than 500 V isolation-to-ground, such as Zener Barriers, standard I/O cards, and some field instruments.

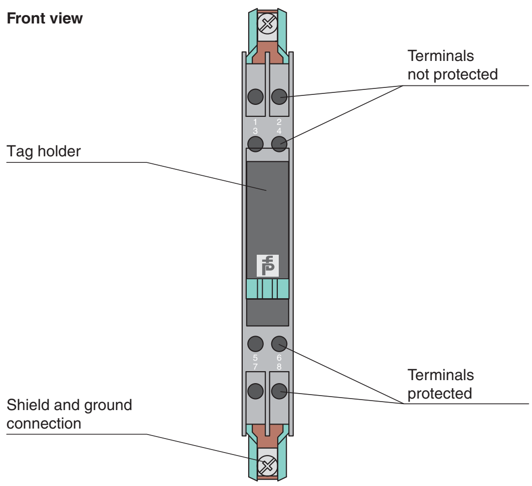
For additional information, refer to the manual and www.pepperl-fuchs.com.

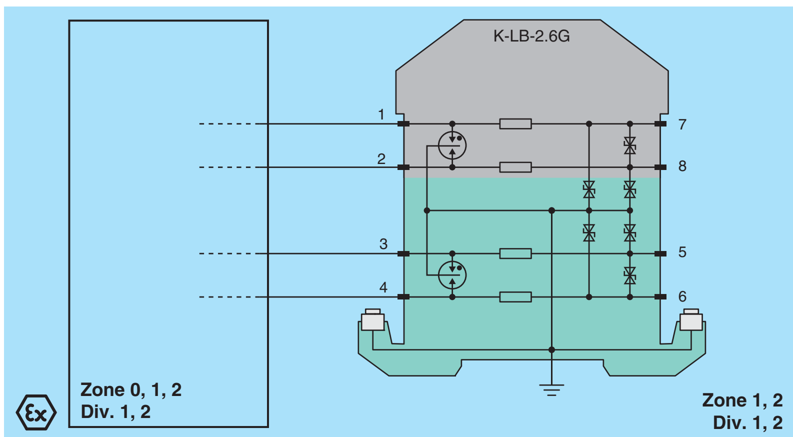
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Technical data

Supply	
Connection	terminals 1, 2; 7, 8/3, 4; 5, 6
Rated voltage	≤ 6 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 12 V
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2176X
Group, category, type of protection, temperature classification	Ex II 2(1)G Ex ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams





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Technical data

Supply	
Rated voltage	≤ 48 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 85 V
Ground insulation	≥ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Housing material	stainless steel 1.4401 (AISI 316) surface all over polished
Protection degree	IP20
Cable	
Length L	0.4 m
Mass	approx. 200 g
Dimensions	AF22 x 77 mm (0.9 x 3 in)
Mounting	½ NPT thread
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2175
Group, category, type of protection, temperature classification	Ⓔx II 2G EEx ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **1-channel**
- **Field mount module**
- **½ NPT thread**
- **Stainless steel housing**
- **Discharge current 10 kA**
- **500 V isolation from earth**
- **Suitable for hazardous area**

Function

This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

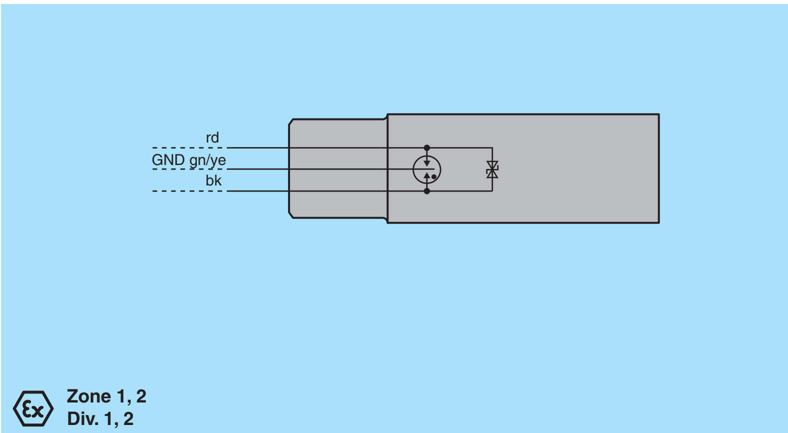
This barrier provides 85 V line-to-line and 500 V line-to-ground clamping voltage for the protected instruments. It also protects instruments that have less than 500 V isolation-to-ground.

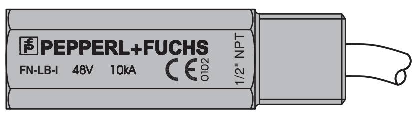
It is installed in an available conduit or cable gland opening like those found on most process transmitters.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams





Surge Protection
DIN Rail Mount Modules
Field Mount Modules
Plug-In Modules
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel**
- **Field mount module**
- **M20 x 1.5 thread**
- **Stainless steel housing**
- **Discharge current 10 kA**
- **500 V isolation from earth**
- **Suitable for hazardous area**

Function

This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

This barrier provides 85 V line-to-line and 500 V line-to-ground clamping voltage for the protected instruments. It also protects instruments that have less than 500 V isolation-to-ground.

It is installed in an available conduit or cable gland opening like those found on most process transmitters.

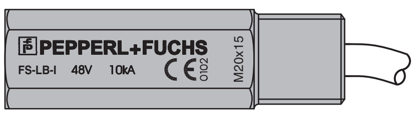
For additional information, refer to the manual and www.pepperl-fuchs.com.

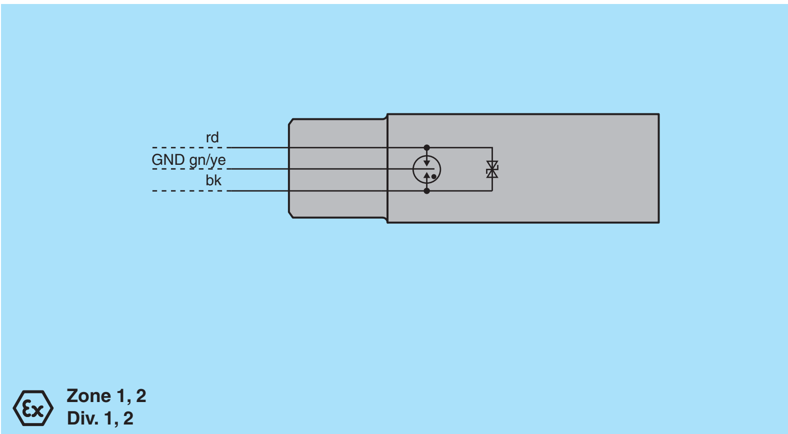
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Technical data

Supply	
Rated voltage	≤ 48 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 85 V
Ground insulation	≥ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Housing material	stainless steel 1.4401 (AISI 316) surface all over polished
Protection degree	IP20
Cable	
Length L	0.4 m
Mass	approx. 200 g
Dimensions	AF22 x 77 mm (0.9 x 3 in)
Mounting	M20 x 1.5 thread
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2175
Group, category, type of protection, temperature classification	Ex II 2G EEx ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams





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Technical data

Supply	
Rated voltage	≤ 48 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 85 V
Ground insulation	≥ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-30 ... 60 °C (-22 ... 140 °F) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Housing material	stainless steel 1.4401 (AISI 316) surface all over polished
Protection degree	IP20
Cable	
Length L	0.4 m
Mass	approx. 200 g
Dimensions	AF22 x 77 mm (0.9 x 3 in)
Mounting	PG13.5 thread
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 00 ATEX 2175
Group, category, type of protection, temperature classification	Ex II 2G EEx ia IIC T6
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **1-channel**
- **Field mount module**
- **PG13.5 thread**
- **Stainless steel housing**
- **Discharge current 10 kA**
- **500 V isolation from earth**
- **Suitable for hazardous area**

Function

This Surge Protection Barrier limits induced transients of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

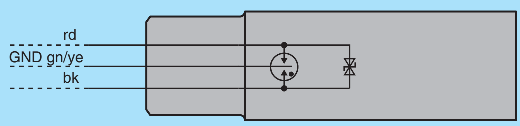
This barrier provides 85 V line-to-line and 500 V line-to-ground clamping voltage for the protected instruments. It also protects instruments that have less than 500 V isolation-to-ground.

It is installed in an available conduit or cable gland opening like those found on most process transmitters.

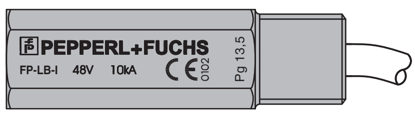
For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams



Zone 1, 2
Div. 1, 2



Surge Protection
DIN Rail Mount Modules
Field Mount Modules
Plug-In Modules
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 1 and 3 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

For additional information, refer to the manual and www.pepperl-fuchs.com.

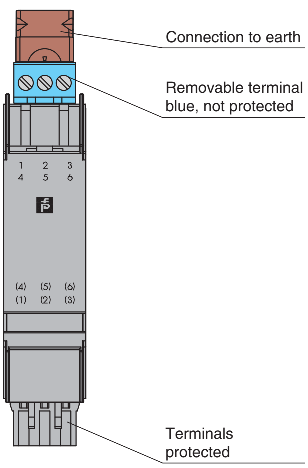
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

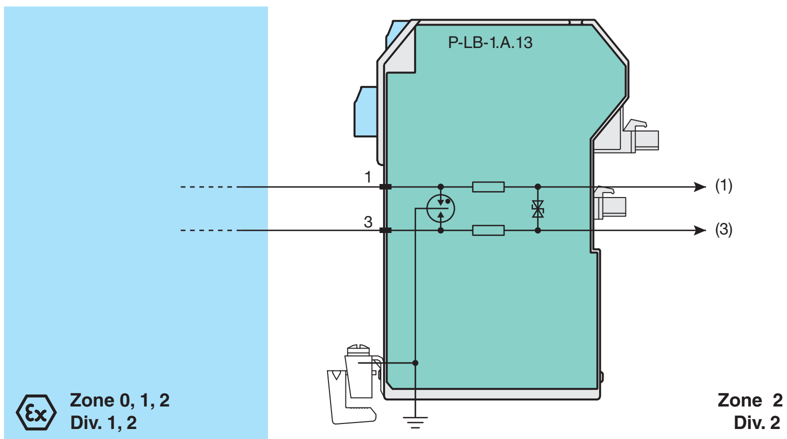
Technical data

Signal lines	
Connection	terminals 1, 3
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Signal lines	
Connection	terminals 1, 3; 4, 6
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **2-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 1, 3, 4 and 6 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

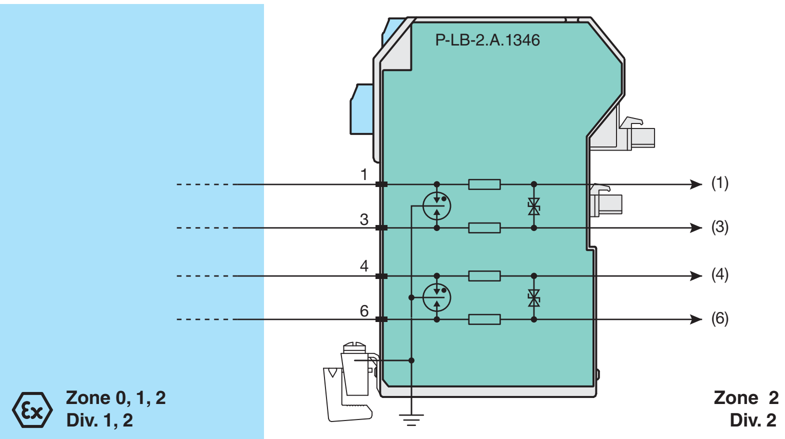
By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

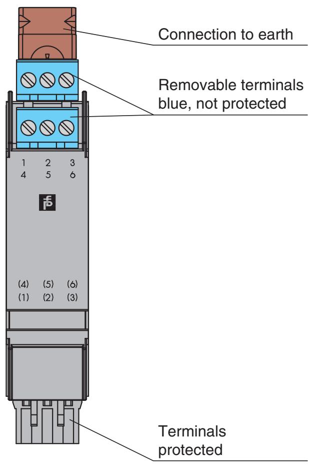
For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Surge Protection
DIN Rail Mount Modules
Field Mount Modules
Plug-In Modules
Accessories

P-LB-1.B.12

Features

- **1-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 1 and 2 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

For additional information, refer to the manual and www.pepperl-fuchs.com.

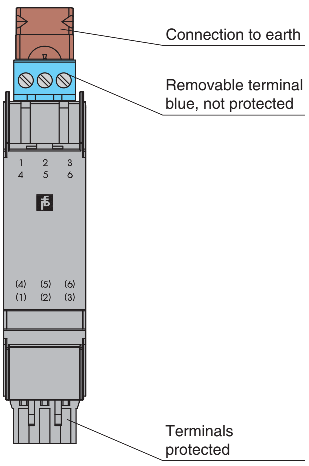
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

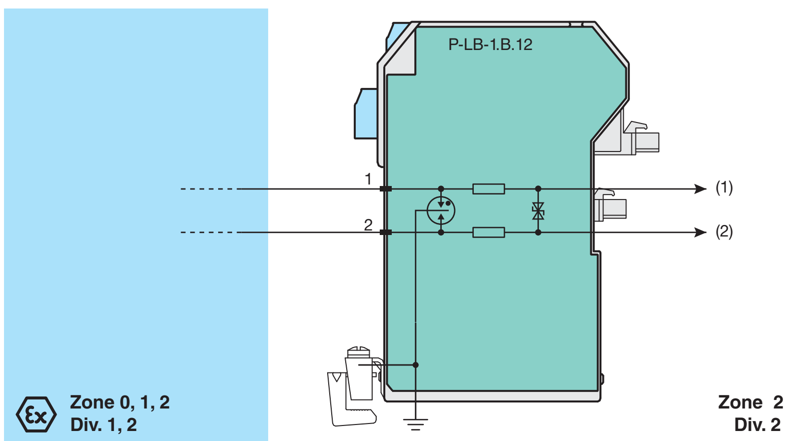
Technical data

Signal lines	
Connection	terminals 1, 2
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

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Technical data

Signal lines	
Connection	terminals 1, 2; 4, 5
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **2-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 1, 2, 4 and 5 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

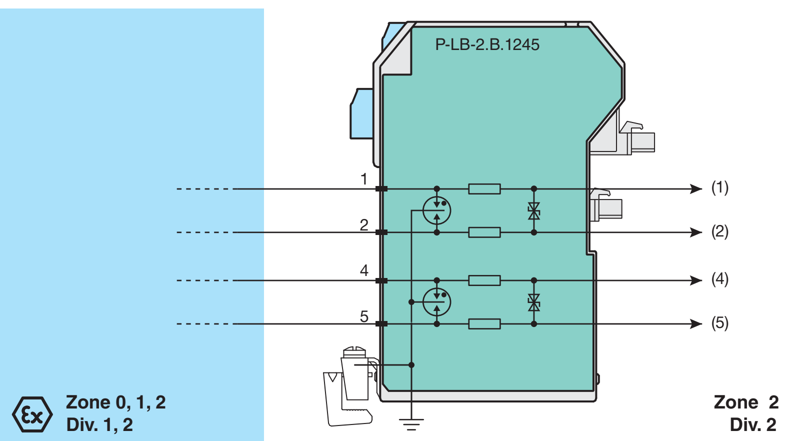
By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

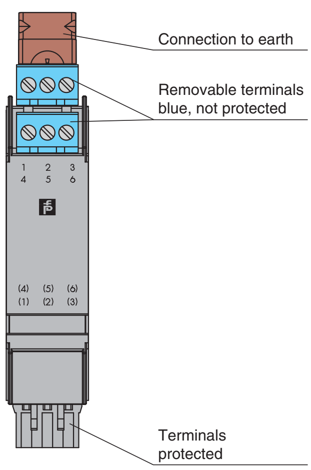
For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 1, 2 and 3 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

For additional information, refer to the manual and www.pepperl-fuchs.com.

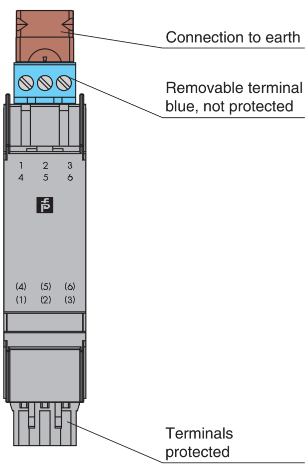
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

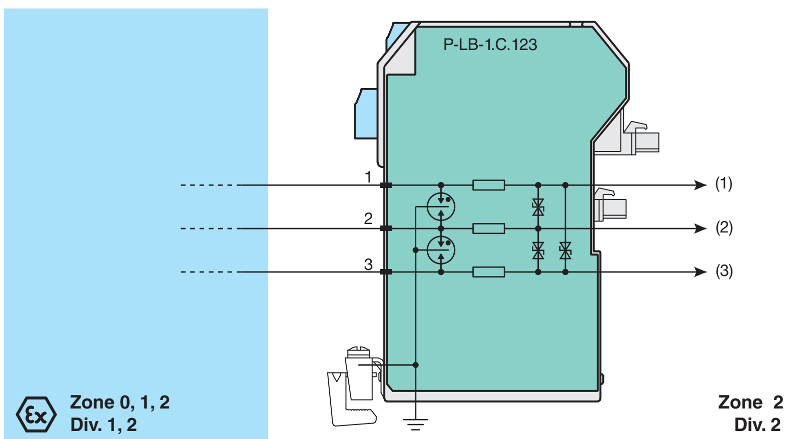
Technical data

Signal lines	
Connection	terminals 1, 2, 3
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Signal lines	
Connection	terminals 1, 2, 3; 4, 5, 6
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **2-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 1, 2, 3, 4, 5 and 6 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

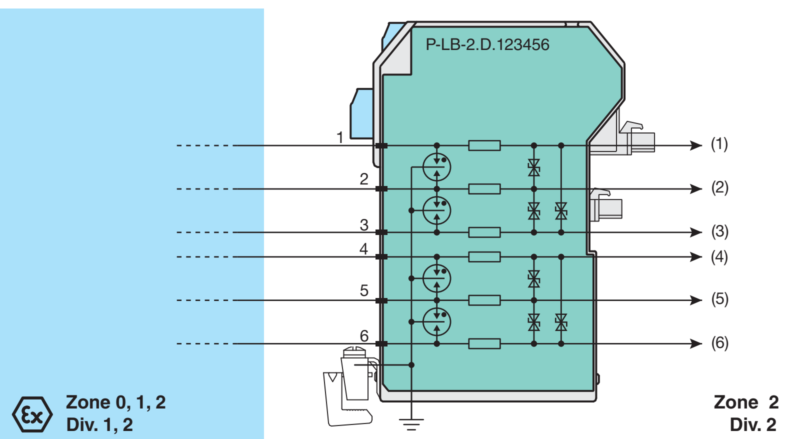
By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

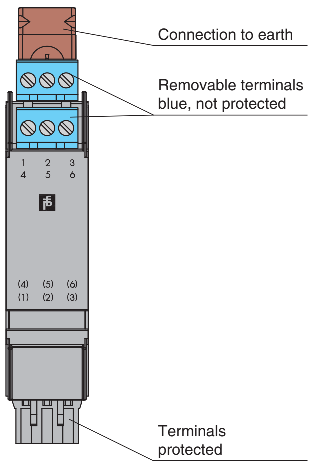
For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams



Front view



Surge Protection
DIN Rail Mount Modules
Field Mount Modules
Plug-In Modules
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

P-LB-1.E.23

Features

- **1-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 2 and 3 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

For additional information, refer to the manual and www.pepperl-fuchs.com.

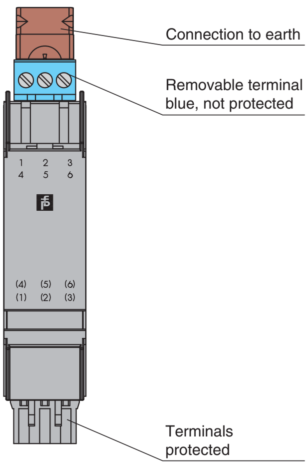
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

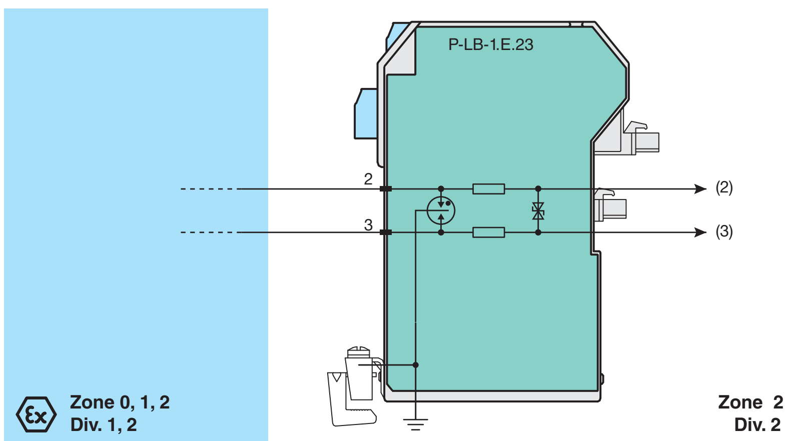
Technical data

Signal lines	
Connection	terminals 2, 3
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams

Front view





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Technical data

Signal lines	
Connection	Terminals 2, 3; 5, 6
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **2-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 2, 3, 5 and 6 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

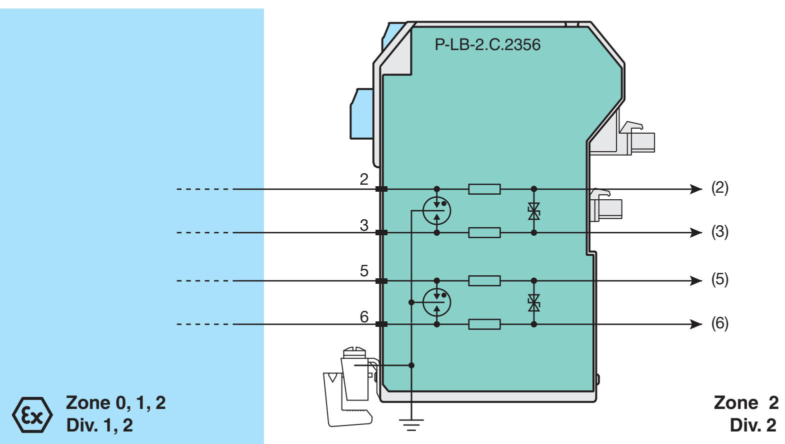
By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

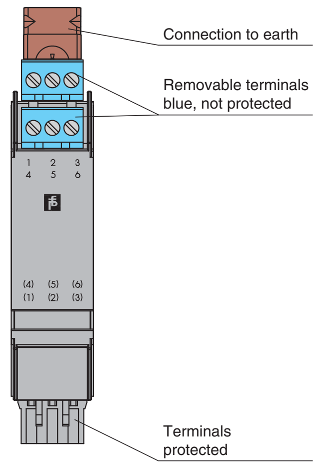
For additional information, refer to the manual and www.pepperl-fuchs.com.

Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **1-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 1, 2, 3 and 4 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

The end digits of the model designation correspond to the protected terminals of the respective KF module.

For additional information, refer to the manual and www.pepperl-fuchs.com.

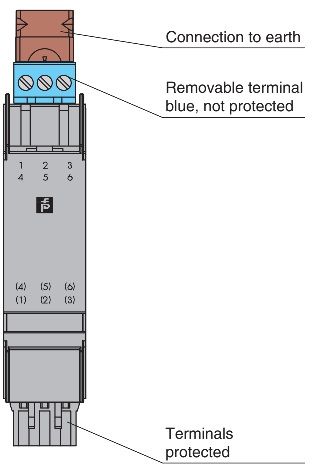
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

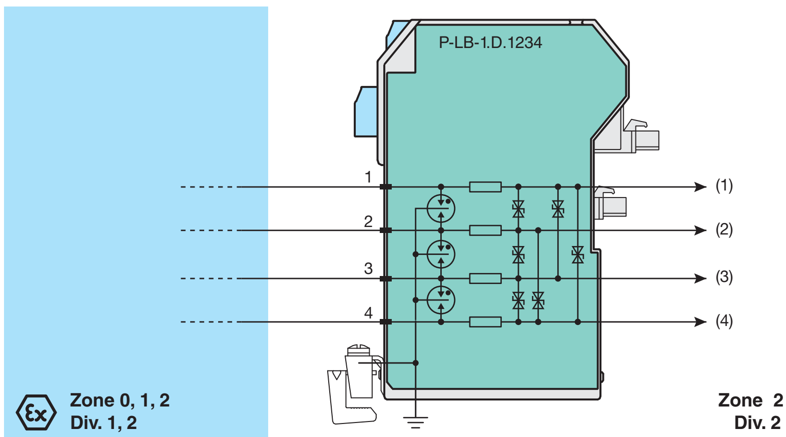
Technical data

Signal lines	
Connection	terminals 1, 2, 3, 4
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Diagrams

Front view





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Technical data

Signal lines	
Connection	terminals 1, 2, 3, 6
Rated voltage	≤ 30 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 70 g
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)
Data for application in connection with Ex-areas	see page 522 for entity parameters
EC-Type Examination Certificate	PTB 02 ATEX 2044
Group, category, type of protection	Ex II (1)G [EEx ia] IIC
CSA approval	
Control drawing	116-0187 (cCSAus)

Features

- **1-channel**
- **Plugs directly in to field side of KF modules**
- **Analog or digital signal inputs**
- **Surge protection up to 10 kA**
- **Protects leads 1, 2, 3 and 6 of KF modules**
- **Uninterruptable operation (auto reset)**

Function

This Surge Protection Barrier is designed for use with K-System (KF modules).

By simply snapping the barriers into a standard KF module, the modules are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.). This is achieved by diverting the transient current to ground and limiting the signal line voltage to a safe level for the duration of the surge.

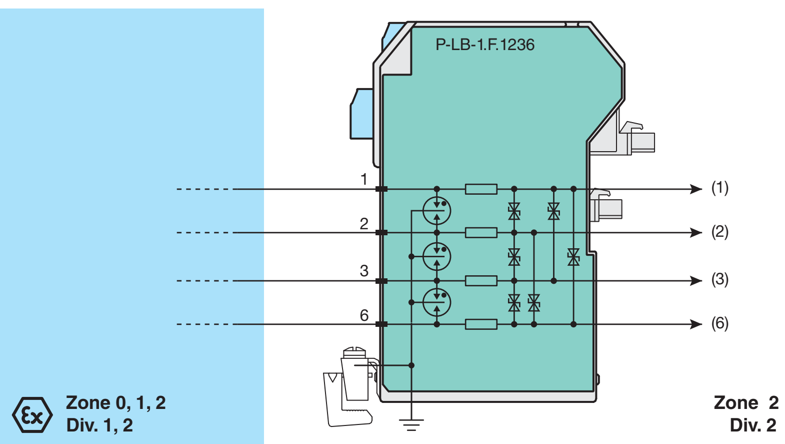
The end digits of the model designation correspond to the protected terminals of the respective KF module.

For additional information, refer to the manual and www.pepperl-fuchs.com.

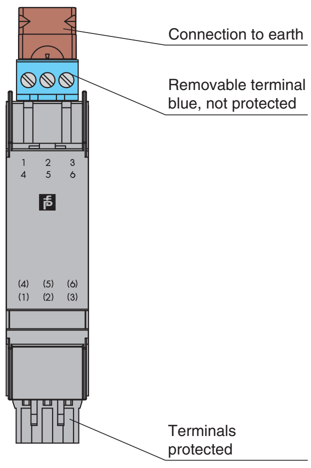
Note: Surge Protection Barriers must always be connected to a solid and effective ground and be at the same equipotential level as the instrument it is protecting. The ground system must comply with all applicable regulations.

Surge Protection
DIN Rail Mount Modules
Field Mount Modules
Plug-In Modules
Accessories

Diagrams



Front view



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ATEX Entity Parameters

Model Number	Terminals	U_i (V)	I_i (mA)
K-LB-1.30	1, 2	30	250
K-LB-2.30	1, 2; 3, 4	30	250
K-LB-1.6	1, 2	6	250
K-LB-2.6	1, 2; 3, 4	6	250
K-LB-1.30G	1, 2	30	250
K-LB-2.30G	1, 2; 3, 4	30	250
K-LB-1.6G	1, 2	6	250
K-LB-2.6G	1, 2; 3, 4	6	250
FN-LB-I	red, black	50	–
FP-LB-I	red, black	50	–
FS-LB-I	red, black	50	–
P-LB-1.A.13	1, 3	30	250
P-LB-2.A.1346	1, 3; 4, 6	30	250
P-LB-1.B.12	1, 2	30	250
P-LB-2.B.1245	1, 2; 4, 5	30	250
P-LB-1.C.123	1, 2, 3	30	250
P-LB-2.D.123456	1, 2, 3; 4, 5, 6	30	250
P-LB-1.E.23	2, 3	30	250
P-LB-2.C.2356	2, 3; 5, 6	30	250
P-LB-1.D.1234	1, 2, 3, 4	30	250
P-LB-1.F.1236	1, 2, 3, 6	30	250

CSA Entity Parameters

Model Number	Terminals	V_{max} (V)	I_{max} (mA)
K-LB-1.30	1, 2	40	250
K-LB-2.30	1, 2; 3, 4	40	250
K-LB-1.6	1, 2	40	250
K-LB-2.6	1, 2; 3, 4	40	250
K-LB-1.30G	1, 2	40	250
K-LB-2.30G	1, 2; 3, 4	40	250
K-LB-1.6G	1, 2	40	250
K-LB-2.6G	1, 2; 3, 4	40	250
FN-LB-I	red, black	48	250
FP-LB-I	red, black	48	250
FS-LB-I	red, black	48	250
P-LB-1.A.13	1, 3	40	250
P-LB-2.A.1346	1, 3; 4, 6	40	250
P-LB-1.B.12	1, 2	40	250
P-LB-2.B.1245	1, 2; 4, 5	40	250
P-LB-1.C.123	1, 2, 3	40	250
P-LB-2.D.123456	1, 2, 3; 4, 5, 6	40	250
P-LB-1.E.23	2, 3	40	250
P-LB-2.C.2356	2, 3; 5, 6	40	250
P-LB-1.D.1234	1, 2, 3, 4	40	250
P-LB-1.F.1236	1, 2, 3, 6	40	250

Edition 908837 (US) / 208599 (EU) 11/2010

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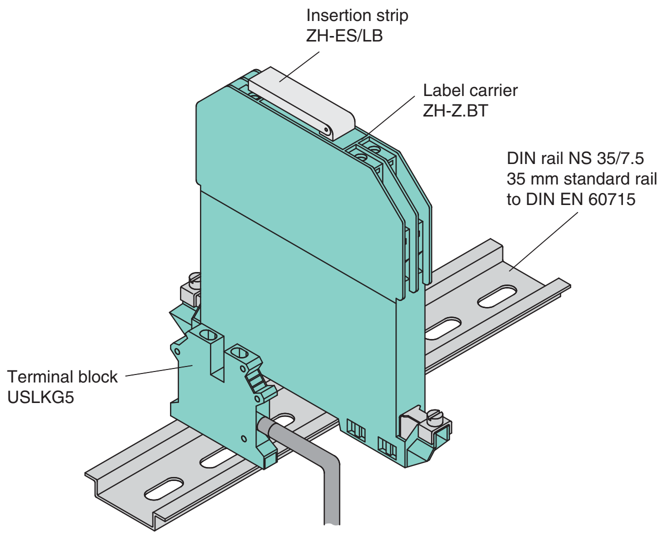
35 mm DIN Rail
NS 35/7.5
Insertion Strip
ZH-ES/LB
Label Carrier
ZH-Z.BT
Terminal Block
USLKG5

Function

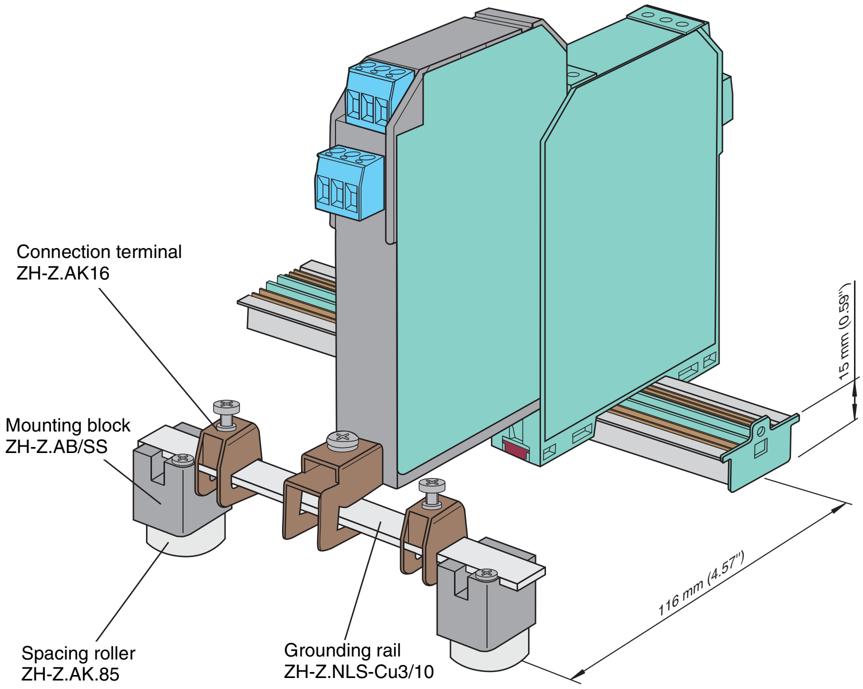
DIN rail mount module grounding



Mounting Block
ZH-Z.AB/SS
Connector
ZH-Z.AK16
Spacing Roller
ZH-Z.AR.85
Grounding Rail
ZH-Z.NLS-Cu3/10

Function

Plug-in module grounding



Notes

When mounting on 35 mm DIN rail:

- installation height 15 mm: spacing roller ZH-Z.AR.85
- installation height 7.5 mm: no spacing roller necessary

Keep the drilling distance of 116 mm between center DIN rail and center grounding bar.

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HART

HART Interface Solutions

Edition 908837 (US) / 208599 (EU) 11/2010

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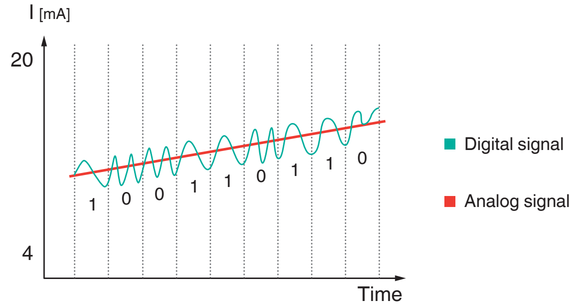
PROTECTING YOUR PROCESS

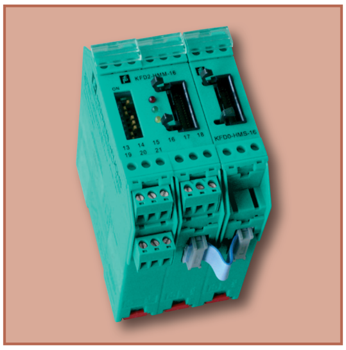
At the core of HART Interface Solution (HIS), the HART Multiplexer acts like a gateway device, routing communications between the maintenance workstation PC and the HART field devices. Pepperl+Fuchs supports several different platforms (K-System, H-System).

Operating principle

HART stands for **H**ighway **A**ddressable **R**emote **T**ransducer. The HART protocol makes use of the Bell 202 **F**requency **S**hift **K**eying (FSK) standard to superimpose digital communication signals at a low level on top of the 4 mA ... 20 mA control signal. This enables two-way field communication to take place and makes it possible for additional information beyond the normal process variable to be communicated to and from a SMART field instrument.

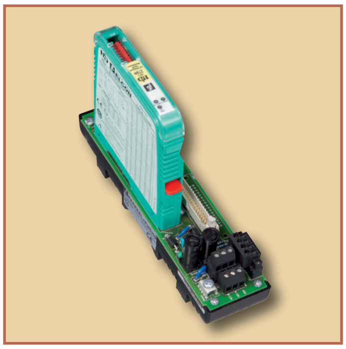


K-System 526



- Master/slave system for up to 7,936 field devices
- Compact design, DIN rail mounting
- Network up to 31 Multiplexers via RS 485
- Compatible with operating and asset management software (AMS, PDM, FieldCare, **PACT***ware***™**)
- Suitable for loop integrity up to SIL3

H-System 550



- Stand-alone Multiplexer for up to 992 field devices
- Termination Board solution
- Network up to 31 Multiplexers via RS 485
- Compatible with operating and asset management software (AMS, PDM, FieldCare, **PACT***ware***™**)
- Suitable for loop integrity up to SIL3

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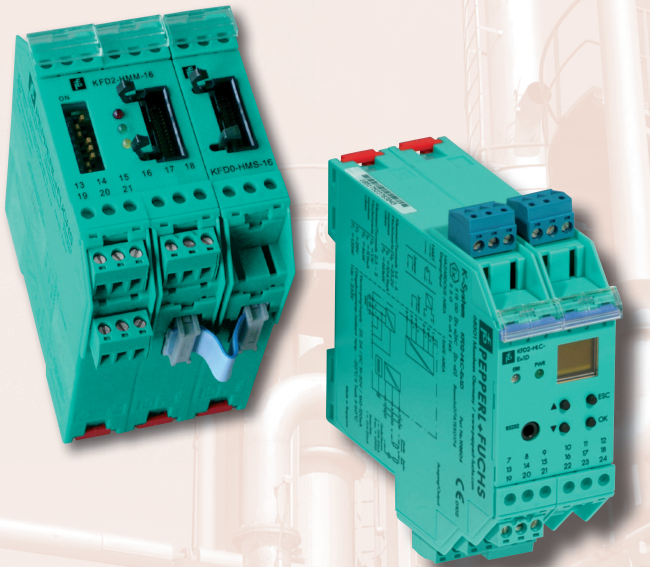
HART
K-System
HART Multiplexers
Termination Boards
HART Loop Converters
Accessories

HART K-System



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Introduction

The K-system provides single- and multi-channel solutions for HART applications.

The K-System HART Multiplexer works as a master/slave system and when fully occupied can drive up to 256 HART field devices. Up to 15 additional slaves can be connected to the master, each of which can support another 16 channels. This allows up to 7936 field devices to be addressed through one RS 485 interface (31 addresses x 256 field devices).

The HART Loop Converter converts the HART communication signal of a field device in analog values or trip points.

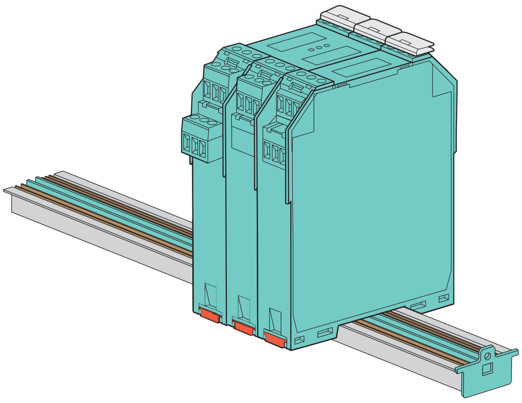

Figure 1 K-System HART communication

Components

HART Multiplexer

HART Multiplexer Master

- HART field device inputs
- 16 field devices and up to 15 KFD0-HMS-16 slave units can be connected
- Configured using **PACT*ware*™**
- Power supply via Power Rail

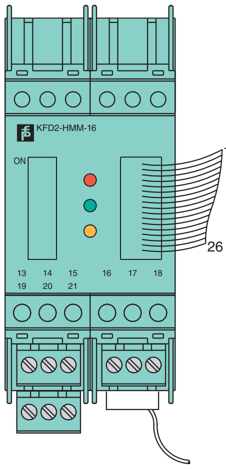

Figure 2 40 mm housing (KFD2-HMM-16)

HART Multiplexer Slave

- Compact 20 mm housing
- HART field device inputs
- Up to 16 field devices can be connected
- Used with HART Multiplexer Master KFD2-HMM-16

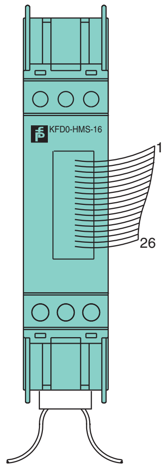

Figure 3 20 mm housing (KFD0-HMS-16)

HART Termination Boards

The wiring of the single I/O components of the HART product portfolio is done via a Termination Board. Since a wide variety of Termination Boards are available, only the basic wiring options are described here.

Field devices and DCS are connected via Termination Boards. The Termination Boards are designed to establish the connection of a KFD*-HM*-16 HART Multiplexer to up to 16 field devices.

More detailed information to connection layout can be found in the data sheet of the according Termination Board.

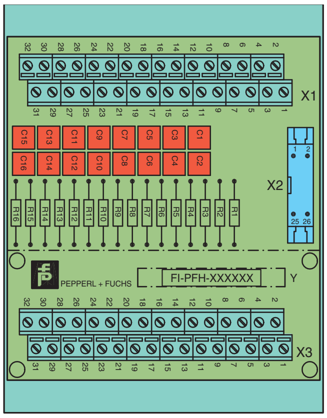

Figure 4 HART Termination Board

HART Loop Converter

HART Loop Converters use the full potential of new and existing multivariable HART field devices.

- HART input with transmitter supply
- One field device can be connected
- Up to 4 relay outputs
- 3 analog outputs 4 mA ... 20 mA
- Sink and source mode output
- Configurable by keypad

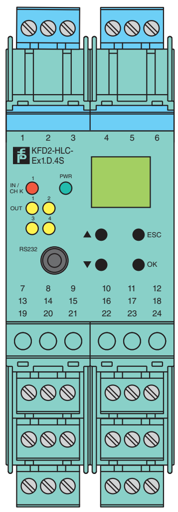

Figure 5 40 mm housing (KFD2-HLC-Ex1.D.4S)

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Topology

HART Multiplexer

A wide variety of Termination Boards are available. For additional information about topology, refer to HART Multiplexer System manual.

Multiplexer Master and Slaves are connected to Termination Boards, which transmits the control signals via screw terminals. In this case the Termination Board provides a parallel connection to the Multiplexer or Slave. This assembly method is completely independent of DCS.

For hazardous location applications, the intelligent field device must be isolated from the safe area via a K-System isolator. The isolated signals are then connected to Termination Boards, where a parallel connection to the Multiplexer or Slave is made via a 26-pin ribbon cable.

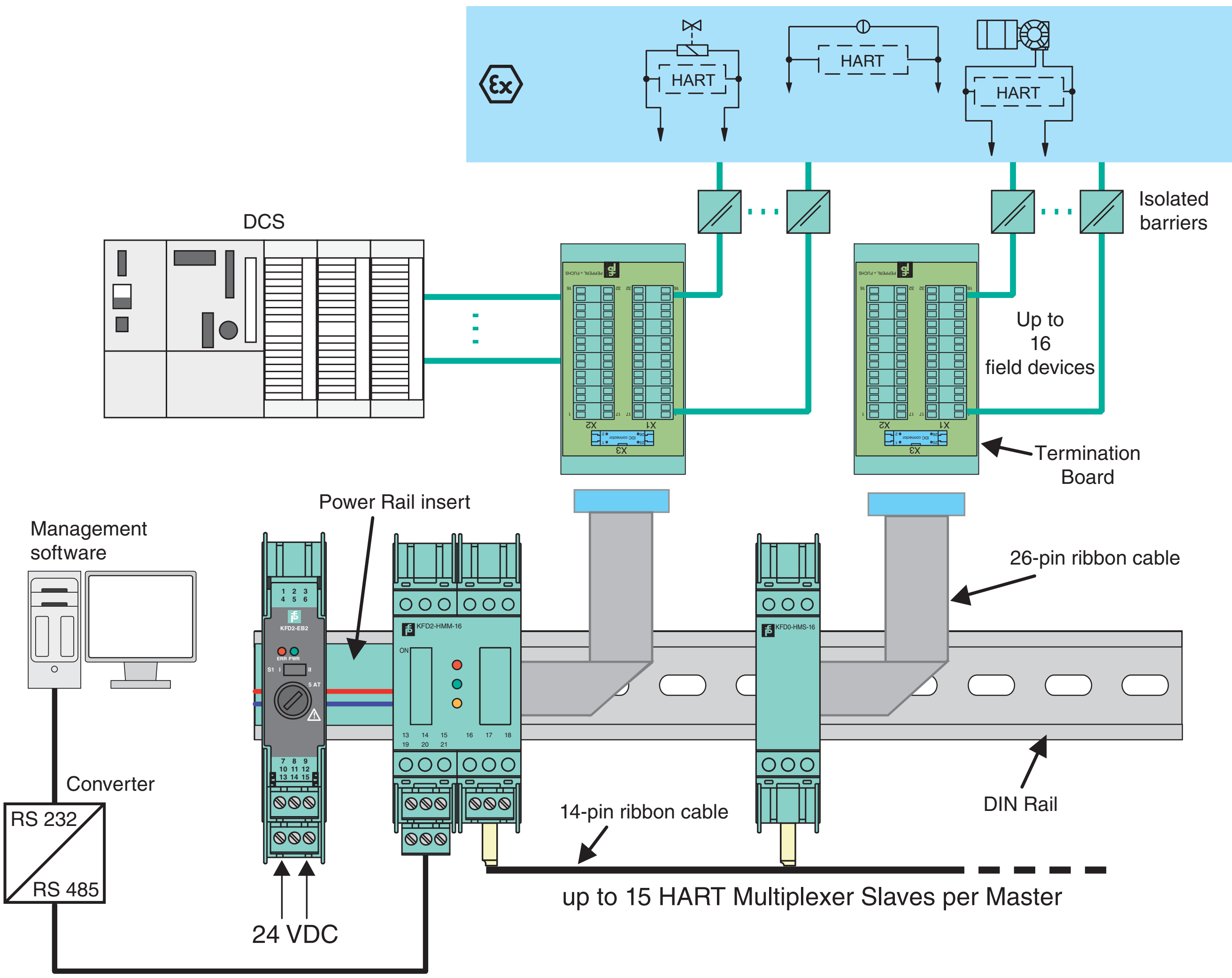

Figure 6 Example of HART Interface topology

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HART Loop Converter

The HART Loop Converter has an active and passive input for the field device. The active input can be used for the transmitter supply. When using the passive input (passive mode), the HLC connected in parallel to the existing field circuit and performs the communication.

Active input

Transmitter supply

The active input is used for supply of a transmitter. The measured value is transmitted via the HART communication not via the 4 mA ... 20 mA signal. The field device (transmitter) is connected to terminals 1(+) and 3(-). The terminals 4 and 5 are jumpered.

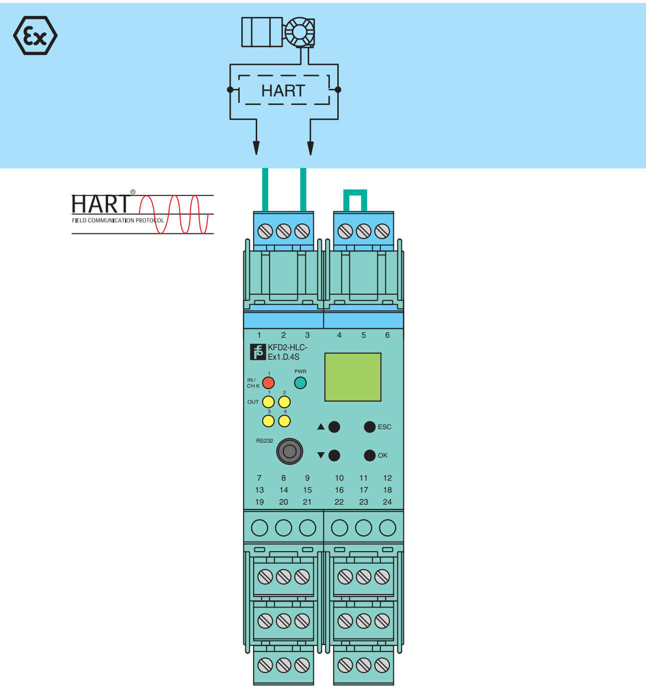

Figure 7 Signal transfer with HART Loop Converter (HLC) – active mode

Passive input

Connection to existing field circuit

The HART Loop Converter can be connected in parallel to an existing, externally-powered field circuit. The field circuit is connected to terminals 2(+) and 3(-).

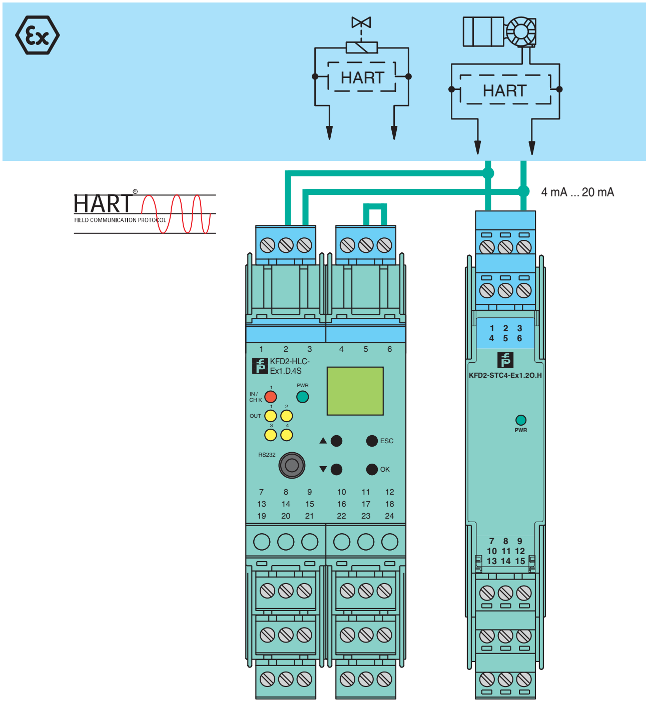

Figure 8 Signal transfer with HART Loop Converter (HLC) – connection to existing field circuit

Connection to field device with active current output

If the HART Loop Converter is connected to an active current source of a 3-wire or 4-wire field device, in addition to the connection to terminals 2(+) and 3(-), terminals 5 and 6 should be jumpered.

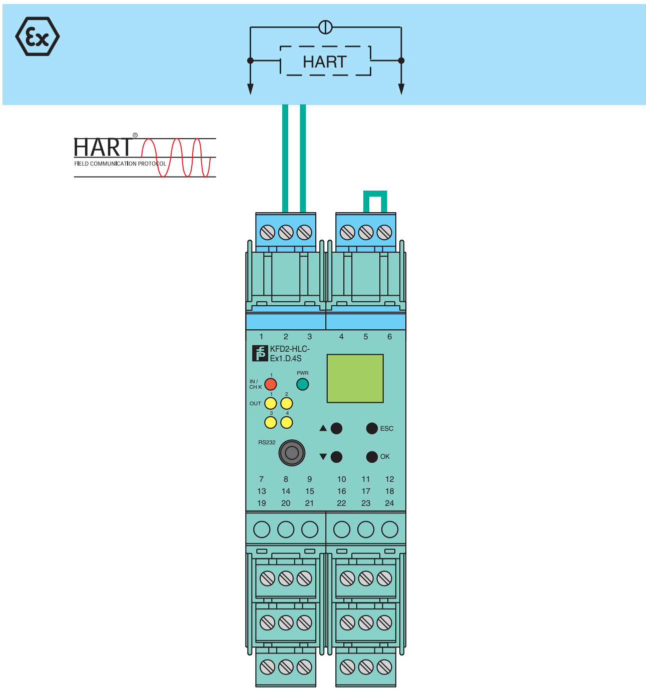

Figure 9 Signal transfer with HART Loop Converter (HLC) – connection to field device with active current source

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Mounting and supply

The HIS devices of K-System are mounted on a 35 mm DIN rail acc. to EN 60715. To reduce wiring and installation costs, Power Rail is the optimum solution.

Low heat dissipation allows vertical or horizontal mounting.

Power Rail

The Power Rail is a plastic insert into a standard DIN rail and contains two leads that deliver power to the modules. Power is sent through the rail by a power feed module that delivers 24 V DC at 4 A. The module uses a 5 A fuse to protect the barriers. The Power Rail virtually eliminates the risk of wiring faults and facilitates easy expansion. Power Rail is available in two versions:

- UPR-03: 3-lead version supplies two leads for power and one lead for error signal
- UPR-05: 5-lead version supplies two leads for power, one lead for error signal and two leads for serial data exchange.

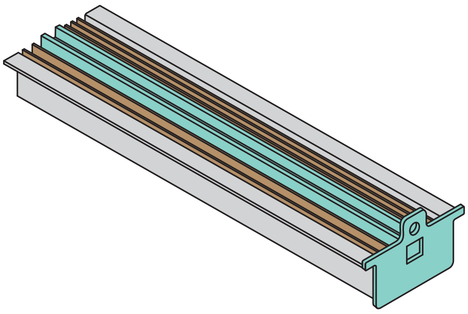

Figure 10 Universal Power Rail UPR-05

Mounting on Power Rail

As shown in the figure, the isolation modules are snapped onto the Universal Power Rail in a vertical downward movement.

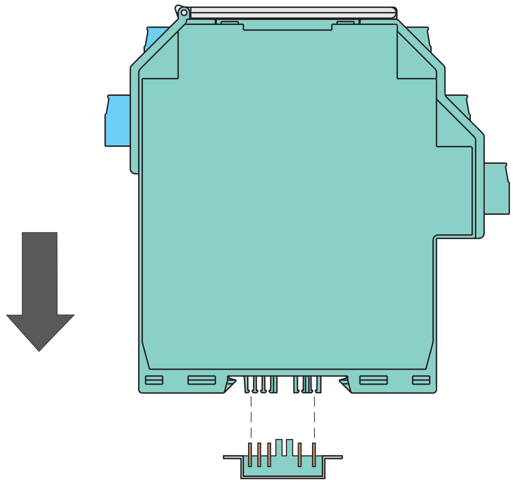

Figure 11 Proper K-System mounting

CORRECT: Device snapped on vertically.

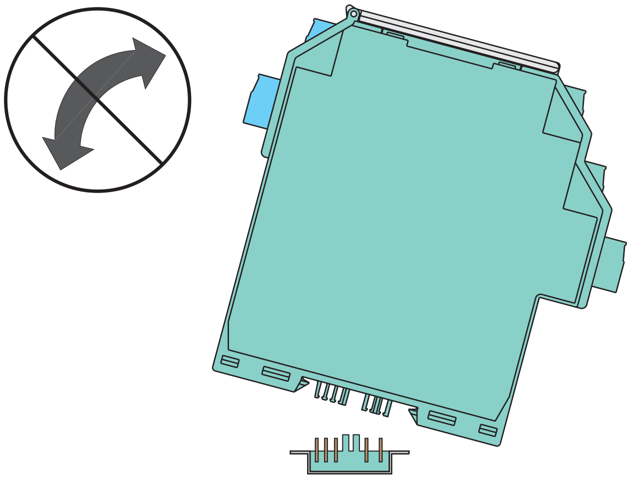

Figure 12 Improper K-System mounting

INCORRECT: Device snapped on from the side.

Mounting the Termination Board

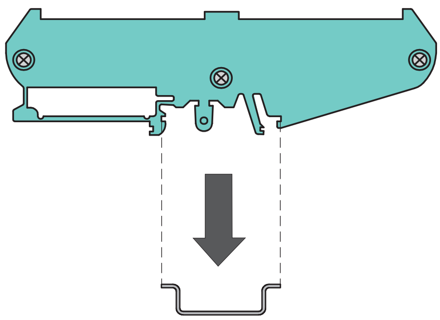

Figure 13 Termination Board mounting on DIN rail

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Conventional power supply without Power Rail

Conventional power supplies create complicated and expensive wiring systems. After all isolated barriers are connected, there is a significant amount of wiring and more wiring must be added for features such as lead breakage and short-circuit monitoring.

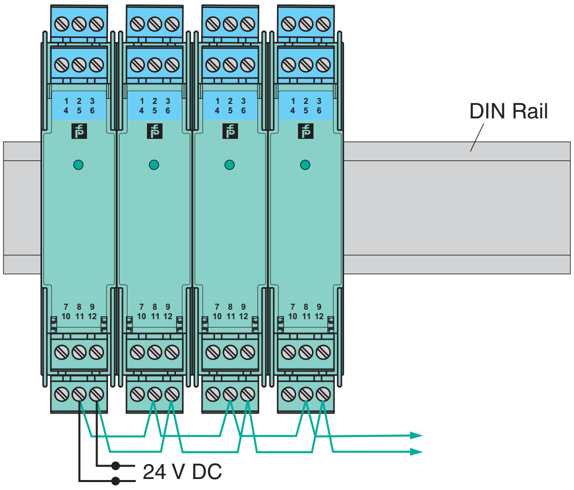

Figure 14 Conventional installation

Power supply with Power Rail

The Pepperl+Fuchs Power Rail eliminates wiring hassles and reduces expense. The power feed module mounts on the Power Rail for easy and reliable distribution of power to all connected isolated modules. This method eliminates all of the parallel power wiring necessary on a conventional installation without Power Rail.

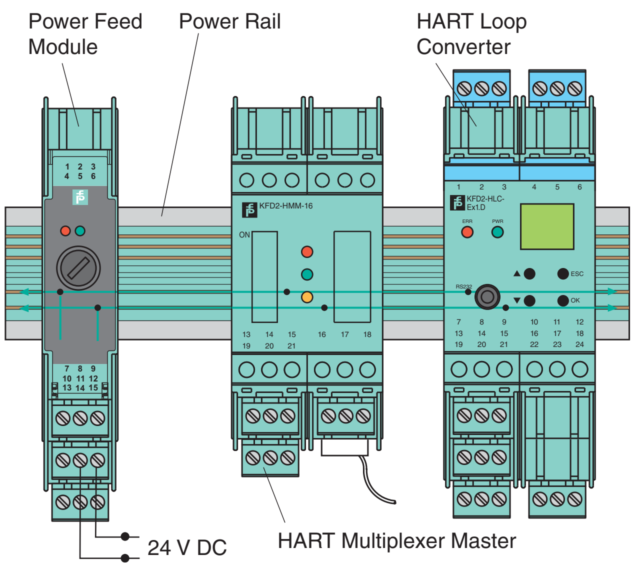

Figure 15 Power Rail installation

For additional information about connection, refer to system description Isolated Barriers K-System.

Safety information

The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

These devices are used in C&I technology for the galvanic isolation of C&I signals, such as 20 mA and 10 V unit signals, and also for the adaptation and/or standardization of signals.

The devices are not suitable for the isolation of signals in power engineering, unless this is specifically referred to in the respective data sheet.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Installation and commissioning

Commissioning and installation must be carried out by specially trained and qualified personnel only.

Installation of the interface devices in the safe area

The devices are constructed to satisfy the IP20 protection classification and must be protected from adverse environmental conditions such as water spray or dirt exceeding the pollution degree 2.

The devices must be installed outside the hazardous area!

Installation and commissioning of the interface devices within Zone 2/Div. 2 of the hazardous area

Only devices with the corresponding manufacturer's Declaration of Conformity or separate certificate of conformity can be installed in Zone 2/Div. 2.

The individual data sheets indicate whether these conditions are met.

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For US and Canada installations, in Zone 2/Div. 2 follow the NEC and CEC wiring methods. The enclosure must be able to accept Zone 2/Div. 2 wiring methods. The referenced product certification control drawing must be observed.

For all other applications, the devices should be installed in a switch or junction box that:

- meets at least IP54 in accordance to EN 60529.
- meets to the requirements of resistance to light and resistance to impact according to EN 60079-0/ IEC 60079-0.
- meets to the requirements of thermal endurance according to EN 60079-15/IEC 60079-15.
- must not cause ignition danger by electrostatic charge during intended use, maintenance and cleaning.

The EC-Type Examination Certificates, standard certificates/approvals or the manufacturer's Declaration of Conformity should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are not allowed.

Isolation coordinates for installations for galvanic isolation according to EN 50178 and EN 61140

The devices of the K-System are electronic equipment for use in secluded electrical operating sites where only skilled personnel or electrically instructed personnel will have admission or access.

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

For additional details, see data sheets.

Technical data

Electrical data

For electrical data, see data sheets.

Mechanical data

Mounting

- Snap-on 35 mm standard DIN rail acc. to EN 60715. Can be mounted horizontally or vertically, side by side.
- Panel mount: The lugs on the base of the modules must be extended and used for mounting purposes with 3 mm screws.
- K-MS mounting base for screw attachment

Mass

Termination Boards: 200 g to 400 g

Modules: 100 g to 250 g

Housing material

Polycarbonate (PC)

Dimensions

Housing drawings please refer to the appendix.

Protection degree

Modules: IP20 acc. to EN 60529

Connection

- Removable connector with integrated self-opening device terminals for leads of up to a max. of 1 x 2.5 mm^2 (14 AWG)
- Signal connection via ribbon cable

Labeling

place for labeling on the front side, label: 8 mm x 18 mm

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Ambient conditions

Ambient temperature

Modules: -20 °C to 60 °C (-4 °F to 140 °F)

Termination Boards: 0 °C to 55 °C (32 °F to 131 °F)

Storage temperature

-40 °C to 90 °C (-40 °F to 194 °F)

Reference conditions for adjustment

20 °C (68 °F)

Relative humidity

max. 95 % without moisture condensation

Vibration resistance

acc. to EN 60068-2-6, 10 Hz to 150 Hz, 1 g, high crossover frequency

Shock resistance

acc. to EN 60068-2-27, 15 g, 11 ms, half-sine

Conformity with standards and directives

General

- EMC acc. to NAMUR NE21 and EN 61326
- LEDs acc. to NAMUR NE44
- Software acc. to NAMUR NE53
- Switch-on pulse suppression
- HART Multiplexer Master KFD2-HMM-16:
  - Supply voltage 20 V DC to 30 V DC via Power Rail or supply terminals
  - Fault signals via Power Rail
- HART Multiplexer Slave KFD0-HMS-16: no additional power supply necessary
- Safety devices acc. to VDE 0660 T.209, AK acc. to DIN 19250

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HART Multiplexers

Model Number	Channels	Master	Slave	Power Rail	SIL*	Zone 2/Division 2 Mounting	Page
KFD2-HMM-16	16	■		■	3	■	537
KFD0-HMS-16	16		■		3	■	538

* see also table Termination Boards

Termination Boards

Model Number	Channels	Communication Resistor	Capacitive Communication Isolation	Parallel Connection	HART Multiplexer Connection	SIL (together with KFD*-HM*-16)	Zone 2 Mounting	Page
FI-DO-Y37023	16			■	■	2	■	539
FI-DO-R-Y41610	16	■			■	2		540
FI-DO-R-Y49092	16			■	■	2		541
FI-PFH-108874	16		■	■	■	3	■	542
FI-PFH-110469	16	■	■		■	3	■	543
FI-PFH-127720	16	■	■		■	3	■	544

HART Loop Converters

Model Number	Channels	Input (Field)		Output (Control System)		Supply 24 V DC	SIL	Zone 2/Division 2 Mounting	Page
		Signal	Transmitter Supply	0/4 mA ... 20 mA (Active/Passive)	Relay				
KFD2-HLC-Ex1.D	1	HART	■	3		■		■	545
KFD2-HLC-Ex1.D.2W	1	HART	■	3	2	■		■	546
KFD2-HLC-Ex1.D.4S	1	HART	■	3	4	■		■	547

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Accessories

Model Number	Description	Page
HISHF-AI-02	HART Filter	548
HISHF-AO-02	HART Filter	548
K-22µ	HART Filter	549
K-HM14	HART Connection Cable with Connectors (Master – Slave)	549
K-HM26	HART Connection Cable with Connectors (Master/Slave – Termination Board)	549

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Technical data

Supply	
Rated voltage	20 ... 32 V DC typical at 100 mA
Power consumption	≤ 3 W
HART signal channels (intrinsically safe)	
HART signal channels	
Connection	26-pin flat cable for analog connections 14-pin flat cable for master-slave connection between KFD2-HMM-16 and KFD0-HMS-16
Leakage current	< 3 µA at -20 ... 85 °C (-4 ... 185 °F)
Terminating resistor	external 230 ... 500 Ω standard (up to 1000 Ω possible)
Output voltage	≥ 400 mV_{pp} (with the terminator resistance specified above)
Output resistance	100 Ω or smaller, capacitive coupling
Input impedance	according to HART specification
Input voltage range	0.08 ... 4 V_{pp}; typ. ± 5.2 V as local reference
Interface	
Transfer rate	9600, 19200, or 38400 Bit/s (selectable with DIL switch (2 and 3) by the user)
Type	RS 485 2-wire multidrop
Address selection	One of 31 possible addresses selectable per DIL switch (4 ... 8)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 250 g
Dimensions	40 x 107 x 115 mm (1.6 x 4.2 x 4.5 in), housing type C1
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X

Features

- **16-channel**
- **24 V DC supply (Power Rail)**
- **HART field device inputs**
- **Up to 15 KFD0-HMS-16 slave units can be connected**
- **Up to SIL3 acc. to IEC 61508**

Function

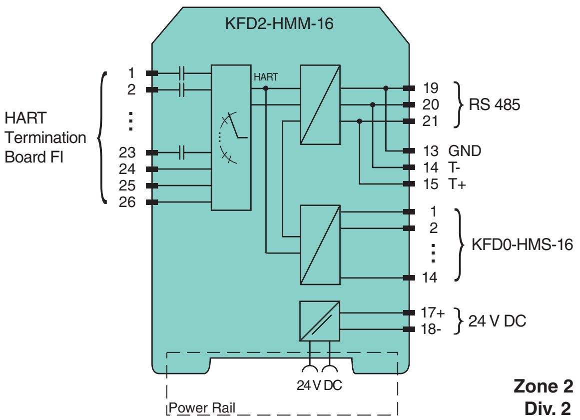
This HART Multiplexer Master operates up to 256 analog field instruments. The built-in slave unit in the HART master operates the first 16 field instruments. If more than 16 field instruments are required, up to 15 additional HART Multiplexer Slaves KFD0-HMS-16 can be connected.

The slave units are connected to the master with a 14-pin flat cable. The connector for the ribbon cable is found on the same housing side as the connectors for the interface and the power supply.

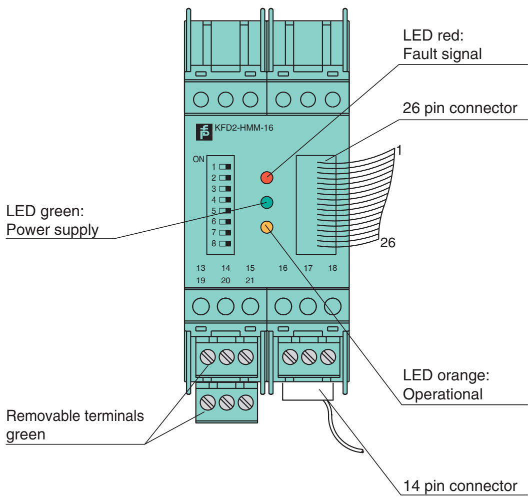
The analog signals are separately linked to a termination board via a 26-pin flat cable for each unit. Sixteen leads are reserved for the HART signal of the analog measurement circuits. The remaining 10 leads are sent to ground.

This unit is designed with removable terminals and can be connected to the Power Rail.

Diagrams



Front view



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Features

- **16-channel**
- **No external power required**
- **HART field device inputs**
- **Used with HART Multiplexer Master KFD2-HMM-16**
- **Up to SIL3 acc. to IEC 61508**

Function

This HART Multiplexer Slave operates up to 16 analog field instruments. It can be operated only with the HART Multiplexer Master KFD2-HMM-16 and is powered by the master across a 14-pin flat cable connection.

Up to 15 slaves can be connected to the master.

The slave address is set with a 16-position rotary switch (addresses 1 ... 16). If only one slave is connected to the master, then the slave address should be 1. If multiple slaves are connected, slaves must be assigned addresses in ascending order.

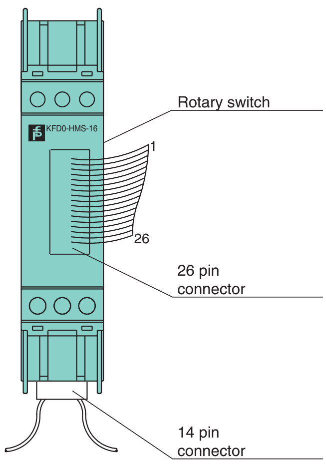
The analog signals are fed into the slave by means of a 26-pin flat cable. Sixteen leads are reserved for the HART signal of the analog measurement circuits. The remaining 10 leads are assigned to ground.

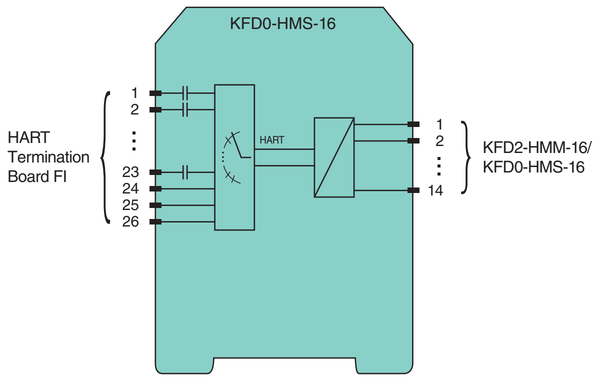
Technical data

Supply	
Connection	via 14-channel flat cable form master KFD2-HMM-16
HART signal channels (intrinsically safe)	
HART signal channels	
Connection	26-pin flat cable for analog connections 14-pin flat cable for master-slave connection between KFD2-HMM-16 and KFD0-HMS-16
Leakage current	< 3 µA at -20 ... 85 °C (-4 ... 185 °F)
Terminating resistor	external 230 ... 500 Ω standard (up to 1000 Ω possible)
Output voltage	400 mV_{pp} (with the terminator resistance specified above)
Output resistance	100 Ω or smaller, capacitive coupling
Input impedance	according to HART specification
Input voltage range	0.08 ... 4 V_{pp}; typ. ± 5.2 V as local reference
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 93 x 115 mm (0.8 x 3.7 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4 X

Diagrams

Front view





Zone 2
Div. 2

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Technical data

HART signal channels (intrinsically safe)	
HART signal channels	
Load resistor	no
Electrical isolation	
HART signal channels	no
Ambient conditions	
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Mechanical specifications	
Core cross-section	2.5 mm^2 (16 AWG)
Connection	field side: screw terminals control side: screw terminals multiplexer connection: 26-pin NFP-26A (Yamaichi)
Mass	approx. 200 g
Dimensions	67 x 50 x 126 mm (2.6 x 1.9 x 5 in)
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
Statement of conformity	PF 10 CERT 1617 X
Group, category, type of protection	Ex II 3G Ex nA II T4

Features

- **16-channel**
- **Connection board for K-System HART Multiplexer**
- **Interface for parallel connections**

Function

This HART Termination Board have 16 terminal blocks to connect up to 16 HART field devices.

It does not have a 250 Ω HART pick-up resistor built in and can be used only in applications that have a 250 Ω resistor in the DCS/PLC or I/O card. It does not come with terminal blocks for 4 mA ... 20 mA signal to DCS/PLC.

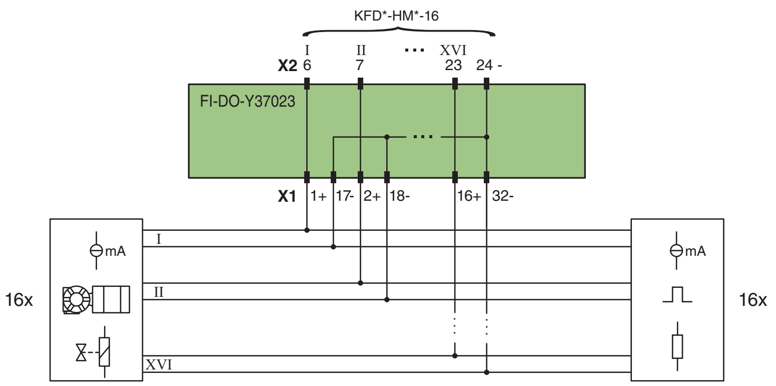
The Termination Board can be used for general-purpose applications or in conjunction with intrinsic safety barriers for hazardous applications.

A 26-pin flat cable K-HM26 is used for connection of each HART Multiplexers KFD*-HM*-16 to the Termination Board.

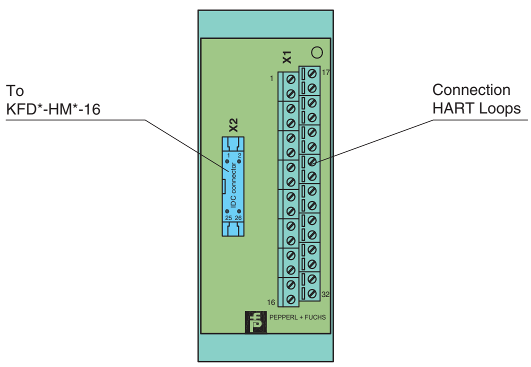
Other Termination Boards are available. Contact Pepperl+Fuchs for details.

HART
K-System
HART Multiplexers
Termination Boards
HART Loop Converters
Accessories

Diagrams



Front view



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Features

- **16-channel**
- **Connection board for K-System HART Multiplexer**
- **Interface for series connections**
- **Integrated 250 Ω resistor**

Function

This HART Termination Board have 16 terminal blocks to connect up to 16 HART field devices.

It has a 250 Ω HART pick-up resistor built in, and terminal blocks for the 4 mA ... 20 mA signal to the DCS/PLC.

The Termination Board can be used for general-purpose applications or in conjunction with intrinsic safety barriers for hazardous applications.

A 26-pin flat cable K-HM26 is used for connection of each HART Multiplexers KFD*-HM*-16 to the Termination Board.

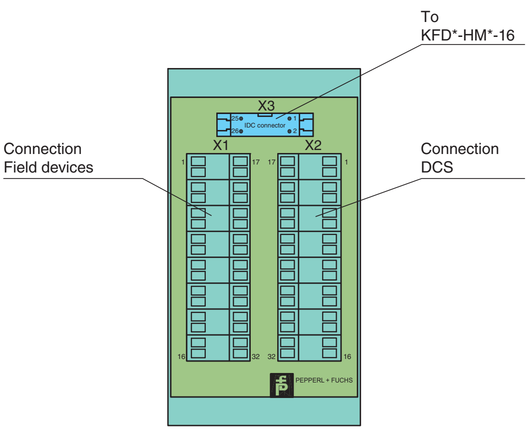
Other Termination Boards are available. Contact Pepperl+Fuchs for details.

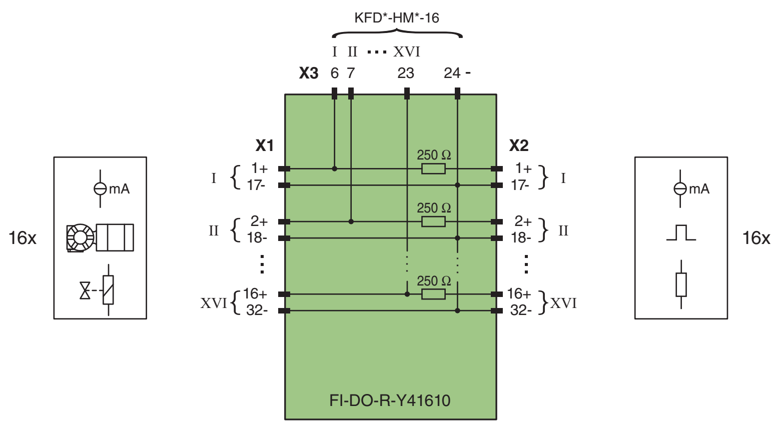
Technical data

HART signal channels (intrinsically safe)	
HART signal channels	
Load resistor	250 Ω
Electrical isolation	
HART signal channels	no
Ambient conditions	
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Mechanical specifications	
Core cross-section	2.5 mm^2 (16 AWG)
Connection	field side: screw terminals control side: screw terminals multiplexer connection: 26-pin NFP-26A (Yamaichi)
Mass	approx. 300 g
Dimensions	67 x 70 x 126 mm (2.6 x 2.8 x 5 in)
Mounting	DIN rail mounting

Diagrams

Front view





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Technical data

HART signal channels (intrinsically safe)	
HART signal channels	
Load resistor	no
Electrical isolation	
HART signal channels	no
Ambient conditions	
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Mechanical specifications	
Core cross-section	2.5 mm^2 (16 AWG)
Connection	field side: screw terminals control side: screw terminals multiplexer connection: 26-pin NFP-26A (Yamaichi)
Mass	approx. 300 g
Dimensions	67 x 70 x 126 mm (2.6 x 2.8 x 5 in)
Mounting	DIN rail mounting

Features

- **16-channel**
- **Connection board for K-System HART Multiplexer**
- **Interface for series connections**

Function

This HART Termination Board have 16 terminal blocks to connect up to 16 HART field devices.

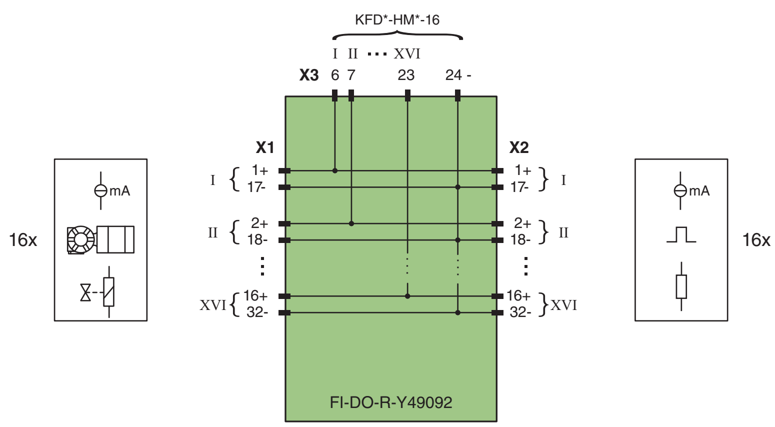
It does not have a 250 Ω HART pick-up resistor built in and can be used only in applications that have a 250 Ω resistor in the DCS/PLC or I/O card. It does not come with terminal blocks for 4 mA ... 20 mA signal to DCS/PLC.

The Termination Board can be used for general-purpose applications or in conjunction with intrinsic safety barriers for hazardous applications.

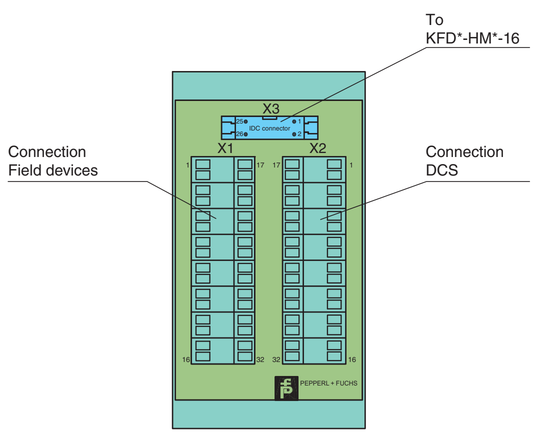
A 26-pin flat cable K-HM26 is used for connection of each HART Multiplexers KFD*-HM*-16 to the Termination Board.

Other Termination Boards are available. Contact Pepperl+Fuchs for details.

Diagrams



Front view



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Features

- **16-channel**
- **Connection board for K-System HART Multiplexer**
- **Interface for parallel connections**
- **Galvanic isolation of HART signal**

Function

This HART Termination Board have 16 terminal blocks to connect up to 16 HART field devices.

The connection board is connected in parallel into the field device loop. The HART signal is galvanically isolated via capacitors.

The Termination Board can be used for general-purpose applications or in conjunction with intrinsic safety barriers for hazardous applications.

A 26-pin flat cable K-HM26 is used for connection of each HART Multiplexers KFD*-HM*-16 to the Termination Board.

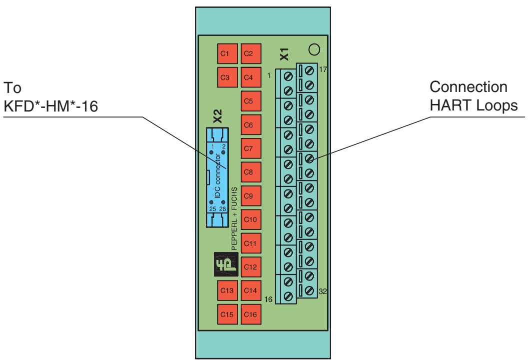
Other Termination Boards are available. Contact Pepperl+Fuchs for details.

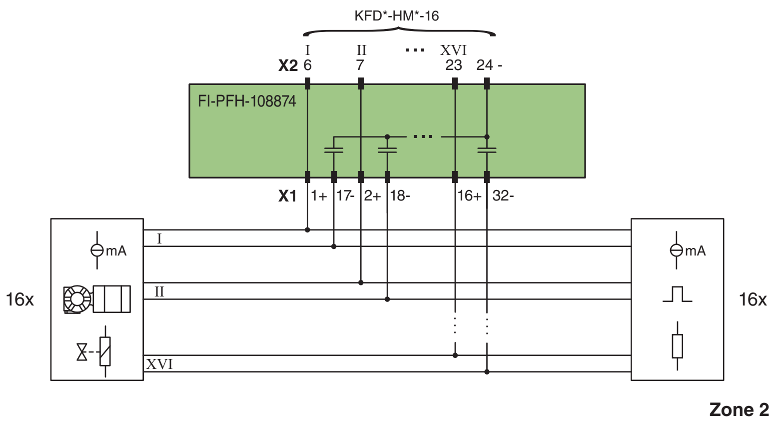
Technical data

HART signal channels (intrinsically safe)	
HART signal channels	
Load resistor	no
Electrical isolation	
HART signal channels	yes
Ambient conditions	
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Mechanical specifications	
Core cross-section	2.5 mm² (16 AWG)
Connection	field side: screw terminals control side: screw terminals multiplexer connection: 26-pin NFP-26A (Yamaichi)
Mass	approx. 200 g
Dimensions	67 x 50 x 126 mm (2.6 x 1.9 x 5 in)
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
Statement of conformity	PF 10 CERT 1617 X
Group, category, type of protection	Ex II 3G Ex nA II T4

Diagrams

Front view





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Technical data

HART signal channels (intrinsically safe)	
HART signal channels	
Load resistor	250 Ω
Electrical isolation	
HART signal channels	yes
Ambient conditions	
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Mechanical specifications	
Core cross-section	2.5 mm^2 (16 AWG)
Connection	field side: screw terminals control side: screw terminals multiplexer connection: 26-pin NFP-26A (Yamaichi)
Mass	approx. 400 g
Dimensions	67 x 100 x 126 mm (2.6 x 3.9 x 5 in)
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
Statement of conformity	PF 10 CERT 1617 X
Group, category, type of protection	Ⓔx II 3G Ex nA II T4

Features

- **16-channel**
- **Connection board for K-System HART Multiplexer**
- **Interface for series connections**
- **Integrated 250 Ω resistor**
- **Galvanic isolation of HART signal**

Function

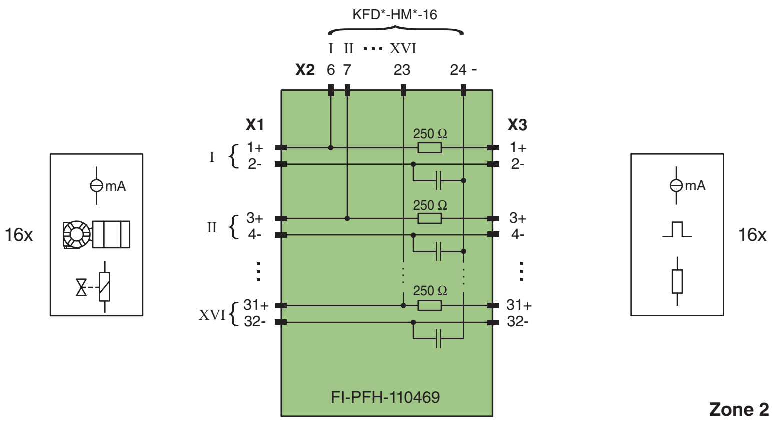
This HART Termination Board have 16 terminal blocks to connect up to 16 HART field devices.

It has a 250 Ω HART pick-up resistor and a ground capacitor built in. It also has terminal blocks for the 4 mA ... 20 mA signal to the DCS/PLC.

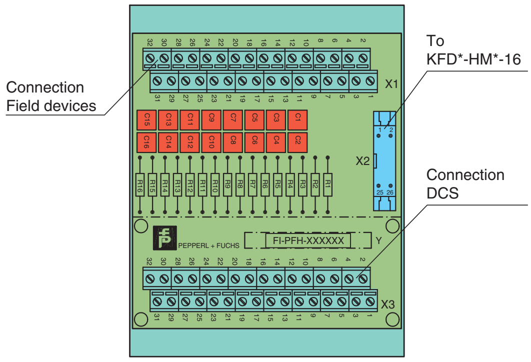
A 26-pin flat cable K-HM26 is used for connection of each HART Multiplexers KFD*-HM*-16 to the Termination Board.

Other Termination Boards are available. Contact Pepperl+Fuchs for details.

Diagrams



Front view



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Features

- **16-channel**
- **Connection board for K-System HART Multiplexer**
- **Interface for series connections**
- **Galvanic isolation of HART signal**

Function

This HART Termination Board have 16 terminal blocks to connect up to 16 HART field devices.

The connection board is connected serially into the field device loop to access the HART signal which is galvanically isolated via capacitors.

The Termination Board can be used for general-purpose applications or in conjunction with intrinsic safety barriers for hazardous applications.

A 26-pin flat cable K-HM26 is used for connection of each HART Multiplexers KFD*-HM*-16 to the Termination Board.

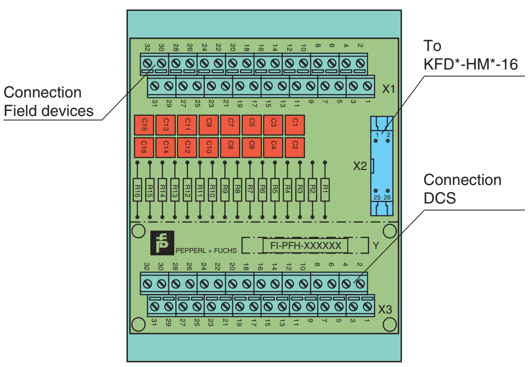
Other Termination Boards are available. Contact Pepperl+Fuchs for details.

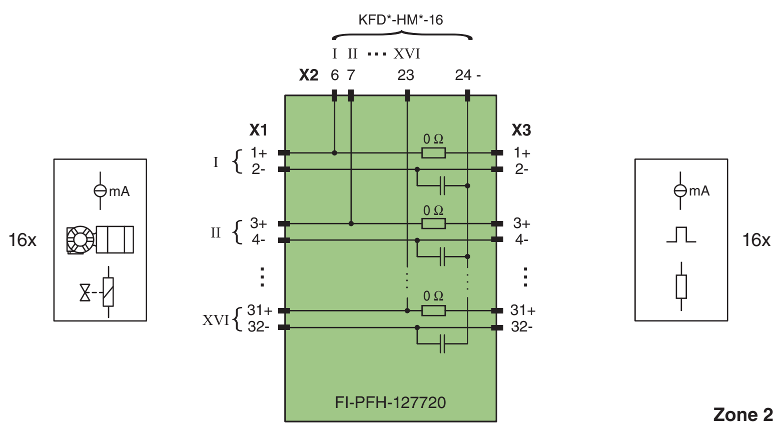
Technical data

HART signal channels (intrinsically safe)	
HART signal channels	
Load resistor	0 Ω
Electrical isolation	
HART signal channels	yes
Ambient conditions	
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Mechanical specifications	
Core cross-section	2.5 mm^2 (16 AWG)
Connection	field side: screw terminals control side: screw terminals multiplexer connection: 26-pin NFP-26A (Yamaichi)
Mass	approx. 400 g
Dimensions	67 x 100 x 126 mm (2.6 x 3.9 x 5 in)
Mounting	DIN rail mounting
Data for application in connection with Ex-areas	
Statement of conformity	PF 10 CERT 1617 X
Group, category, type of protection	Ⓔx II 3G Ex nA II T4

Diagrams

Front view





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Technical data

Supply	
Rated voltage	19 ... 30 V DC
Rated current	approx. 120 mA at 24 V DC
Power loss	2.3 W
Power consumption	2.9 W
Input	
Input signal	HART communication, transmitter supply
Open circuit voltage/short-circuit current	typ. 24 V/28 mA
Input resistance	250 Ω, 5 % (terminals 2, 3 and with jumper on 5, 6)
Available voltage	≥ 15.5 V at 20 mA, short-circuit proof
Output	
Output signal	analog
Current range	4 ... 20 mA, source or sink mode
Load	≤ 650 Ω, source mode
Voltage range	5 ... 30 V, sink mode from external supply
Collective error message	Power Rail and LED red
Fault signal	downscale I ≤ 2 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43) or hold measurement value
Other outputs	HART communicator on terminals 22, 24
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 07 ATEX 0174
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input HART with transmitter supply**
- **3 analog outputs 4 mA ... 20 mA**
- **Sink and source mode output**
- **Configurable by keypad**

Function

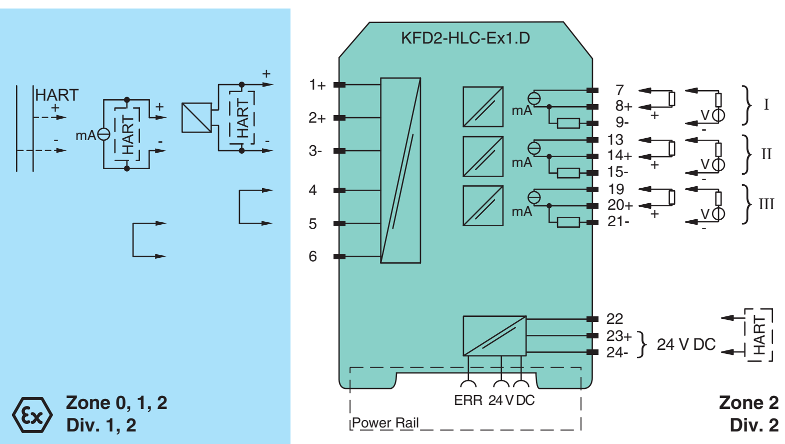
This isolated barrier is used for intrinsic safety applications. It is a HART loop converter that provides power to transmitters or can be connected to existing HART loops in parallel.

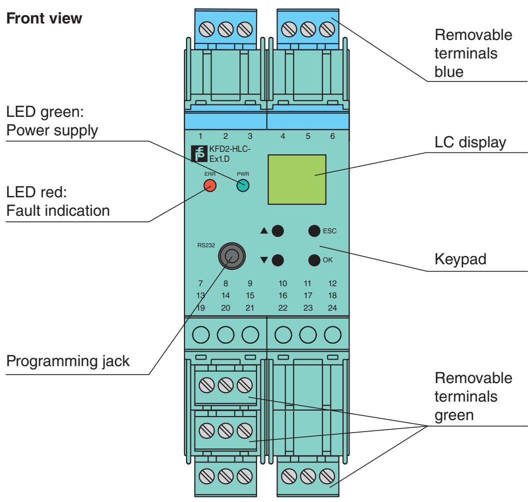
It is able to evaluate up to four HART variables (PV, SV, TV, QV). Of those four HART variables, the data contained in any three of them can be converted to three different 4 mA ... 20 mA current signals. These loop signals can be connected to display devices or analog inputs on the process control system/control system.

The unit is easily programmed by the use of a keypad located on the front of the unit.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input HART with transmitter supply**
- **2 relay outputs (changeover contacts)**
- **3 analog outputs 4 mA ... 20 mA**
- **Sink and source mode output**
- **Configurable by keypad**

Function

This isolated barrier is used for intrinsic safety applications. It is a HART loop converter that provides power to transmitters or can be connected to existing HART loops in parallel.

It is able to evaluate up to four HART variables (PV, SV, TV, QV). Of those four HART variables, the data contained in any three of them can be converted to three different 4 mA ... 20 mA current signals. These loop signals can be connected to display devices or analog inputs on the process control system/control system.

In addition to the current outputs, two form C changeover relay contacts are available and can be programmed to operate at trip values from the HART variables.

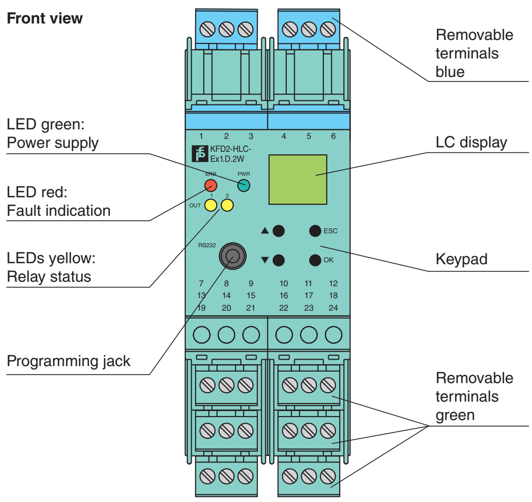
The unit is easily programmed by the use of a keypad located on the front of the unit.

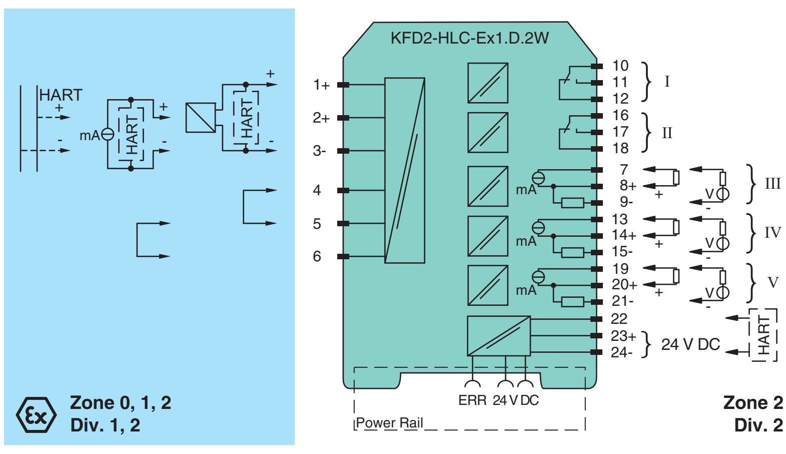
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	19 ... 30 V DC
Rated current	approx. 130 mA at 24 V DC
Power loss	2.5 W
Power consumption	3.1 W
Input	
Input signal	HART communication, transmitter supply
Open circuit voltage/short-circuit current	typ. 24 V/28 mA
Input resistance	250 Ω, 5 % (terminals 2, 3 and with jumper on 5, 6)
Available voltage	≥ 15.5 V at 20 mA, short-circuit proof
Output	
Collective error message	Power Rail and LED red
Output I, II	
Output signal	relay and LED yellow
Mechanical life	10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III, IV, V	
Output signal	analog
Current range	4 ... 20 mA, source or sink mode
Load	≤ 650 Ω, source mode
Voltage range	5 ... 30 V, sink mode from external supply
Fault signal	downscale I ≤ 2 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43) or hold measurement value
Other outputs	HART communicator on terminals 22, 24
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 07 ATEX 0174
Group, category, type of protection	Ex II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC II T4 X

Diagrams





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Technical data

Supply	
Rated voltage	19 ... 30 V
Rated current	approx. 140 mA at 24 V DC
Power loss	2.7 W
Power consumption	3.3 W
Input	
Input signal	HART communication, transmitter supply
Open circuit voltage/short-circuit current	typ. 24 V/28 mA
Input resistance	250 Ω, 5 % (terminals 2, 3 and with jumper on 5, 6)
Available voltage	≥ 15.5 V at 20 mA, short-circuit proof
Output	
Collective error message	Power Rail and LED red
Output I, II, III, IV	
Output signal	relay and LED yellow
Mechanical life	10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output V, VI, VII	
Output signal	analog
Current range	4 ... 20 mA, source or sink mode
Load	≤ 650 Ω, source mode
Voltage range	5 ... 30 V, sink mode from external supply
Fault signal	downscale I ≤ 2 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43) or hold measurement value
Other outputs	HART communicator on terminals 22, 24
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	see page 258 for entity parameters
EC-Type Examination Certificate	BASEEFA 07 ATEX 0174
Group, category, type of protection	Ⓔx II (1)GD [Ex ia] IIC, [Ex iaD]
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC II T4 X

Features

- **1-channel isolated barrier**
- **24 V DC supply (Power Rail)**
- **Input HART with transmitter supply**
- **4 relay outputs (NO)**
- **3 analog outputs 4 mA ... 20 mA**
- **Sink and source mode output**
- **Configurable by keypad**

Function

This isolated barrier is used for intrinsic safety applications. It is a HART loop converter that provides power to transmitters or can be connected to existing HART loops in parallel.

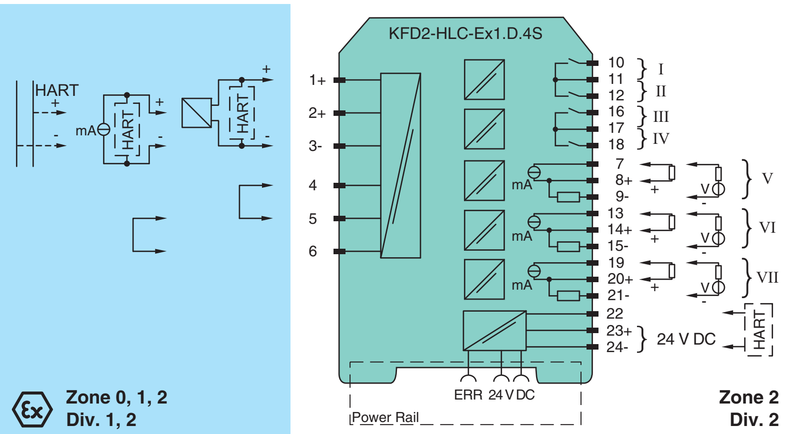
It is able to evaluate up to four HART variables (PV, SV, TV, QV). Of those four HART variables, the data contained in any three of them can be converted to three different 4 mA ... 20 mA current signals. These loop signals can be connected to display devices or analog inputs on the process control system/control system.

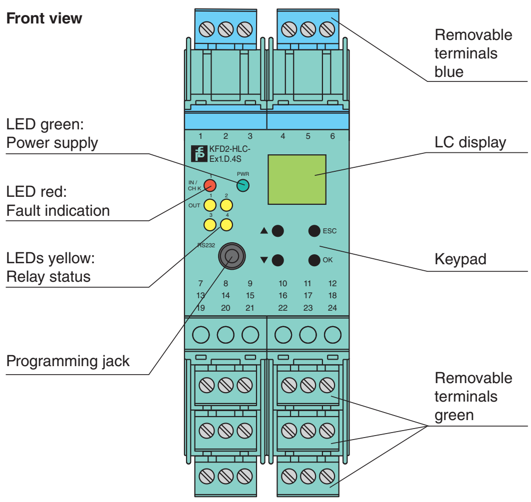
In addition to the current outputs, four form A normally open relay contacts are available and can be programmed to operate at trip values from the HART variables.

The unit is easily programmed by the use of a keypad located on the front of the unit.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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HART Filter
HISHF-AI-02

Features

- **2-channel**
- **Ideal for retrofitting existing installations**
- **Connection terminals for HART communicators**
- **Analog input only**
- **Current limiting**

Function

The unit is a stand-alone HART analog input filter. It is designed to complement the I/O Termination Boards. It filters the HART signal from the 4 mA ... 20 mA control loop.

This unit mounts on DIN rail, has removable terminal blocks, and includes connections for HART communicators.

Technical data

HART signal channels (intrinsically safe)	
HART signal channels	
Isolation	30 V DC
Ambient conditions	
Ambient temperature	0 ... 60 °C (32 ... 140 °F)
Mechanical specifications	
Mass	510 g

HART Filter
HISHF-AO-02

Features

- **2-channel**
- **Ideal for retrofitting existing installations**
- **Connection terminals for HART communicators**
- **Analog output only**
- **Current limiting**

Function

This unit is a stand-alone HART analog output filter. It is designed to complement the I/O Termination Boards. It filters the HART signal from the 4 mA ... 20 mA control loop.

This unit mounts on DIN rail, has removable terminal blocks, and includes connections for HART communicators.

Technical data

HART signal channels (intrinsically safe)	
HART signal channels	
Isolation	30 V DC
Ambient conditions	
Ambient temperature	0 ... 60 °C (32 ... 140 °F)
Mechanical specifications	
Mass	510 g

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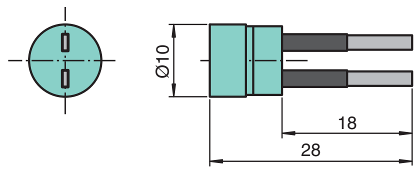


HART Filter K-22µ

Features

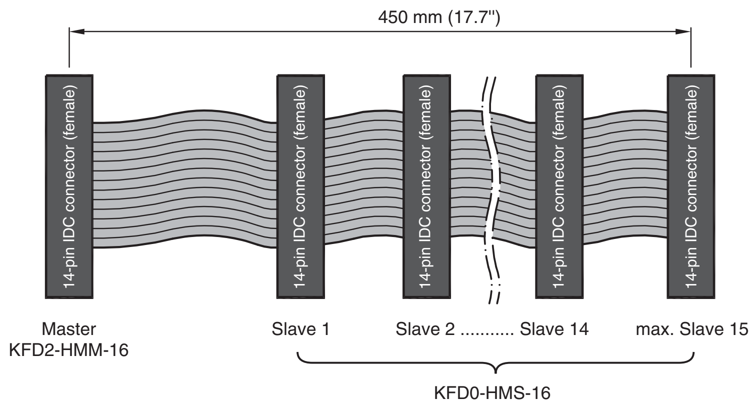
- **1-channel**
- **Parallel connection to HART loop**
- **Filters HART signal from control loop**

Function

The capacitor is used to filter or suppress HART communication.

Technical data

Electrical specifications	
Capacitance	22 µF, 16 V
Damping	20 µA, at 250 Ω
Mechanical specifications	
Dimensions	Ø10 x 28 mm (0.4 x 1.1 in)



HART Connection Cable with Connectors K-HM14

Features

- **K-System accessory**
- **Connection cable for KFD2-HMM-16 to up to 15 KFD0-HMS-16**
- **14-pin flat cable**

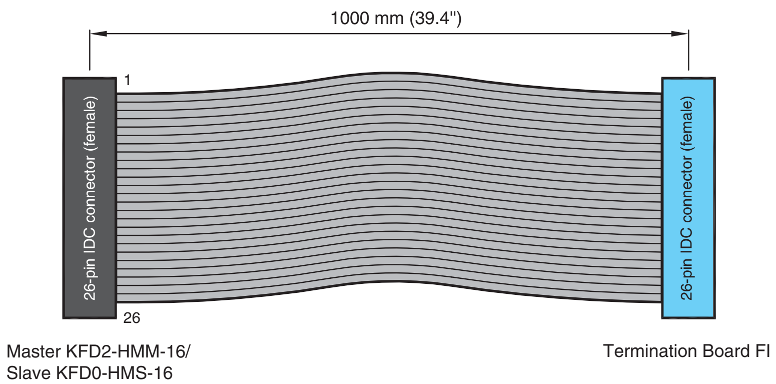
Function

The connection cable K-HM14 is used for connection of a HART Multiplexer Master KFD2-HMM-16 to up to 15 HART Multiplexer Slaves KFD0-HMS-16.

The connection cable has 16 connectors and a length of 0.45 m. Other cable lengths (max. 8 m) are available upon request.

Technical data

Ambient conditions	
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Mechanical specifications	
Connection	14-pin IDC female connector
Cable length	0.45 m
Note	distance of plugs 3 cm (1.2 in)



HART Connection Cable with Connectors K-HM26

Features

- **K-System accessory**
- **Connection cable for KF*-HM*-16 to Termination Board**
- **26-pin flat cable**

Function

The connection cable K-HM26 is used for connection of a HART Multiplexer KFD*-HM*-16 to a K-System Termination Board.

The connection cable has a length of 1 m. Other cable lengths (max. 8 m) are available upon request.

Technical data

Ambient conditions	
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Mechanical specifications	
Connection	26-pin IDC female connector
Cable length	1 m

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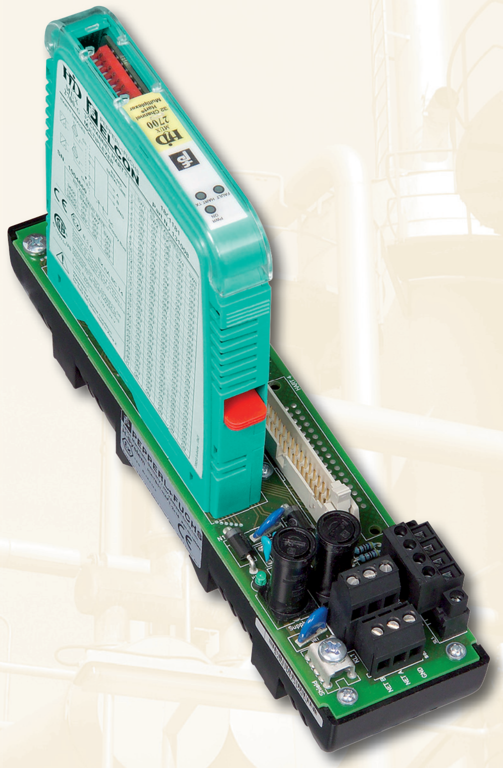
HART
H-System
HART Multiplexers
Termination Boards
Accessories

HART

H-System



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PROTECTING YOUR PROCESS

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Introduction

The H-System HART Multiplexer (HiDMux2700) provides communication to 32 HART devices. A network is built by multidropping Multiplexers; up to 31 Multiplexers are connected to support a single network with a maximum of 992 field devices per communication port on one RS 485 interface.

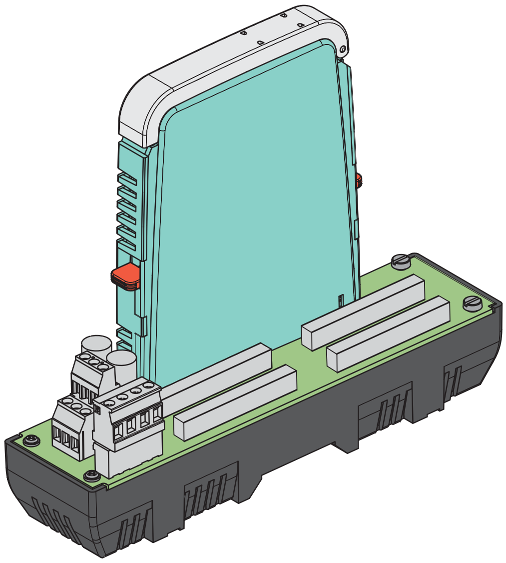

Figure 1 H-System HART Communication Board

Components

HART Multiplexer

- Compact 18 mm housing
- HART field device inputs
- Termination Board mounted
- DIP switch settings for RS 485

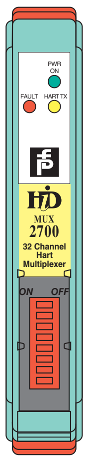

Figure 2 18 mm housing (HiDMux2700)

HART Communication Board

The HART Communication Board can interface with HART enabled H-System Termination Boards. It contains one slot to mount the 32-channel HART Multiplexer type HiDMux2700.

The HiACA-UNI-FLK34-*. cables provide easy connection between the HiD/HiC (H-System) Termination Boards and the HART Communication Board.

It offers redundantly fused, power supply connections with LED indication. Redundant RS 485 terminals are also available and can be wired in a daisy chain configuration.

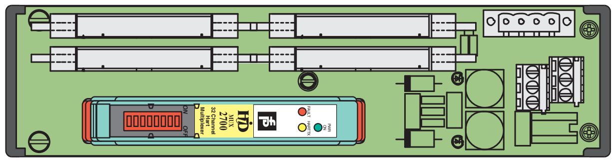

Figure 3 HART Communication Board

Topology

This figure illustrates a typical H-System solution. It contains a Termination Board, Fault Indication Board and HART Communication Board. One HART Communication Board is required for each Termination Board while one Fault Indication Board can be used for many Termination Boards.

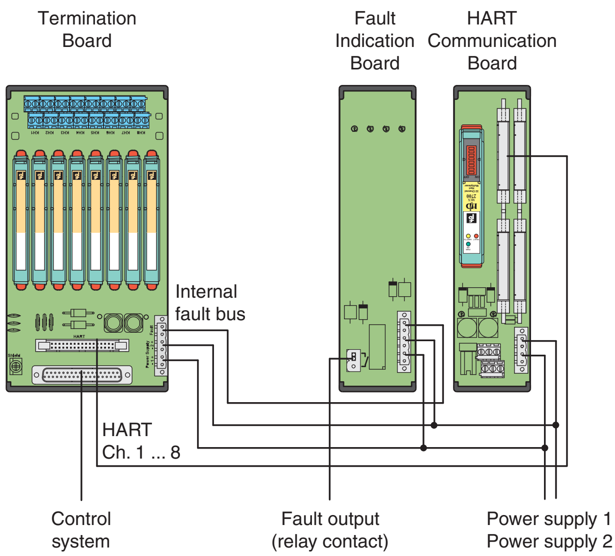

Figure 4 H-System topology

Mounting

The Termination Boards are mounted on 35 mm DIN rail. The DIN rail is centered under the Termination Board.

The H-System Termination Boards have been designed for protection category IP20 with isolated barriers installed (IP00 without modules) according to EN 60529; therefore, the boards must be appropriately protected against splashing water and contamination.

Mounting the Termination Board

- Place the Termination Board onto the DIN rail (Figure 5).
- Tighten the fastening screws (Figure 6).

The Termination Board is now properly mounted and secured.

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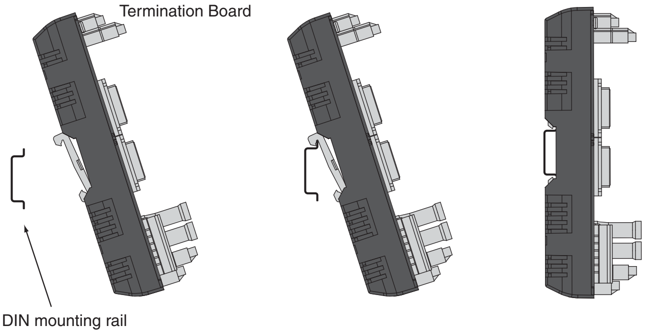

Figure 5 Proper mounting of the H-System Termination Board

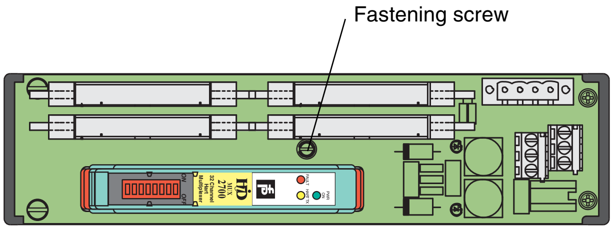

Figure 6 Top view of the H-System HART Communication Board

Mounting the module on the Termination Board

- Ensure that the red Quick Lok Bar (1) is in the upper position
- Center the pins over the contacts on the Termination Board and observe the plug orientation of the device
- Carefully press the device into the contacts
- Press the red Quick Lok Bar (1) down on either side of the device (see Figure 7)

This completes the mounting of a module.

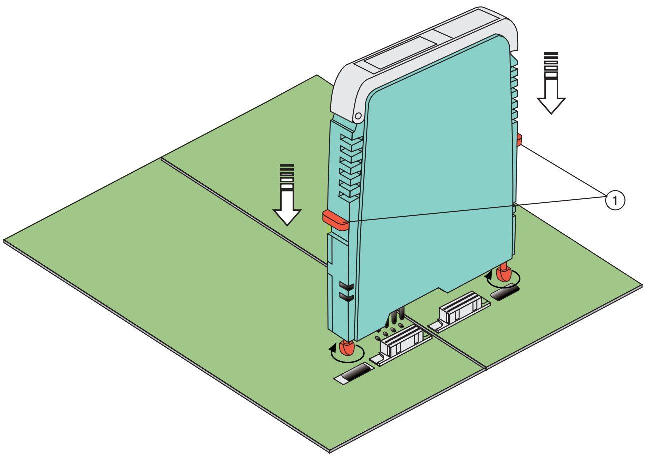

Figure 7 Proper mounting of an HiDMux2700 module

Model number description

Module

Hi	D	Mux	2	7	0	0

Model number
2700

Type
Mux HART Multiplexer

Housing
D 18 mm module

Hi H-System

HART Communication Boards

HiATB	01	–	HART	–	

Number of connectors and terminals
2X16 with 2 connectors of 16 channels each
4X8 with 4 connectors of 8 channels each

Type of communication
HART HART communication

Number of slots
01 1 slot

Termination Board type
HiATB for HiD accessory modules

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Safety information

The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

These devices are used in C&I technology for the galvanic isolation of C&I signals, such as 20 mA and 10 V unit signals, and also for the adaptation and/or standardization of signals.

The devices are not suitable for the isolation of signals in power engineering, unless this is specifically referred to in the respective data sheet.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Installation and commissioning

Commissioning and installation must be carried out by specially trained and qualified personnel only.

Installation of the interface devices in the safe area

The devices are constructed to satisfy the IP20 protection classification and must be protected from adverse environmental conditions such as water spray or dirt exceeding the pollution degree 2.

The devices must be installed outside the hazardous area!

Installation and commissioning of the interface devices within Zone 2/Div. 2 of the hazardous area

Only devices with the corresponding manufacturer's Declaration of Conformity or separate certificate of conformity can be installed in Zone 2/Div. 2.

The individual data sheets indicate whether these conditions are met.

For US and Canada installations, in Zone 2/Div. 2 follow the NEC and CEC wiring methods. The enclosure must be able to accept Zone 2/Div. 2 wiring methods. The referenced product certification control drawing must be observed.

For all other applications, the devices should be installed in a switch or junction box that:

- meets at least IP54 in accordance to EN 60529.
- meets to the requirements of resistance to light and resistance to impact according to EN 60079-0/ IEC 60079-0.
- meets to the requirements of thermal endurance according to EN 60079-15/IEC 60079-15.
- must not cause ignition danger by electrostatic charge during intended use, maintenance and cleaning.

The EC-Type Examination Certificates, standard certificates/approvals or the manufacturer's Declaration of Conformity should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are not allowed.

Isolation coordinates for installations for galvanic isolation according to EN 50178 and EN 61140

The devices of the K-System are electronic equipment for use in secluded electrical operating sites where only skilled personnel or electrically instructed personnel will have admission or access.

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

For additional details, see data sheets.

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Technical data

Electrical data

Power supply (modules)

20.4 V DC to 30 V DC

Each module is protected internally. The Termination Boards have redundant power supply connections with fuses that can be replaced by the customer.

Mechanical data

Location

Mounting outside hazardous areas possible as well as in Zone 2/Div. 2 where a manufacturer's Declaration of Conformity exists.

Protection degree

- Termination Boards: IP20 with modules plugged in (IP00 without modules)
- Modules: IP20

Mass

Termination Boards:

- HiATB01 approx. 150 g

Modules:

- HiDMux2700 approx. 140 g

Material

Modules: Polycarbonate

Termination Boards: Polycarbonate, fiber glass reinforced

Dimensions

Termination Boards (height inclusive module assembly):

- HiATB01: 50 x 190 x 200 mm

Modules:

- HiD module: 18 x 106 x 130 mm

Housing drawings please refer to the appendix.

Labeling

A plastic label holder is available on the front of the module:

- HiD module: 35 x 10.5 mm

A large label carrier kit HiALC-… for the Termination Boards is available as an option.

Fire protection class

Housing: V2 according to UL 94 standard. (Unless stated otherwise all details relate to the reference conditions.)

Ambient conditions

Ambient temperature:

-20 °C to 60 °C, (-4 °F to 140 °F)

Storage temperature:

-40 °C to 70 °C, (-40 °F to 158 °F)

Relative humidity:

max. 95 % no moisture condensation

Reference conditions

- Temperature: 20 °C (68 °F)
- Relative humidity: 50 %
- Supply voltage: 24 V DC
- Working resistance, where applicable: 250 Ω
- Full scale value: 20 mA

Conformity with standards and directives

General

- EMC acc. to NAMUR NE21 and EN 61326
- LEDs acc. to NAMUR NE44
- Software acc. to NAMUR NE53

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HART Multiplexers

Model Number	Channels	RS 485 Connection	Supply 24 V DC	Zone 2/Division 2 Mounting	Page
HiDMux2700	32	■	■	■	558

Termination Boards

Model Number	Channels	2 x 16 Channels	4 x 8 Channels	RS 485 Connection	Redundant Power Supply	Supply 24 V DC	Zone 2/Division 2 Mounting	Page
HiATB01-HART-2X16	32	■		■	■	■	■	559
HiATB01-HART-4X8	32		■	■	■	■	■	560
HISHPSM/32/MM-01	32			■	■	■		561
HISHPSM/32/TB-02/HF32	32			■	■	■		562

Accessories

Model Number	Description	Page
HiACA-UNI-FLK34-FLK34-0M5	HART Interface Cable	563
HiACA-UNI-FLK34-FLK34-2M0	HART Interface Cable	563
HiACA-UNI-FLK34-FLK34-3M0	HART Interface Cable	563
HiACA-UNI-FLK34-FLK34-6M0	HART Interface Cable	563

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Features

- **32-channel**
- **24 V DC supply**
- **HART field device inputs**
- **RS 485 interface**
- **Up to SIL3 acc. to IEC 61508**

Function

The HART Multiplexer Master provides 32 signal channels for connection to SMART transmitters or control devices supporting digital communication according to the HART standard.

Full three-port isolation is included and each input channel has dual capacitor isolation for freedom of loop connection.

Each HART Multiplexer Master is networked simply by connecting the high-speed RS 485 output in a multidrop configuration.

The device interrogates each field device, under the supervision of the workstation, retrieving information for storage in its internal database, which is then easily accessed.

This module is intended to mount on an HiD Termination Board or HART Communcation Board. Also special boards for DCS integration are available.

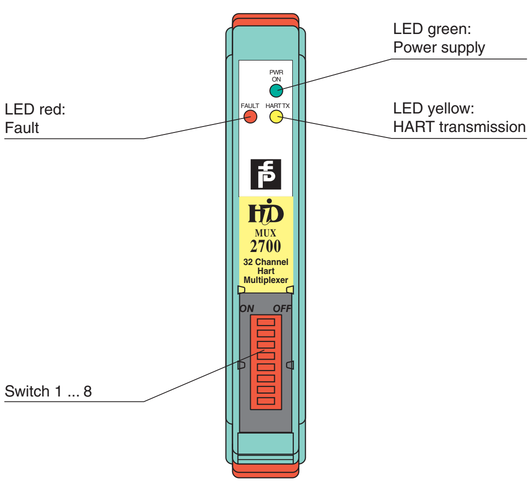
For additional information, refer to the manual and www.pepperl-fuchs.com.

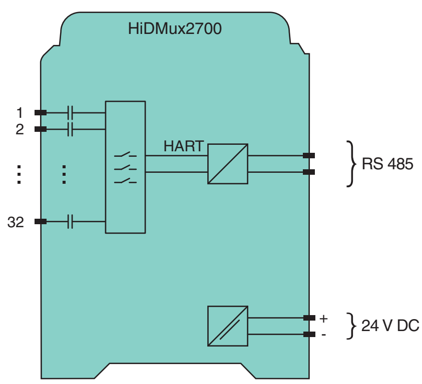
Technical data

Supply	
Rated voltage	20.4 ... 30 V DC via Termination Board
Power loss	0.7 W at 24 V
HART signal channels (intrinsically safe)	
HART signal channels	
Number of channels	32
Signal range	0.12 V_{pp} < signal < 1.5 V_{pp}
Leakage current	< 3 µA at -20 ... 85 °C (-4 ... 185 °F)
Terminating resistor	external 230 ... 500 Ω standard (up to 1000 Ω possible)
Output voltage	≥ 400 mV_{pp} (with the terminator resistance specified above)
Output resistance	100 Ω or smaller, capacitive coupling
DC isolation	dual capacitor each channel
Common mode voltage	up to 30 V
Input impedance	> 5 kΩ, according to HART specification
Input voltage range	0.12 ... 1.5 V_{pp}
Common mode voltage	≤ 30 V
Differential mode clamping	± 5.2 V, for transient or AC signals
Common mode clamping	± 10 V, for transient or AC signals
Device type	DC isolated bus device
Data link type	HART primary and secondary
Field multi point support	option available upon request
Interface	
Transfer rate	9600 MBit/s, 19200 MBit/s or 38400 MBit/s, selectable via switch
Address	1 ... 31, adjustable via DIP switch
Topology	multi point, master/slave connection
Ambient conditions	
Ambient temperature	0 ... 60 °C (32 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	18 x 106 x 128 mm (0.7 x 4.2 x 5 in)
Data for application in connection with Ex-areas	
Declaration of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA II T4
CSA approval	1256050
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC

Diagrams

Front view





Zone 2
Div. 2

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Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. Each supply is decoupled and fused (500 mA).
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	screw terminal for max. 2.5 mm^2, fixed
Mass	approx. 150 g
Dimensions	50 x 200 x 163 mm (1.97 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Accessories	
Designation	optional accessories: - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-...

Features

- **2 x 16-channel**
- **24 V DC supply**
- **Suitable for HART communication**
- **Dual RS 485 connections**
- **Used with HiD/HiC Termination Boards**
- **LED indicator for supply status**

Function

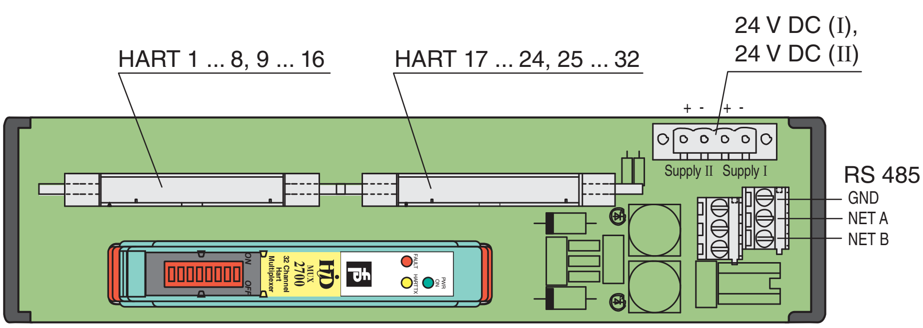
This HART Communication Board can interface with two, 16-channel H-System Termination Boards.

It contains one slot to mount the 32-channel HART Multiplexer Master type HiD Mux2700.

HART interface cables provide easy connection between the HiD/HiC Termination Boards and the HART Communication Board.

It offers fused redundant power supply connections with LED indication. RS 485 terminals are redundant and can be daisy chained.

Diagrams



Zone 2
Div. 2

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Features

- **4 x 8-channel**
- **24 V DC supply**
- **Suitable for HART communication**
- **Dual RS 485 connections**
- **Used with HiD/HiC Termination Boards**
- **LED for supply status**

Function

This HART Communication Board can interface with four, 8-channel H-System Termination Boards.

It contains one slot to mount the 32-channel HART Multiplexer type HiD Mux2700.

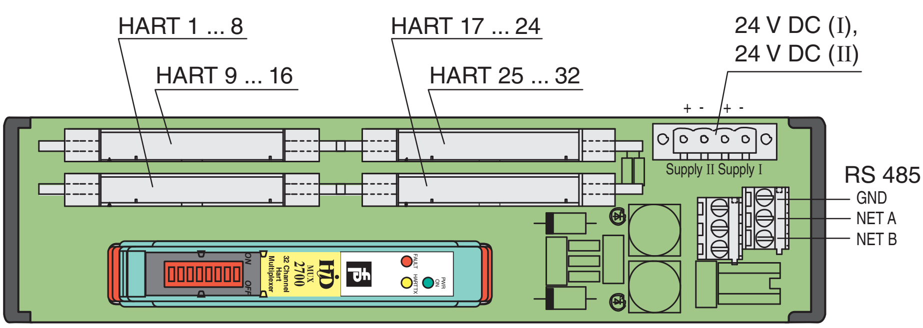
The HART interface cable provides easy connection between the HiD/HiC Termination Boards and the HART Communication Board.

It offers fused redundant power supply connections with LED indication. RS 485 terminals are redundant and can be daisy chained.

Technical data

Supply	
Rated voltage	24 V DC, in consideration of rated voltage of used isolated barriers
Voltage drop	0.9 V, voltage drop across the series diode on the Termination Board must be considered
Ripple	≤ 10 %
Power loss	≤ 500 mW, without module
Reverse polarity protected	yes
Redundancy	
Supply	Redundancy available. Each supply is decoupled and fused (500 mA).
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	screw terminal for max. 2.5 mm^2, fixed
Mass	approx. 150 g
Dimensions	50 x 200 x 163 mm (1.97 x 7.9 x 6.42 in), height including module assembly
Mounting	DIN rail mounting
Accessories	
Designation	optional accessories: - HART Multiplexer Master HiDMux2700 - HART connection cable HiACA-...

Diagrams



Zone 2
Div. 2

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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Fusing	3.15 A, 5 x 20 mm (0.2 x 0.8 in)
Power loss	0.7 W, with Multiplexer
Reverse polarity protected	yes
HART signal channels (intrinsically safe)	
HART signal channels	
Number of channels	32 unbalanced signal loops
Redundancy	
Supply	yes
Ambient conditions	
Ambient temperature	-20 ... 55 °C (-4 ... 131 °F)
Mechanical specifications	
Core cross-section	2.5 mm^2 (16 AWG)
Connection	field side: fixed screw terminals control side: fixed screw terminals RS 485 interface: removable screw terminals power: removable screw terminals
Mass	approx. 500 g
Dimensions	222 x 122 x 208 mm (8.7 x 4.8 x 8.2 in), height including module assembly
Mounting	DIN rail mounting

Features

- **32-channel**
- **24 V DC supply**
- **Interface for serial or parallel wiring options**
- **Dual RS 485 connections**
- **Slot for HART Multiplexer**

Function

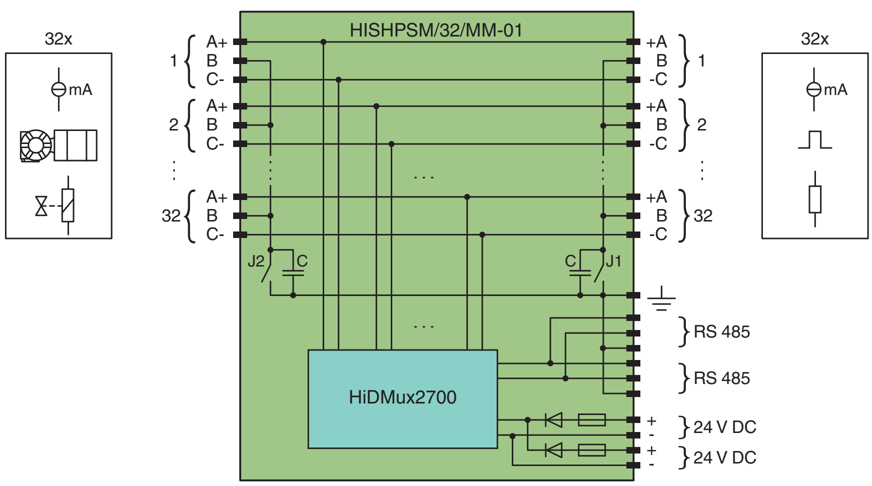
This HART Termination Board has 32 terminal blocks to connect up to 32 HART field devices.

It contains one slot to mount the 32-channel HART Multiplexer Master type HiDMux2700.

The Termination Board can be used for general-purpose applications or in conjunction with intrinsic safety barriers for hazardous applications.

It offers fused redundant power supply connections. RS 485 terminals are redundant and can be daisy chained.

Diagrams



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Features

- 32-channel
- 24 V DC supply
- For analog output cards
- HART output filters
- Interface for serial or parallel wiring options
- 37-pin Sub-D connectors
- Slot for HART Multiplexer

Function

The Termination Board is designed to complement the I/O termination panels and provide access to all HART information.

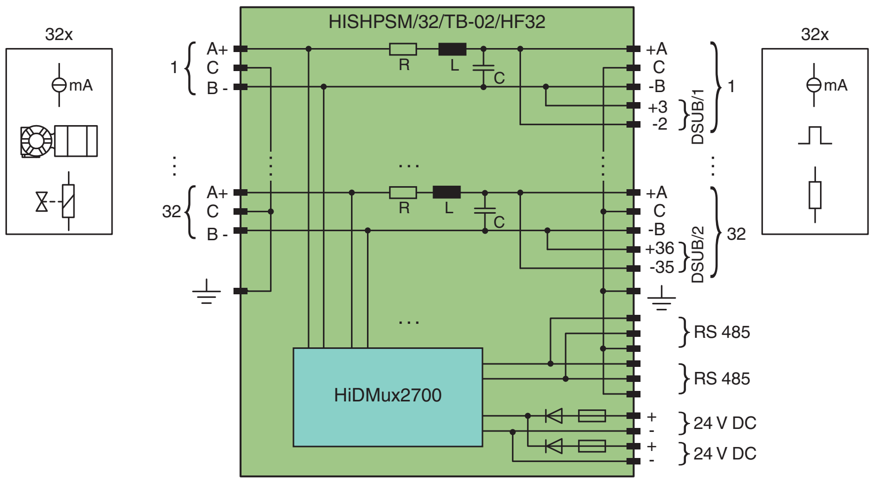
The Termination Board provides a robust solution for on-line HART communications, interfaces up to 32 field located HART devices, and it allows the user to retain standard DCS field termination panels. This ideal for retrofitting existing installations and maintains all existing hardware and field wiring.

The Termination Board offers analog output filters.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Fusing	100 mA, 5 x 20 mm (0.2 x 0.8 in)
Power loss	0.7 W, with Multiplexer
Reverse polarity protected	yes
HART signal channels (intrinsically safe)	
HART signal channels	
Number of channels	32 unbalanced signal loops
Redundancy	
Supply	yes
Ambient conditions	
Ambient temperature	-20 ... 55 °C (-4 ... 131 °F)
Mechanical specifications	
Core cross-section	2.5 mm^2 (16 AWG)
Connection	field side: screw terminals control side: screw terminals/Sub-D socket 2 x 37-pin RS 485 interface: removable screw terminals power: removable screw terminals
Mass	approx. 700 g
Dimensions	300 x 127 x 186 mm (11.8 x 5 x 7.3 in), height including module assembly
Mounting	DIN rail mounting

Diagrams



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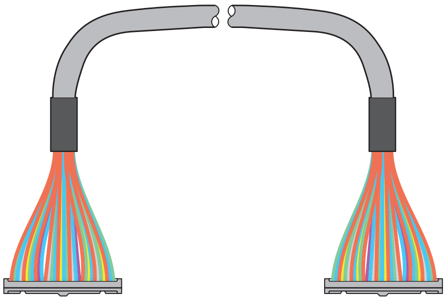

HART Interface Cables
HiACA-UNI-FLK34-FLK34-0M5
HiACA-UNI-FLK34-FLK34-2M0
HiACA-UNI-FLK34-FLK34-3M0
HiACA-UNI-FLK34-FLK34-6M0

Features

- **H-System accessory**
- **Connection cable between HART Communication Board and Termination Board**
- **34-pin cable**

Function

The HART connection cable is used for connection of a HART Communication Board to a H-System Termination Board.

Technical data

Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Connection	34-pin FLK connector (female)
Mass	HiACA-UNI-FLK34-FLK34-0M5: approx. 150 g HiACA-UNI-FLK34-FLK34-2M0: approx. 600 g HiACA-UNI-FLK34-FLK34-3M0: approx. 900 g HiACA-UNI-FLK34-FLK34-6M0: approx. 1800 g
Cable length	HiACA-UNI-FLK34-FLK34-0M5: 0.5 m HiACA-UNI-FLK34-FLK34-2M0: 2 m HiACA-UNI-FLK34-FLK34-3M0: 3 m HiACA-UNI-FLK34-FLK34-6M0: 6 m

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Signal Conditioners

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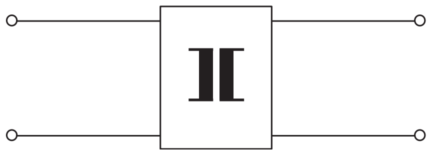
With the variety of process control systems available, it is often necessary to convert an input signal into a format that the system will accept. Signal conditioners take signals from an assortment of field instruments such as thermocouples and RTDs, and convert those signals into any of several standard instrument signals (1 V to 5 V, 4 mA to 20 mA, etc.). Signal conditioners are also beneficial to the accurate transfer of these signals, isolation, and the elimination of ground loops.

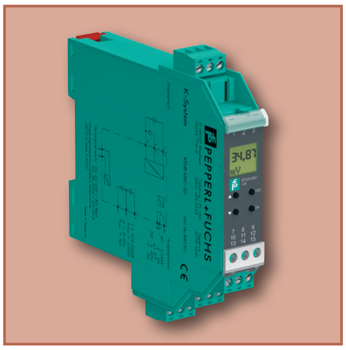
Operating principle

The key to process control is accuracy both in measurement and in signal conditioning. The biggest and most overlooked threat to effective process control is the presence of ground loops. Whenever analog data is transferred through long cable runs, there is a high probability that ground loop problems will occur.
A ground loop exists when multiple earth ground connections are made in a system. A difference in potential between the grounds generates an extraneous current flow in the signal conductor.



The result is commonly known as noise. In its mildest form, noise in the signal line causes measurement offsets, incorrect sensor readings, and general signal corruption. In its most severe form, however, noise contamination can deteriorate communication to a point where control of the process is lost. Isolation between the ground circuits is essential to the prevention of ground loop currents and, therefore, the elimination of noise. Signal conditioners provide the necessary isolation as well as amplification, filtering, and linearity corrections.

K-System 566



- Broad product range
- 3-port galvanically isolated barriers
- SIL rated for safety instrumented systems
- Limit detection
- Logic functions: pushbutton programmable
- Fault detection and alarming
- Loop-powered and analog isolators

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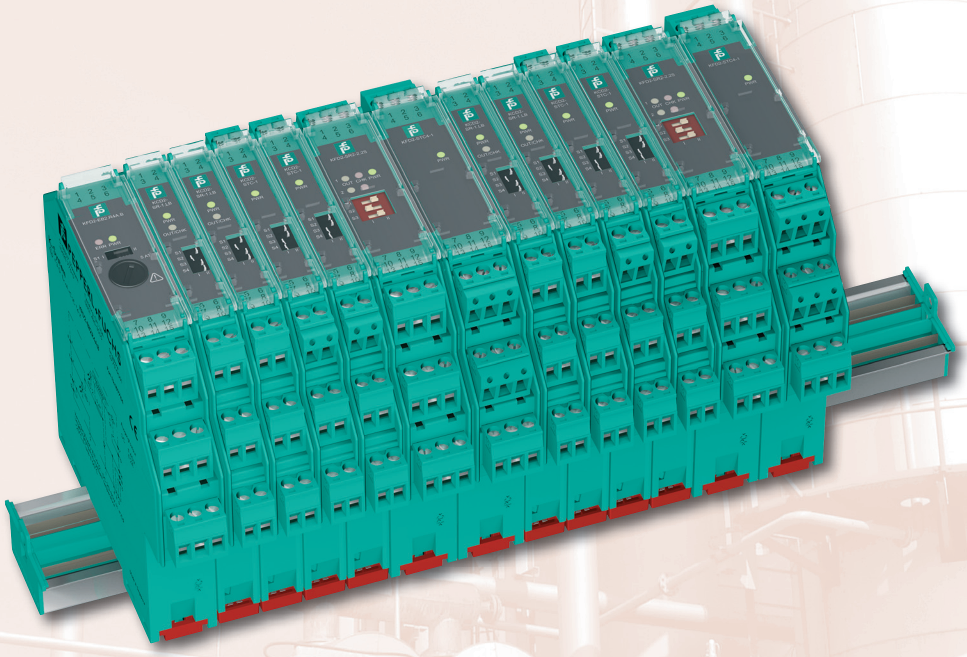
K-System



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Introduction

The K-System consists of wide range of signal conditioners suitable for mounting on 35 mm DIN rail. K-System is easy to specify, integrate and expand and has become synonymous with safety and reliability. Our extensive line of signal conditioner for safety location applications contains over 60 different models, each containing industry leading features and benefits.

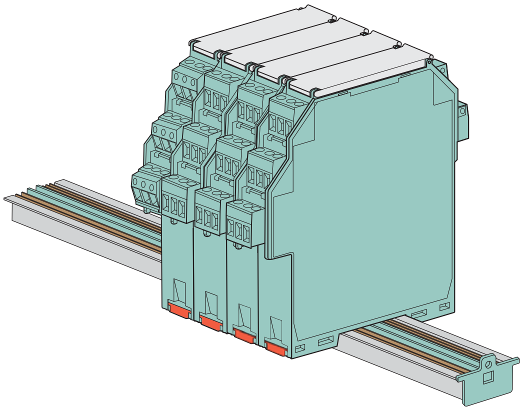

Figure 1 K-System on Power Rail

Housing types

Depending on the functionality and application, K-System has different housing widths. Whether it is the 12.5 mm KC modules or the well-proven 20 mm KF modules, the electrical and mechanical characteristics of the K-System are maintained. This collection of modules provides a wide range of interface barriers that can be combined on Power Rail.

KC module housing

Used for high signal integrity

- Compact housing, only 12.5 mm wide
- Single loop integrity
- Power loss only 0.8 W per device

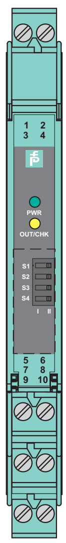

Figure 2 12.5 mm housing (KC module)

KF module housings

Used for high channel density

- 20 mm housing
- Highest packing density on the market
- As low as 5 mm per channel

Figure 3 20 mm housing (KF module)

Used for applications with high functionality

- Logic controls determine and monitor speed, direction of rotation, slip, flow rates and time
- Analog controls monitor transmitter signals, strain gauges, temperature and load cells
- Configured using **PACT***ware*™ or by push button
- Universal power supply

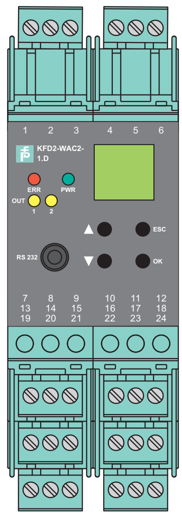

Figure 4 40 mm housing (KF module)

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Supply voltage

K-System signal conditioners are available with different supply voltages. The most widely used rating is 24 V DC; however, 115 V AC and 230 V AC are also available for applications when DC power is not available.
The universal supply units carry the complete range from 20 V DC to 90 V DC and 48 V AC to 230 V AC on the same input terminals. The supported supply voltage for each barrier is identified on the side plate.

Mounting

The K-System is mounted on a 35 mm DIN rail acc. to EN 60715. To reduce wiring and installation costs, Power Rail is the optimum solution.

Low heat dissipation allows vertical or horizontal mounting.

Power Rail

The Power Rail is a plastic insert into a standard DIN rail and contains two leads that deliver power to the modules. Power is sent through the rail by a power feed module that delivers 24 V DC at 4 A. The module uses a 5 A fuse to protect the barriers. The Power Rail virtually eliminates the risk of wiring faults and facilitates easy expansion. Power Rail is available in two versions:

- UPR-03: 3-lead version supplies two leads for power and one lead for error signal
- UPR-05: 5-lead version supplies two leads for power, one lead for error signal and two leads for serial data exchange.

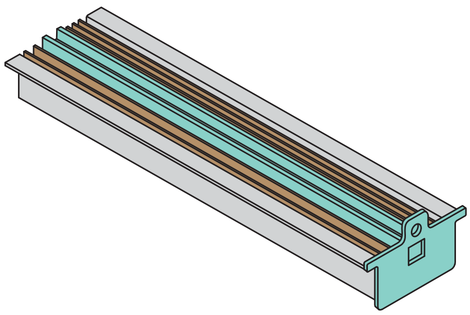

Figure 5 Universal Power Rail UPR-05

Mounting on Power Rail

As shown in the figure, the isolation modules are snapped onto the Universal Power Rail in a vertical downward movement.

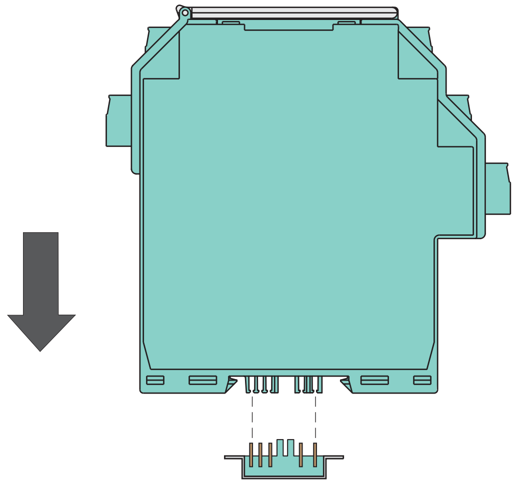

Figure 6 Proper K-System mounting

CORRECT: Device snapped on vertically.

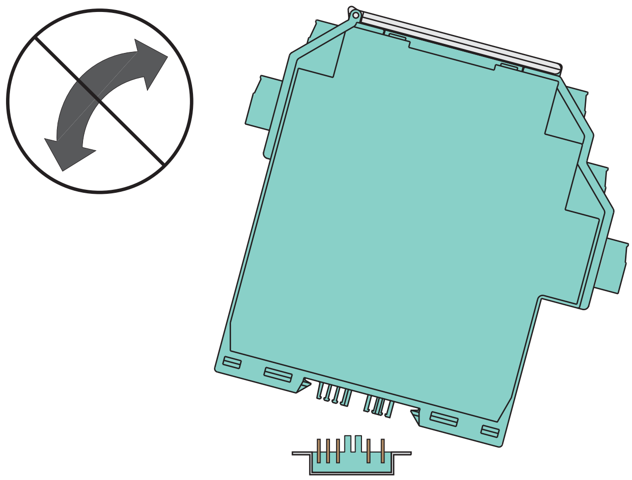

Figure 7 Improper K-System mounting

INCORRECT: Device snapped on from the side.

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Power connection to K-System

Conventional power supply without Power Rail

Conventional power supplies create complicated and expensive wiring systems. After all signal conditioners are connected, there is a significant amount of wiring and more wiring must be added for features such as lead breakage and short-circuit monitoring.

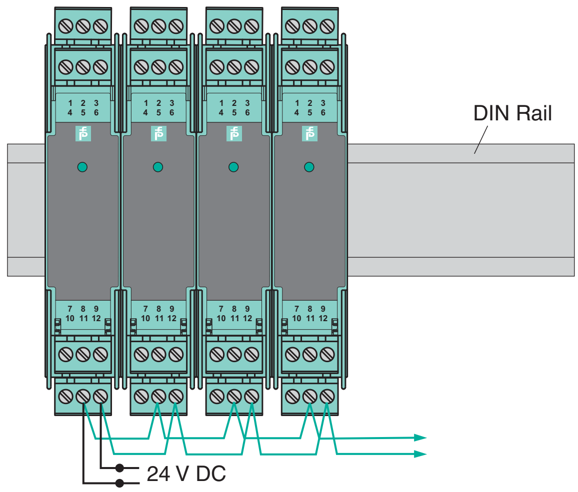

Figure 8 *Conventional installation*

Power supply with Power Rail

Supply with Power Feed Modules

The Pepperl+Fuchs Power Rail eliminates wiring hassles and reduces expense. The power feed module mounts on the Power Rail for easy and reliable distribution of power to all connected signal conditioners. This method eliminates all of the parallel power wiring necessary on a conventional installation without Power Rail.

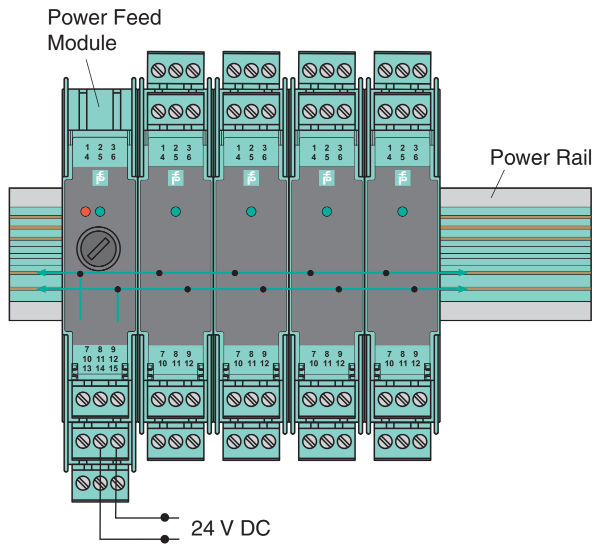

Figure 9 *Power Rail installation*

Redundant Supply with Power Feed Modules

Two power supplies or a redundant power supply with two power feed modules offers a high degree of safety and reliability. If a power supply is damaged or a fuse opens in a power feed module, the redundant power supply continues to energize the isolator modules through their Power Rail connection.

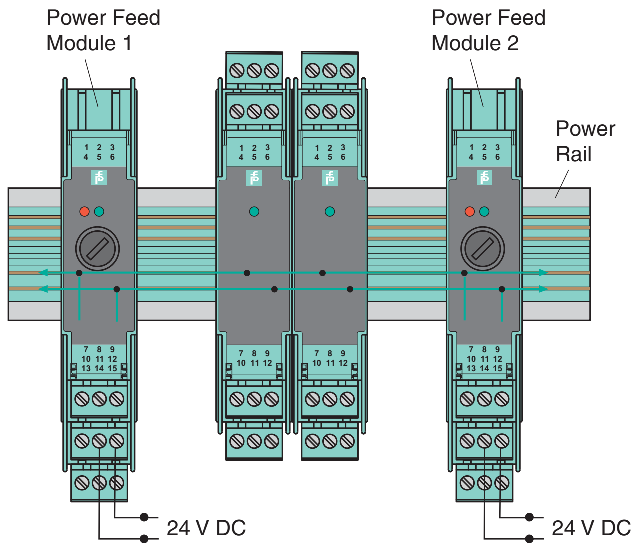

Figure 10 *Redundant power connections*

Direct Supply with Power Supplies

A complete power solution for a K-System installation is possible by using a 115/230 V AC to 24 V DC/4 A power supply with the KFA6-STR-1.24.4 or by using the KFA6-STR-1.24.500 that provides 24 V DC/500 mA. The power supplies snap-on the Power Rail to easily and efficiently distribute power to the signal conditioners.

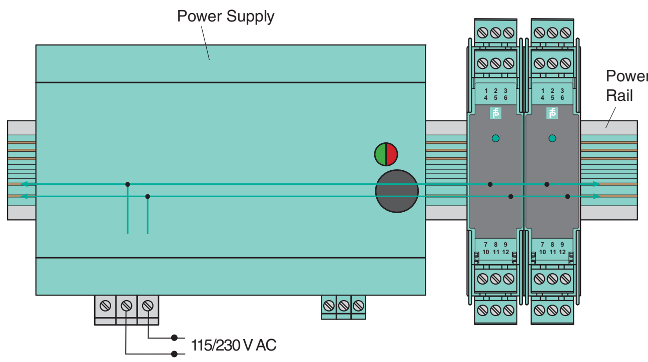

Figure 11 *Integrated power supply (4 A)*

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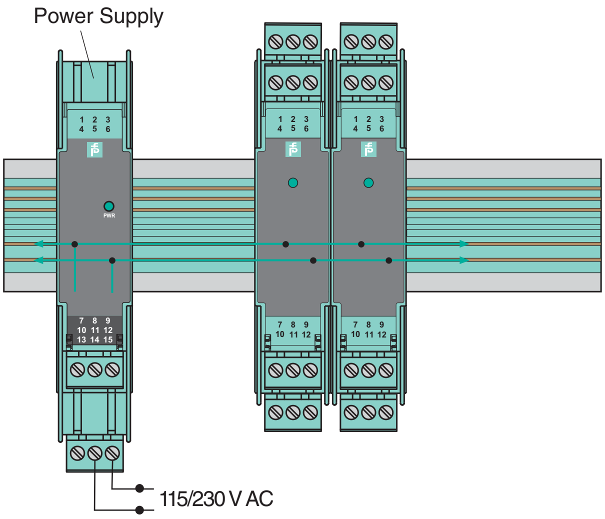

Figure 12 *Integrated power supply (500 mA)*

Collective error messaging

Collective error messaging enables lead breakage and short-circuit monitoring for isolator modules without additional wiring expenses. During a fault condition of the field circuit, an interrupt signal from an isolator module is transferred to the Power Rail. The power feed module evaluates the signal and transfers the interrupt signal to the control system via a relay contact.

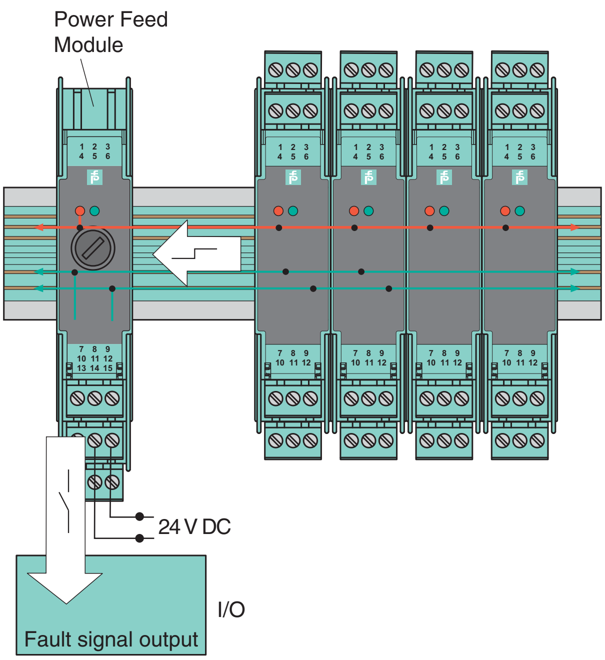

Figure 13 *Collective error message via power feed module*

Terminal blocks

Removable terminal blocks

The removable terminal blocks simplify control cabinet construction and allow the units to be replaced while they are energized. These screw-secured, cage clamp terminals allow space for the connection of leads with core cross-sections of up to 2.5 mm^2 (14 AWG). The connectors are coded with red pins so misconnection of a terminal block is eliminated. With the KF-CP coding pins (available separately), additional terminal block styles with test sockets or cage spring release can be easily coded and inserted into a signal conditioner.

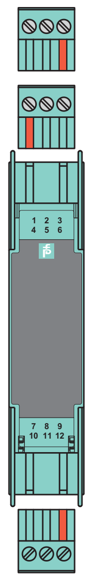

Figure 14 *K-System removable terminal blocks*

Terminal designation

Please reference appropriate model for terminal designation.

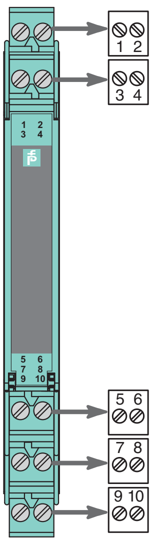

Figure 15 *12.5 mm housing (KC module)*

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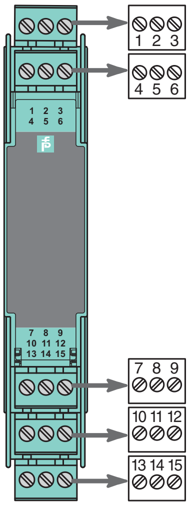

Figure 16 *20 mm housing (KF module)*

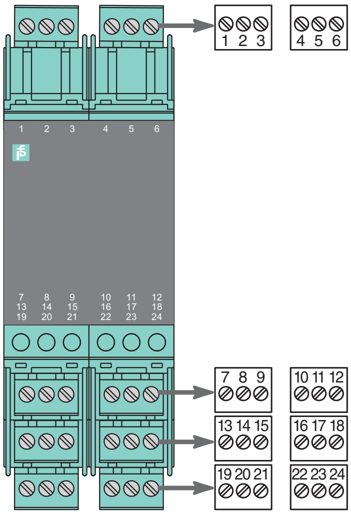

Figure 17 *40 mm housing (KF module)*

Color identification

The color identification of the devices has the following meaning:

- green indicates devices with DC power supply
- black indicates devices with AC power supply
- grey indicates devices with universal power supply of 20 V DC to 90 V DC or 48 V AC to 253 V AC

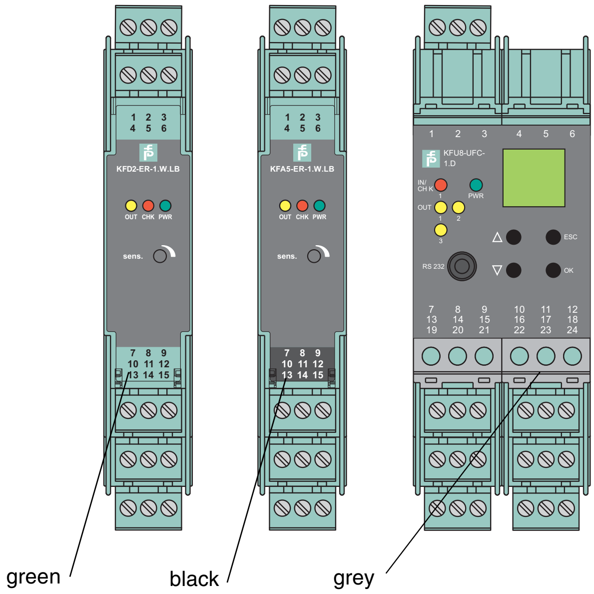

Figure 18 *Color identification of devices*

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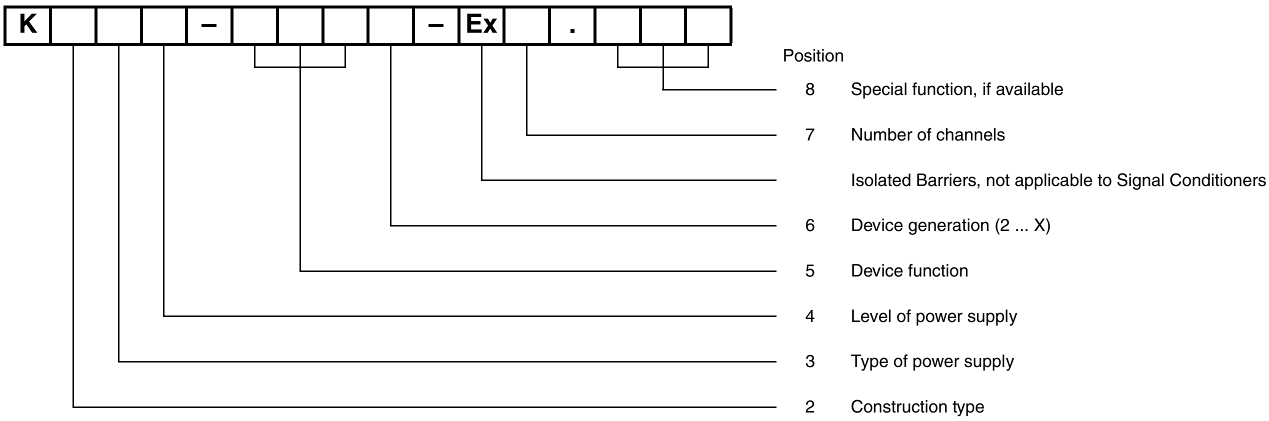
Model number description



Position 1	K	=	K-System
Position 2	C	=	Version with removable terminals, 12.5 mm width
	F	=	Version with removable terminals, 20 mm or 40 mm width
	H	=	Version without removable terminals, 20 mm or 40 mm width
Position 3	D	=	DC power supply
	A	=	AC power supply
	U	=	AC-/DC power supply
Position 4	0	=	without power supply
	2	=	24 V
	4	=	100 V
	5	=	115 V
	6	=	230 V
	8	=	20 V DC to 90 V DC, 48 V AC to 253 V AC
Position 5	CC	=	Converter for current/voltage
	CD	=	Current driver, active
	CR	=	Transmitter power supply device, current output
	CRG	=	Transmitter power supply device with limit value output
	CS	=	Current driver, passive
	DU	=	Switch amplifier, timer relay
	DWB	=	Rotational speed monitor, logic control unit
	EB	=	Power feed module
	ELD	=	Ground fault detection
	ER		Conductivity switch amplifier
	FF	=	RS 232 repeater
	GS	=	Trip amplifier for current/voltage
	GU	=	Universal trip amplifier
	GUT	=	Temperature converter with trip values
	HLC	=	HART Loop Converters
	HMM	=	HART Multiplexer Master
	HMS	=	HART Multiplexer Slave
	PT	=	Potentiometer converter
	RC	=	Converter for resistors
	RCI	=	Solenoid driver
	RO	=	Relay module
	RR	=	Repeater for resistance measuring sensor
	RSH	=	Relay module in safety application
	SCD	=	SMART current driver
	SCS	=	SMART current driver/repeater
	SD	=	Solenoid driver
	SH	=	Safety switch amplifier
	SL	=	Solenoid driver module with logic input
	SOT	=	Switch amplifier with passive, potential free transistor output
	SR	=	Switch amplifier with relay output
	SRA	=	Switch amplifier with relay output, 2:1 operation mode
	SRT	=	Switch amplifier with active transistor and relay output
	ST	=	Switch amplifier with active transistor output
	STC	=	SMART transmitter power supply with current output
	STR	=	Power supply
	STV	=	SMART transmitter power supply with voltage output
	TR	=	Converter for resistance measuring sensor
	TT	=	Converter for thermocouple/mV
	UFC	=	Universal frequency converter
	UFT	=	Frequency converter with direction and synchronization monitoring
	USC	=	Universal signal converter with trip values
	UT	=	Universal temperature converter
	VC	=	Converter for current/voltage
	VCR	=	Transmitter power supply, repeater for current/voltage
	VD	=	Solenoid driver
	VM	=	Solenoid driver
	VR	=	Voltage repeater
	WAC	=	Converter for strain gauges

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Safety information

The corresponding data sheets, the Declaration of Conformity, the EC-Type Examination Certificate and applicable certificates (see data sheet) are an integral part of this document.

Intended use

Laws and regulations applicable to the usage or planned purpose of usage must be observed. Devices are only approved for proper usage in accordance with intended use. Improper handling will result in voiding of any warrantee or manufacturer's responsibility.

These devices are used in C&I technology for the galvanic isolation of C&I signals, such as 20 mA and 10 V unit signals, and also for the adaptation and/or standardization of signals.

The devices are not suitable for the isolation of signals in power engineering, unless this is specifically referred to in the respective data sheet.

Protection of operating personnel and the system is not ensured if the product is not used in accordance with its intended use.

Installation and commissioning

Commissioning and installation must be carried out by specially trained and qualified personnel only.

Installation of the interface devices in the safe area

The devices are constructed to satisfy the IP20 protection classification and must be protected from adverse environmental conditions such as water spray or dirt exceeding the pollution degree 2.

The devices must be installed outside the hazardous area!

Installation and commissioning of the interface devices within Zone 2/Div. 2 of the hazardous area

Only devices with the corresponding manufacturer's Declaration of Conformity or separate certificate of conformity can be installed in Zone 2/Div. 2.

The individual data sheets indicate whether these conditions are met.

For US and Canada installations, in Zone 2/Div. 2 follow the NEC and CEC wiring methods. The enclosure must be able to accept Zone 2/Div. 2 wiring methods. The referenced product certification control drawing must be observed.

For all other applications, the devices should be installed in a switch or junction box that:

- meets at least IP54 in accordance to EN 60529.
- meets to the requirements of resistance to light and resistance to impact according to EN 60079-0/ IEC 60079-0.
- meets to the requirements of thermal endurance according to EN 60079-15/IEC 60079-15.
- must not cause ignition danger by electrostatic charge during intended use, maintenance and cleaning.

The EC-Type Examination Certificates, standard certificates/approvals or the manufacturer's Declaration of Conformity should be observed. It is especially important to observe the "special conditions" if these are included in the certificates.

Repair and maintenance

The transfer characteristics of the devices remain stable over long periods of time. This eliminates the need for regular adjustment. Maintenance is not required.

Fault elimination

No changes can be made to devices that are operated in hazardous areas. Repairs on the device are not allowed.

Isolation coordinates for installations for galvanic isolation according to EN 50178 and EN 61140

The devices of the K-System are electronic equipment for use in secluded electrical operating sites where only skilled personnel or electrically instructed personnel will have admission or access.

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Connect only power supplies to power feed modules, which provide protection against direct contact (e. g. SELV or PELV).

For additional details, see data sheets.

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Technical data

Electrical data

Control circuit signals

- 0/4 mA to 20 mA signal level acc. to NE43
- Current output HART compatible
- Current input HART compatible
- Digital output: active or, passive electronic output 100 mA/30 V, short circuit protected
- Relay output 2 A, minimum load 1 mA/24 V
- Logic level 24 V acc. to IEC 60946
- Functional isolation or safe isolation acc. to EN 50178 and NAMUR NE23

For additional details, see data sheets.

Field circuit signals

- Transmitter power supply up to 17 V DC
- Current input HART compatible
- Pt100, in 2-, 3-, (4-)wire technology
- Resistor 0 Ω to 400 Ω with freely definable characteristic
- Potentiometer
- Thermocouples of all types, internal cold junction, external reference
- Current output HART compatible
- Digital input NAMUR EN 60947-5-6

For additional details, see data sheets.

Mechanical data

Mounting

- Snap-on 35 mm standard DIN rail acc. to EN 60715. Can be mounted horizontally or vertically, side by side.
- Panel mount: The lugs on the base of the modules must be extended and used for mounting purposes with 3 mm screws.
- K-MS mounting base for screw attachment

Housing material

Polycarbonate (PC)

Dimensions

Housing drawings please refer to www.pepperl-fuchs.com.

Protection degree

IP20 acc. to EN 60529

Connection

- KH*-modules:
  self-opening connection terminals for max. core diameter of 1 x 2.5 mm^2 (14 AWG)
- KF*-and KC*-modules:
  removable connector with integrated self opening device terminals for leads of up to a max. of 1 x 2.5 mm^2 (14 AWG)

Fire protection class

Housing: V2 according to UL 94 standard. (Unless stated otherwise all details relate to the reference conditions.)

Labeling

place for labeling on the front side, label:

- KC-modules (12.5 mm): 22 mm x 9 mm
- KF-modules (20 mm): 22 mm x 16.5mm
- KF-modules (40 mm): 18 mm x 8 mm

Ambient conditions

Ambient temperature

-20 °C to 60 °C (-4 °F to 140 °F)

Exceptions see data sheets.

Storage temperature

-40 °C to 90 °C (-40 °F to 194 °F)

Reference conditions for adjustment

20 °C (68 °F)

Relative humidity

max. 95 % without moisture condensation

Vibration resistance

acc. to EN 60068-2-6, 10 Hz to 150 Hz, 1 g, high crossover frequency

Shock resistance

acc. to EN 60068-2-27, 15 g, 11 ms, half-sine

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Conformity with standards and directives

General

- EMC acc. to NAMUR NE21 and EN 61326
- LEDs acc. to NAMUR NE44
- Software acc. to NAMUR NE53
- Switch-on pulse suppression
- Devices K*D2:
  - Supply voltage 20 V DC to 30 V DC via Power Rail or supply terminals
  - Fault signals via Power Rail
- Devices K*A and K*U:
  - Supply voltage 115 V/230 V AC ±10 %
- Safety devices acc. to VDE 0660 T.209, AK acc. to DIN 19250

Digital inputs/outputs in accordance with NAMUR

The standards references for this interface have changed many times:

German standard (old): **DIN 19234**: Electrical distance sensors – DC interface for distance sensors and switch amplifiers; 1990-06

European standard (old): **EN 50227**: Low voltage switch gear and control gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 1996-10

German version (old): **DIN EN 50227**: Low voltage switch gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 1997, German nomenclature VDE 0660, part 212

Current designation: DIN EN 60947-5-6: Low voltage switch gear – control devices and switching elements – proximity switches, DC interface for proximity sensors and switch amplifiers (NAMUR), 2000, German nomenclature. VDE 0660 part 212

Current IEC designation: IEC 60947-5-6: Low voltage switch gear and control gear – part 5-6: Control circuit devices and switching elements – DC interface for proximity sensors and switching amplifiers (NAMUR), 1999.

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Switch Amplifiers

Model Number	Channels	Function Timer	Input (Field): NAMUR Sensor/ Dry Contact	Input (Field): 3-wire Sensor	Input (Field): Line Fault Detection	Output (Control System): Relay	Output (Control System): Error Message Output	Supply: 24 V DC	Supply: 115 V AC/ 230 V AC	SIL	Page
KCD2-SR-1.LB	1		■		■	2	■	■		2	579
KCD2-SR-2	2		■		■	2		■		2	580
KFD2-SR2-2.2S	2		■		■	2x2		■		2	581
KFU8-SR-1.3L.V	1	■		■		2		■	■		582
KFA6-SR-2.3L	2			■		2			■		583

Frequency Converters

Model Number	Functions: Speed Monitor	Functions: Frequency Conversion	Functions: Special Functions	Input (Field): NAMUR Sensor/ Dry Contact	Input (Field): Line Fault Detection	Output (Control System): Relay	Output (Control System): Transistor (Passive)	Output (Control System): Error Message Output	Output (Control System): 0/4 mA ... 20 mA	Supply: 24 V DC	Supply: 115 V AC/ 230 V AC	SIL	Page
KFD2-SR2-2.W.SM	■		■	■	■	2				■		2	584
KFD2-DWB-1.D	■			■	■	2		■		■		2	585
KFU8-DWB-1.D	■			■	■	2		■		■	■	2	586
KFD2-UFC-1.D	■	■	■	■	■	2	1	■	1	■		2	587
KFU8-UFC-1.D	■	■	■	■	■	2	1	■	1	■	■	2	588
KFD2-UFT-2.D	■	■	■	■	■	2	2	■	1	■			589
KFU8-UFT-2.D	■	■	■	■	■	2	2	■	1	■	■		590

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Conductivity Switch Amplifiers

Model Number	Channels	Function: Measurement of Conductivity	Input (Field): Line Fault Detection	Input (Field): Resistance	Output (Control System): Relay	Output (Control System): Error Message Output	Supply: 24 V DC	Supply: 115 V AC/ 230 V AC	SIL	Page
KFD2-ER-1.5	1	■			1		■			591
KFD2-ER-1.6	1	■			1		■			592
KFA5-ER-1.5	1	■			1			■		593
KFA5-ER-1.6	1	■			1			■		594
KFA6-ER-1.5	1	■			1			■		595
KFA6-ER-1.6	1	■			1			■		596
KFD2-ER-1.W.LB	1	■	■	■	2	■	■			597
KFD2-ER-2.W.LB	2	■	■	■	2	■	■			598
KFA5-ER-1.W.LB	1	■	■	■	2	■		■		599
KFA5-ER-2.W.LB	2	■	■	■	2	■		■		600
KFA6-ER-1.W.LB	1	■	■	■	2	■		■		601
KFA6-ER-2.W.LB	2	■	■	■	2	■		■		602

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Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 500 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal or error message; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 30 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 119 mm (0.5 x 4.5 x 4.7 in), housing type A2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Fault relay contact output**
- **Line fault detection (LFD)**
- **Housing width 12.5 mm**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner transfers digital signals (NAMUR sensors/mechanical contacts) from the field to the control system.

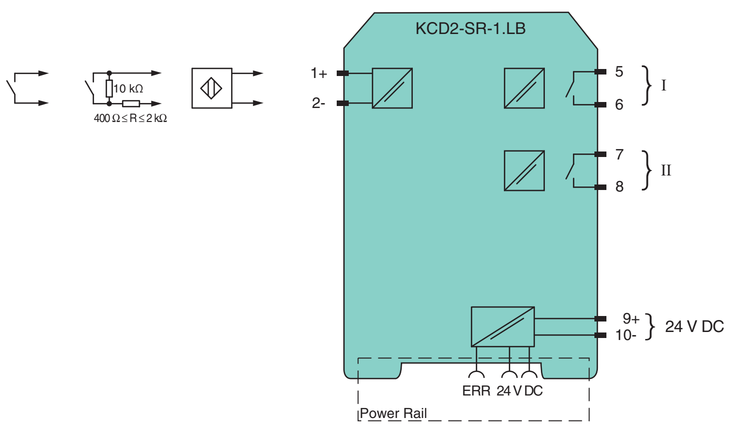
The proximity sensor or switch controls a form A normally open relay contact for the load. The normal output state is reversed using switch S1. Switch S2 allows output II to be switched between a signal output and an error message output. Switch S3 enables or disables line fault detection of the field circuit.

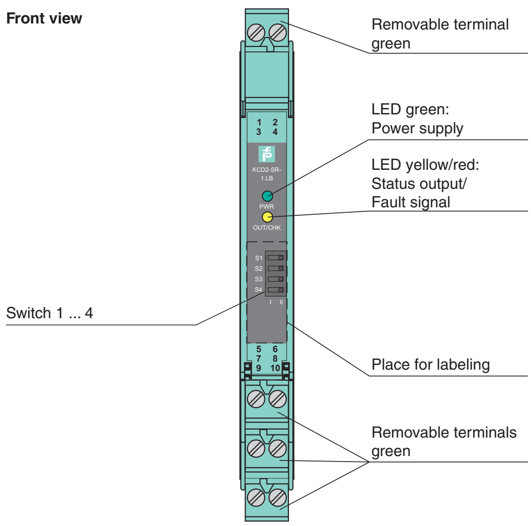
During an error condition, relays revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Due to its compact housing design and low heat dissipation, this device is useful for detecting positions, end stops, and switching states in space-critical applications.

Diagrams





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KCD2-SR-2

Switch Amplifier

Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Relay contact output**
- **Line fault detection (LFD)**
- **Housing width 12.5 mm**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner transfers digital signals (NAMUR sensors/mechanical contacts) from the field to the control system.

The proximity sensor or switch controls a form A normally open relay contact for the load. The normal output state can be reversed using switches S1 and S2. Switch S3 is used to enable or disable line fault detection of the field circuit.

During an error condition, relays revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

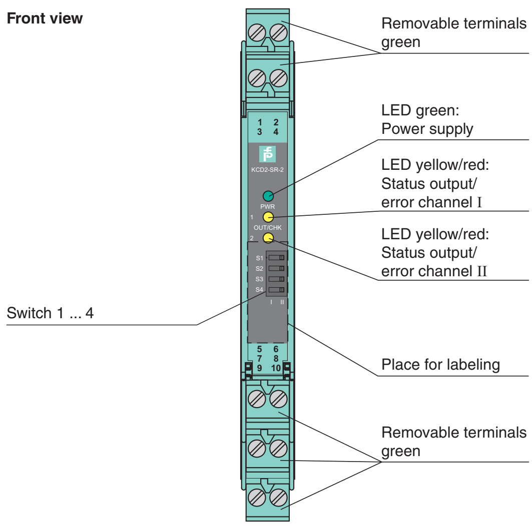
Due to its compact housing design and low heat dissipation, this device is useful for detecting positions, end stops, and switching states in space-critical applications.

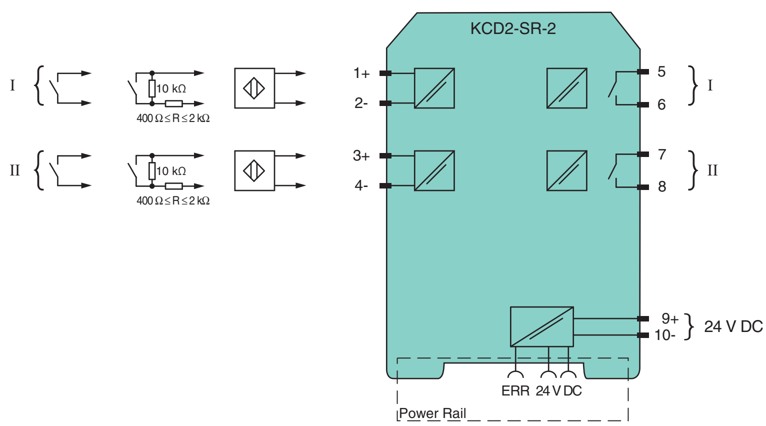
Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 600 mW
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 10 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I ≥ 6.5 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Output I	signal; relay
Output II	signal; relay
Contact loading	253 V AC/2 A/cos Φ > 0.7; 126.5 V AC/4 A/cos Φ > 0.7; 30 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	≤ 20 ms/≤ 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 119 mm (0.5 x 4.5 x 4.7 in), housing type A2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	< 1.3 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Open circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Line fault detection	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Output	
Collective error message	Power Rail
Output I, II, III, IV	channel 1, 2; relay
Contact loading	50 V AC/1 A/cos Φ > 0.7; 40 V DC/1 A resistive load
Minimum switch current	1 mA/24 V DC
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^8 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **2 x 2 relay contact outputs with AND logic**
- **Line fault detection (LFD)**
- **Reversible mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

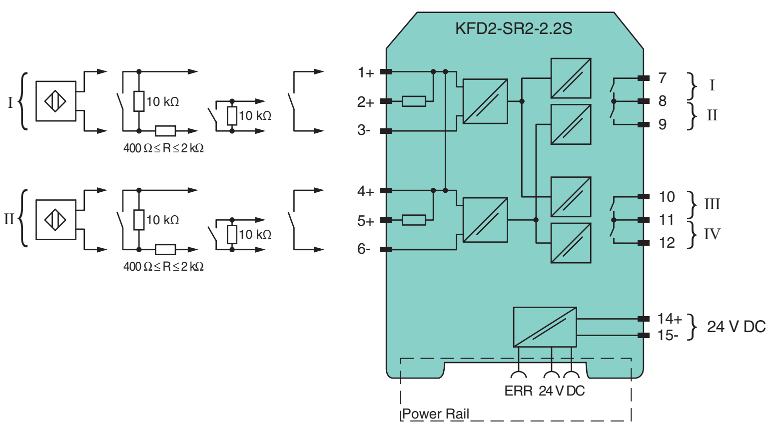
This signal conditioner transfers digital signals (NAMUR sensors/mechanical contacts).

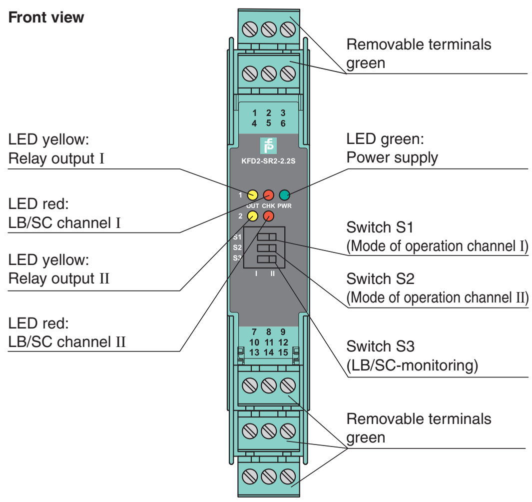
Each sensor or switch controls two form A normally open relay contacts. The normal output state can be reversed using switches S1 and S2. Switch S3 is used to enable or disable line fault detection of the field circuit.

During an error condition, the relays revert to their de-energized state and the LEDs indicate the fault according to NAMUR NE44.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams





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Features

- **1-channel signal conditioner**
- **AC/DC wide range supply**
- **3-wire PNP/NPN sensor or push-pull input**
- **2 relay contact outputs**
- **Adjustable energized/de-energized delay**

Function

This signal conditioner converts the state of 3-wire sensors (PNP or NPN) or sensors with push-pull output stages into two relay outputs.

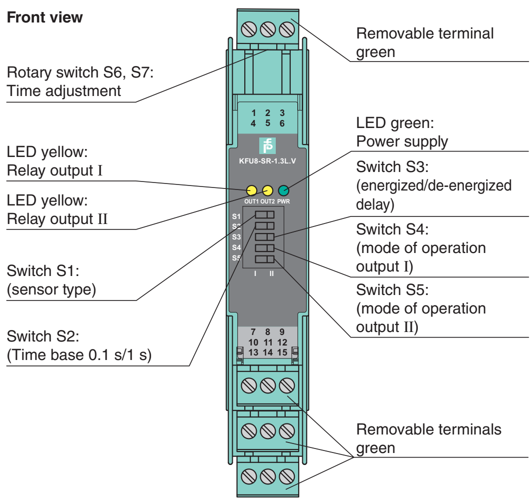
It has one input and two form C changeover relay outputs.

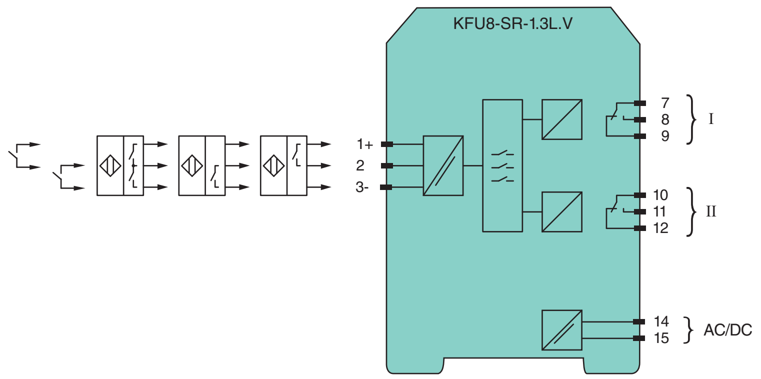
The switch amplifier has an adjustable energized/de-energized delay for the relay outputs.

Technical data

Supply	
Rated voltage	20 ... 48 V DC or 90 ... 253 V AC, 45 ... 65 Hz
Power consumption	≤ 4.5 W
Input	
Rated values	22 ... 24 V DC/100 mA
Short-circuit current	≤ 125 mA
Switching point	PNP: 0-signal: < 12.5 V, 1-signal: > 13.5 V NPN and push-pull output: 0-signal: < 4.5 V, 1-signal: > 5.5 V
Output	
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 125 V AC/4 A/cos Φ > 0.7; 40 V DC/2 A
Mechanical life	20 x 10^6 switching cycles
Electrical life	0.2 x 10^6 switching cycles (40 V DC, 2 A, ohmic) 0.4 x 10^6 switching cycles (253 V AC, 2 A, cos Φ = 1) 0.25 x 10^6 switching cycles (253 V AC, 2 A, cos Φ = 0.7)
Minimum load	50 mW, 5 V DC
Energized/De-energized delay	≤ 90 ms/≤ 90 ms
Transfer characteristics	
Switching frequency	≤ 5 Hz for delay 0 s adjustable energized/de-energized delay: 0 ... 79 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 166 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams





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Technical data

Supply	
Rated voltage	90 ... 253 V AC, 45 ... 65 Hz
Power consumption	≤ 7 W
Input	
Rated values	22 ... 24 V DC/100 mA
Short-circuit current	110 mA
Switching point	0-signal: < 5 V 1-signal: > 13 V
Output	
Output I, II	
Contact loading	250 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	max. 6 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **2-channel signal conditioner**
- **230 V AC supply**
- **3-wire PNP/NPN sensor or push-pull input**
- **Relay contact output**
- **DIP switch selectable functions**
- **Minimum/maximum control**

Function

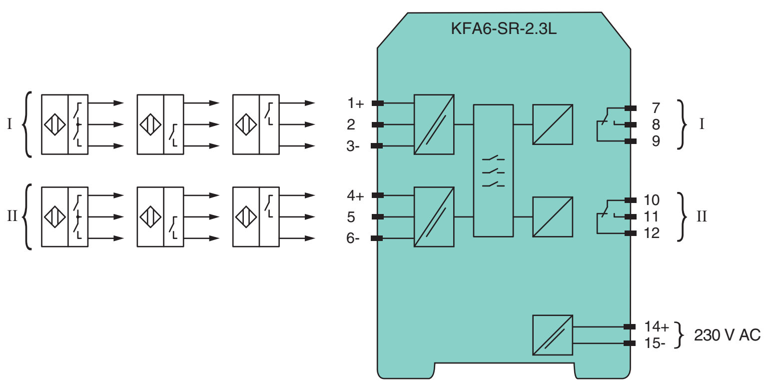
This signal conditioner converts the state of 3-wire sensors (PNP or NPN) or sensors with push-pull output stages into a relay output.

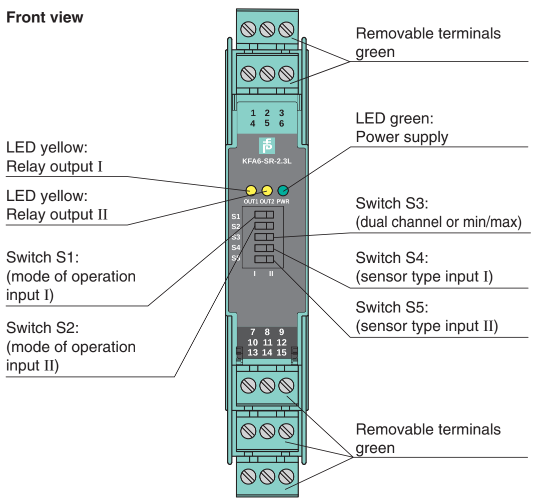
It has two inputs and two form C changeover relay outputs.

The device can be used either as dual channel signal conditioner or as a two-point level controller.

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Diagrams





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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **1-channel signal conditioner**
- **24 V DC supply**
- **PNP/push-pull, dry contacts or NAMUR inputs**
- **Selectable frequency trip values**
- **2 relay contact outputs**
- **Start-up override**
- **Selectable mode of operation**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is a zero speed/standstill monitor that accepts input frequency pulses and triggers an output when the frequency drops below a selected value.

Two startup override values are available. This unit can also be used to determine rotation direction.

During an error condition, relays revert to their de-energized state and LEDs indicate the fault according to NAMUR NE44.

The available diagnostic LEDs show rotation detection, limit trip indicator, power on, and hardware error indication.

The unit is easily programmed via switches mounted on the front of the unit.

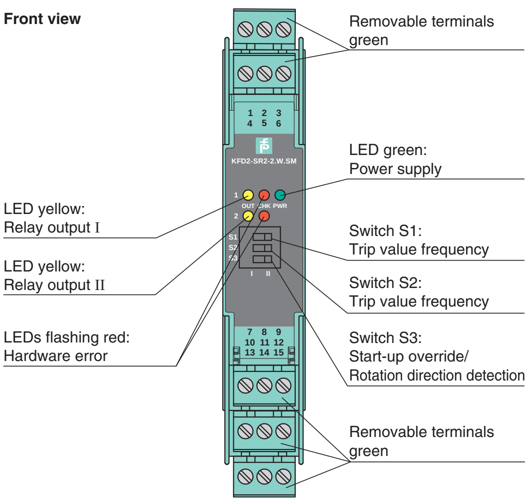
For additional information, refer to www.pepperl-fuchs.com.

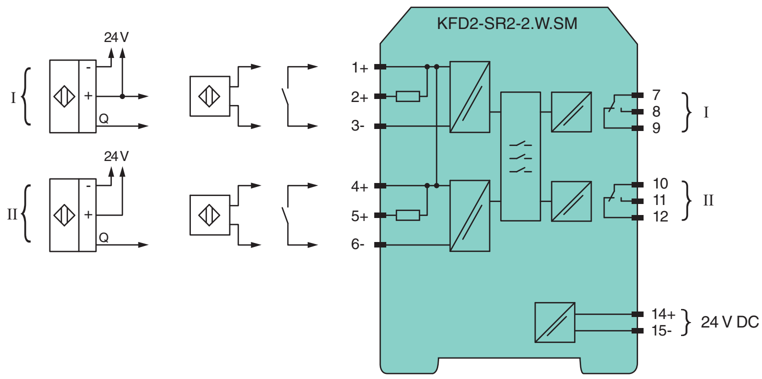
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	≤ 1.5 W
Input	
Rated values	acc. to EN 60947-5-6 (NAMUR)
Switching point/switching hysteresis	x ≤ 1.2 mA or x ≥ 2.1 mA/approx. 0.9 mA
Control input	sensor power supply approx. 8.2 V, impedance 1.2 kΩ
Lead monitoring	not available
Pulse duration	> 200 µs for standstill monitoring, > 250 µs for rotation direction detecion
Output	
Relay	2 changeover contacts
Contact loading	253 V AC/2 A/cos Φ > 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Mechanical life	5 x 10^6 switching cycles
Trip value f_{max}	for standstill monitoring: 0.1 Hz; 0.5 Hz; 2 Hz; 10 Hz adjustable via DIP switch (S1 and S2)
Transfer characteristics	
Accuracy	± 5 %
Start-up override	5 seconds or 20 seconds, programmable
Frequency range	≤ 2 kHz
Rotation direction detection	90° phase difference between pulse input signal 1 and 2, overlapping ≥ 125 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Connection	plug-in terminals
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 1.8 W/1.8 W
Input	
Input I	sensor acc. to EN 60947-5-6 (NAMUR) or mechanical contact
Open circuit voltage/short-circuit current	22 V/40 mA
Input resistance	4.7 kΩ
Switching point/switching hysteresis	logic 1: > 2.5 mA; logic 0: < 1.9 mA
Pulse duration	> 50 µs
Input frequency	0.001 ... 12000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 4 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Collective error message	Power Rail
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Transfer characteristics	
Input I	
Measurement range	0.001 ... 12000 Hz
Output I, II	
Response delay	≤ 200 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA nC IIC T4

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 12 kHz**
- **2 relay contact outputs**
- **Start-up override**
- **Configurable by keypad**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner monitors for an overspeed or underspeed condition of a digital signal (NAMUR sensor/mechanical contact) by comparing the input frequency to the user programmed reference frequency.

An overspeed or underspeed condition is signaled via the relay outputs. Line fault detection of the field circuit is indicated by a red LED, Power Rail and/or relay. The startup override feature sets relay outputs to default conditions programmed by the user for up to 1,000 seconds.

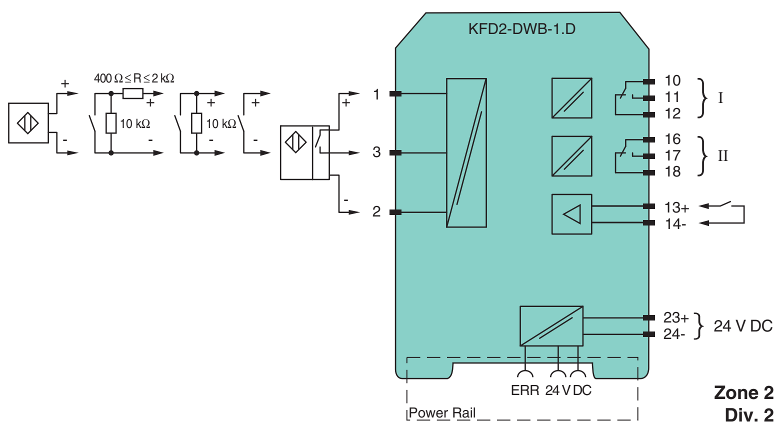
The unit is easily programmed by the use of a keypad located on the front of the unit.

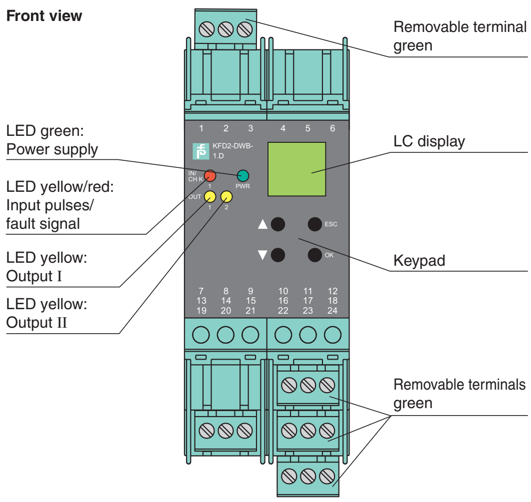
A unique collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Diagrams





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Features

- **1-channel signal conditioner**
- **AC/DC wide range supply**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 12 kHz**
- **2 relay contact outputs**
- **Start-up override**
- **Configurable by keypad**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner monitors an overspeed or underspeed condition of a digital signal (NAMUR sensor/mechanical contact) by comparing the input frequency to the user programmed reference frequency.

An overspeed or underspeed condition is signaled via the relay outputs. Line fault detection of the field circuit is indicated by a red LED and/or relay. The startup override feature sets relay outputs to default conditions programmed by the user for up to 1,000 seconds.

The unit is easily programmed by the use of a keypad located on the front of the unit.

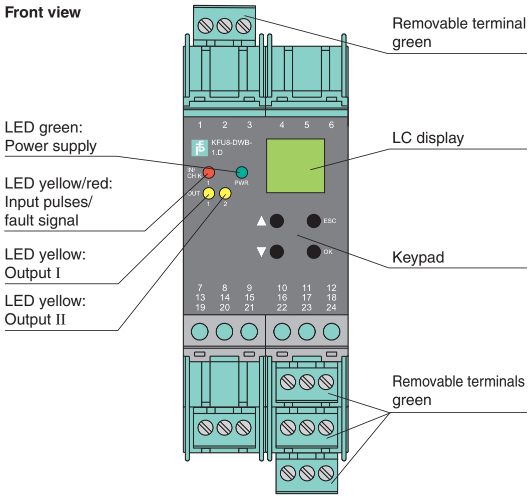
For additional information, refer to the manual and www.pepperl-fuchs.com.

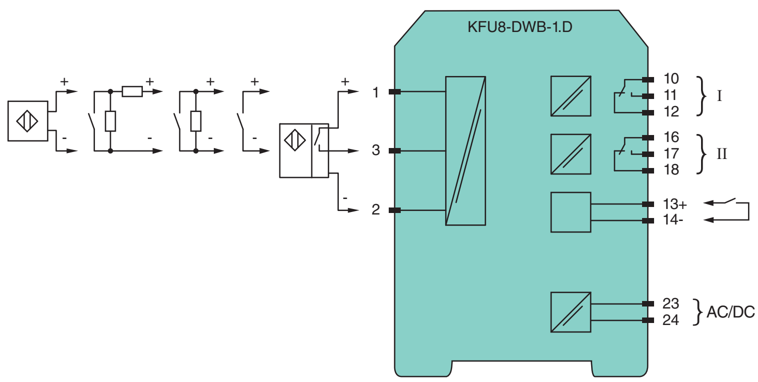
Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC 50 ... 60 Hz
Power loss/power consumption	≤ 1.8 W; 2 VA/1.8 W; 2 VA
Input	
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 6.5 mA
Input I	sensor acc. to EN 60947-5-6 (NAMUR) or mechanical contact
Open circuit voltage/short-circuit current	22 V/40 mA
Input resistance	4.7 kΩ
Switching point/switching hysteresis	logic 1: > 2.5 mA; logic 0: < 1.9 mA
Pulse duration	> 50 µs
Input frequency	0.001 ... 12000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 4 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Transfer characteristics	
Input I	
Measurement range	0.001 ... 12000 Hz
Output I, II	
Response delay	≤ 200 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 2 W/2.2 W
Input	
Input I	sensor acc. to EN 60947-5-6 (NAMUR) or mechanical contact
Pulse duration	> 50 µs
Input frequency	0.001 ... 12000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 4 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Output	
Collective error message	Power Rail
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	electronic output, passive
Contact loading	40 V DC
Signal level	1-signal: (L+) -2.5 V (50 mA, short-circuit/overload proof) 0-signal: blocked output (off-state current ≤ 10 µA)
Output IV	analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale ≥ 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 12 kHz**
- **Current output 0/4 mA ... 20 mA**
- **Relay and transistor output**
- **Start-up override**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is an universal frequency converter that changes a digital input (NAMUR sensor/mechanical contact) into a proportional free adjustable 0/4 mA ... 20 mA analog output and functions as a switch amplifier and a trip alarm.

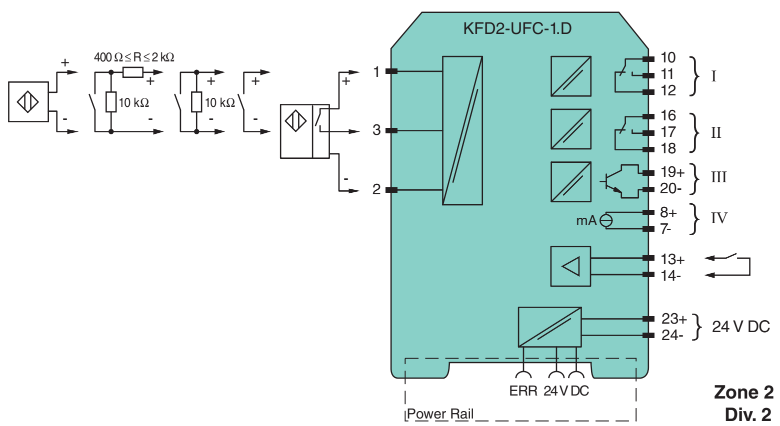
Also the functions of the switch outputs (2 relay outputs and 1 potential free transistor output) are easily adjustable [trip value display (min/max alarm), serially switched output, pulse divider output, error signal output].

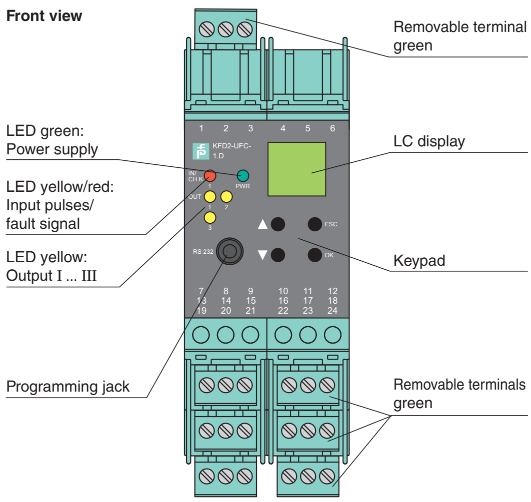
The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

Line fault detection of the field circuit is indicated by a red LED and through the collective error output via Power Rail.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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KFU8-UFC-1.D

Frequency Converter with Trip Values

Features

- **1-channel signal conditioner**
- **AC/DC wide range supply**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 12 kHz**
- **Current output 0/4 mA ... 20 mA**
- **Relay and transistor output**
- **Start-up override**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is an universal frequency converter that changes a digital input (NAMUR sensor/mechanical contact) into a proportional free adjustable 0/4 mA ... 20 mA analog output and functions as a switch amplifier and a trip alarm.

Also the functions of the switch outputs (2 relay outputs and 1 potential free transistor output) are easily adjustable [trip value display (min/max alarm), serially switched output, pulse divider output, error signal output].

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

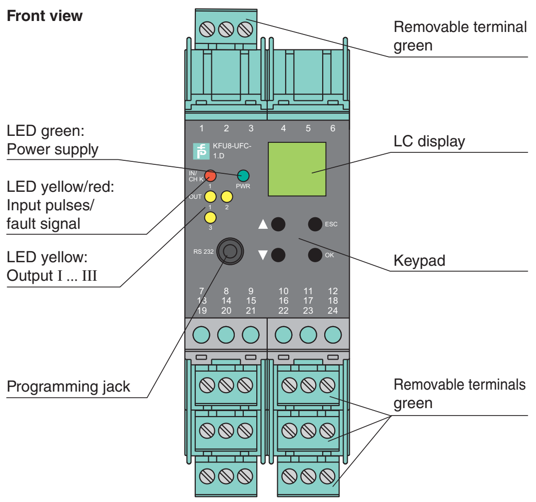
Line fault detection of the field circuit is indicated by a red LED.

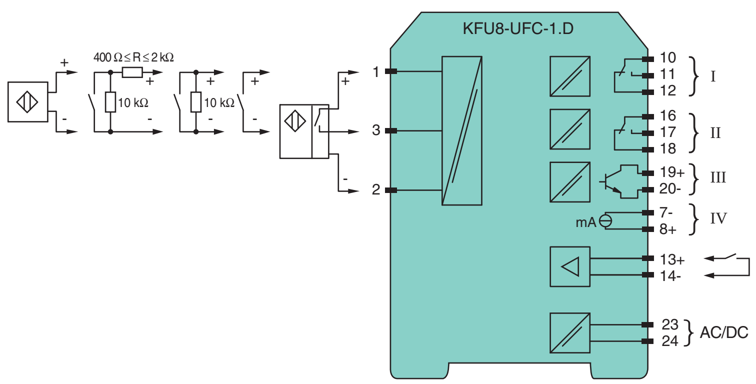
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC 50 ... 60 Hz
Power loss/power consumption	≤ 2 W; 2.5 VA/2.2 W; 3 VA
Input	
Input I	sensor acc. to EN 60947-5-6 (NAMUR) or mechanical contact
Pulse duration	> 50 µs
Input frequency	0.001 ... 12000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 4 mA
Input II	startup override: 1 ... 1000 s, adjustable in steps of 1 s
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Output	
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	electronic output, passive
Contact loading	40 V DC
Signal level	1-signal: (L+) -2.5 V (50 mA, short-circuit/overload proof) 0-signal: blocked output (off-state current ≤ 10 µA)
Output IV	analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale ≥ 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	2.5 W
Input	
Input I, II	sensor acc. to EN 60947-5-6 (NAMUR) or mechanical contact
Open circuit voltage/short-circuit current	8.2 V/10 mA
Switching point/switching hysteresis	logic 1: > 2.5 mA; logic 0: < 1.9 mA
Pulse duration	≥ 250 µs, overlap on direction of rotation signal: ≥ 125 µs
Input frequency	rotation direction monitoring 0.001 ... 1000 Hz slip monitoring 10 ... 1000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 4 mA
Input III, IV	
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Collective error message	Power Rail
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 DC/2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III and IV	signal; electronic output, passive
Contact loading	40 V DC
Output V	analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	max. 24 V DC
Load	max. 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43)
Programming interface	
Interface	RS 232
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 1 kHz**
- **Current output 0/4 mA ... 20 mA**
- **Relay and transistor output**
- **Start-up override**
- **Line fault detection (LFD)**

Function

This signal conditioner analyzes 2 digital signals (NAMUR sensor/mechanical contact) and functions as a rotation direction indicator, slip monitor, frequency monitor or synchronization monitor.

Each proximity sensor or switch controls a passive transistor output. The 2 relay outputs indicate if the input signal is above or below the trip value or the rotational direction.

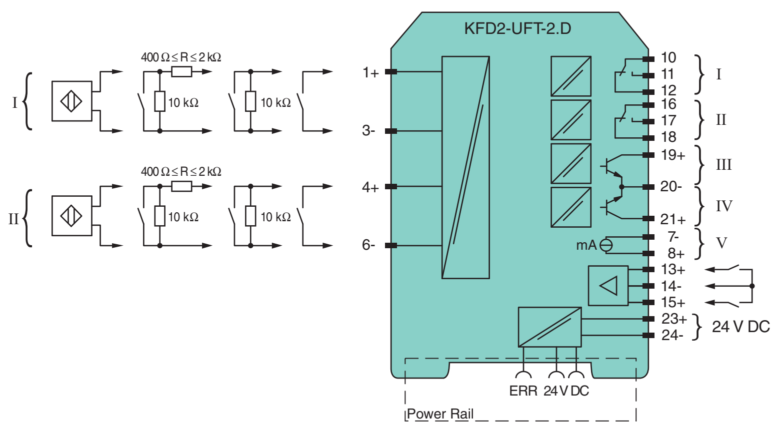
The analog output can be programmed to be proportional to the input frequency or slip differential.

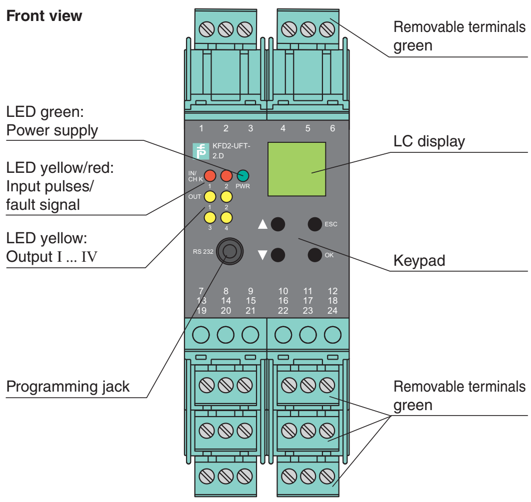
The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

Line fault detection of the field current is indicated by a red LED and through the collective error output via Power Rail.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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KFU8-UFT-2.D

Frequency Converter with Direction and Synchronization Monitor

Features

- **2-channel signal conditioner**
- **AC/DC wide range supply**
- **Dry contact or NAMUR inputs**
- **Input frequency 1 mHz ... 1 kHz**
- **Current output 0/4 mA ... 20 mA**
- **Relay and transistor output**
- **Start-up override**
- **Line fault detection (LFD)**

Function

This signal conditioner analyzes 2 digital signals (NAMUR sensor/mechanical contact) and functions as a rotation direction indicator, slip monitor, frequency monitor or synchronization monitor.

Each proximity sensor or switch controls a passive transistor output. The 2 relay outputs indicate if the input signal is above or below the trip value or the rotational direction.

The analog output can be programmed to be proportional to the input frequency or slip differential.

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

Line fault detection of the field current is indicated by a red LED.

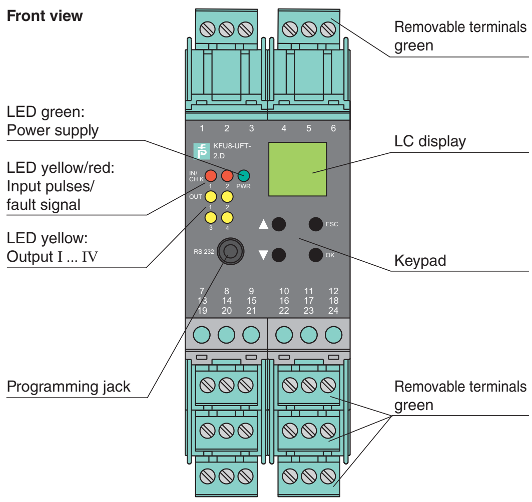
For additional information, refer to the manual and www.pepperl-fuchs.com.

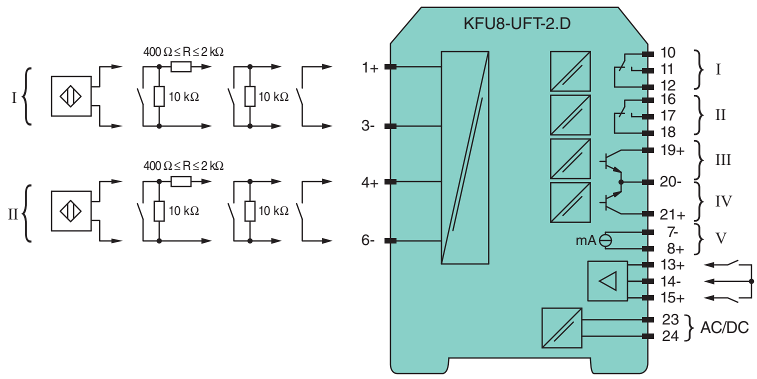
Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC 50 ... 60 Hz
Power consumption	2.5 W/4 VA
Input	
Input I, II	sensor acc. to EN 60947-5-6 (NAMUR) or mechanical contact
Open circuit voltage/short-circuit current	8.2 V/10 mA
Switching point/switching hysteresis	logic 1: > 2.5 mA; logic 0: < 1.9 mA
Pulse duration	≥ 250 µs, overlap on direction of rotation signal: ≥ 125 µs
Input frequency	rotation direction monitoring 0.001 ... 1000 Hz slip monitoring 10 ... 1000 Hz
Lead monitoring	breakage I ≤ 0.15 mA; short-circuit I > 4 mA
Input III, IV	
Active/Passive	I > 4 mA (for min. 100 ms)/I < 1.5 mA
Open circuit voltage/short-circuit current	18 V/5 mA
Output	
Output I, II	signal; relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 DC/2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III and IV	signal; electronic output, passive
Contact loading	40 V DC
Output V	analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	max. 24 V DC
Load	max. 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43)
Programming interface	
Interface	RS 232
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Open circuit voltage/short-circuit current	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 30 kΩ, adjustable via potentiometer (20 turns)
Output	
Output	1 changeover contact
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 1 s/approx. 1 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 30 kΩ**
- **Latching relay output**
- **Minimum/maximum control**

Function

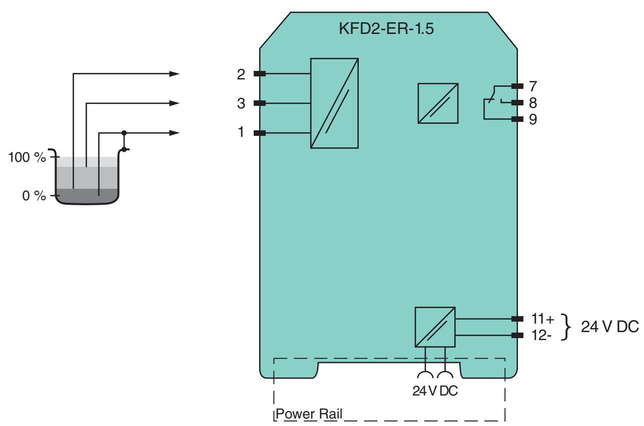
This signal conditioner provides the AC measuring voltage for the level-sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

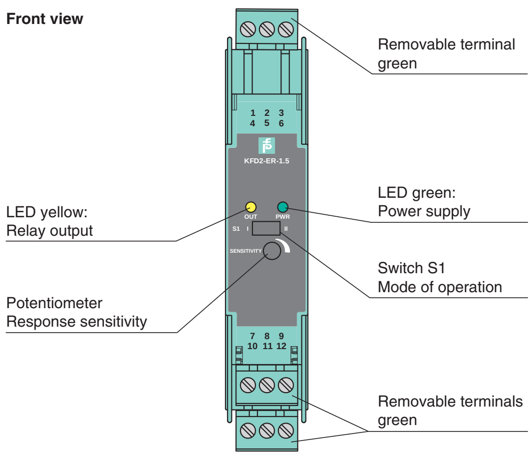
The module is voltage and temperature stabilized and guarantees defined switching characteristics. An electronic holding circuit is used that allows minimum/maximum control. Since the conductance of the media may vary, the relay response sensitivity is adjustable.

The normal output state can be reversed through the mode of operation switch S1.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Level sensing input**
- **Adjustable range 5 kΩ ... 150 kΩ**
- **Latching relay output**
- **Minimum/maximum control**

Function

This signal conditioner provides the AC measuring voltage for the level-sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees defined switching characteristics. An electronic holding circuit is used that allows minimum/maximum control. Since the conductance of the media may vary, the relay response sensitivity is adjustable.

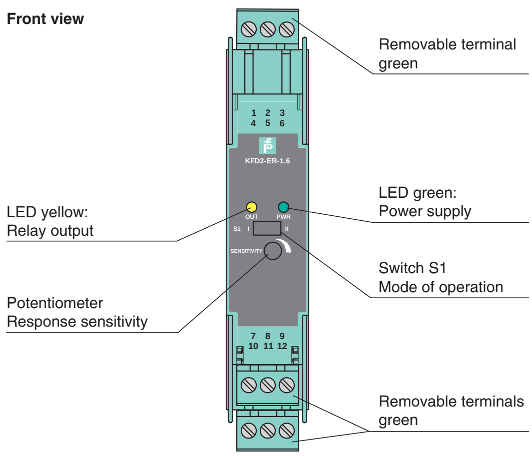
The normal output state can be reversed through the mode of operation switch S1.

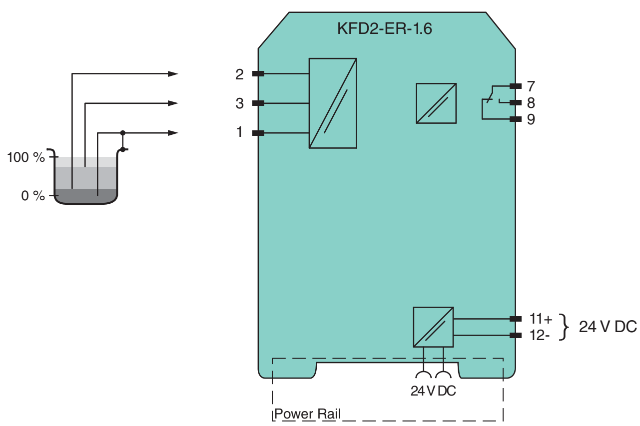
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Open circuit voltage/short-circuit current	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	5 ... 150 kΩ, adjustable via potentiometer (20 turns)
Output	
Output	1 changeover contact
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 1 s/approx. 1 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Diagrams

Front view





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Technical data

Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	approx. 0.8 W
Input	
Open circuit voltage/short-circuit current	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 30 kΩ, adjustable via potentiometer (20 turns)
Output	
Output	1 changeover contact
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 1 s/approx. 1 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Features

- **1-channel signal conditioner**
- **115 V AC supply**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 30 kΩ**
- **Latching relay output**
- **Minimum/maximum control**

Function

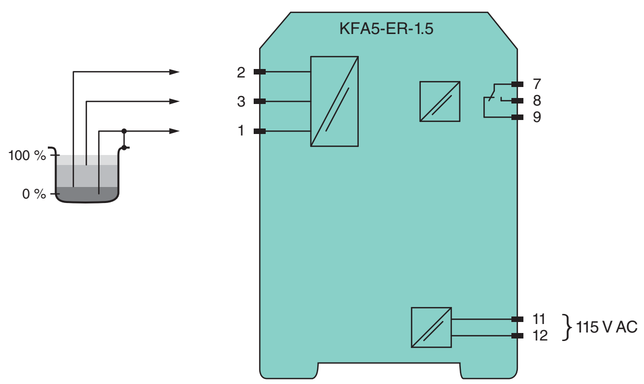
This signal conditioner provides the AC measuring voltage for the level-sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

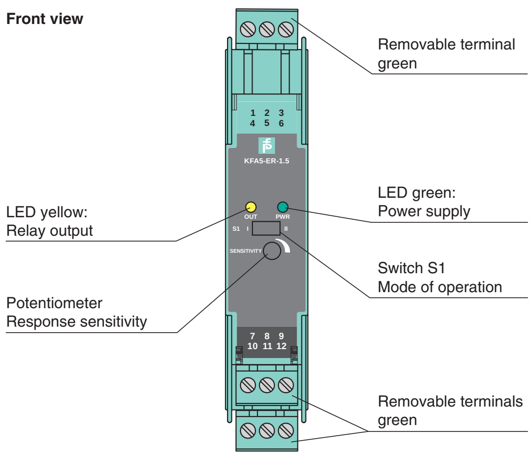
The module is voltage and temperature stabilized and guarantees defined switching characteristics. An electronic holding circuit is used that allows minimum/maximum control. Since the conductance of the media may vary, the relay response sensitivity is adjustable.

The normal output state can be reversed through the mode of operation switch S1.

Diagrams



Front view



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KFA5-ER-1.6

Conductivity Switch Amplifier

Features

- **1-channel signal conditioner**
- **115 V AC supply**
- **Level sensing input**
- **Adjustable range 5 kΩ ... 150 kΩ**
- **Latching relay output**
- **Minimum/maximum control**

Function

This signal conditioner provides the AC measuring voltage for the level-sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees defined switching characteristics. An electronic holding circuit is used that allows minimum/maximum control. Since the conductance of the media may vary, the relay response sensitivity is adjustable.

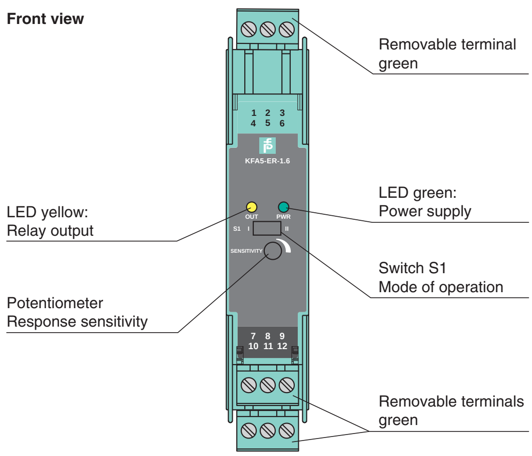
The normal output state can be reversed through the mode of operation switch S1.

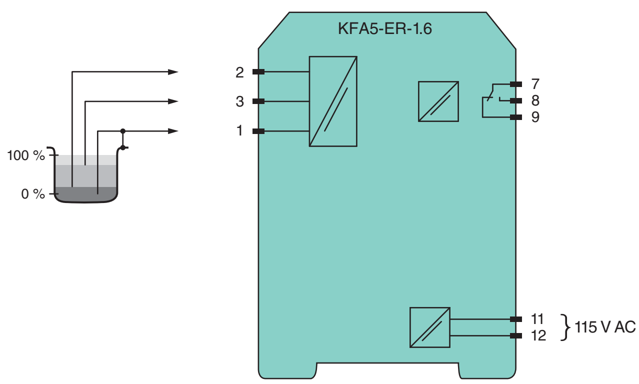
Technical data

Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	approx. 0.8 W
Input	
Open circuit voltage/short-circuit current	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	5 ... 150 kΩ, adjustable via potentiometer (20 turns)
Output	
Output	1 changeover contact
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 1 s/approx. 1 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Diagrams

Front view





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Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	approx. 0.8 W
Input	
Open circuit voltage/short-circuit current	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 30 kΩ, adjustable via potentiometer (20 turns)
Output	
Output	1 changeover contact
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 1 s/approx. 1 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Features

- **1-channel signal conditioner**
- **230 V AC supply**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 30 kΩ**
- **Latching relay output**
- **Minimum/maximum control**

Function

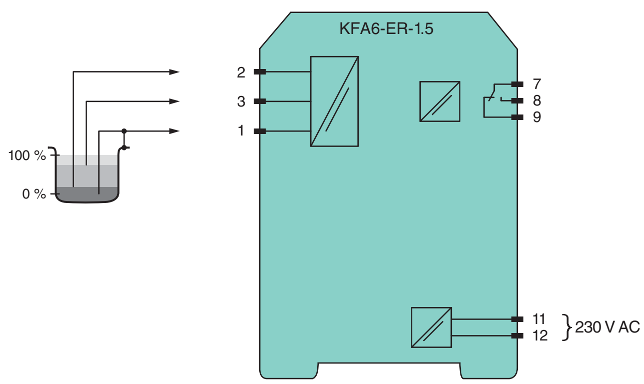
This signal conditioner provides the AC measuring voltage for the level-sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

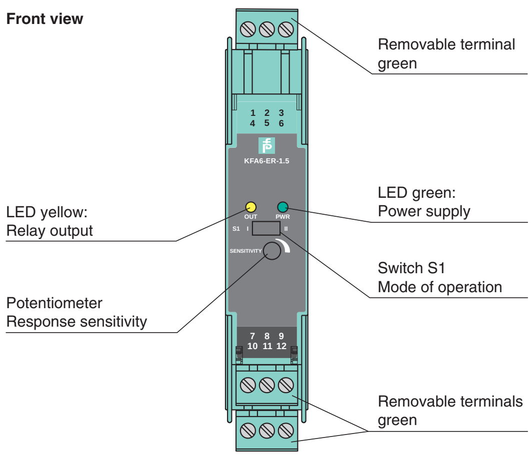
The module is voltage and temperature stabilized and guarantees defined switching characteristics. An electronic holding circuit is used that allows minimum/maximum control. Since the conductance of the media may vary, the relay response sensitivity is adjustable.

The normal output state can be reversed through the mode of operation switch S1.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **230 V AC supply**
- **Level sensing input**
- **Adjustable range 5 kΩ ... 150 kΩ**
- **Latching relay output**
- **Minimum/maximum control**

Function

This signal conditioner provides the AC measuring voltage for the level-sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees defined switching characteristics. An electronic holding circuit is used that allows minimum/maximum control. Since the conductance of the media may vary, the relay response sensitivity is adjustable.

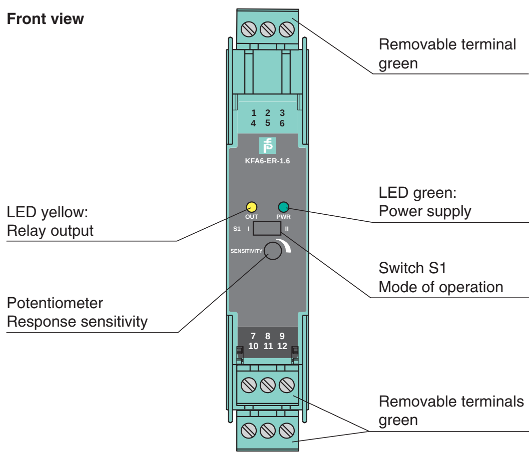
The normal output state can be reversed through the mode of operation switch S1.

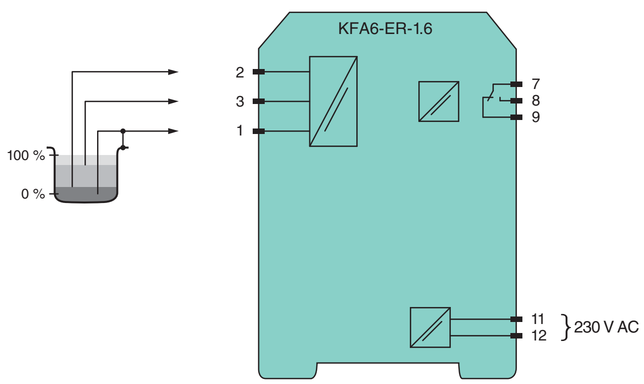
Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	approx. 0.8 W
Input	
Open circuit voltage/short-circuit current	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	5 ... 150 kΩ, adjustable via potentiometer (20 turns)
Output	
Output	1 changeover contact
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energized/De-energized delay	approx. 1 s/approx. 1 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 110 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This signal conditioner provides the AC measuring voltage for the level sensing electrodes.

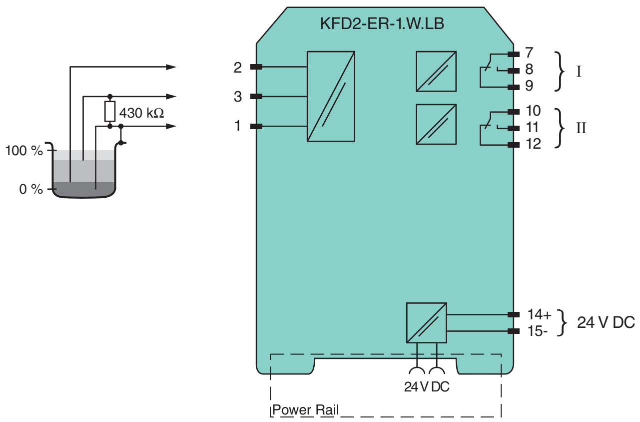
Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

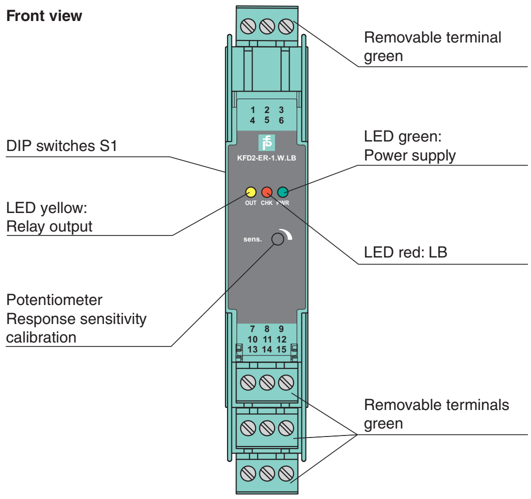
It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. If LB monitoring is selected, output II serves as the fault signal output; otherwise, it will follow the function of output I.

Diagrams



Front view



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Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This signal conditioner provides the AC measuring voltage for the level sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

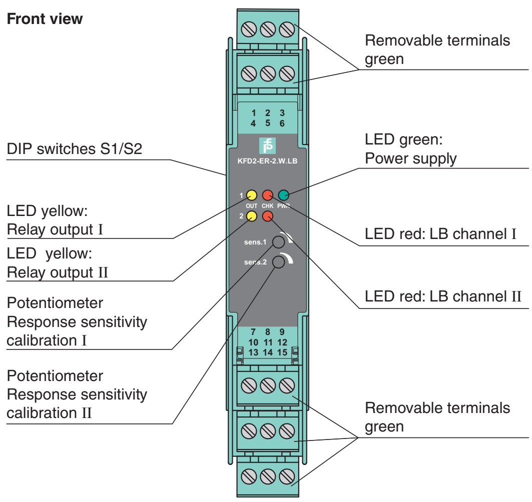
It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

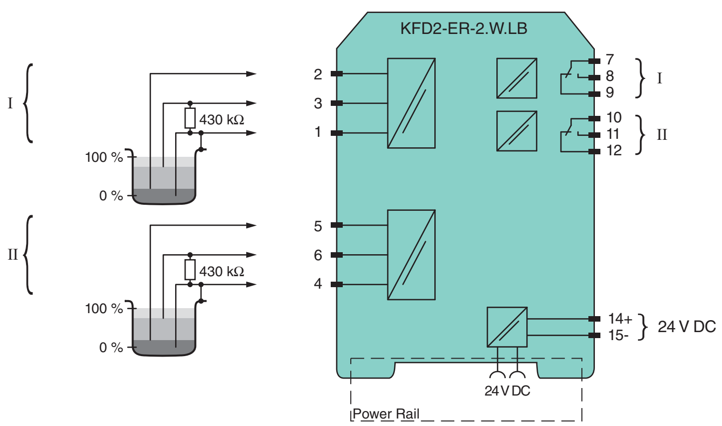
This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. This function can be deactivated with DIP switches.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Control input	min./max. control system: terminals 1, 2, 3; 4, 5. 6 on/off control system: terminals 1, 3; 4, 6
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams





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Technical data

Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	< 1.2 W
Input	
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **115 V AC supply**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This signal conditioner provides the AC measuring voltage for the level sensing electrodes.

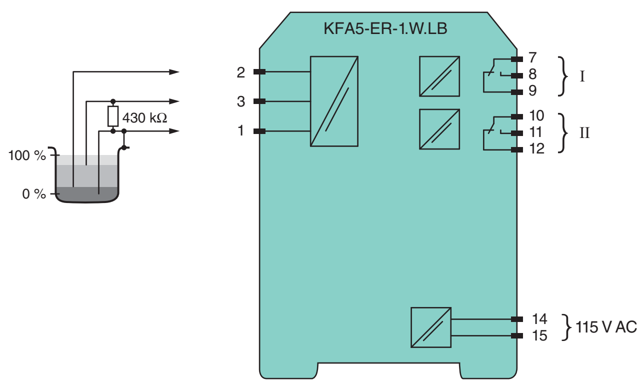
Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

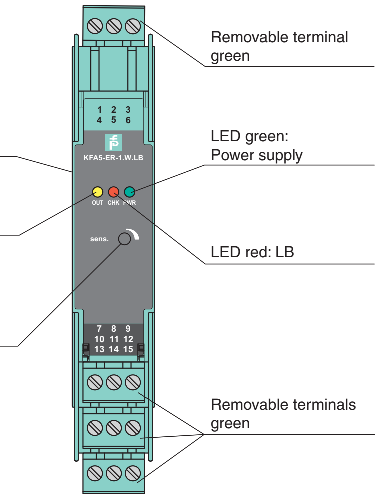
It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. If LB monitoring is selected, output II serves as the fault signal output; otherwise, it will follow the function of output I.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel signal conditioner**
- **115 V AC supply**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This signal conditioner provides the AC measuring voltage for the level sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

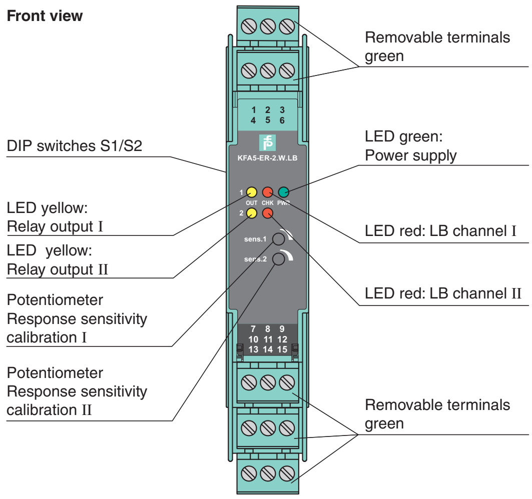
This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. This function can be deactivated with DIP switches.

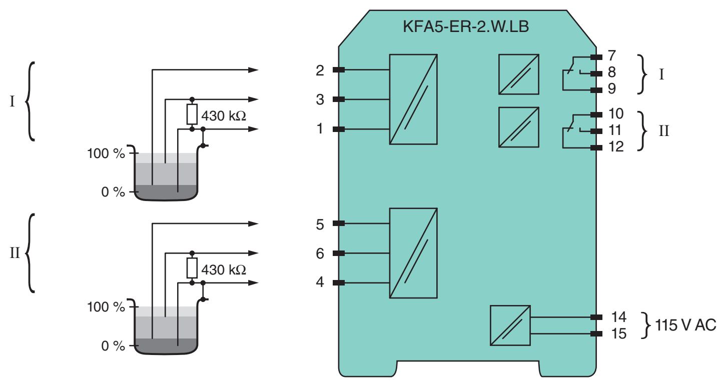
Technical data

Supply	
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz
Power consumption	< 1.2 W
Input	
Control input	min./max. control system: terminals 1, 2, 3; 4, 5. 6 on/off control system: terminals 1, 3; 4, 6
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	< 1.2 W
Input	
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **230 V AC supply**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This signal conditioner provides the AC measuring voltage for the level sensing electrodes.

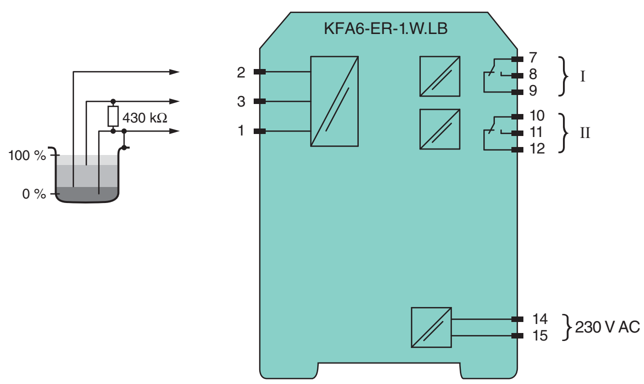
Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

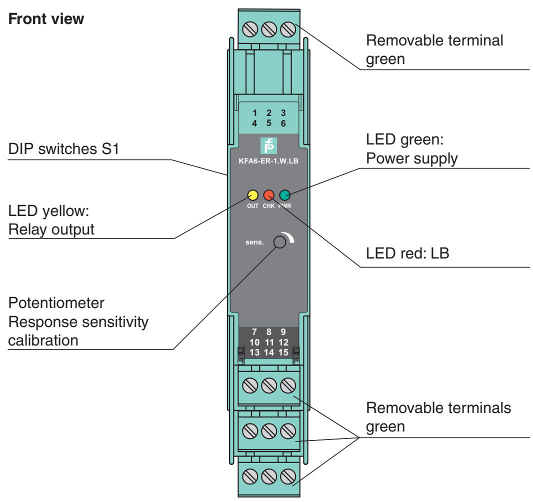
The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. If LB monitoring is selected, output II serves as the fault signal output; otherwise, it will follow the function of output I.

Diagrams





K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel signal conditioner**
- **230 V AC supply**
- **Level sensing input**
- **Adjustable range 1 kΩ ... 150 kΩ**
- **Latching relay output**
- **Adjustable time delay up to 10 s**
- **Minimum/maximum control**
- **Line fault detection (LFD)**

Function

This signal conditioner provides the AC measuring voltage for the level sensing electrodes.

Once the measured medium reaches the electrodes, the unit reacts by energizing a form C changeover relay contact.

The module is voltage and temperature stabilized and guarantees a defined switching characteristic.

It can be used for on/off control or minimum/maximum control. A signal delay feature is available and is adjustable between 0.5 s and 10 s.

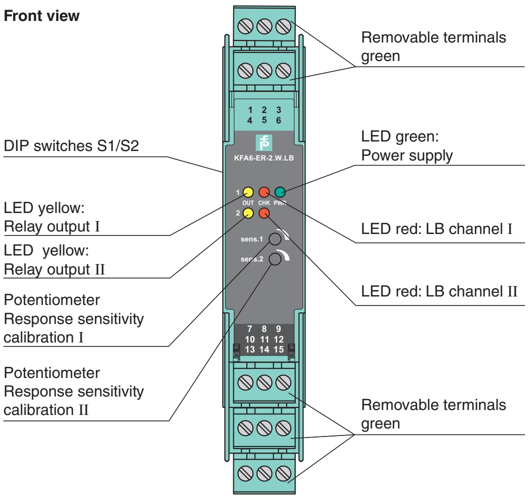
This module can also monitor the field circuit for lead breakage (LB). LB is indicated by a red LED. This function can be deactivated with DIP switches.

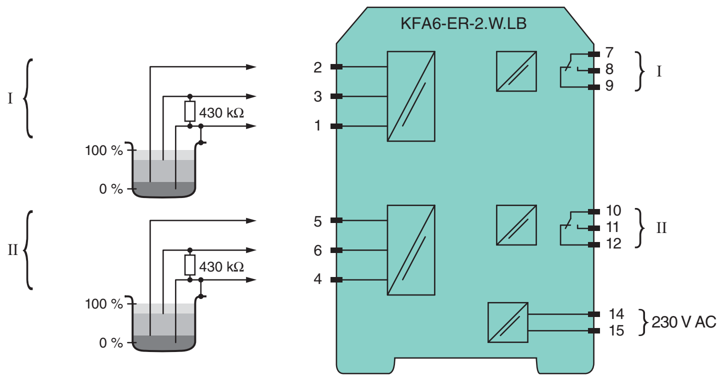
Technical data

Supply	
Rated voltage	207 ... 253 V AC, 45 ... 65 Hz
Power consumption	< 1.2 W
Input	
Control input	min./max. control system: terminals 1, 2, 3; 4, 5. 6 on/off control system: terminals 1, 3; 4, 6
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer
Output	
Switch power	max. 192 W, 2000 VA
Output	relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





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Solenoid Drivers

Model Number	Channels	Input (Control System)		Output (Field)		Supply 24 V DC	SIL	Page
		Loop Powered	Logic Input	Voltage (V)	Max. Current (mA)			
KFD2-SL-4	4		■	24	600	■	2	604

Relay Outputs

Model Number	Channels	Input (Control System)			Output (Field)				Supply		SIL	Page
		Loop Powered	Logic Input	Immune to DCS Test Pulses	Relay	ETS (Energized to Safe)	DTS (De-energized to Safe)	DPS (Dual Pole Switching)	24 V DC	Loop Powered		
KFD0-RSH-1	1	■	■		1		■			■	3	605
KFD0-RSH-1.4S.PS2	1	■	■	Yokogawa	2	■	■	■		■	3	606
KFD0-RSH-1-Y2	1	■	■	Triconex	1		■			■	3	607

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **4-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Output 600 mA per channel**
- **Logic inputs**
- **Common disable input**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is a 4-channel barrier with outputs that switch 600 mA to high-power solenoids. It is also used as power amplifier up to a switching frequency of 1 kHz.

Two channels per module can be paralleled. The output current of a parallel combination is 1.2 A. If the supply voltage falls below 18 V, the outputs will be switched off.

The outputs are sustained short-circuit proofed and overload-proofed.

Lead breakage and short circuit, which is selected via DIP switch, is indicated by a red LED and through the collective error output via Power Rail.

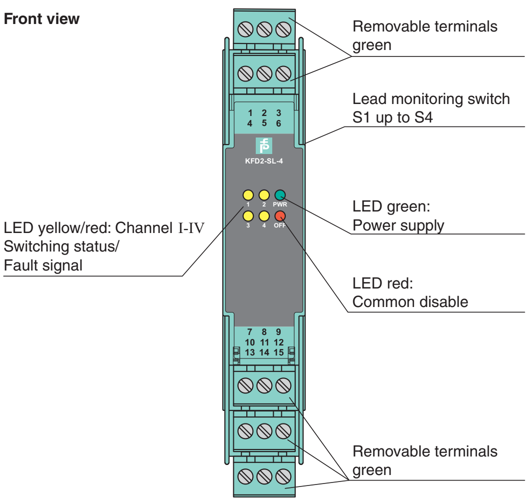
With the common disable input (terminals 11 and 12), the auxiliary power for all 4 channels can be switched off simultaneously. This central switch-off is also indicated by a red LED and reported as an error signal to the Power Rail.

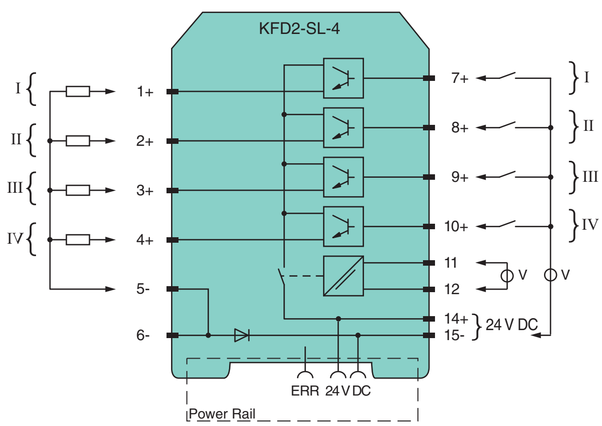
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Input	
Input current	approx. 2 mA at 24 V DC
Signal level	0-signal: 0 ... 5 V DC 1-signal: 16 ... 30 V
Comon disable	
Input current	≤ 50 mA at 24 V, depolarized currentless state: downscale of the outputs
Switch on	≥ 15 V
Switch off	≤ 5 V
Output	
Open loop voltage	24 V DC
Switching frequency f	1 kHz
Output rated operating current	600 mA, sustained short-circuit proof and overload-proof
Off-state current I_r	< 1 mA at 24 V DC
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





Edition 908837 (US) / 208599 (EU) 11/2010

Technical data

Supply	
Power loss	< 1.5 W
Power consumption	< 1.5 W
Input	
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Signal level	0-signal: 0 ... 5 V DC 1-signal: 16 ... 30 V
Rated current I_i	approx. 50 mA
Output	
Contact loading	230 V AC/2 A/cos Φ0.7; 40 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	approx. 10 ms/approx. 5 ms
Mechanical life	5 x 10^6 switching cycles
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Fail-safe relay contact output**
- **Logic input 16 V DC ... 30 V DC, non-polarized**
- **Up to SIL3 acc. to IEC 61508**

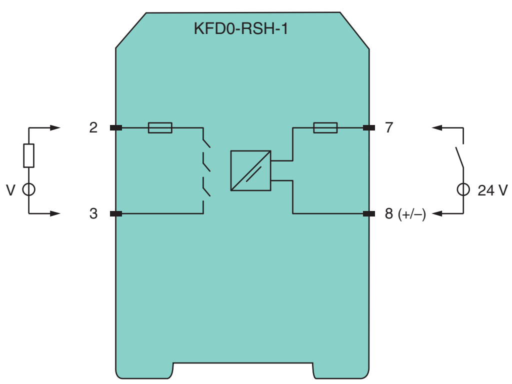
Function

This signal conditioner is a relay module that is suitable for safely switching applications of a load circuit. The device isolates load circuits up to 230 V and the 24 V control interface.

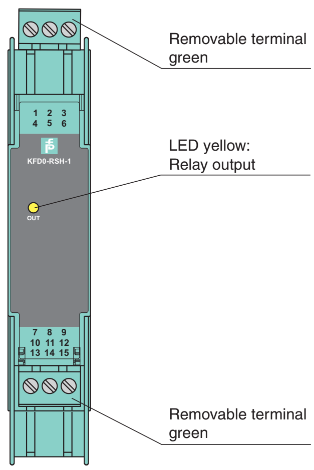
The output is galvanically isolated from the input and is protected against contact welding by a fuse.

The three relays are of diverse design, but have a common effect on the switch output.

Diagrams



Front view



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KFD0-RSH-1.4S.PS2

Relay Module

Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Fail-safe relay contact output for de-energized and energized to safe function**
- **Logic input 20 V DC ... 26.5 V DC, non-polarized**
- **Immune to DCS test pulses (Yokogawa)**
- **Up to SIL3 acc. to IEC 61508**

Function

This signal conditioner is a relay module that is suitable for safely switching applications of a load circuit. The device isolates load circuits up to 230 V and the 24 V control interface.

The energized to safe (ETS) function is permitted for SIL3 applications with output I. The de-energized to safe (DTS) function is permitted for SIL3 applications with output II. Additionally a dual pole switching (DPS) is possible by combination of output I and II.

The relays are of diverse design, but have a common effect on the individual switch output. For checking of these relays, terminals 10, 11 and 12 can be used. The test mode will be indicated by LEDs according to NAMUR NE44.

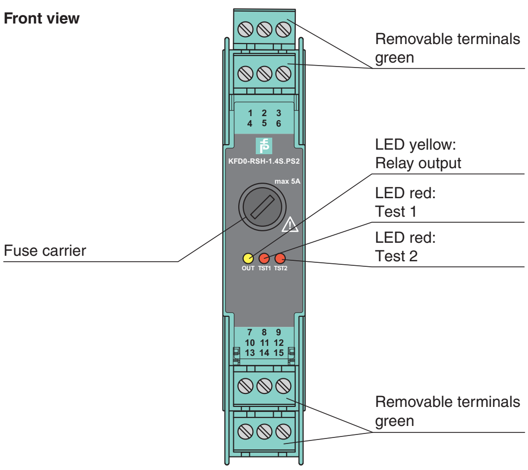
The outputs are galvanically isolated from the input. Output II is protected against contact welding by a fuse depending on the used terminal.

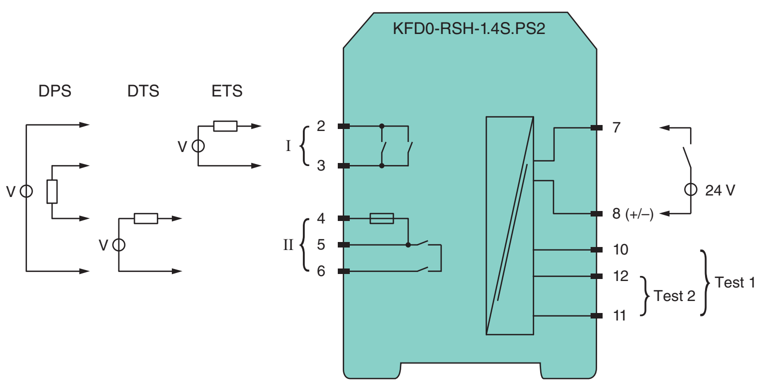
Technical data

Supply	
Power loss	< 1.5 W
Power consumption	< 1.5 W
Input	
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Test input	see Safety Manual
Signal level	0-signal: -3 ... 3 V DC 1-signal: 20 ... 26.5 V
Rated current I_i	45 ... 50 mA
Output	
Contact loading	230 V AC/5 A/cos Φ0.7; 24 V DC/5 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	approx. 10 ms/approx. 5 ms
Mechanical life	5 x 10^6 switching cycles
Electrical life	2.5 x 10^5 switching cycles at 2 A 1 x 10^4 switching cycles at 5 A
Fuse rating	2.5 A (max. 5 A) recommended maximum utilization of the fuse: 80 %
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Power loss	< 1.5 W
Power consumption	< 1.5 W
Input	
Pulse/Pause ratio	≥ 35 ms/≥ 35 ms
Pulse/Pause ratio test pulse	< 10 %
Test pulse length	max. 2 ms
Signal level	0-signal: 0 ... 5 V DC 1-signal: 20 ... 30 V
Rated current I_i	approx. 58 mA
Output	
Contact loading	230 V AC/2 A/cos Φ0.7; 40 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energized/De-energized delay	5 ... 15 ms/5 ... 10 ms
Mechanical life	5 x 10^6 switching cycles
Electrical life	2.5 x 10^5 switching cycles, at maximium load
Transfer characteristics	
Switching frequency	< 10 Hz
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Fail-safe relay contact output**
- **Logic input 20 V DC ... 30 V DC, non-polarized**
- **Immune to DCS test pulses (Triconex)**
- **Up to SIL3 acc. to IEC 61508**

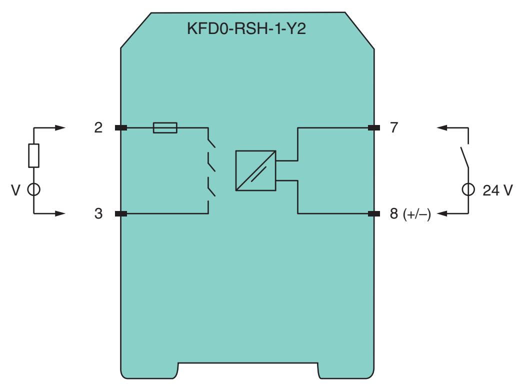
Function

This signal conditioner is a relay module that is suitable for safely switching applications of a load circuit. The device isolates load circuits up to 230 V and the 24 V control interface.

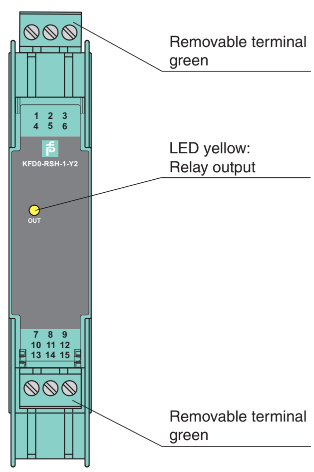
The output is galvanically isolated from the input and is protected against contact welding by a fuse.

The three relays are of diverse design, but have a common effect on the switch output.

Diagrams



Front view



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Transmitter Power Supplies

Model Number	Channels	Input (Field): 2-wire Transmitter	Input (Field): 3-wire Transmitter	Input (Field): Current Source	Input (Field): 0/2 V ... 10 V	Output (Control System): 0/4 mA ... 20 mA (Source)	Output (Control System): 0/4 mA ... 20 mA (Sink)	Output (Control System): 1 V ... 5 V	Output (Control System): 0/2 V ... 10 V	Specials: SMART	Specials: Signal Splitting (1 Input – 2 Outputs)	Supply: 24 V DC	Supply: 115 V AC/ 230 V AC	SIL	Page
KCD2-STC-1	1	■		■		■	■	1		■		■		2	612
KFD2-STC4-1	1	■	■	■		1				■		■		2	613
KFD2-STC4-1-3	1	■	■	■			1			■		■		2	614
KFD2-STV4-1-1	1	■	■	■				1		■		■		2	615
KFD2-CR4-1	1	■	■	■		1						■		2	616
KFD2-STC4-1.2O	1	■	■	■		2				■	■	■		3	617
KFD2-STC4-1.2O-3	1	■	■	■			2			■	■	■		3	618
KFD2-CR4-1.2O	1	■	■	■		2					■	■		3	619
KFU8-VCR-1	1	■	■	■	■	■	■		■			■	■		620
KFD2-STC4-2	2	■				2				■		■		2	621
KFD2-STC4-2-3	2	■					2			■		■		2	622
KFD2-STV4-2-1	2	■						2		■		■		2	623
KFD2-CR4-2	2	■				2						■		2	624

Transmitter Power Supplies with Trip Values

Model Number	Channels	Input (Field): 2-wire Transmitter	Input (Field): 3-wire Transmitter	Input (Field): Current Source	Output (Control System): 0/4 mA ... 20 mA (Source)	Output (Control System): Relay	Output (Control System): SMART	Supply: 24 V DC	Supply: 115 V AC/ 230 V AC	SIL	Page
KFD2-CRG2-1.D	1	■	■	■	1	2		■		2	625
KFU8-CRG2-1.D	1	■	■	■	1	2		■	■	2	626

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Current Repeaters

Model Number	Channels	Input (Field)				Output (Control System)			Supply	SIL	Page
		0 mA ... 40 mA	1 mA ... 20 mA	4 mA ... 20 mA	Fire Alarm	0 mA ... 40 mA	4 mA ... 20 mA	SMART	Loop Powered		
KFD0-SCS-1.55	1			■			1	■	■	2	627
KFD0-CS-1.50	1			■	■		1		■	2	628
KFD0-CS-2.50	2			■	■		2		■	2	629
KFD0-CS-2.51P	2	■			■	2			■	2	630

Current and Voltage Converters

Model Number	Channels	Input (Field)					Output (Control System)			Supply			SIL	Page
		mV	-10 V ... 10 V	0/2 V ... 10 V	0/4 mA ... 20 mA	Strain Gauge	0/4 mA ... 20 mA	0/1 V ... 5 V 0/2 V ... 10 V	Relay	Loop Powered	24 V DC	115 V AC/ 230 V AC		
KFD0-CC-1	1			■	■		1			■				631
KFD2-USC-1.D	1	■		■	■		■	■	1		■			632
KFU8-USC-1.D	1	■		■	■		■	■	1		■	■		633
KFD2-GS-1.2W	1			■	■				2		■			634
KFD2-WAC2-1.D	1	■				■	1		2		■			635
KFD0-VC-1.10	1		■				1			■				636

Temperature Converters and Repeaters

Model Number	Channels	Input (Field)				Output (Control System)			Supply		SIL	Page
		RTD	TC	Potentiometer	V	0/4 mA ... 20 mA	0/1 V ... 5 V	Resistance	24 V DC	Loop Powered		
KFD2-UT2-1	1	■	■	■	■	1			■		2	637
KFD2-UT2-1-1	1	■	■	■	■		1		■		2	638
KFD2-UT2-2	2	■	■	■	■	2			■		2	639
KFD2-UT2-2-1	2	■	■	■	■		2		■		2	640
KFD0-TR-1	1	■				1				■		641
KFD0-TT-1	1		■			1				■		642

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Temperature Converters with Trip Values

Model Number	Channels	Input (Field) RTD	Input (Field) TC	Input (Field) Potentiometer	Input (Field) V	Input (Field) mA	Output (Control System) 4 mA ... 20 mA	Output (Control System) Relay	Supply 24 V DC	Supply 115 V AC/ 230 V AC	SIL	Page
KFD2-GU-1	1	■	■		■	■		2	■			643
KFD2-GUT-1.D	1	■	■	■	■		1	2	■		2	644
KFU8-GUT-1.D	1	■	■	■	■		1	2	■	■	2	645

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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters and 2-wire SMART current sources**
- **Output 4 mA ... 20 mA or 1 V ... 5 V**
- **Sink or source mode**
- **Housing width 12.5 mm**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire SMART transmitters, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal as an isolated current value.

Digital signals may be superimposed on the input signal and are transferred bi-directionally.

Selectable output of current source, sink mode, or voltage output is available via DIP switches.

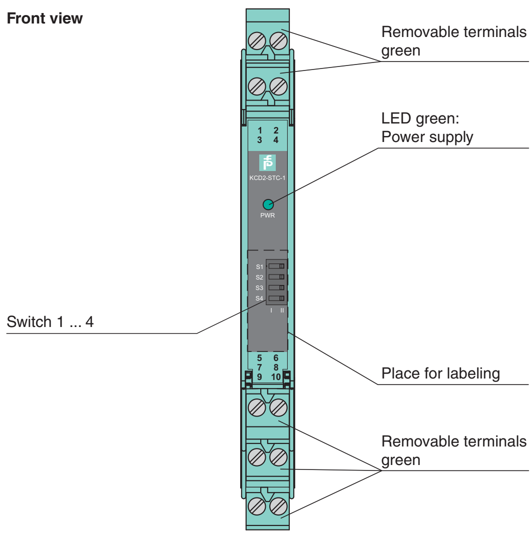
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 6 and 8 can be used.

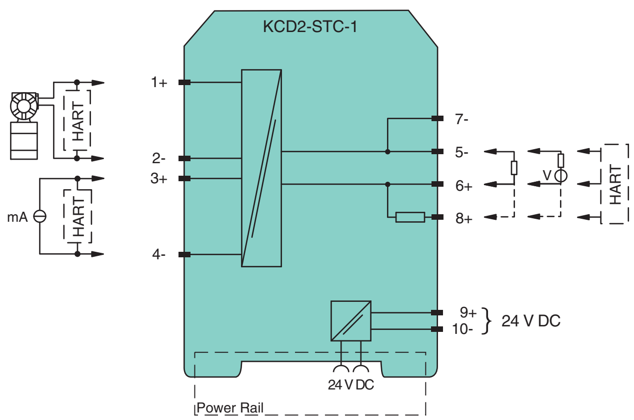
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 1.1 W
Input	
Input signal	4 ... 20 mA limited to approx. 30 mA
Voltage drop U_d	approx. 5 V on terminals 3+, 4-
Available voltage	≥ 15 V at 20 mA terminals 1+, 2-
Output	
Load	0 ... 300 Ω (source mode)
Output signal	4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt) 4 ... 20 mA (sink mode), operating voltage 15.5 ... 26 V
Ripple	20 mV_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F) ≤ ± 0.1 % incl. non-linearity and hysteresis (source mode 4 ... 20 mA) ≤ ± 0.2 % incl. non-linearity and hysteresis (sink mode 4 ... 20 mA) ≤ ± 0.2 % incl. non-linearity and hysteresis (source mode 1 ... 5 V)
Influence of ambient temperature	< 2 µA/K (0 ... 60 °C (32 ... 140 °F)); < 4 µA/K (-20 ... 0 °C (-4 ... 32 °F)) (source mode and sink mode 4 ... 20 mA) < 0.5 mV/K (0 ... +60 °C (32 ... 140 °F)); < 1 mV/K (-20 ... 0 °C (-4 ... 32 °F)) (source mode 1 ... 5 V)
Frequency range	bandwidth at 0.5 V_{pp} signal 0 ... 3 kHz (-3 dB)
Rise time	10 to 90 % ≤ 20 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 124 mm (0.5 x 4.5 x 4.9 in), housing type A2

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.9 W
Input	
Input signal	0/4 ... 20 mA
Voltage drop U_d	≤ 2.4 V at 20 mA (terminals 5, 6)
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Output	
Load	0 ... 800 Ω
Output signal	4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	input to output: bandwidth with 0.5 V_{pp} signal 0 ... 7.5 kHz (-3 dB) output to input: bandwidth with 0.5 V_{pp} signal 0.3 ... 7.5 kHz (-3 dB)
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire and 3-wire SMART transmitters, and can also be used with 2-wire SMART current sources.

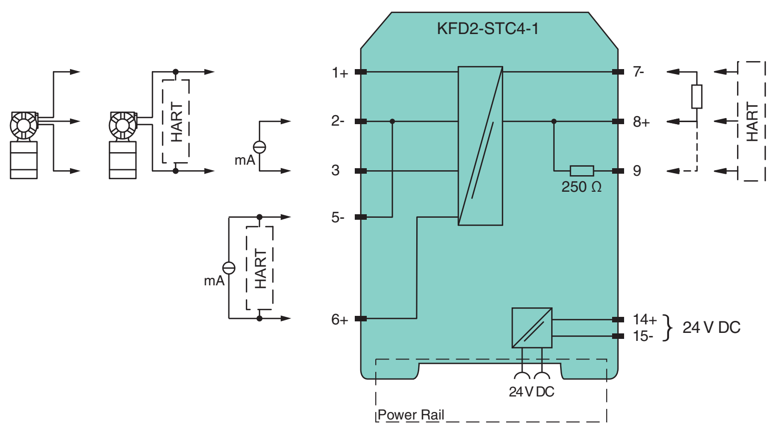
It transfers the analog input signal as an isolated current value.

Digital signals may be superimposed on the input signal and are transferred bi-directionally.

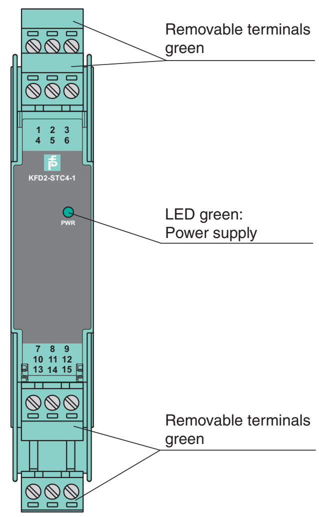
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8 and 9 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **0/4 mA ... 20 mA current sink output**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire and 3-wire SMART transmitters, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal as an isolated current value.

Digital signals may be superimposed on the input or output signal and are transferred bi-directionally.

It is designed to provide a sink mode output.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8 and 9 can be used.

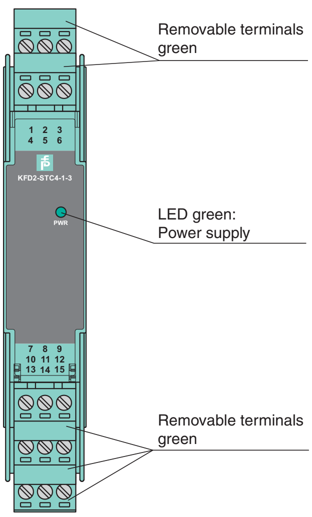
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

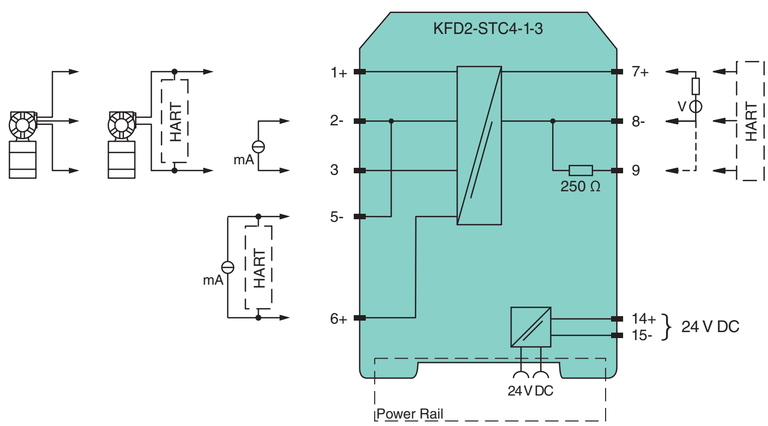
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	2.5 W
Input	
Input signal	0/4 ... 20 mA
Voltage drop U_d	≤ 2.4 V at 20 mA (terminals 5, 6)
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
External supply (loop)	11 ... 30 V DC
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	input to output: bandwidth with 0.5 V_{pp} signal 0 ... 7.5 kHz (-3 dB) output to input: bandwidth with 0.5 V_{pp} signal 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Diagrams

Front view





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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.9 W
Input	
Input signal	0/4 ... 20 mA
Voltage drop U_d	≤ 2.4 V at 20 mA (terminals 5, 6)
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Load	output resistance: 250 Ω
Output signal	0/1 ... 5 V
Ripple	≤ 12.5 mV
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/1 ... 5 V ≤ 5 mV incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Output 0/1 V ... 5 V**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire and 3-wire SMART transmitters, and can also be used with 2-wire SMART current sources.

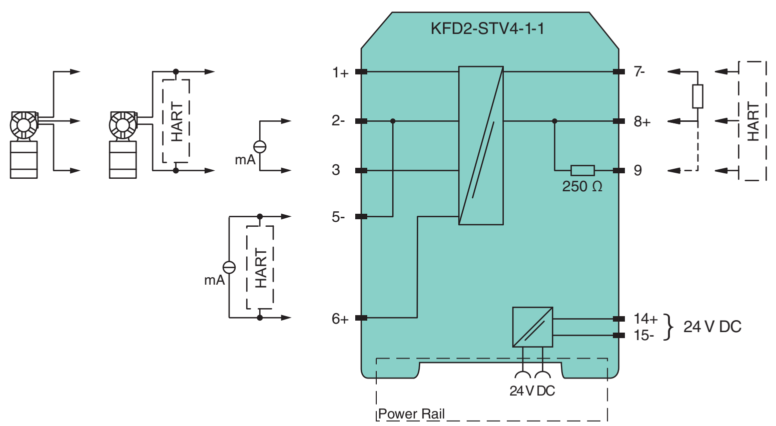
It transfers the analog input signal as an isolated voltage value.

Digital signals may be superimposed on the input signal and are transferred bi-directionally.

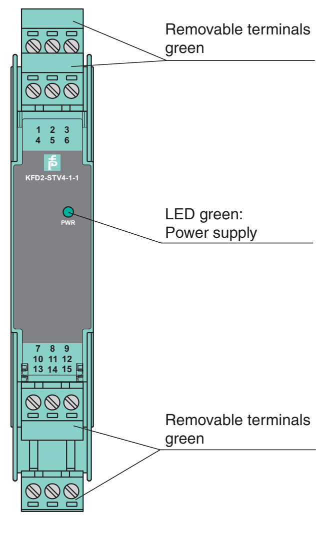
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8 and 9 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire transmitters and 2-wire current sources**
- **Output 0/4 mA ... 20 mA**
- **Accuracy 0.1 %**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire and 3-wire transmitters, and can also be used with 2-wire current sources.

It transfers the analog input signal as an isolated current value.

The output provides a 0/4 mA ... 20 mA current corresponding to the input signal. The minimum available field voltage is 16 V at 20 mA.

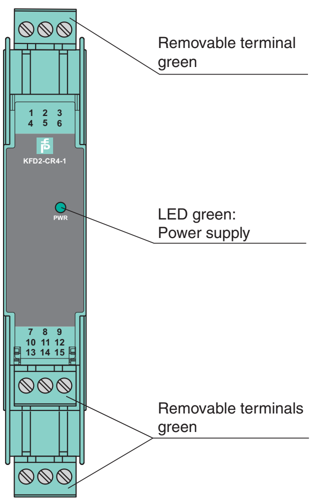
If necessary, the internal resistance of 250 Ω between terminals 8, 9 can be used for conversion into a 0 V ... 5 V voltage signal.

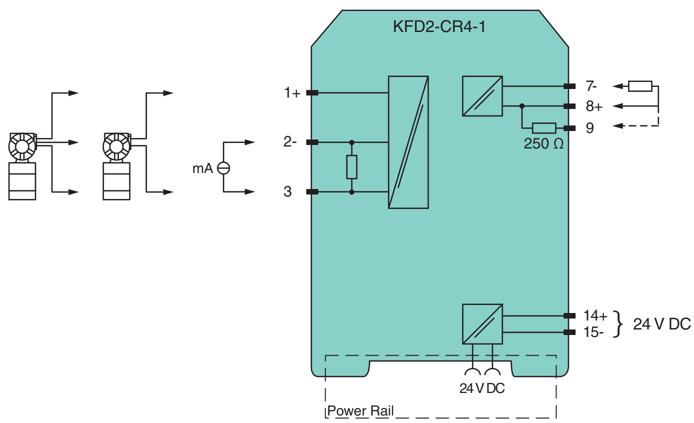
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	1.6 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 15.7 V at 20 mA terminals 1+, 3
Ripple	50 mV_{pp} at 20 mA
Output	
Load	0 ... 800 Ω
Output signal	0/4 ... 20 mA
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	2.5 W
Input	
Input signal	0/4 ... 20 mA
Voltage drop U_d	≤ 2.4 V at 20 mA (terminals 5, 6)
Input resistance	≤ 76 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Ripple	0
Output	
Load	0 ... 550 Ω
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ ± 10 µA incl. calibration, linearity, hysteresis, loads and supply voltage fluctuations
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	Input in output: bandwidth with 1 mA_{pp} signal 0 ... 7.5 kHz (-3 dB) output in input: band width with 1 V_{pp} signal 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Dual output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **Up to SIL3 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire and 3-wire SMART transmitters, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal to the safe area as two isolated current values.

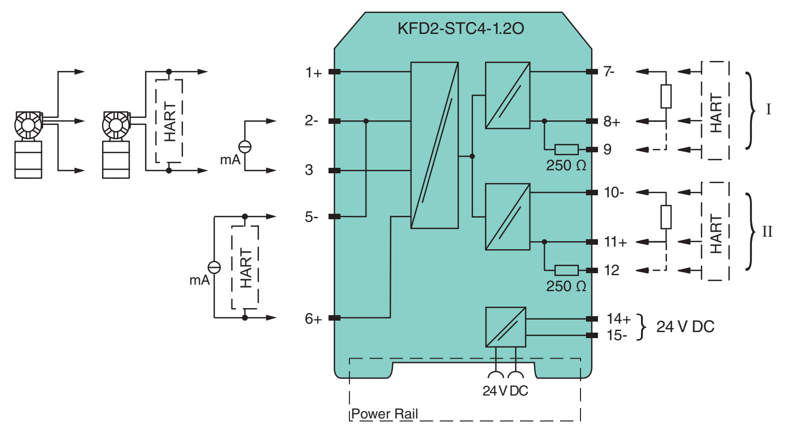
Digital signals may be superimposed on the input signal and are transferred bi-directionally.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

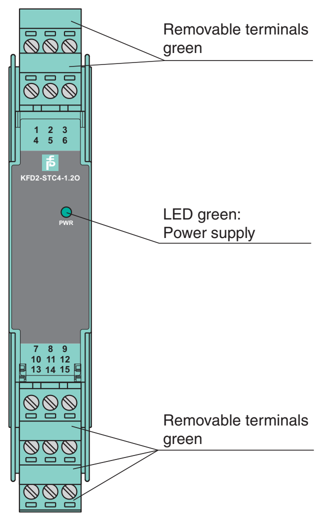
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire SMART transmitters and 2-wire SMART current sources**
- **Dual output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **Up to SIL3 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire and 3-wire SMART transmitters, and can also be used with 2-wire SMART current sources.

It transfers the analog input signal as two isolated current values.

Digital signals may be superimposed on the input or the output signals and are transferred bi-directionally.

It is designed to provide sink mode outputs.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

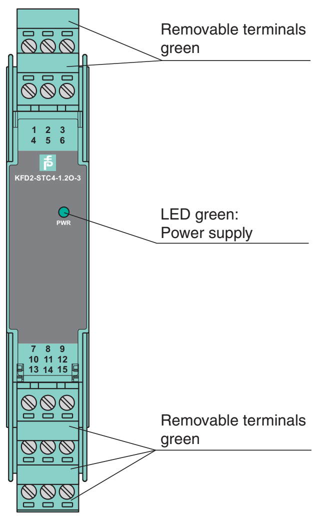
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

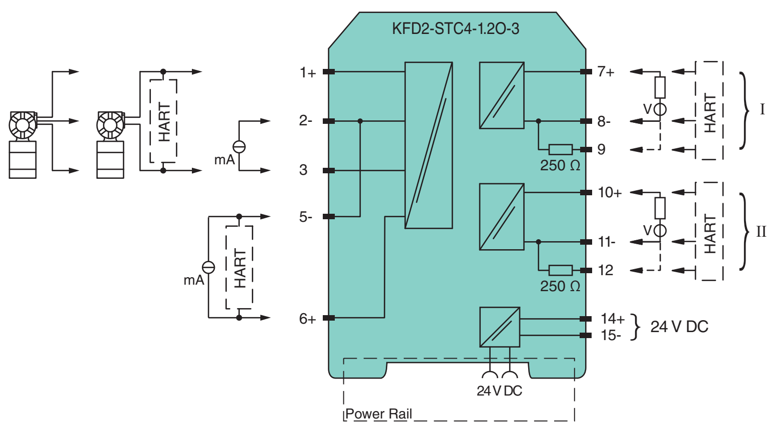
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	2.5 W
Input	
Input signal	0/4 ... 20 mA
Voltage drop U_d	≤ 2.4 V at 20 mA (terminals 5, 6)
Input resistance	≤ 76 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Output	
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 μA_{rms}
External supply (loop)	11 ... 30 V DC
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	input to output: bandwidth with 0.5 V_{pp} signal 0 ... 7.5 kHz (-3 dB) output to input: bandwidth with 0.5 V_{pp} signal 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 32 V DC
Power consumption	approx. 2.5 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 85 Ω terminals 2-, 3
Available voltage	≥ 16 V at 20 mA terminals 1+, 3
Ripple	50 mV_{pp} at 20 mA
Output	
Load	0 ... 550 Ω
Output signal	0/4 ... 20 mA
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire transmitters and 2-wire current sources**
- **Dual output 0/4 mA ... 20 mA**
- **Accuracy 0.1 %**
- **Up to SIL3 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

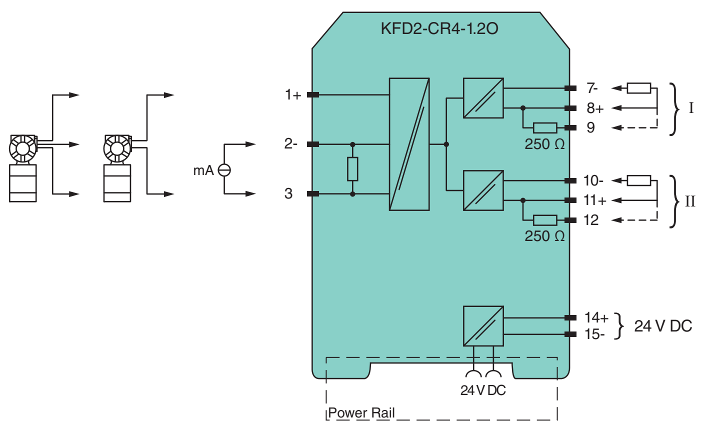
The device supplies 2-wire and 3-wire transmitters, and can also be used with 2-wire current sources.

It transfers the analog input signal as two isolated current values.

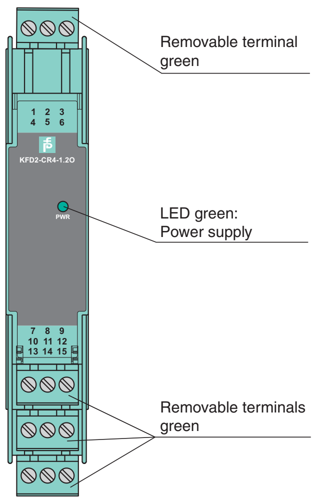
Both outputs provide a 0/4 mA ... 20 mA current corresponding to the input signal. The minimum available field voltage is 16 V at 20 mA.

If necessary, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used for conversion into a 0 V ... 5 V voltage signal.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **AC/DC wide range supply**
- **Current and voltage inputs**
- **Current or voltage output**
- **Switch selectable ranges**

Function

This isolated signal conditioner is a signal converter that is suitable for the connection of current and voltage signals and provides isolation for non-intrinsically safe applications.

The input ranges include 0/4 mA ... 20 mA or 0/2 V ... 10 V.

The output measuring signals are 0/4 mA ... 20 mA or 0/2 V ... 10 V.

The measuring range is easily selected by switches located on the front of device.

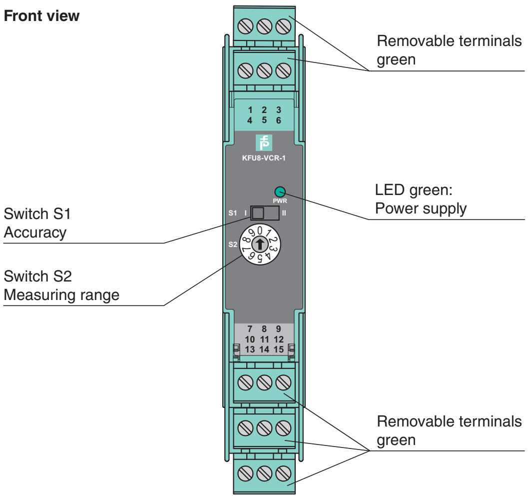
For additional information, refer to the manual and www.pepperl-fuchs.com.

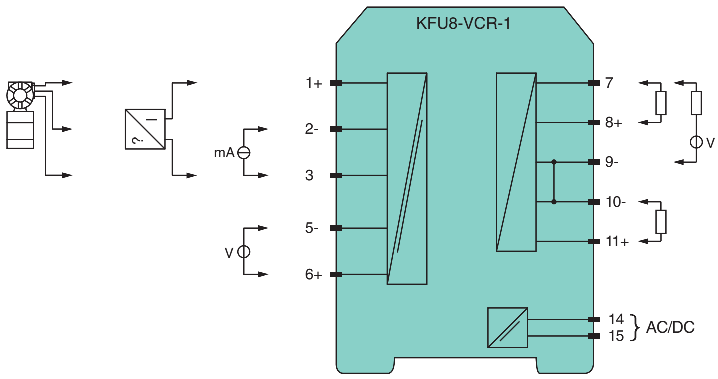
Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC
Power consumption	≤ 2.1 W/≤ 4 VA
Input	
Input I	
Input signal	0/4 ... 20 mA
Available voltage	> 15 V at 20 mA terminals 1+, 3-
Open circuit voltage/short-circuit current	21 V/26 mA
Input resistance	< 55 Ω terminals 2-, 3+
Input II	
Input signal	0/2 ... 10 V
Input resistance	> 1 MΩ
Output	
Output I	analog current output
Output signal	0/4 ... 20 mA
Source	load 0 ... 750 Ω open circuit voltage > 21 V
Sink	voltage across terminals 5 ... 30 V. If the current is supplied from a source > 16.5 V, series resistance of ≥ (V - 16.5)/0.0215 Ω is needed, where V is the source voltage.
Output II	analog voltage output
Output signal	0/2 ... 10 V
Load	≥ 2 kΩ
Transfer characteristics	
Deviation	0.1 % of output signal range
Resolution/accuracy	current: 7 µA/20 µA voltage: 3.5 mV/10 mV
Influence of ambient temperature	0.01 %/K of output signal range
Reaction time	150 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.8 W
Input	
Input signal	0/4 ... 20 mA
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Output	
Load	0 ... 550 Ω
Output signal	4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 µA$_{rms}$
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	input to output: bandwidth with 1 V$_{pp}$ signal 0 ... 7.5 kHz (-3 dB) output to input: bandwidth with 1 V$_{pp}$ signal 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters**
- **Output 0/4 mA ... 20 mA**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire SMART transmitters.

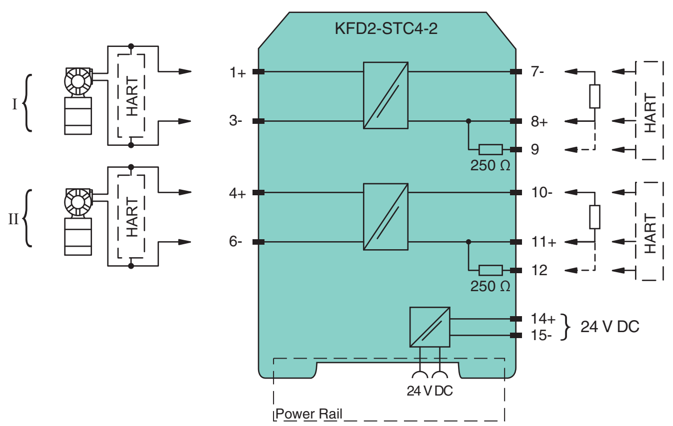
It transfers the analog input signal as an isolated current value.

Digital signals may be superimposed on the input signal and are transferred bi-directionally.

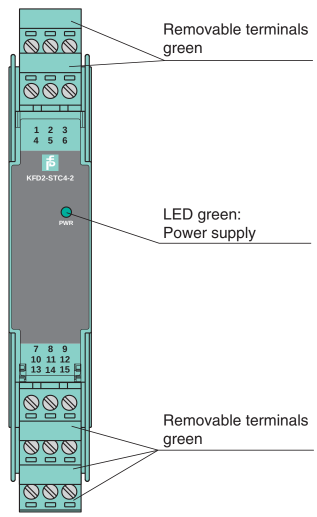
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

KFD2-STC4-2-3

SMART Transmitter Power Supply, Output Current

Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters**
- **0/4 mA ... 20 mA current sink output**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire SMART transmitters.

It transfers the analog input signal as an isolated current value.

Digital signals may be superimposed on the input or output signals and transferred bi-directionally.

It is designed to provide sink mode outputs.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

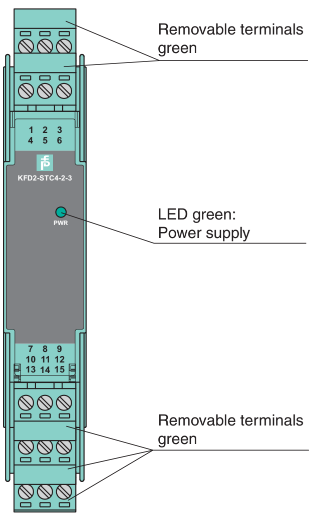
Test sockets for the connection of HART communicators are integrated into the terminals of the device.

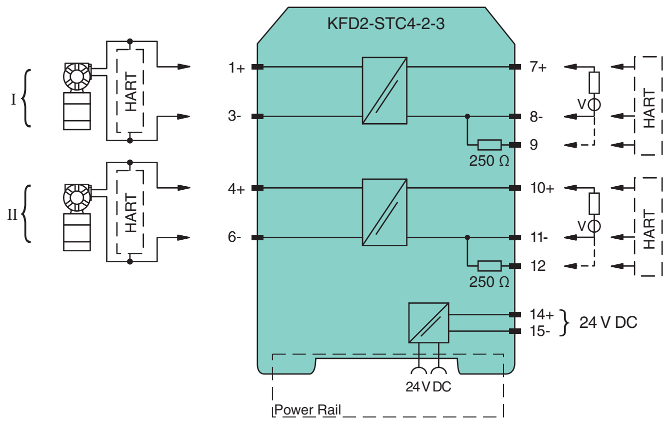
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.8 W
Input	
Input signal	0/4 ... 20 mA
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Output	
Output signal	0/4 ... 20 mA (overload > 25 mA)
Ripple	≤ 50 µA_{rms}
External supply (loop)	11 ... 30 V DC
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Frequency range	input to output: bandwidth with 0.5 V_{pp} signal 0 ... 7.5 kHz (-3 dB) output to input: bandwidth with 0.5 V_{pp} signal 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.5 W
Input	
Input signal	0/4 ... 20 mA
Available voltage	≥ 16 V at 20 mA
Output	
Load	output resistance: 250 Ω
Output signal	0/1 ... 5 V
Ripple	≤ 12.5 mV
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/1 ... 5 V ≤ 5 mV incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	hazardous area into the safe area: bandwidth with 0.5 V_{pp} 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp} 0.3 ... 7.5 kHz (-3 dB)
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire SMART transmitters**
- **Output 0/1 V ... 5 V**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire SMART transmitters.

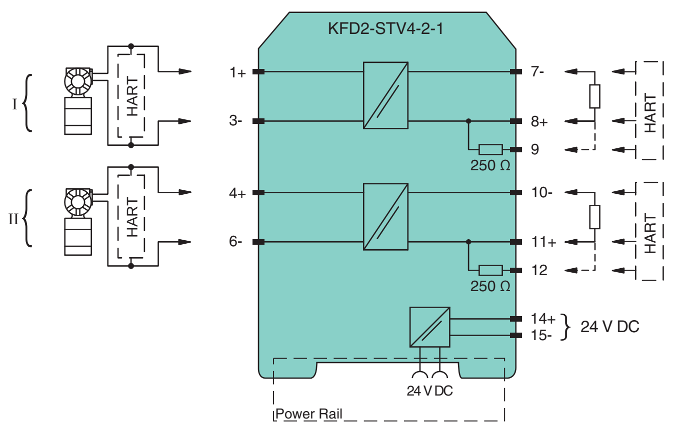
It transfers the analog input signal as an isolated voltage value.

Digital signals may be superimposed on the input signal and are transferred bi-directionally.

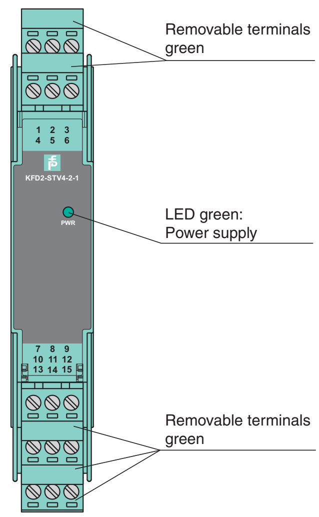
If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used.

Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Diagrams



Front view



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Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire transmitters**
- **Output 0/4 mA ... 20 mA**
- **Accuracy 0.1 %**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire transmitters.

It transfers the analog input signal as an isolated current value.

The output provides a 0/4 mA ... 20 mA current corresponding to the input signal. The minimum available field voltage is 16 V at 20 mA.

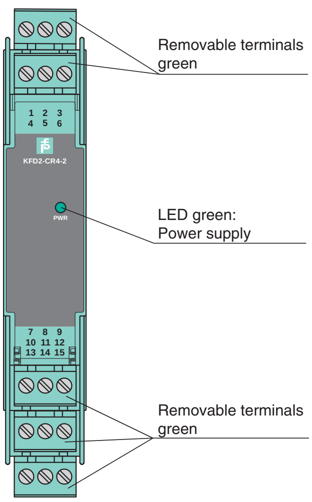
If necessary, the internal resistance of 250 Ω between terminals 8, 9 and 11, 12 can be used for conversion into a 0 V ... 5 V voltage signal.

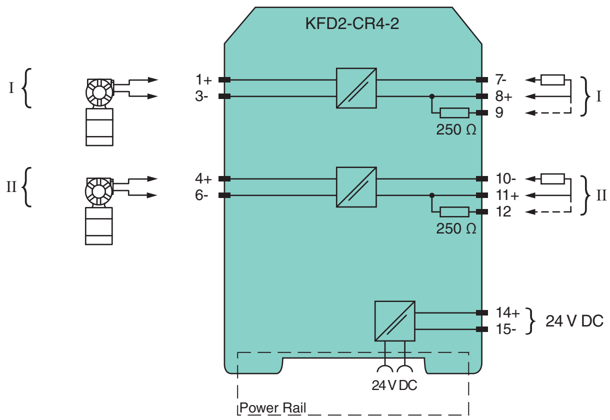
Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 2.8 W
Input	
Input signal	0/4 ... 20 mA
Input resistance	≤ 500 Ω terminals 1+, 3- (250 Ω load)
Available voltage	≥ 15.7 V at 20 mA terminals 1+, 3
Ripple	50 mV_{pp} at 20 mA
Output	
Load	0 ... 550 Ω
Output signal	0/4 ... 20 mA
Ripple	≤ 50 μA_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	0.25 µA/K
Rise time	20 µs
Start-up time	200 µs
De-energized delay	20 µs
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	2.5 W
Input	
Input I	
Input signal	0/4 ... 20 mA
Available voltage	≥ 15 V at 20 mA
Open circuit voltage/short-circuit current	24 V/33 mA
Input resistance	45 Ω (terminals 2, 3)
Lead monitoring	breakage I < 0.2 mA; short-circuit I > 22 mA acc. to NAMUR NE43
Output	
Output signal	0 ... 20 mA or 4 ... 20 mA
Output I, II	signal, relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	signal, analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Input 2-wire and 3-wire transmitters and 2-wire current sources**
- **Output 0/4 mA ... 20 mA**
- **2 relay contact outputs**
- **Programmable high/low alarm**
- **Linearization function (max 20 points)**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire and 3-wire transmitters, and can also be used with active current sources.

Two relays and an active 0/4 mA ... 20 mA current source are available as outputs. The relay contacts and the current output can be integrated in security-relevant circuits. The current output is easily scaled.

On the display the measured value can be indicated in various physical units.

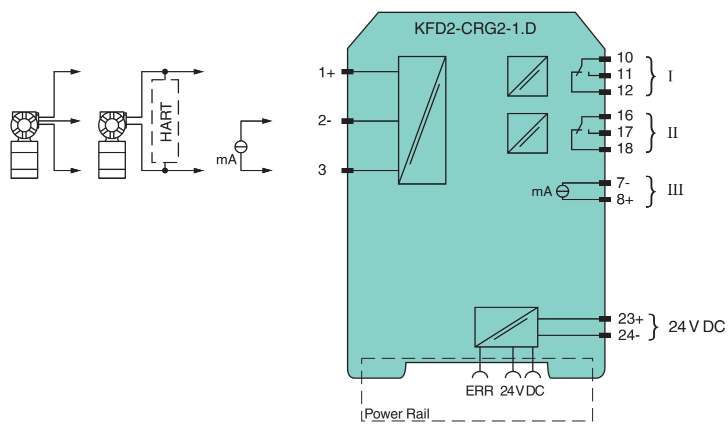
The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

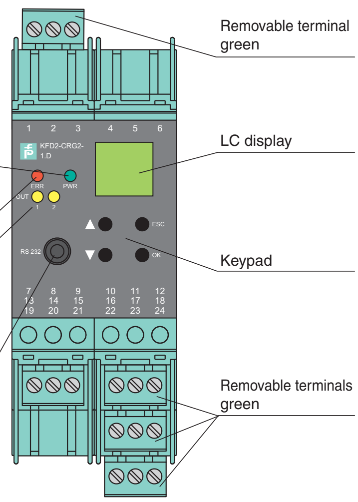
The input has a line fault detection.

A unique collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **1-channel signal conditioner**
- **AC/DC wide range supply**
- **Input 2-wire and 3-wire transmitters and 2-wire current sources**
- **Output 0/4 mA ... 20 mA**
- **2 relay contact outputs**
- **Programmable high/low alarm**
- **Linearization function (max 20 points)**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner provides the isolation for non-intrinsically safe applications.

The device supplies 2-wire and 3-wire transmitters, and can also be used with active current sources.

Two relays and an active 0/4 mA ... 20 mA current source are available as outputs.

The relay contacts and the current output can be integrated in security-relevant circuits. The current output is easily scaled.

On the display the measured value can be indicated in various physical units.

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

The input has a line fault detection.

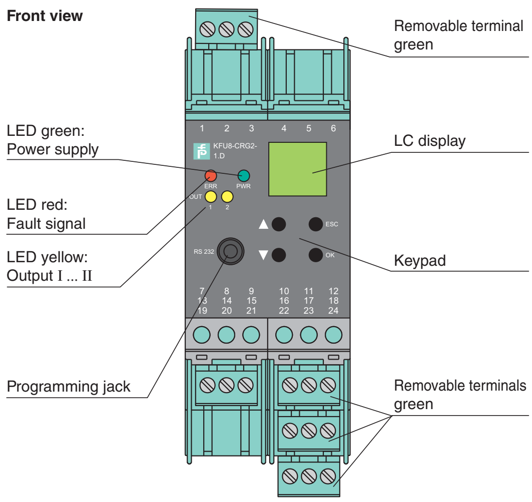
For additional information, refer to the manual and www.pepperl-fuchs.com.

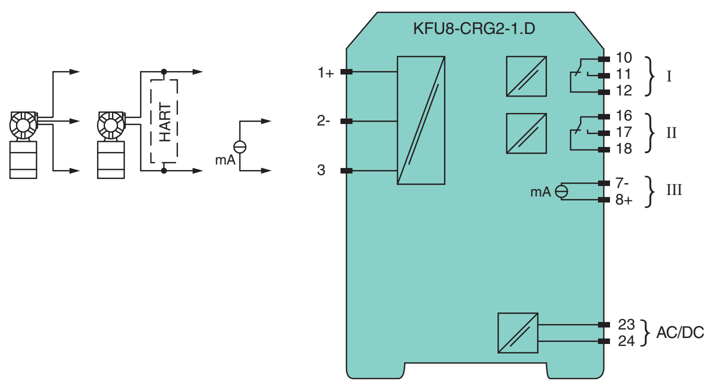
Technical data

Supply	
Rated voltage	20 ... 90 V DC or 48 ... 253 V AC
Power consumption	2.2 W/4 VA
Input	
Input I	
Input signal	0/4 ... 20 mA
Available voltage	> 15 V at 20 mA
Open circuit voltage/short-circuit current	24 V/33 mA
Input resistance	45 Ω (terminals 2, 3)
Lead monitoring	breakage I < 0.2 mA; short-circuit I > 22 mA acc. to NAMUR NE43
Output	
Output signal	0 ... 20 mA or 4 ... 20 mA
Output I, II	signal, relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 V DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	Signal, analog
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21.5 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Field circuit	
Available voltage	≥ 16 V for supply voltage > 21 V
Current	4 ... 20 mA (linear transmission 1 ... 22 mA)
Load	≤ 800 Ω (at 20 mA)
Supply circuit	
Voltage	max. 30 V DC
Current	4 ... 20 mA (quiescent current < 0.5 mA)
Power loss	150 mW at 20 mA and U_E < 24 V
Transfer characteristics	
Deviation	
After calibration	≤ ± 80 µA linearity, load and voltage dependence at 20 °C (68 °F)
Influence of ambient temperature	< 0.5 µA/K
Damping	approx. 3 dB
Rise time	≤ 20 µs at 0 Ω, ≤ 600 µs with 800 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **HART I/P or transmitter power supply**
- **Low voltage drop**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

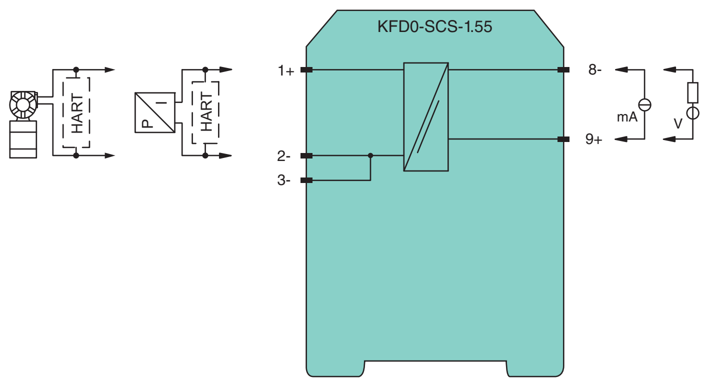
This signal conditioner is loop powered and isolates a 4 mA ... 20 mA signal for transmitters and positioners and is HART compatible.

The low voltage drop of 5 V in comparison to active signal conditioners also allows transmitter applications with unstable power sources between 20 V DC ... 30 V DC.

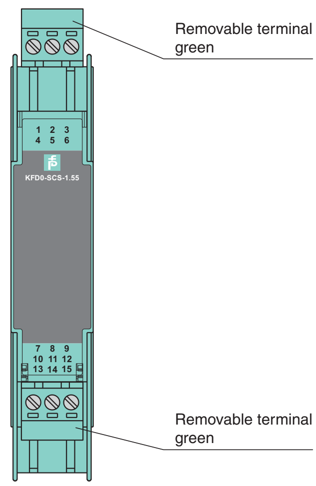
Line fault detection of the field circuit is possible if the control loop in the safe area is monitored for overscale or underscale conditions of the 4 mA ... 20 mA range.

The module can also be used for controlling solenoid valves and discrete outputs, such as LEDs. In this case, terminals 8- and 9+ are driven with a 24 V signal.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **I/P or transmitter power supply**
- **Accuracy 0.1 %**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner transfers DC signals from fire alarms, smoke alarms, and temperature sensors and provides isolation for non-intrinsically safe applications. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

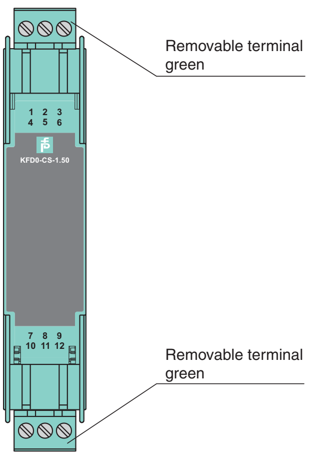
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

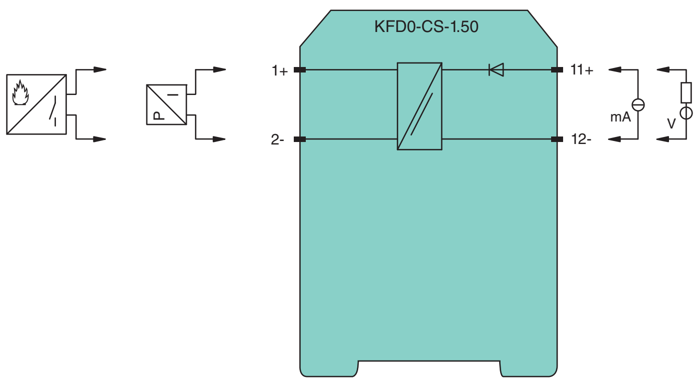
Technical data

Supply	
Rated voltage	loop powered
Input	
Rated voltage U_i	10 ... 35 V
Rated current I_i	4 ... 20 mA
Power loss	< 150 mW per channel at 25 mA and U < 26.1 V < 400 mW per channel at 25 mA and U > 26.1 V
Output	
Voltage	≥ 0.9 x U_{in} - (0.23 x current in mA) - 0.7 for 10 V < U_{in} < 26.1 V ≥ 23 V - (0.23 x current in mA) for U_{in} > 26.1 V
Short-circuit current	≤ 100 mA
Transfer current	≤ 25 mA
Transfer characteristics	
Deviation	
After calibration	U_{in} ≥ 5 V ± 20 µA/U_{in} ≤ 5 V ± 50 µA incl. calibration, linearity, hysteresis and output load fluctuations at 20 °C (68 °F)
Influence of ambient temperature	≤ 2 µA/K (0 ... 50 °C (32 ... 122 °F)); ≤ 5 µA/K (-20 ... 60 °C (-4 ... 140 °F))
Rise time	≤ 5 ms at 4 ... 20 mA and U_{in} = input voltage < 26 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Input	
Rated voltage U_i	10 ... 35 V
Rated current I_i	4 ... 20 mA
Power loss	< 150 mW per channel at 25 mA and U < 26.1 V < 400 mW per channel at 25 mA and U > 26.1 V
Output	
Voltage	≥ 0.9 x U_{in} - (0.23 x current in mA) - 0.7 for 10 V < U_{in} < 26.1 V ≥ 23 V - (0.23 x current in mA) for U_{in} > 26.1 V
Short-circuit current	≤ 100 mA
Transfer current	≤ 25 mA
Transfer characteristics	
Deviation	
After calibration	U_{in} ≥ 5 V ± 20 µA/U_{in} ≤ 5 V ± 50 µA incl. calibration, linearity, hysteresis and output load fluctuations at 20 °C (68 °F)
Influence of ambient temperature	≤ 2 µA/K (0 ... 50 °C (32 ... 122 °F)); ≤ 5 µA/K (-20 ... 60 °C (-4 ... 140 °F))
Rise time	≤ 5 ms at 4 ... 20 mA and U_{in} = input voltage < 26 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Features

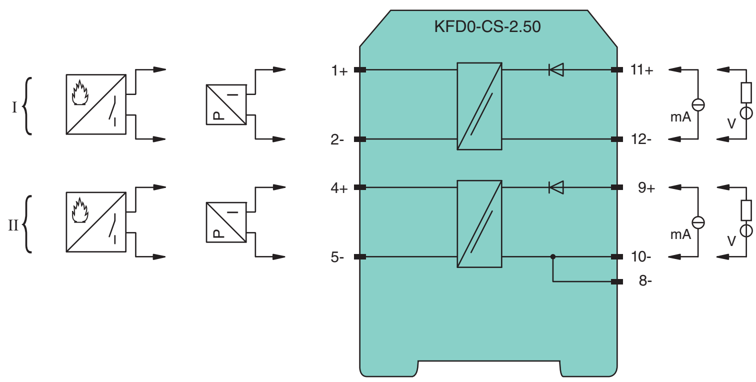
- **2-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **I/P or transmitter power supply**
- **Accuracy 0.1 %**
- **Up to SIL2 acc. to IEC 61508**

Function

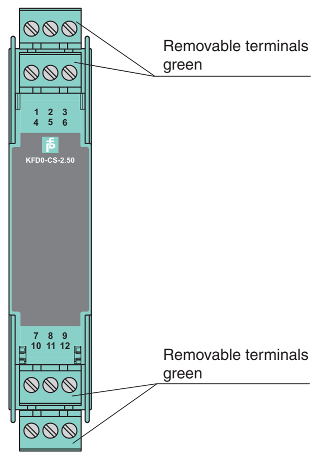
This signal conditioner transfers DC signals from fire alarms, smoke alarms, and temperature sensors and provides isolation for non-intrinsically safe applications. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

Diagrams



Front view



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Features

- **2-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current input/output 0 mA ... 40 mA**
- **I/P or transmitter power supply**
- **Accuracy 1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner transfers DC signals from fire alarms, smoke alarms, and temperature sensors to the control and provides isolation for non-intrinsically safe applications. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

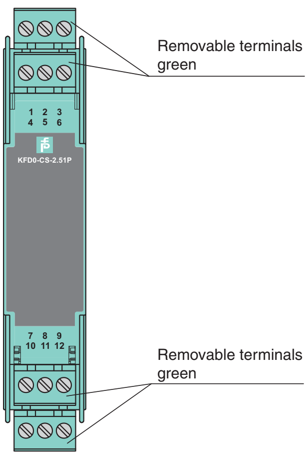
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

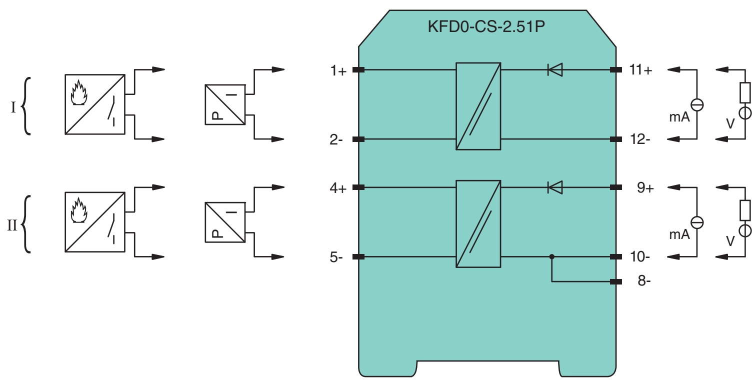
Technical data

Supply	
Rated voltage	loop powered
Input	
Rated voltage U_i	4 ... 35 V
Rated current I_i	0 ... 40 mA
Power loss	at 40 mA and U_{in} < 22 V: 700 mW per channel at 40 mA and U_{in} > 22 V: 1.2 W per channel
Output	
Voltage	for 4 V < U_{in} < 24 V: ≥ 0.9 x U_{in} - (0.37 x current in mA) - 1.0 for U_{in} > 24 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24 V: ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 200 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ and current ≤ 20 mA at 20 °C (68 °F)
Influence of ambient temperature	≤ ± 2 µA/K at U_{in} ≤ 20 V; ≤ ± 5 µA/K at U_{in} > 20 V
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Diagrams

Front view





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Technical data

Supply	
Rated voltage	12 ... 35 V DC loop powered
Input	
Current range	0 ... 20 mA, load ≤ 50 Ω
Voltage range	0 ... 10 V, load ≥ 100 kΩ
Output	
Load	(U -12 V)/0.02 A
Current output	4 ... 20 mA, limited to ≤ 35 mA
Fault signal	downscaling ≤ 3 mA
Transfer characteristics	
Deviation	
After calibration	0.1 % of full-scale value
Temperature effect	span: 0.050 % of span/K; zero point: 0.060 % of span/K
Linearization	≤ 0.04 % of full-scale value
Influence of supply voltage	6.5 ppm/V
Rise time	250 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current or voltage input**
- **Output: 4 ... 20 mA**
- **Potentiometer or DIP switch selectable ranges**
- **Line fault detection (LFD)**

Function

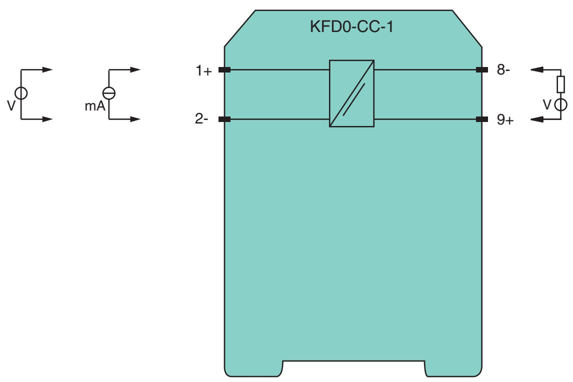
This signal conditioner converts a 2-wire voltage or current to a 4 mA ... 20 mA signal and provides isolation for non-intrinsically safe applications.

The device can be used to double signals in 20 mA measurement circuits due to the limited current signal input load of 50 Ω.

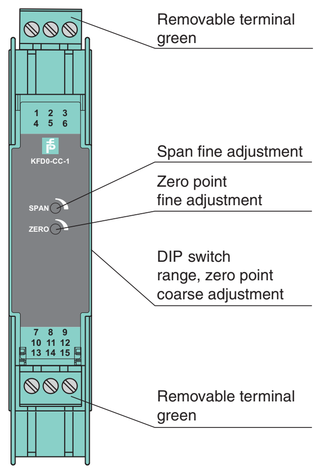
DIP switches and potentiometers make field calibration easy.

Since this isolator is loop-powered, use the technical data to verify that the proper voltage is available to the field devices.

Diagrams



Front view



Edition 908837 (US) / 208599 (EU) 11/2010

KFD2-USC-1.D

Signal Converter with Trip Value

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Scaleable current or voltage input**
- **Current or voltage output**
- **Relay contact output**
- **Configurable by keypad**
- **Line fault detection (LFD)**

Function

This signal conditioner is suitable for the connection of current and voltage signals and provides isolation for non-intrinsically safe applications.

The input ranges include 0 mA ... 20 mA, 0 V ... 10 V or 0 mV ... 60 mV. Subranges from the input ranges are selectable.

The output measuring signals are 0/4 mA ... 20 mA, 0/2 V ... 10 V or 0/1 V ... 5 V.

The output relay serves as trip value contact.

On the display the measured value can be indicated in various physical units.

The unit is easily programmed by the use of a keypad located on the front of the unit.

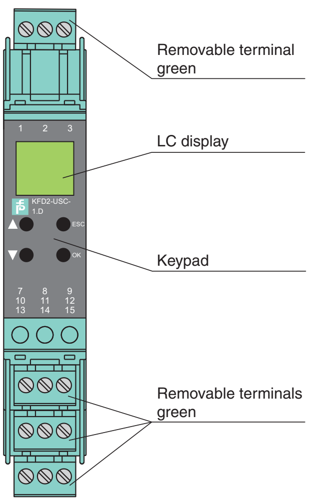
For additional information, refer to the manual and www.pepperl-fuchs.com.

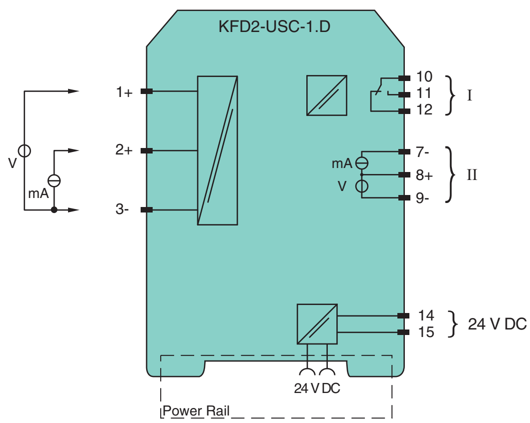
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	≤ 1.6 W
Input	
Input resistance	voltage: 1 MΩ, current: ≤ 100 Ω
Limit	30 V
Current	0 ... 20 mA
Voltage	0 ... 10 V/0 ... 60 mV
Resolution	15 Bit
Output	
Output I	signal, relay
Contact loading	250 V AC/2 A/cos Φ 0.7; 40 V DC/2 A
Mechanical life	2 x 10^7 switching cycles
Energized/De-energized delay	approx. 10 ms/approx. 10 ms
Output II	analog
Load	current: ≤ 550 Ω, voltage: ≥ 1 kΩ
Analog voltage output	0/1 ... 5 V, 0/2 ... 10 V
Analog current output	0/4 ... 20 mA
Transfer characteristics	
Deviation	0.1 % of full-scale value
Resolution/accuracy	current: 1 µA/20 µA voltage: 0.5 mV/10 mV mV: 3 µV/60 µV
Influence of ambient temperature	0.003 %/K (30 ppm)
Reaction time	≥ 150 ms/≤ 300 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B3

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC
Power consumption	≤ 1.6 W/≤ 2.6 VA
Input	
Input resistance	voltage: 1 MΩ, current: ≤ 100 Ω
Limit	30 V
Current	0 ... 20 mA
Voltage	0 ... 10 V/0 ... 60 mV
Resolution	15 Bit
Output	
Output I	signal, relay
Contact loading	250 V AC/2 A/cos Φ0.7; 40 V DC/2 A
Mechanical life	2 x 10^7 switching cycles
Energized/De-energized delay	approx. 10 ms/approx. 10 ms
Output II	analog
Load	current: ≤ 550 Ω, voltage: ≥ 1 kΩ
Analog voltage output	0/1 ... 5 V, 0/2 ... 10 V
Analog current output	0/4 ... 20 mA
Transfer characteristics	
Deviation	0.1 % of full-scale value
Resolution/accuracy	current: 1 µA/20 µA voltage: 0.5 mV/10 mV mV: 3 µV/60 µV
Influence of ambient temperature	0.003 %/K (30 ppm)
Reaction time	≥ 150 ms/≤ 300 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B3

Features

- **1-channel signal conditioner**
- **AC/DC wide range supply**
- **Scaleable current or voltage input**
- **Current or voltage output**
- **Relay contact output**
- **Configurable by keypad**
- **Line fault detection (LFD)**

Function

This signal conditioner is suitable for the connection of current and voltage signals and provides isolation for non-intrinsically safe applications.

The input ranges include 0 mA ... 20 mA, 0 V ... 10 V or 0 mV ... 60 mV. Subranges from the input ranges are selectable.

The output measuring signals are 0/4 mA ... 20 mA, 0/2 V ... 10 V or 0/1 V ... 5 V.

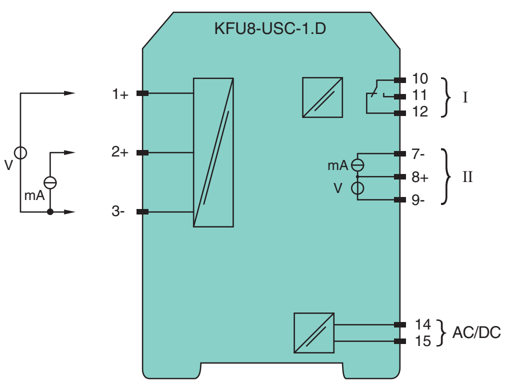
The output relay serves as trip value contact.

On the display the measured value can be indicated in various physical units.

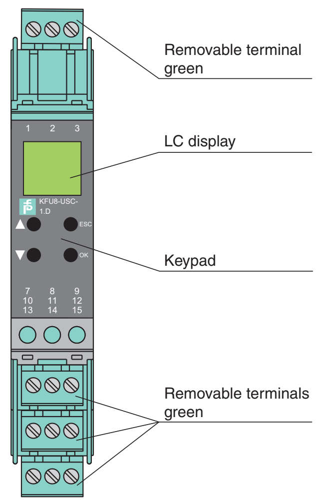
The unit is easily programmed by the use of a keypad located on the front of the unit.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Current and voltage inputs**
- **2 relay contact outputs**
- **Programmable high/low alarm**
- **DIP switch programmable**
- **Terminals with test points**

Function

This signal conditioner is a trip alarm with two independently adjustable trip points that provides isolation for non-intrinsically safe applications.

The unit actuates a relay output when it reaches a user-programmed input level.

DIP switches are used to program voltage input low alarms and high alarms.

The hysteresis, the operating mode of the relay outputs, and the type of alarm are selectable for each trip point.

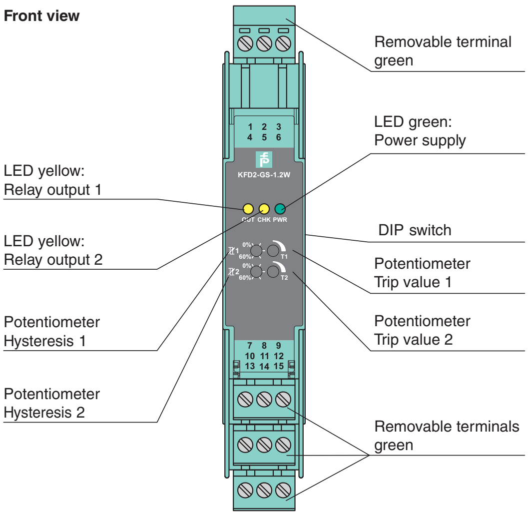
For addtional information, refer to www.pepperl-fuchs.com.

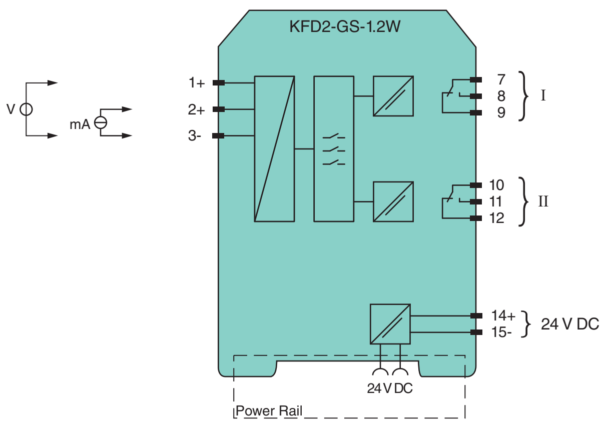
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power consumption	2.25 W (typ. 1.68 W)
Input	
Measurement range	terminals 1+, 3-; voltage: 0/1 ... 5 V; 50 kΩ or 0/2 ... 10 V; 100 kΩ terminals 2+, 3-; current: 0/4 ... 20 mA; 50 Ω
Output	
Output I	trip value: terminals 7, 8, 9
Output II	trip value: terminals 10, 11, 12
Contact loading	250 V AC/5 A/1250 VA; 125 V DC/5 A/150 W
Transfer characteristics	
Deviation	≤ 0.5 %
Influence of ambient temperature	0.01 %/K of adjusted trip value
Input delay	100 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 35 V DC
Power consumption	≤ 3 W
Interface	
Connection	Power Rail or terminals 19+, 20 GND, 21-
Type	RS 485
Programming interface	RS 232 programming jack
Field circuit	
Lead resistance	≤ 25 Ω per lead
Input I	
Connection	terminals 1+, 2-
Sensor supply	1 ... 5 V
Connection	terminals 3+, 4-, 5+, 6-
Short-circuit current	50 mA
Load	≥ 116 Ω up to 5V, ≥ 85 Ω up to 4V
Input	
Programmable Tare	0 ... 500 % of span
Input I	signal, analog
Input signal	-100 ... 100 mV
Input resistance	> 1 MΩ for voltage measurement
Input II, III	tare adjustment, calibration and zero
Active/Passive	I > 4 mA/I < 1.5 mA
Output	
Output I, II	relay output
Mechanical life	2 x 10^7 switching cycles
Output III	Analog output
Current range	-20 ... 20 mA
Load	≤ 550 Ω
Line fault detection	downscale -21.5 mA (-10.75 V) or 2 mA (1 V), upscale 21.5 mA (10.75 V)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 250 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Strain gauge input**
- **Output 0 mA ... ± 20 mA or 0 V ... ± 10 V**
- **Relay contact output**
- **Programmable high/low alarm**
- **RS 485 interface**
- **Line fault detection (LFD)**

Function

This signal conditioner is used with strain gauges, load cells and resistance measuring bridges and provides isolation for non-intrinsically safe applications.

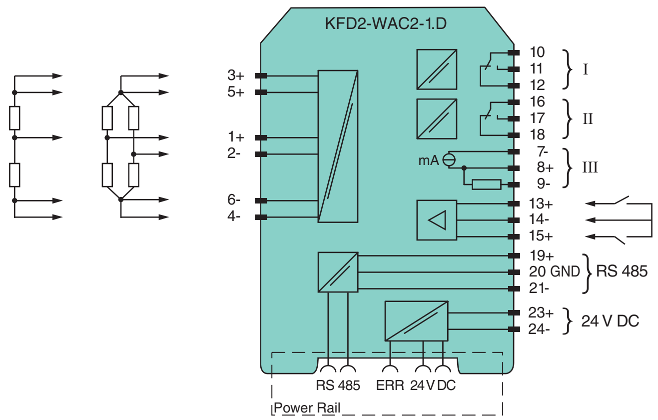
Designed to provide 5 V excitation voltage, this barrier's high quality A/D converter allows it to be used with those devices requiring 10 V.

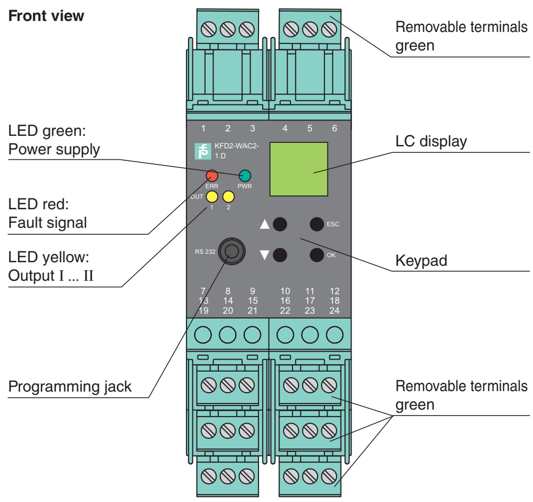
The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software. The actual measurement for tare, zero point, and final value can be entered in this manner.

A unique collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Voltage input -10 V ... 10 V**
- **Output 4 mA ... 20 mA**
- **Span and zero point adjustment**

Function

This signal conditioner receives a -10 V ... 10 V voltage input, produces a 4 mA ... 20 mA signal output. It also provides isolation for non-intrinsically safe applications.

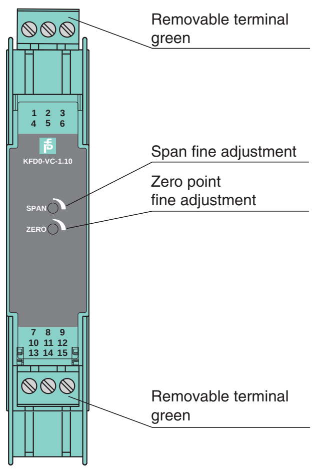
Fine adjustment for zero and span are performed with the potentiometers on top of the unit.

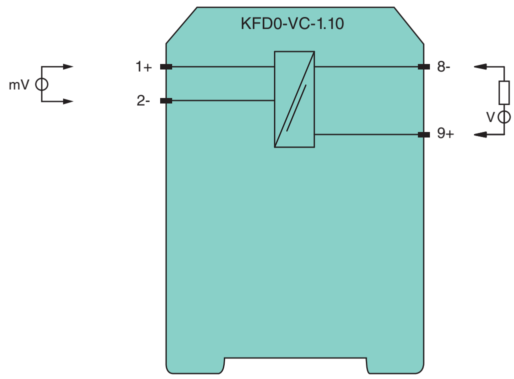
Technical data

Supply	
Rated voltage	12 ... 35 V DC loop powered
Input	
Voltage range	-10 ... 10 V (factory adjustment)
Output	
Load	≤ (supply voltage -12 V)/0.02 A
Current output	4 ... 20 mA, limited to ≤ 35 mA
Transfer characteristics	
Measurement range f_n	-10 ... +10 V, zero point ± 1 % of full-scale value, span ± 1.5 % of full-scale value
Deviation	
After calibration	0.1 % of full-scale value
Temperature effect	span: 0.050 % of span/K zero point: 0.060 % of span/K
Linearization	≤ 0.04 % of full-scale value
Influence of supply voltage	6.5 ppm/V
Rise time	250 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 0.95 W/0.95 W
Input	
RTD	type Pt10, Pt50, Pt100, Pt500, Pt1000 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt500GOST, Pt1000GOST (6651-94) type Cu10, Cu50, Cu100 (P50353-92) type Ni100 (DIN 43760)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-, 4-wire connection
Lead resistance	≤ 50 Ω per lead
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Potentiometer	0 ... 20 kΩ (2-wire connection), 0.8 ... 20 kΩ (3-wire connection)
Input resistance	≥ 1 MΩ (-100 ... 100 mV)
Output	
Output	analog current output
Current range	0 ... 20 mA or 4 ... 20 mA
Fault signal	downscale 0 or 2 mA, upscale 21.5 mA (acc. NAMUR NE43)
Source	load 0 ... 550 Ω open-circuit voltage ≤ 18 V
Sink	voltage across terminals 5 ... 30 V. If the current is supplied from a source > 16.5 V, series resistance of ≥ (V - 16.5)/0.0215 Ω is needed, where V is the source voltage. The maximum value of the resistance is (V - 5)/0.0215 Ω.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 130 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Current output 0/4 mA ... 20 mA**
- **Sink or source mode**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is designed to connect RTDs, thermocouples, or potentiometers, and provide a proportional 0/4 mA ... 20 mA signal.

The barrier offers 3-port isolation between input, output, and power supply.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

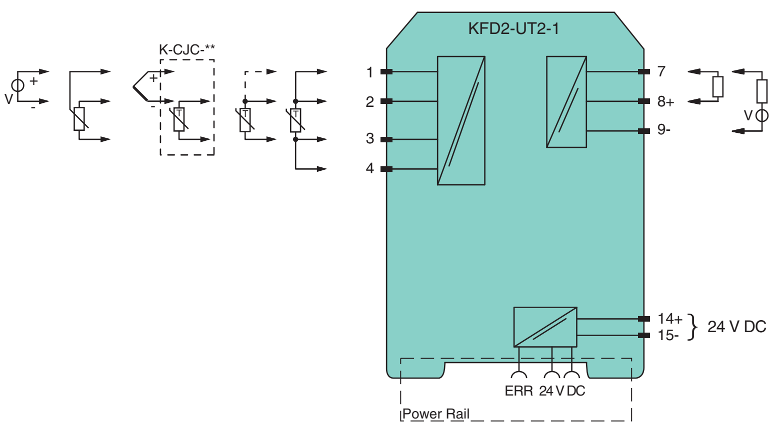
A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

The unit is easily programmed with the **PACT***ware*™ configuration software.

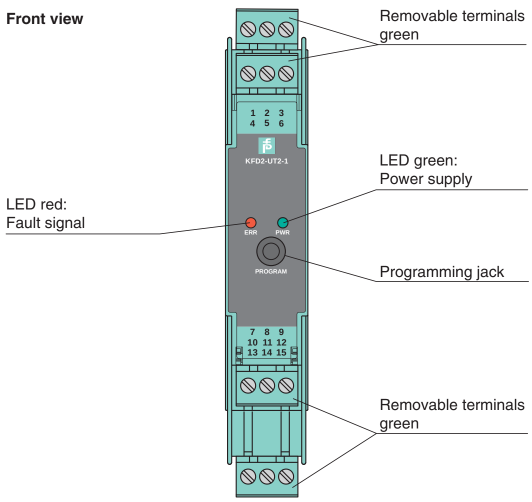
A unique collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Voltage output 0/1 V ... 5 V**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is designed to connect RTDs, thermocouples, or potentiometers, and provide a proportional 0/1 V ... 5 V signal.

The barrier offers 3-port isolation between input, output, and power supply.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

The unit is easily programmed with the **PACT***ware***™** configuration software.

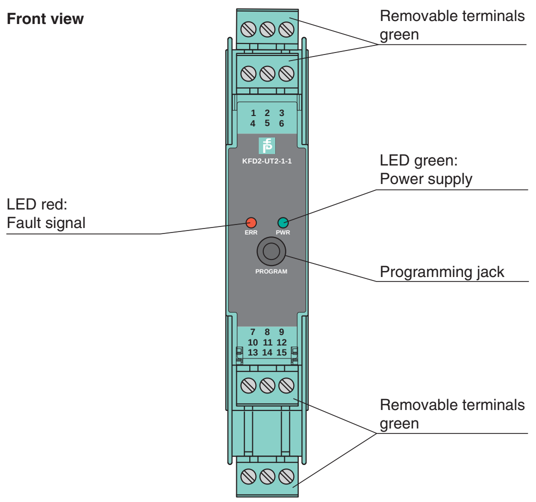
A unique collective error messaging feature is available when used with the Power Rail system.

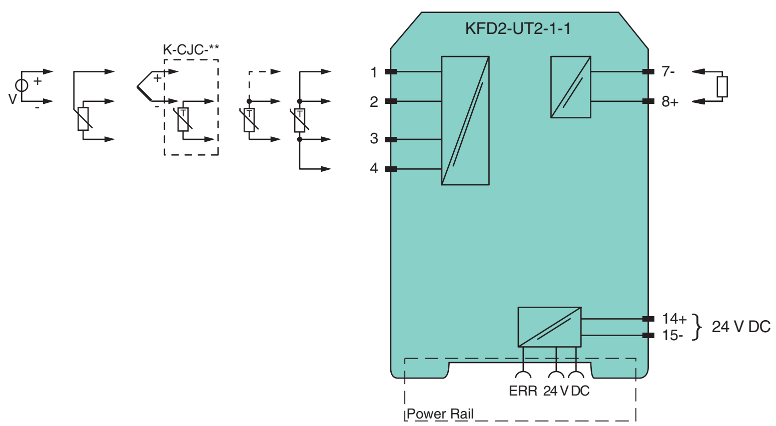
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 0.64 W/0.64 W
Input	
RTD	type Pt10, Pt50, Pt100, Pt500, Pt1000 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt500GOST, Pt1000GOST (6651-94) type Cu10, Cu50, Cu100 (P50353-92) type Ni100 (DIN 43760)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-, 4-wire connection
Lead resistance	≤ 50 Ω per lead
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Potentiometer	0 ... 20 kΩ (2-wire connection), 0.8 ... 20 kΩ (3-wire connection)
Input resistance	≥ 1 MΩ (-100 ... 100 mV)
Output	
Voltage output	0 ... 5 V or 1 ... 5 V; output resistance: ≤ 5 Ω; load: ≥ 10 kΩ
Fault signal	downscale 0 V or 0.5 V, upscale 5.375 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 130 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams





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Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 1.5 W/1.5 W
Input	
RTD	type Cu10, Cu50, Cu100, Pt10, Pt50, Pt100, Pt500, Pt1000, Ni100 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt500GOST, Pt1000GOST (P50353-92)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-wire connection
Lead resistance	≤ 50 Ω per lead
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Potentiometer	0 ... 20 kΩ (2-wire connection), 0.8 ... 20 kΩ (3-wire connection)
Input resistance	≥ 1 MΩ (-100 ... 100 mV)
Output	
Output I, II	analog current output
Current range	0 ... 20 mA or 4 ... 20 mA
Fault signal	downscale 0 or 2 mA, upscale 21.5 mA (acc. NAMUR NE43)
Source	load 0 ... 550 Ω open-circuit voltage ≤ 18 V
Sink	voltage across terminals 5 ... 30 V. If the current is supplied from a source > 16.5 V, series resistance of ≥ (V - 16.5)/0.0215 Ω is needed, where V is the source voltage. The maximum value of the resistance is (V - 5)/0.0215 Ω.
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 130 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Current output 0/4 mA ... 20 mA**
- **Sink or source mode**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is designed to connect RTDs, thermocouples, or potentiometers, and provide a proportional 0/4 mA ... 20 mA signal.

The barrier offers 3-port isolation between input, output, and power supply.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

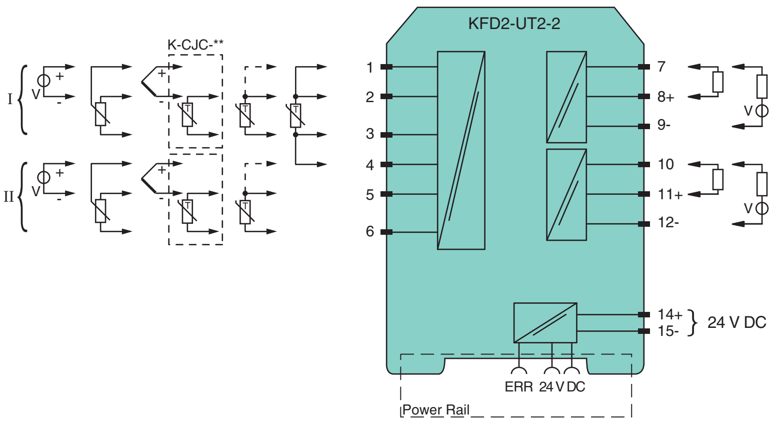
A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

The unit is easily programmed with the **PACT***ware*™ configuration software.

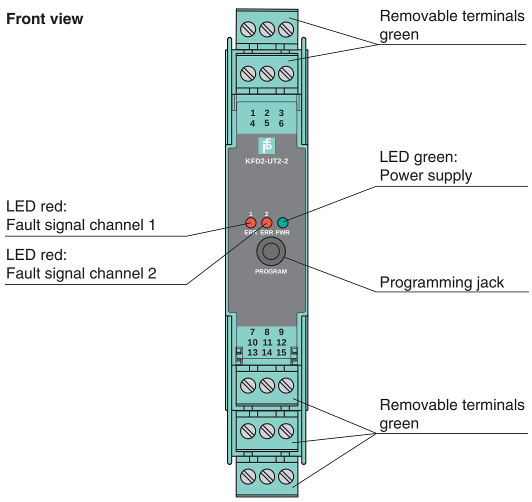
A unique collective error messaging feature is available when used with the Power Rail system.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

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Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Voltage output 0/1 V ... 5 V**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is designed to connect RTDs, thermocouples, or potentiometers, and provide a proportional 0/1 V ... 5 V signal.

The barrier offers 3-port isolation between input, output, and power supply.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

The unit is easily programmed with the **PACT***ware*™ configuration software.

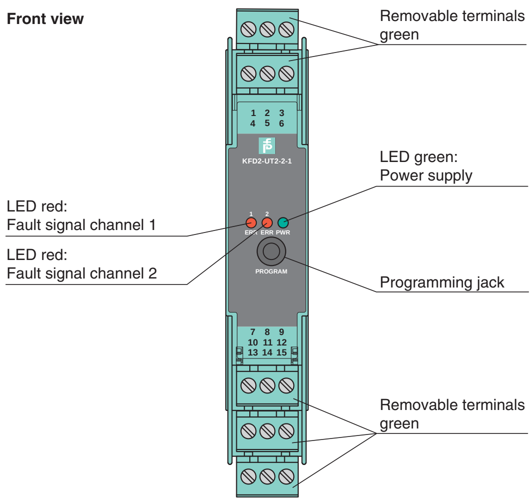
A unique collective error messaging feature is available when used with the Power Rail system.

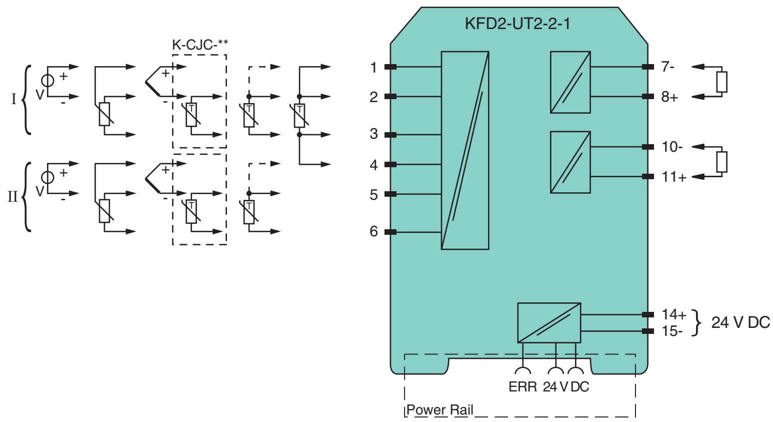
For additional information, refer to the manual and www.pepperl-fuchs.com.

Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 0.8 W/0.8 W
Input	
RTD	type Pt10, Pt50, Pt100, Pt500, Pt1000 (EN 60751: 1995) type Pt10GOST, Pt50GOST, Pt100GOST, Pt500GOST, Pt1000GOST (6651-94) type Cu10, Cu50, Cu100 (P50353-92) type Ni100 (DIN 43760)
Measuring current	approx. 200 µA with RTD
Types of measuring	2-, 3-wire connection
Lead resistance	≤ 50 Ω per lead
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985) type TXK, TXKH, TXA (P8.585-2001)
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	selectable within the range -100 ... 100 mV
Potentiometer	0 ... 20 kΩ (2-wire connection), 0.8 ... 20 kΩ (3-wire connection)
Input resistance	≥ 1 MΩ (-100 ... 100 mV)
Output	
Voltage output	0 ... 5 V or 1 ... 5 V; output resistance: ≤ 5 Ω; load: ≥ 10 kΩ
Fault signal	downscale 0 V or 0.5 V, upscale 5.375 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 130 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams





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Technical data

Supply	
Rated voltage	12 ... 35 V DC loop powered
Input	
Lead resistance	≤ 100 Ω per lead
Measuring current	approx. 1 mA
Output	
Load	(U -12 V)/0.02 A
Current output	4 ... 20 mA, limited to ≤ 35 mA
Fault signal	Sensor burnout: upscaling ≥ 22 mA, limited to ≤ 35 mA
Transfer characteristics	
Measurement range f_n	span without linearization 25 ... 800 °C (77 ... 1472 °F)/ with linearisation 25 ... 375 °C (77 ... 707 °F) zero point without linearization -200 ... 400 °C (-328 ... 752 °F)/ with linearisation -30 ... 375 °C (-22 ... 707 °F) span and zero point adjustable
Deviation	
After calibration	0.1 % of full-scale value
Influence of ambient temperature	span and zero point 0.015 %/K or ± 10 mΩ/K
Influence of supply voltage	6.5 ppm/V
Rise time	250 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **2- or 3-wire Pt100 RTD input**
- **Output 4 mA ... 20 mA, temperature linearization selectable**
- **DIP switch selectable ranges**
- **Sensor breakage detection**

Function

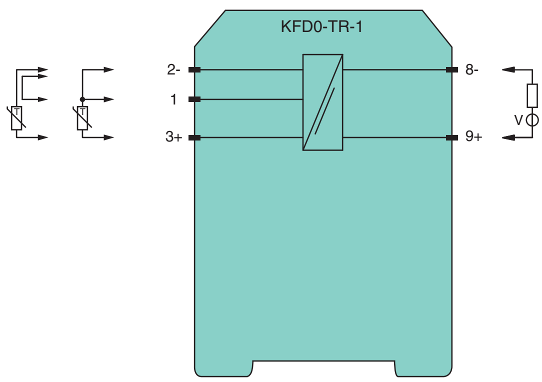
This isolated signal conditioner is a loop-powered isolator that converts the resistance from a 3-wire RTD to a 4 mA ... 20 mA signal and provides isolation for non-intrinsically safe applications.

A selectable analog linearization ensures a temperature linear 4 mA ... 20 mA output between 25 °C ... 375 °C.

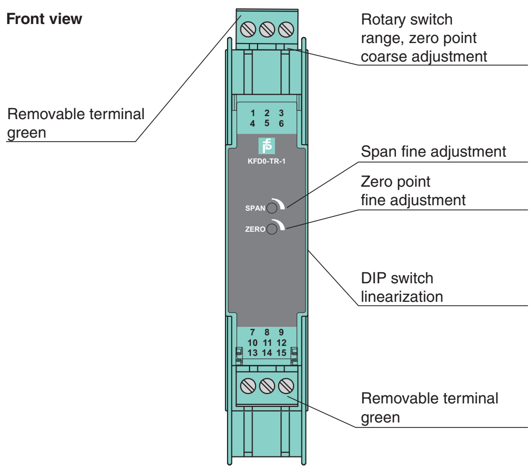
It also features conveniently located DIP switches and potentiometers to make field calibration easy.

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Diagrams



Front view



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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Thermocouple input**
- **Output 4 mA ... 20 mA**
- **Internal cold junction compensation**
- **Sensor breakage detection**
- **DIP switch selectable ranges**

Function

This isolated signal conditioner is a loop-powered isolator that converts thermocouple inputs to a 4 mA ... 20 mA signal and provides isolation for non-intrinsically safe applications.

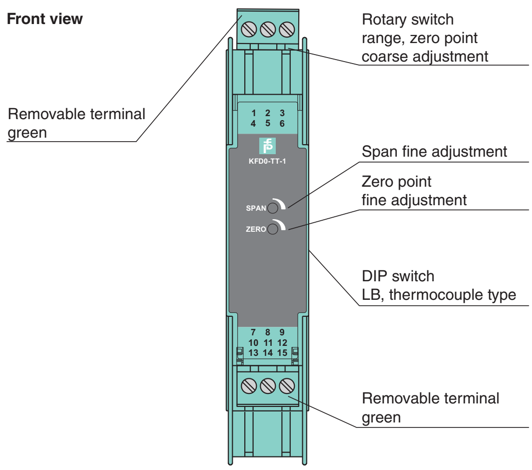
The internal cold junction compensation can be bypassed by using terminals 1 and 3.

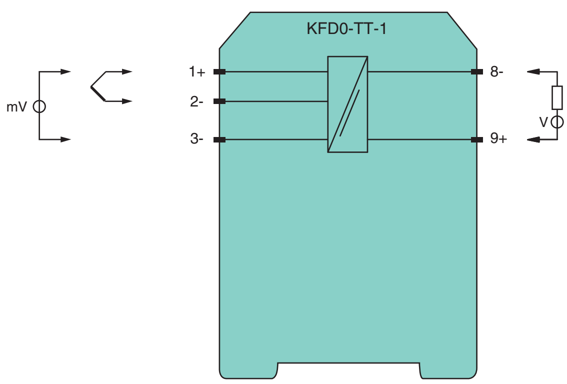
The output current is linear to input voltage, not proportional to temperature. Zero, span, and burnout detection are field-configurable.

Technical data

Supply	
Rated voltage	12 ... 35 V DC loop powered
Input	
Lead resistance	≤ 100 Ω per lead
Current	lead monitoring ON: ≤ 15 nA; OFF: ≤ 1 nA
Output	
Load	(U -12 V)/0.02 A
Current output	4 ... 20 mA, limited to ≤ 35 mA
Fault signal	downscaling ≤ 3 mA, upscaling ≥ 22 mA
Transfer characteristics	
Measurement range f_n	span 4 ... 100 mV, zero point -12 ... 60 mV, both adjustable
Deviation	
After calibration	0.1 % of full-scale value ± 1 K for the cold junction
Temperature effect	temperature deviation 0.015 % of the span/K or 1.5 µV/K cold junction ± 2 K (calibrated at T_{amb} = 20 °C (68 °F))
Influence of supply voltage	6.5 ppm/V
Characteristic curve	the output voltage is linearly proportionate to the input voltage (not to temperature)
Rise time	250 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Diagrams





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Technical data

Supply	
Rated voltage	19 ... 35 V DC
Power consumption	0.8 W
Input	
RTD or resistance	type Pt100 (EN 60751: 1995) type Ni100 (DIN 43760) 0 ... 500 Ω (including lead resistance)
Measuring current	approx. 400 µA with RTD
Lead resistance	≤ 50 Ω per lead
Thermocouples	type B, E, J, K, N, R, S, T (IEC 584-1: 1995) type L (DIN 43710: 1985)
Load	20 Ω for 20 mA; 200 kΩ for 10 V
Output	
Output I, II	
Contact loading	253 V AC/2 A/500 VA/cos Φ min. 0.7; 40 V DC/2 A resistive load
Mechanical life	2 x 10^7 switching cycles
Transfer characteristics	
Deviation	
Voltage input	± 0.02 % of 10 V measuring range
Resistance input	± 0.025 % of measuring range (4-wire connection)
Current input	± 0.02 % of 20 mA measuring range
Pt100	± 0.01 % of abs. temperature value of switching point in K + 0.2 K (4-wire connection)
Thermocouple	± 0.05 % of abs. temperature value of switching point in K + 1.1 K (1.2 K for thermocouple types R and S) this includes ± 0.8 K error of the cold junction compensation (+0.9 K for thermocouple types R and S).
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Thermocouple, RTD, voltage or current input**
- **2 relay contact outputs**
- **Programmable high/low alarm**
- **Sensor breakage detection**

Function

This signal conditioner accepts a variety of inputs including RTDs or thermocouples and provides a relay trip whenever it reaches a user-programmed set point. It also provides isolation for non-intrinsically safe applications.

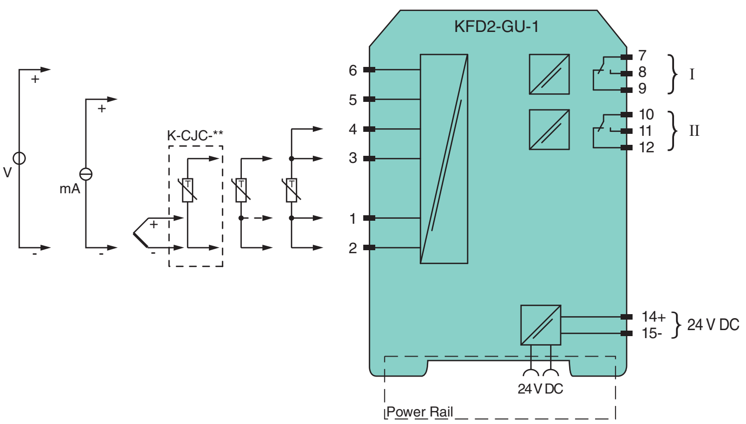
A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

A fault is indicated by a red flashing LED per NAMUR NE44 and user-configured fault outputs.

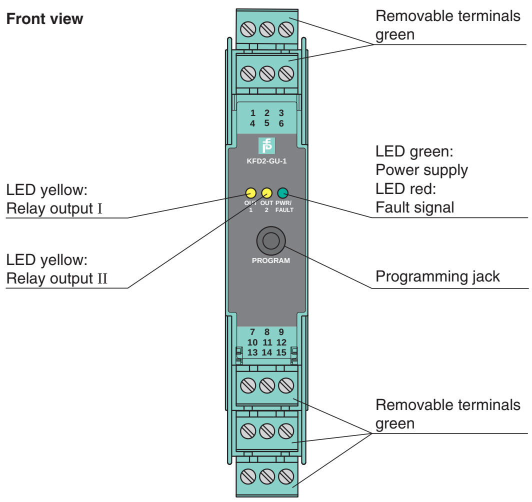
The unit is easily programmed with the **PACT*ware*™** configuration software.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **TC, RTD, potentiometer or voltage input**
- **Redundant TC input**
- **Current output 0/4 mA ... 20 mA**
- **2 relay contact outputs**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner is a universal input trip alarm that converts the signal of an RTD, thermocouple, potentiometer, or voltage source to a proportional output current. It also provides a relay trip value and isolation for non-intrinsically safe applications.

A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

A unique collective error messaging feature is available when used with the Power Rail system.

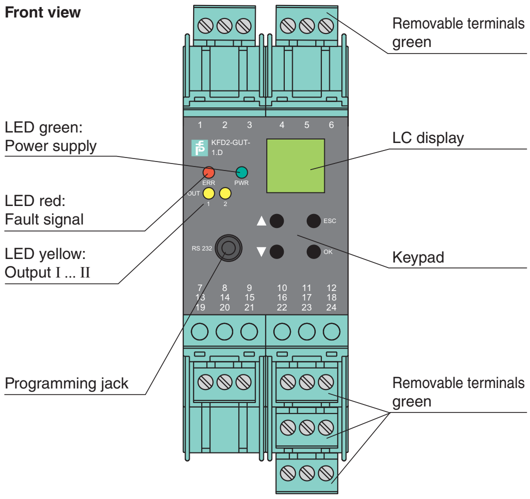
For additional information, refer to the manual and www.pepperl-fuchs.com.

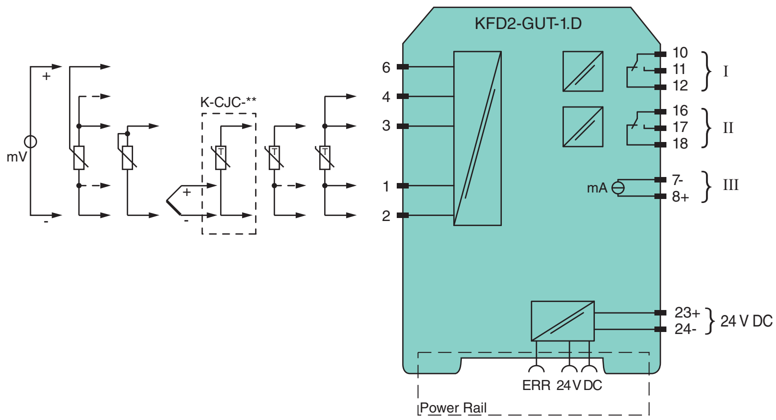
Technical data

Supply	
Rated voltage	20 ... 30 V DC
Power loss/power consumption	≤ 2 W/2.2 W
Input	
RTD	Pt100, Pt500, Pt1000, Ni100, Ni1000
Types of measuring	2-, 3-, 4-wire technology
Lead resistance	≤ 50 Ω
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, L, N, R, S, T
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	0 ... 10 V, 2 ... 10 V, 0 ... 1 V, -100 ... 100 mV
Potentiometer	0.8 ... 20 kΩ
Types of measuring	2-, 3-, 5-wire technology
Input resistance	≥ 250 kΩ (0 ... 10 V) ≥ 1 MΩ (0 ... 1 V, -100 ... 100 mV)
Measuring current	approx. 400 µA with resistance measuring sensor
Output	
Output I, II	relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	analog current output
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 90 V DC/48 ... 253 V AC
Power loss/power consumption	≤ 2 W; 2.5 VA/2.2 W; 3 VA
Input	
RTD	Pt100, Pt500, Pt1000, Ni100, Ni1000
Types of measuring	2-, 3-, 4-wire technology
Lead resistance	≤ 50 Ω
Measuring circuit monitoring	sensor burnout, sensor short-circuit
Thermocouples	type B, E, J, K, L, N, R, S, T
Cold junction compensation	external and internal
Measuring circuit monitoring	sensor burnout
Voltage	0 ... 10 V, 2 ... 10 V, 0 ... 1 V, -100 ... 100 mV
Potentiometer	0.8 ... 20 kΩ
Types of measuring	2-, 3-, 5-wire technology
Input resistance	≥ 250 kΩ (0 ... 10 V) ≥ 1 MΩ (0 ... 1 V, -100 ... 100 mV)
Measuring current	approx. 400 µA with resistance measuring sensor
Output	
Output I, II	relay
Contact loading	250 V AC/2 A/cos Φ ≥ 0.7; 40 DC/2 A
Mechanical life	5 x 10^7 switching cycles
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Output III	analog current output
Current range	0 ... 20 mA or 4 ... 20 mA
Open loop voltage	≤ 24 V DC
Load	≤ 650 Ω
Fault signal	downscale I ≤ 3.6 mA, upscale I ≥ 21 mA (acc. NAMUR NE43)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	300 g
Dimensions	40 x 119 x 115 mm (1.6 x 4.7 x 4.5 in), housing type C3

Features

- **1-channel signal conditioner**
- **AC/DC wide range supply**
- **TC, RTD, potentiometer or voltage input**
- **Redundant TC input**
- **Current output 0/4 mA ... 20 mA**
- **2 relay contact outputs**
- **Line fault (LFD) and sensor burnout detection**
- **Up to SIL2 acc. to IEC 61508**

Function

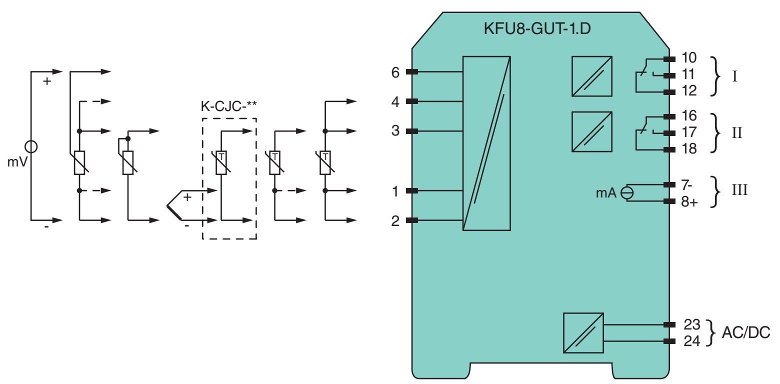
This signal conditioner is a universal input trip alarm that converts the signal of an RTD, thermocouple, potentiometer, or voltage source to a proportional output current. It also provides a relay trip value and isolation for non-intrinsically safe applications.

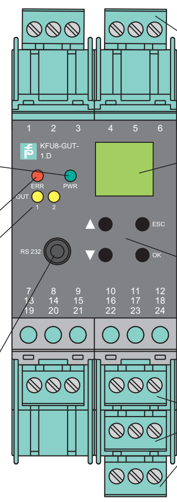
A removable terminal block K-CJC-** is available for thermocouples when internal cold junction compensation is desired.

The unit is easily programmed by the use of a keypad located on the front of the unit or with the **PACT***ware*™ configuration software.

For additional information, refer to the manual and www.pepperl-fuchs.com.

Diagrams





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Current Drivers

Model Number	Channels	Input (Control System)		Output (Field)			SMART	Supply		SIL	Page
		0 mA ... 40 mA	4 mA ... 20 mA	mA	Fire Alarm	Line Fault Detection		24 V DC	Loop Powered		
KCD2-SCD-1	1		■	■			■	■		2	648
KFD2-SCD2-1.LK	1		■	■		■	■	■		2	649
KFD2-SCD2-2.LK	2		■	■		■	■	■		2	650
KFD0-SCS-1.55	1		■	■		■	■		■	2	651
KFD0-CS-1.50	1		■	■	■				■	2	652
KFD0-CS-2.50	2		■	■	■				■	2	653
KFD0-CS-2.51P	2	■		■	■				■	2	654

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Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Current output up to 650 Ω load**
- **HART I/P and valve positioner**
- **Lead breakage monitoring**
- **Accuracy 0.1 %**
- **Housing width 12.5 mm**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner drives SMART I/P converters, electrical valves, and positioners and provides isolation for non-intrinsically safe applications.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

Current transferred across the DC/DC converter is repeated at terminals 1 and 2.

An open field circuit presents a high input impedance to the control side to allow lead breakage monitoring by control system.

If the loop resistance for the digital communication is too low, an internal resistor of 250 Ω between terminals 6 and 8 is available, which may be used as the HART communication resistor.

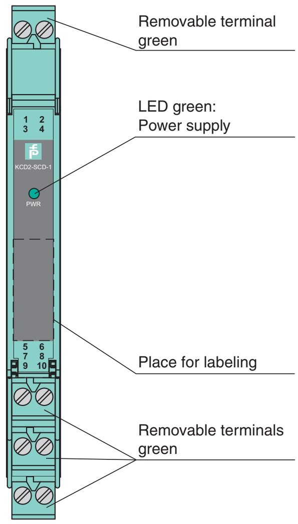
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

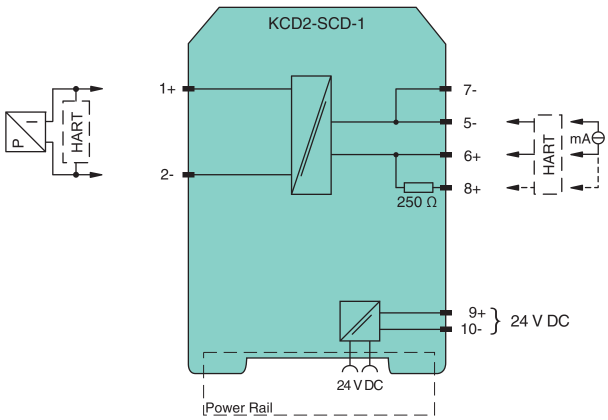
Technical data

Supply	
Rated voltage	19 ... 30 V DC
Power consumption	≤ 700 mW
Input	
Input signal	4 ... 20 mA limited to approx. 30 mA
Voltage drop U_d	approx. 6 V or internal resistance 300 Ω at 20 mA
Input resistance	> 100 kΩ at max. 23 V, with field wiring open
Output	
Current	4 ... 20 mA
Load	0 ... 650 Ω
Voltage	≥ 13 V at 20 mA
Ripple	20 mV_{rms}
Transfer characteristics	
Deviation	at 20 °C (68 °F), 0/4 ... 20 mA ≤ ± 0.1 % incl. non-linearity and hysteresis
Influence of ambient temperature	< 2 µA/K (0 ... 60 °C (32 ... 140 °F)); < 4 µA/K (-20 ... 0 °C (-4 ... 32 °F))
Frequency range	bandwidth at 0.5 V_{pp} signal 0 ... 3 kHz (-3 dB)
Rise time	10 to 90 % ≤ 100 ms
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	12.5 x 114 x 124 mm (0.5 x 4.5 x 4.9 in), housing type A2

Diagrams

Front view





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Technical data

Supply	
Rated voltage	10 ... 35 V DC
Power consumption	1 W at 20 mA
Input	
Voltage drop U_d	approx. 4 V or internal resistance 200 Ω at 20 mA
Input resistance	> 100 kΩ, when wiring resistance in the field > 16 V (equivalent to 800 Ω at 20 mA)
Current	4 ... 20 mA limited to approx. 25 mA
Output	
Current	4 ... 20 mA
Load	100 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): 10 µA incl. non-linearity, calibration, hysteresis, supply and load changes
Influence of ambient temperature	1 µA/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **HART I/P and valve positioner**
- **Line fault detection (LFD)**
- **Accuracy 0.05 %**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner drives SMART I/P converters, electrical valves, and positioners and provides isolation for non-intrinsically safe applications.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

Current transferred across the DC/DC converter is repeated at terminals 1 and 2.

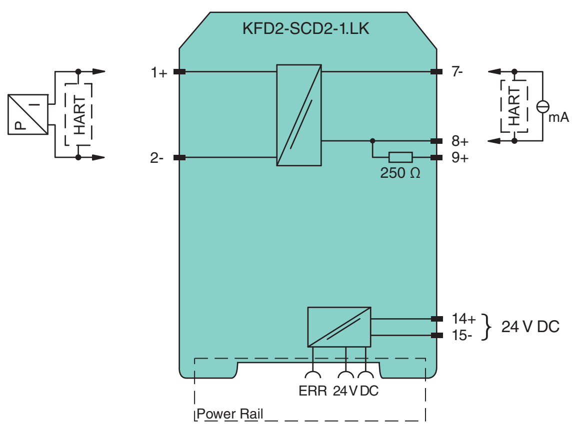
An open and shorted field circuit presents a high input impedance to the control side to allow line fault detection by control system.

If the loop resistance for digital communication is too low, an internal resistor of 250 Ω between terminals 8 and 9 is available, which may be used as the HART communication resistor.

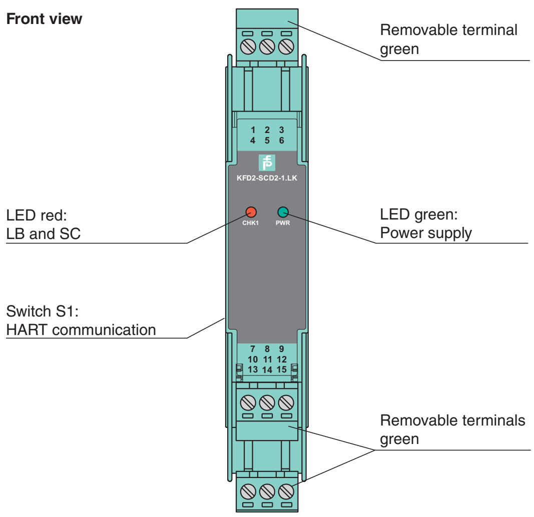
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

A unique collective error messaging feature is available when used with the Power Rail system.

Diagrams



Front view



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Features

- **2-channel signal conditioner**
- **24 V DC supply (Power Rail)**
- **Current output up to 700 Ω load**
- **HART I/P and valve positioner**
- **Line fault detection (LFD)**
- **Accuracy 0.05 %**
- **Terminals with test points**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner drives SMART I/P converters, electrical valves, and positioners and provides isolation for non-intrinsically safe applications.

Digital signals are superimposed on the analog values at the field or control side and are transferred bi-directionally.

Current transferred across the DC/DC converter is repeated at terminals 1, 2 and 4, 5.

An open and shorted field circuit presents a high input impedance to the control side to allow line fault detection by control system.

If the loop resistance for digital communication is too low, an internal resistor of 250 Ω between terminals 8, 9 and 11, 12 is available, which may be used as the HART communication resistor.

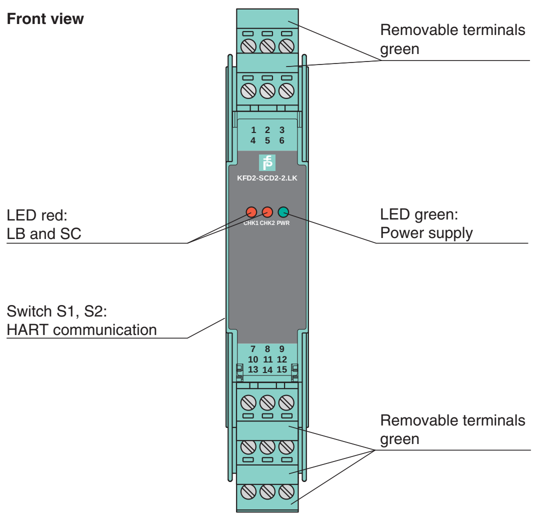
Sockets for the connection of a HART communicator are integrated into the terminals of the device.

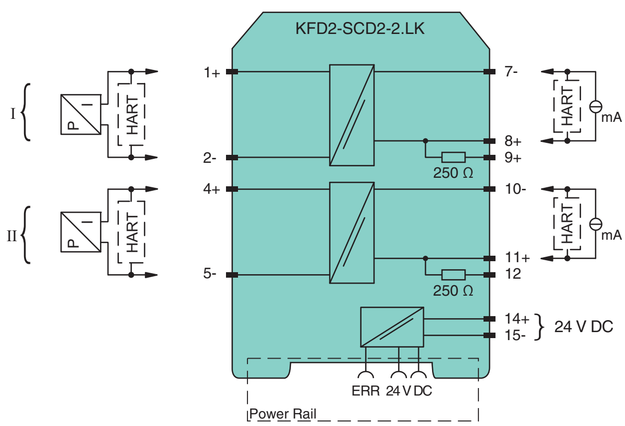
A unique collective error messaging feature is available when used with the Power Rail system.

Technical data

Supply	
Rated voltage	10 ... 35 V DC
Power consumption	1.8 W at 20 mA
Input	
Voltage drop U_d	approx. 4 V or internal resistance 200 Ω at 20 mA
Input resistance	> 100 kΩ, when wiring resistance in the field > 16 V (equivalent to 800 Ω at 20 mA)
Current	4 ... 20 mA limited to approx. 25 mA
Output	
Current	4 ... 20 mA
Load	100 ... 700 Ω
Voltage	≥ 14 V at 20 mA
Transfer characteristics	
Deviation	
After calibration	at 20 °C (68 °F): 10 µA incl. non-linearity, calibration, hysteresis, supply and load changes
Influence of ambient temperature	1 µA/K
Rise time	< 100 µs (bounce from 10 ... 90 %)
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Diagrams





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Technical data

Supply	
Rated voltage	loop powered
Field circuit	
Available voltage	≥ 16 V for supply voltage > 21 V
Current	4 ... 20 mA (linear transmission 1 ... 22 mA)
Load	≤ 800 Ω (at 20 mA)
Supply circuit	
Voltage	max. 30 V DC
Current	4 ... 20 mA (quiescent current < 0.5 mA)
Power loss	150 mW at 20 mA and U_E < 24 V
Transfer characteristics	
Deviation	
After calibration	≤ ± 80 µA linearity, load and voltage dependence at 20 °C (68 °F)
Influence of ambient temperature	< 0.5 µA/K
Damping	approx. 3 dB
Rise time	≤ 20 µs at 0 Ω, ≤ 600 µs with 800 Ω load
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 124 x 115 mm (0.8 x 4.9 x 4.5 in), housing type B2

Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **HART I/P or transmitter power supply**
- **Low voltage drop**
- **Line fault detection (LFD)**
- **Up to SIL2 acc. to IEC 61508**

Function

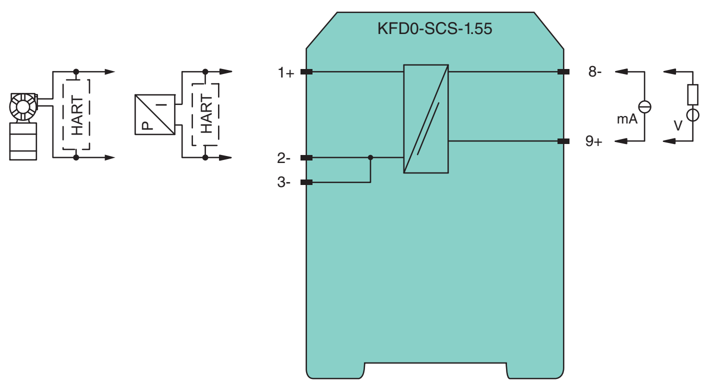
This signal conditioner is loop powered and isolates a 4 mA ... 20 mA signal for transmitters and positioners and is HART compatible.

The low voltage drop of 5 V in comparison to active signal conditioners also allows transmitter applications with unstable power sources between 20 V DC ... 30 V DC.

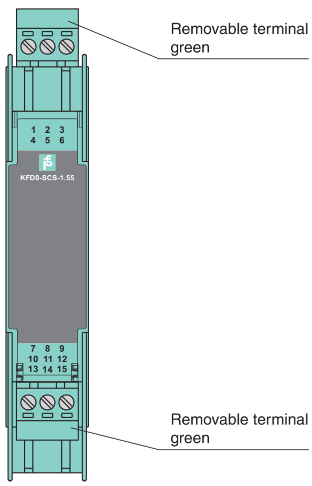
Line fault detection of the field circuit is possible if the control loop in the safe area is monitored for overscale or underscale conditions of the 4 mA ... 20 mA range.

The module can also be used for controlling solenoid valves and discrete outputs, such as LEDs. In this case, terminals 8- and 9+ are driven with a 24 V signal.

Diagrams



Front view



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Features

- **1-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **I/P or transmitter power supply**
- **Accuracy 0.1 %**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner transfers DC signals from fire alarms, smoke alarms, and temperature sensors and provides isolation for non-intrinsically safe applications. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

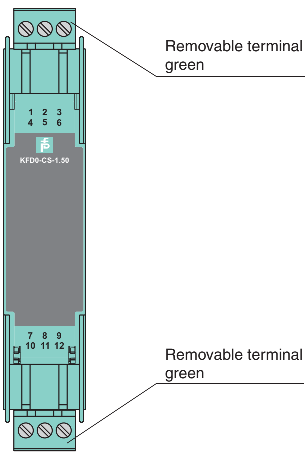
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

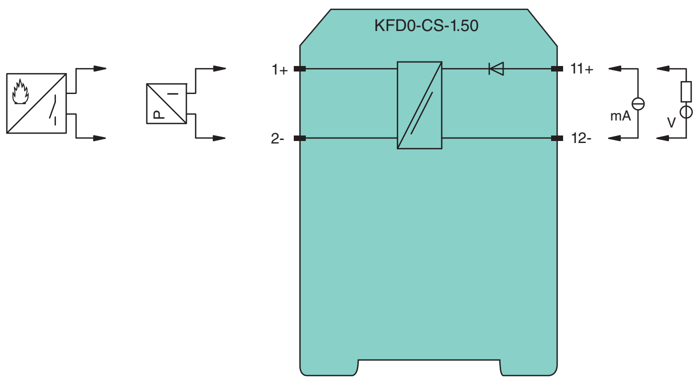
Technical data

Supply	
Rated voltage	loop powered
Input	
Rated voltage U_i	10 ... 35 V
Rated current I_i	4 ... 20 mA
Power loss	< 150 mW per channel at 25 mA and U < 26.1 V < 400 mW per channel at 25 mA and U > 26.1 V
Output	
Voltage	≥ 0.9 x U_{in} - (0.23 x current in mA) - 0.7 for 10 V < U_{in} < 26.1 V ≥ 23 V - (0.23 x current in mA) for U_{in} > 26.1 V
Short-circuit current	≤ 100 mA
Transfer current	≤ 25 mA
Transfer characteristics	
Deviation	
After calibration	U_{in} ≥ 5 V ± 20 µA/U_{in} ≤ 5 V ± 50 µA incl. calibration, linearity, hysteresis and output load fluctuations at 20 °C (68 °F)
Influence of ambient temperature	≤ 2 µA/K (0 ... 50 °C (32 ... 122 °F)); ≤ 5 µA/K (-20 ... 60 °C (-4 ... 140 °F))
Rise time	≤ 5 ms at 4 ... 20 mA and U_{in} = input voltage < 26 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Diagrams

Front view





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Technical data

Supply	
Rated voltage	loop powered
Input	
Rated voltage U_i	10 ... 35 V
Rated current I_i	4 ... 20 mA
Power loss	< 150 mW per channel at 25 mA and U < 26.1 V < 400 mW per channel at 25 mA and U > 26.1 V
Output	
Voltage	$\geq$ 0.9 x U_{in} - (0.23 x current in mA) - 0.7 for 10 V < U_{in} < 26.1 V $\geq$ 23 V - (0.23 x current in mA) for U_{in} > 26.1 V
Short-circuit current	$\leq$ 100 mA
Transfer current	$\leq$ 25 mA
Transfer characteristics	
Deviation	
After calibration	$U_{in} \geq$ 5 V ± 20 µA/$U_{in} \leq$ 5 V ± 50 µA incl. calibration, linearity, hysteresis and output load fluctuations at 20 °C (68 °F)
Influence of ambient temperature	$\leq$ 2 µA/K (0 ... 50 °C (32 ... 122 °F)); $\leq$ 5 µA/K (-20 ... 60 °C (-4 ... 140 °F))
Rise time	$\leq$ 5 ms at 4 ... 20 mA and U_{in} = input voltage < 26 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Features

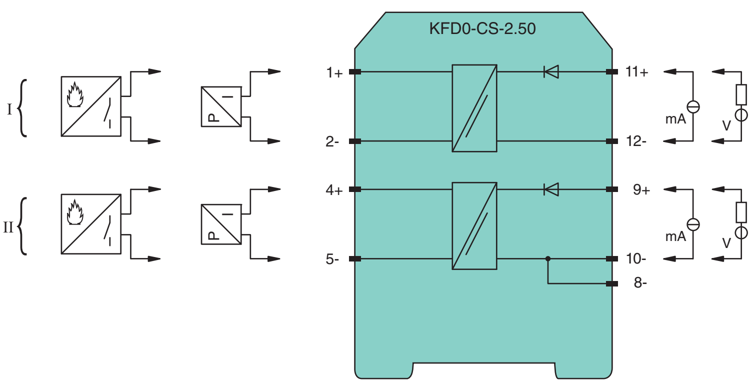
- **2-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current input/output 4 mA ... 20 mA**
- **I/P or transmitter power supply**
- **Accuracy 0.1 %**
- **Up to SIL2 acc. to IEC 61508**

Function

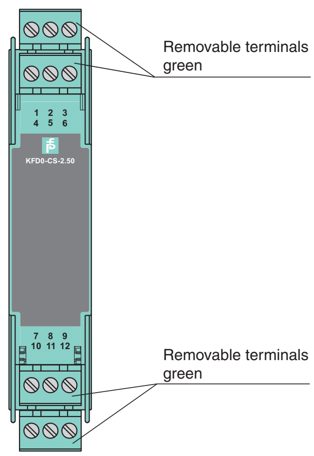
This signal conditioner transfers DC signals from fire alarms, smoke alarms, and temperature sensors and provides isolation for non-intrinsically safe applications. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

Diagrams



Front view



K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Edition 908837 (US) / 208599 (EU) 11/2010

Features

- **2-channel signal conditioner**
- **24 V DC supply (loop powered)**
- **Current input/output 0 mA ... 40 mA**
- **I/P or transmitter power supply**
- **Accuracy 1 %**
- **Reverse polarity protection**
- **Up to SIL2 acc. to IEC 61508**

Function

This signal conditioner transfers DC signals from fire alarms, smoke alarms, and temperature sensors to the control and provides isolation for non-intrinsically safe applications. It can also be used to control I/P converters, power solenoids, LEDs, and audible alarms.

Reverse polarity protection prevents damage to the isolator caused by faulty wiring.

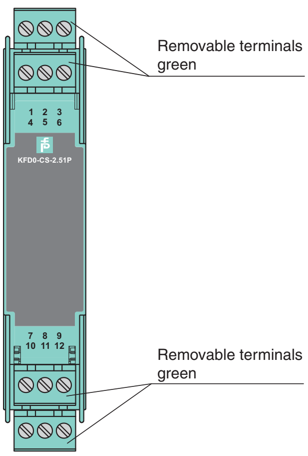
Since this isolator is loop powered, use the technical data to verify that proper voltage is available to the field devices.

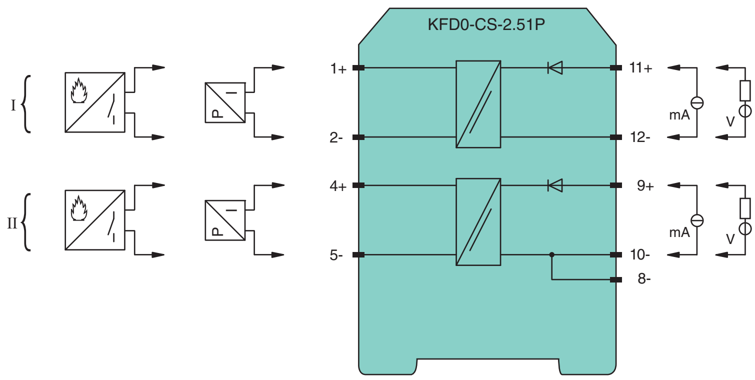
Technical data

Supply	
Rated voltage	loop powered
Input	
Rated voltage U_i	4 ... 35 V
Rated current I_i	0 ... 40 mA
Power loss	at 40 mA and U_{in} < 22 V: 700 mW per channel at 40 mA and U_{in} > 22 V: 1.2 W per channel
Output	
Voltage	for 4 V < U_{in} < 24 V: ≥ 0.9 x U_{in} - (0.37 x current in mA) - 1.0 for U_{in} > 24 V: ≥ 21 V - (0.36 x current in mA)
Short-circuit current	at U_{in} > 24 V: ≤ 65 mA
Transfer current	≤ 40 mA
Transfer characteristics	
Deviation	
After calibration	≤ ± 200 µA; incl. calibration, linearity, hysteresis and load fluctuations at the output up to a load of 1 kΩ and current ≤ 20 mA at 20 °C (68 °F)
Influence of ambient temperature	≤ ± 2 µA/K at U_{in} ≤ 20 V; ≤ ± 5 µA/K at U_{in} > 20 V
Rise time	≤ 5 ms at 4 ... 20 mA step and U_{in} < 24 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1

Diagrams

Front view





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Supply and Installation

Model Number	Description	Page
KFA6-STR-1.24.500	Power Supply, 24 V, 500 mA	657
KFA6-STR-1.24.4	Power Supply, 24 V, 4 A	658
KFD2-EB2	Power Feed Module	659
KFD2-EB2.R4A.B	Redundant Power Feed Module	660
UPR-03-*	Universal Power Rail, insert for DIN rail, 3-lead	661
UPR-05-*	Universal Power Rail, insert for DIN rail, 5-lead	662
UPR-E	End Cap for Universal Power Rail UPR-**-*	661, 662
UPR-I	Insulation Spacer for Universal Power Rail UPR-**-*	665
K-DUCT-GY-UPR-03	Profile Rail with UPR-03-* insert, 3-lead, wiring comb field side grey	663
K-DUCT-GY-UPR-05	Profile Rail with UPR-05-* insert, 5-lead, wiring comb field side grey	664
E/AL-NS35	End Bracket	666
TS 35 Typ 12	End Bracket	666
K-MS	Mounting Socket	665

Terminal Blocks

Model Number	Description	Type		Module					Packaging Unit, Color			Page
		Screw Terminal	Cage Clamp Terminal	KC-Modules	KF-Modules	Number of Poles	Test Sockets	Cold Junction Compensation	Green	Black	Red	
K-CJC-BK	Terminal Block	■			■	3		■		1		667
KC-ST-5GN	Terminal Block	■		■		2			5			667
KF-ST-5GN	Terminal Block	■			■	3			5			668
KC-STP-5GN	Terminal Block	■		■		2	■		5			668
KF-STP-5GN	Terminal Block	■			■	3	■		5			669
KC-CTT-5GN	Terminal Block		■	■		2	■		5			669
KF-CTT-5GN	Terminal Block		■		■	3	■		5			670
KF-CP	Coding Pins			■	■						20 x 6	670

Commissioning

Model Number	Description	Page
PACT*ware*™ 4.X	FDT-Framework	671
K-ADP-USB	Adapter with USB Interface	672
K-ADP1	Adapter with RS 232 Interface	673

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Further Accessories

Model Number	Description	Page
K-500R0%1	Measuring Resistor	674
KF-SEAL	Adhesive Sticker	674
KFD0-LGH-GN	Place Holder Barrier, KF Module	675
KFD0-LGH-Y34868	Place Holder Barrier, KF Module	676

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Technical data

Supply	
Rated voltage	90 ... 253 V AC, 48 ... 63 Hz
Power loss	2.5 W
Output	
Current	500 mA at 60 °C (140 °F), permanent short-circuit protection (electronic)
Voltage	24 V ± 0.5 V
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 140 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2

Features

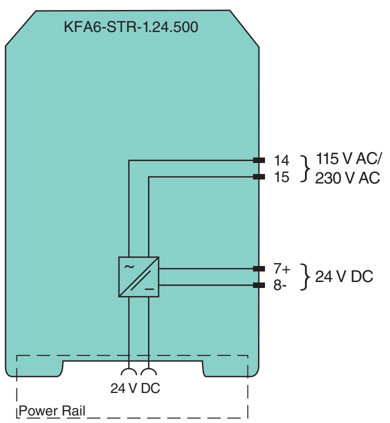
- **115/230 V AC supply**
- **Output 24 V DC, 500 mA**
- **Electronic short circuit protection**
- **Power Rail connection**

Function

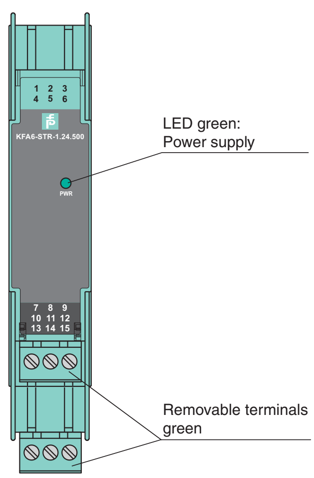
This regulated power supply provides 24 V DC, at 500 mA.

The KFA6-STR-1.24.500 features removable terminals and mounts directly on the Power Rail. This allows usage as Power Rail supply as well as stand alone power supply.

Diagrams



Front view



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KFA6-STR-1.24.4

Features

- **115/230 V AC supply**
- **Output 24 V DC, 4 A**
- **Fused output**
- **Power Rail connection**

Function

This regulated power supply provides 24 V DC, at 4 A. It features removable terminals, LED fault indication, and mounts directly on the Power Rail.

Designed with a replaceable fuse and LED, it will provide a green visual indication for normal operation or a flashing red indication if a fault occurs.

Attention: Ignoring the safety instructions (i. e., touching hot sections when the device is open, handling malpractices) can be extremely dangerous.

When exceeding the values stated in the technical data, there is a danger of overheating. As a result, the operation of the power supply and its electrical safety may be impaired.

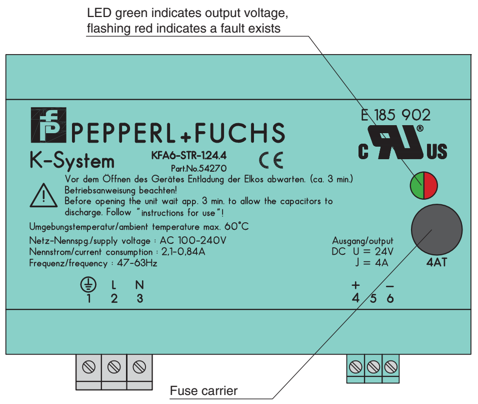
Before starting installation or service, switch mains off. Do not plug or unplug powered!

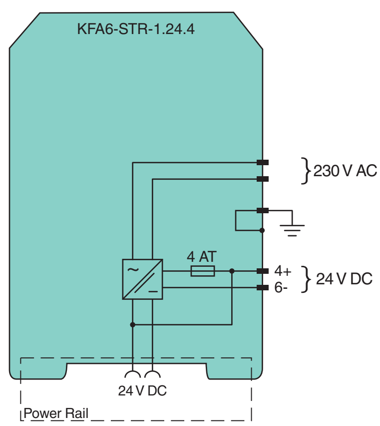
Technical data

Supply	
Rated voltage	92 ... 265 V AC, 47 ... 63 Hz
Rated current	2.1 ... 0.84 A
Failure override time	> 75 ms/230 V AC; 5 ms/115 V AC
Output	
Current	0 ... 4 A, Power Rail limiting by means of fuse 4 AT, electron. limitation typ. 4.6 A
Voltage	23.28 ... 24.72 V DC
Ripple	< 100 mV_{pp}
Efficiency	typ. 87 %
Overvoltage protected	< 28 V DC
Electromagnetic compatibility	
Safety	acc. to VDE 0805/EN 60950
Radio-interference supression	acc. to VDE 0875 Part 11, EN 55011 class B
Electrostatic discharge	acc. to IEC 60801-2
Contact discharging	8 kV
Air discharging	15 kV
Electromagnetic fields	acc. to IEC 801-3, 10 V/m
Burst IEC 60801-4	Input: 4 kV; output/capacitively coupled: 2 kV
Surge IEC 60801-5	asymmetrical: L, N -> PE 4 kV; symmetrical: L -> N 2 kV
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 800 g
Dimensions	140 x 103.5 x 99 mm (5.5 x 4.1 x 3.9 in)
Mounting	mounting clips for snap-mounting on DIN rail as per DIN EN 60715
Connection possibilities	self-opening connection terminals, max. core cross-section 2 x 2.5 mm^2
Data for application in connection with Ex-areas	
UL approval	UL recognized E185902

Diagrams

Front view





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Technical data

Supply	
Rated voltage	20 ... 30 V DC The maximum rated operational voltage of the devices plugged onto the Power Rail must not be exceeded.
Power loss	≤ 1 W
Output	
Power Rail feed	output current: ≤ 4 A
Fault signal	relay output: NO
Contact loading	40 V DC; 2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Fusing	5 AT
Ambient conditions	
Ambient temperature	-25 ... 60 °C (-13 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	
Statement of conformity	TÜV 00 ATEX 1618 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0160
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC
CSA approval	
Control drawing	116-0160
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC

Features

- **Interface for Power Rail**
- **Supply rating 4 A, external fused**
- **Relay contact output, reversible**
- **LED status indication**

Function

The power feed module interfaces 24 V DC power to the Power Rail at a maximum current of 4 A. The twin input terminals allow for daisy-chaining of supply (max. 10 A).

A green LED on the front of the unit indicates that power is on, and a red LED illuminates during error conditions.

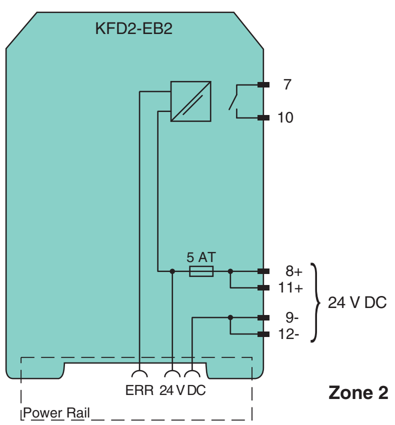
In the event of a field wiring or barrier fault from any barrier on the Power Rail, the integral collective error messaging relay alerts the controller via a single discrete I/O point.

This relay can be configured as normally open or normally closed.

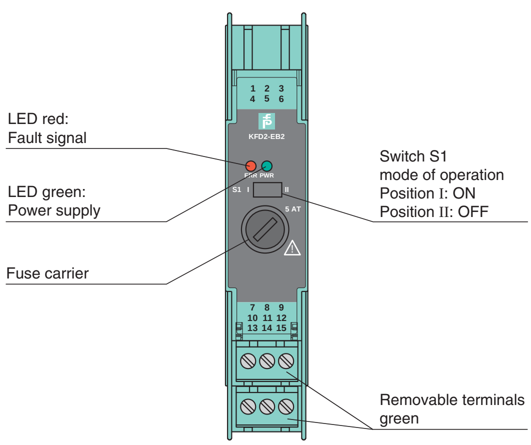
In the sense of functional safety (SIL) the device provides no dangerous failures. Thereby the safe condition of the supplied barrier must be defined as the powerless state. Thus the device will not influence the safety calculation or the SIL value.

This device is compatible with all versions of the Power Rail.

Diagrams



Front view



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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

Features

- **Interface for Power Rail**
- **Used for redundant configuration**
- **Supply rating 4 A, external fused**
- **Relay contact output, reversible**

Function

The power feed module interfaces 24 V DC power to the Power Rail at a maximum current of 4 A and is designed for applications requiring redundant power. The twin input terminals allow for daisy-chaining of supply (max. 10 A).

A green LED on the front of the unit indicates that power is on, and a red LED illuminates during error conditions.

In the event of a field wiring or barrier fault from any barrier on the Power Rail, the integral collective error messaging relay alerts the controller via a single digital I/O point. This relay can be configured as normally open or normally closed.

Additionally, the bus implemented in the Power Rail is forwarded to the outside terminals 13 and 15 for usage with KFD2-WAC2-Ex1.D RS 485 connection. Terminal 14 is only for test purposes.

In the sense of functional safety (SIL) the device provides no dangerous failures. Thereby the safe condition of the supplied barrier must be defined as the powerless state. Thus the device will not influence the safety calculation or the SIL value.

This device is compatible with all versions of the Power Rail and provides group fusing.

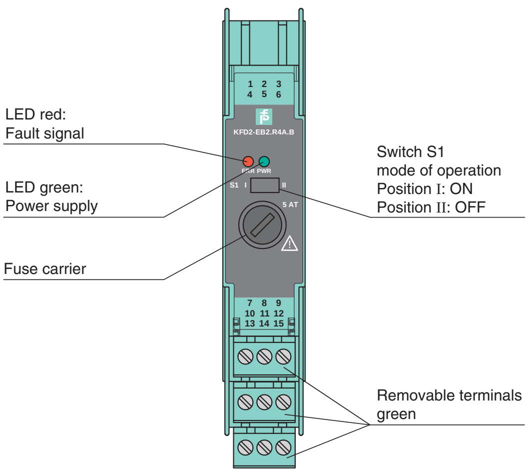
Note: Redundant systems require two KFD2-EB.R4A.B modules.

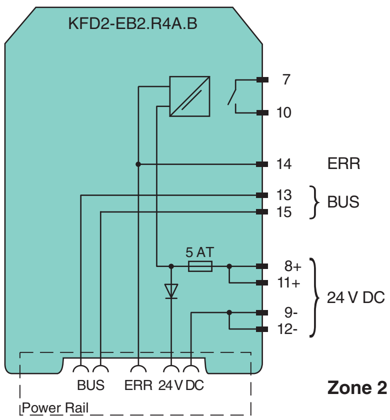
Technical data

Supply	
Rated voltage	20 ... 30 V DC The maximum rated operational voltage of the devices plugged onto the Power Rail must not be exceeded.
Power loss	≤ 2.4 W
Output	
Power Rail feed	output current: ≤ 4 A
Fault signal	relay output: NO
Contact loading	40 V DC; 2 A
Energized/De-energized delay	approx. 20 ms/approx. 20 ms
Fusing	5 AT
Ambient conditions	
Ambient temperature	-25 ... 60 °C (-13 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.7 x 4.5 in), housing type B2
Data for application in connection with Ex-areas	
Statement of conformity	TÜV 00 ATEX 1618 X
Group, category, type of protection, temperature classification	Ⓔx II 3G Ex nA nC IIC T4
FM approval	
Control drawing	116-0160
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC
CSA approval	
Control drawing	116-0160
Approved for	Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, IIC

Diagrams

Front view





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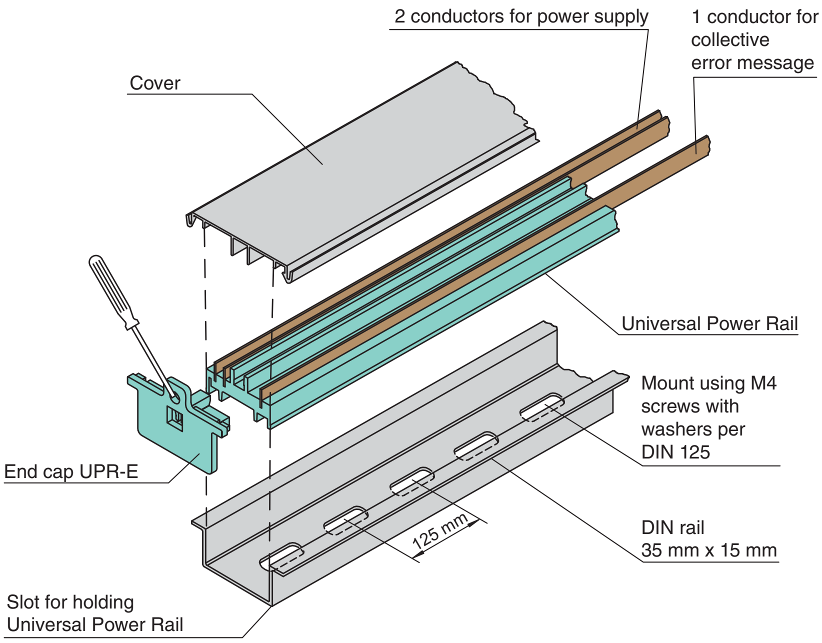
Dimensions



Technical data

Electrical specifications	
Rated voltage	24 V DC
Rated current	4 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Dimensions	UPR-03-S: 35 x 15 x 800 mm (1.4 x 0.6 x 31.5 in) UPR-03: 35 x 15 x 2000 mm (1.4 x 0.6 x 78.7 in)

Features

- **Gold plated 3-conductor insert in 35 mm DIN rail acc. to EN 60715**
- **Provides DC supply voltage to all equipped K-System modules**
- **Standard length 0.8 m (2.6 ft) or 2 m (6 ft), simple to customize to application space**
- **Eliminates daisy-chains**

Function

The universal Power Rail is a plastic insert with integral gold-plated conductors that fits into its own integral, 35 mm DIN rail and supplies components with power.

It has two conductors for power and one conductor for collective error messaging.

It reduces wiring and maintenance costs because it eliminates the need to daisy-chain the wires. It also simplifies expansion – just snap in a new module when you're ready to expand a system.

It comes in 2 m segments (UPR-03) or in 0.8 m segments (UPR-03-S) but can be cut to any size.

It is delivered with two UPR-E end caps. More end caps can be ordered separately.

In conjunction with K-System modules the universal Power Rail can be mounted in Zone 2.

Accessories

UPR-E

End cap for UPR-03-* and UPR-05-*

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Features

- **Gold plated 5-conductor insert in 35 mm DIN rail acc. to EN 60715**
- **Provides DC supply voltage and the bus connection to all equipped K-System modules**
- **Standard length 0.8 m (2.6 ft) or 2 m (6 ft), simple to customize to application space**
- **Eliminates daisy-chains**

Function

The universal Power Rail is a plastic insert with integral gold-plated conductors that fits into its own integral, 35 mm DIN rail and supplies components with power.

It has two conductors for power, one conductor for collective error messaging, and two conductors for bus connections.

It reduces wiring and maintenance costs because it eliminates the need to daisy-chain the wires. It also simplifies expansion – just snap in a new module when you're ready to expand a system.

It comes in 2 m segments (UPR-05) or in 0.8 m segments (UPR-05-S) but can be cut to any size.

It is delivered with two UPR-E end caps. More end caps can be ordered separately.

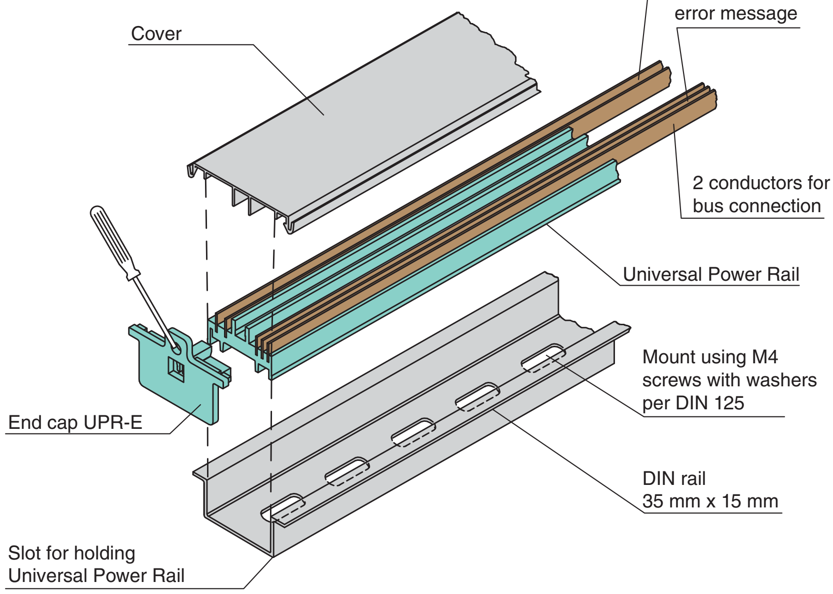
In conjunction with K-System modules the universal Power Rail can be mounted in Zone 2.

Accessories

UPR-E

End cap for UPR-03-* and UPR-05-*

Dimensions



Technical data

Electrical specifications	
Rated voltage	24 V DC
Rated current	4 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Dimensions	UPR-05-S: 35 x 15 x 800 mm (1.4 x 0.6 x 31.5 in) UPR-05: 35 x 15 x 2000 mm (1.4 x 0.6 x 78.7 in)

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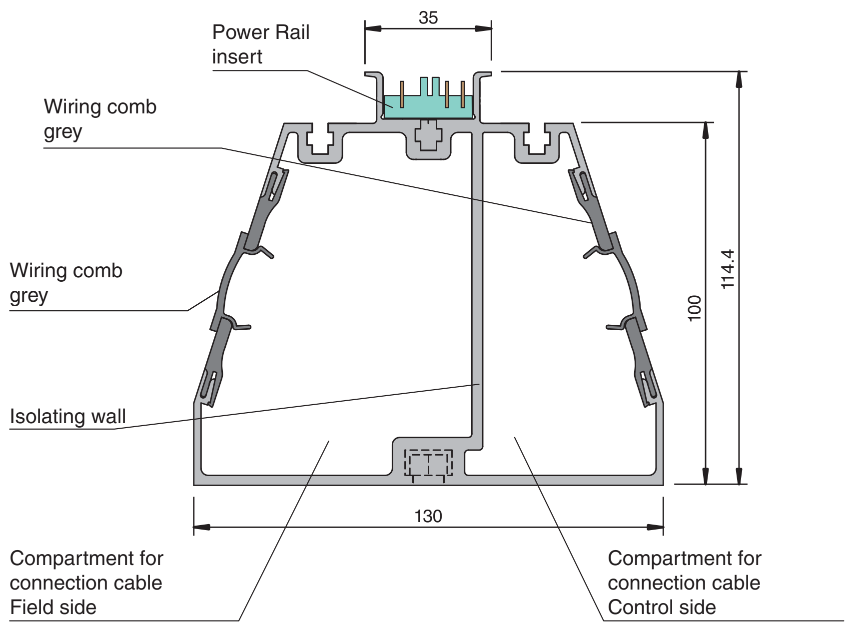
Dimensions



Technical data

Mechanical specifications	
Dimensions	130 x 114.4 x 1800 mm (5 x 4.5 x 71 in)

Features

- **Cable trunking with integrated Power Rail UPR-03**
- **Safe spacious separation of field and control signals**
- **No additional cable guides necessary**
- **Provides DC supply voltage to all equipped K-System modules**
- **Standard length 1.8 m (5.8 ft), simple to customize to application space**

Function

The profile rail can be used to provide space-saving mounting for interface modules and accommodate the associated wiring. The system and field cables are easily installed in the integral cable ducts of the profile rail. Thus no additional cable guides are necessary.

The power supply to the individual modules is preferably provided via the Power Rail UPR-03 that is integrated into the system. Additionally the Power Rail UPR-03 has one lead for collective error messaging.

The asymmetrical segmented connection compartment can be changed dependent on the required space by turning the profile rail. Please note that the Power Rail insert must be also rotated.

In conjunction with K-System modules the profile rail can be mounted in Zone 2.

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Features

- **Cable trunking with integrated Power Rail UPR-05**
- **Safe spacious separation of field and control signals**
- **No additional cable guides necessary**
- **Provides DC supply voltage and the bus connection to all equipped K-System modules**
- **Standard length 1.8 m (5.8 ft), simple to customize to application space**

Function

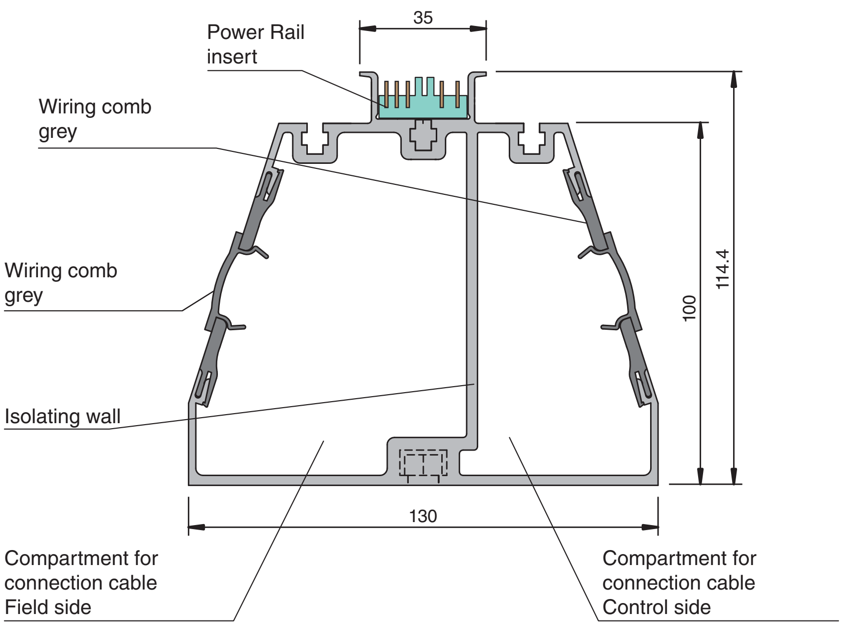
The profile rail can be used to provide space-saving mounting for interface modules and accommodate the associated wiring. The system and field cables are easily installed in the integral cable ducts of the profile rail. Thus no additional cable guides are necessary.

The power supply to the individual modules is preferably provided via the Power Rail UPR-05 that is integrated into the system. Additionally the Power Rail UPR-05 has one lead for collective error messaging and two leads for bus connections.

The asymmetrical segmented connection compartment can be changed dependent on the required space by turning the profile rail. Please note that the Power Rail insert must be also rotated.

In conjunction with K-System modules the profile rail can be mounted in Zone 2.

Dimensions



Technical data

Mechanical specifications	
Dimensions	130 x 114.4 x 1800 mm (5 x 4.5 x 71 in)

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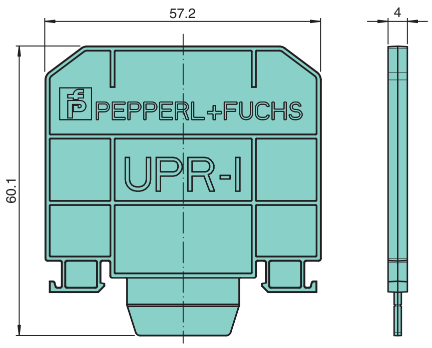


Insulation Spacer for UPR-**-*
UPR-I

Features

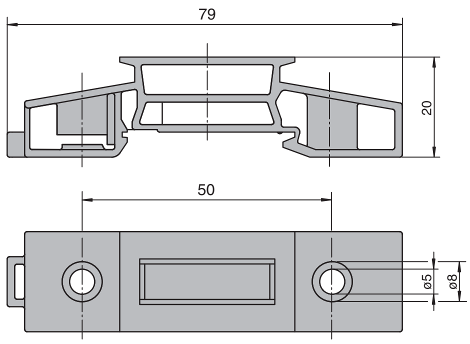
- **Electrical insulation of segmented Power Rail inserts**

Function

The insulation spacer mounts onto a 35 mm DIN rail. It is used for electrical insulation of segmented Power Rail inserts.

Technical data

Mechanical specifications	
Material	Polycarbonate
Mass	approx. 20 g
Dimensions	4 x 57 x 60 mm (0.16 x 2.24 x 2.36 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715



Mounting Socket
K-MS

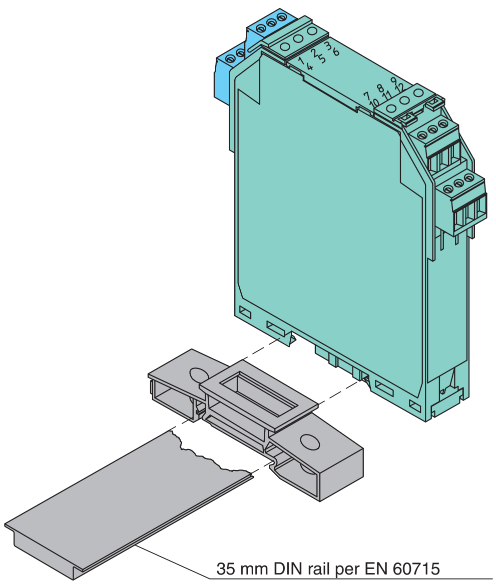
Features

- **1-channel**
- **KF module DIN rail isolation block**
- **Snaps on to 35 mm DIN rail acc. to EN 60715**
- **Easy panel mounting**

Function

This mounting socket enables the "snap-on" mounting of K devices on a 35 mm DIN rail when there is not enough space to install the Power Rail device contacts.

Sockets can be mounted in rows, so mounting can be accomplished with a minimum loss of space. The socket may also be used to cover unused mounting positions on the Power Rail.



Technical data

Mechanical specifications	
Material	Polyamide PA 66
Mass	approx. 30 g
Dimensions	20 x 20 x 79 mm (0.8 x 0.8 x 3.1 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715

K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

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End Bracket
E/AL-NS35

Features

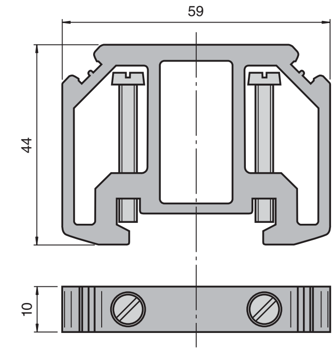
- **For end support**

Function

The end bracket is used for end support of devices on the 35 mm DIN rail. It is pushed onto DIN rail and fixed with two screws.

Note: This component is not supplied by Pepperl+Fuchs.

Supplier: Phoenix Contact



Technical data

Mechanical specifications	
Material	aluminium
Mass	approx. 25 g
Dimensions	10 x 44 x 59 mm (0.4 x 1.7 x 2.3 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715

End Bracket
TS 35 Typ 12

Features

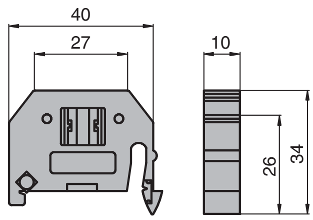
- **End terminal as termination for DIN rail**

Function

TS 35 Type 12 end brackets are used as terminations when K devices are mounted on the DIN rail.

Note: This component is not supplied by Pepperl+Fuchs.

Supplier: Wago



Technical data

Mechanical specifications	
Mass	approx. 10 g
Dimensions	10 x 34 x 40 mm (0.4 x 1.34 x 1.57 in)
Mounting	mounting on 35 mm DIN rail acc. to DIN EN 60715

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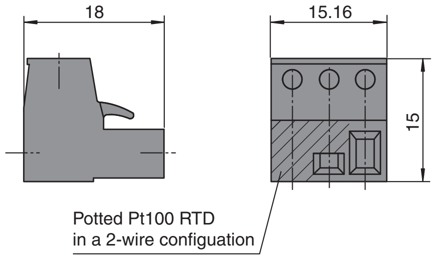
Terminal Block with Cold Junction Compensation
K-CJC-BK



Features

- **3-pin screw terminal**
- **For KF modules**
- **Integrated Cold Junction Compensation**
- **Packaging unit: 1 piece, black**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The black terminal block is used for connection of field signals as well as the connection of control signals.

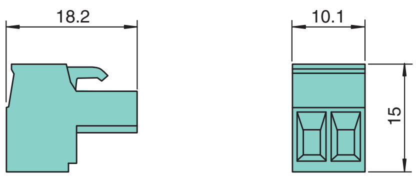
This terminal block has an integrated encapsulated Pt100 RTD for cold junction compensation.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 5 g
Dimensions	15.2 x 15 x 18 mm (0.6 x 0.6 x 0.7 in)
Construction type	removable screw terminal with integrated cold junction compensation

Terminal Block
KC-ST-5GN



Features

- **2-pin screw terminal**
- **For KC modules**
- **Packaging unit: 5 pieces green**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 4 g
Dimensions	10.1 x 15 x 18.2 mm (0.4 x 0.5 x 0.7 in)
Construction type	removable screw terminal

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

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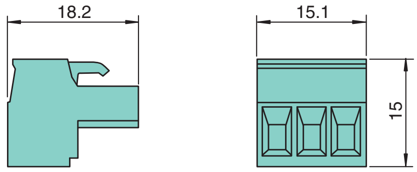
Terminal Block
KF-ST-5GN



Features

- **3-pin screw terminal**
- **For KF modules**
- **Packaging unit: 5 pieces green**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

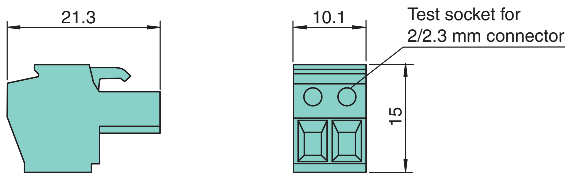
Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 5 g
Dimensions	15.1 x 15 x 18.2 mm (0.5 x 0.5 x 0.7 in)
Construction type	removable screw terminal

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

Terminal Block with Test Points
KC-STP-5GN



Features

- **2-pin screw terminal**
- **For KC modules**
- **Integrated test points for connection of HART communicators**
- **Packaging unit: 5 pieces green**

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

This terminal block has integrated test points for connection of HART communicators.

The terminal block can be coded with the provided coding pins KF-CP.

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 4 g
Dimensions	10.1 x 15 x 21.3 mm (0.4 x 0.5 x 0.84 in)
Construction type	removable screw terminal with integrated test points

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

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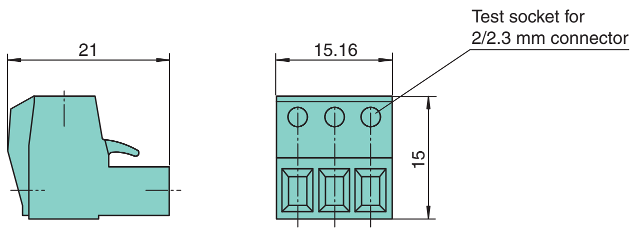


Terminal Block with Test Points KF-STP-5GN

Features

- **3-pin screw terminal**
- **For KF modules**
- **Integrated test points for connection of HART communicators**
- **Packaging unit: 5 pieces green**

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 5 g
Dimensions	15.2 x 15 x 21 mm (0.6 x 0.6 x 0.83 in)
Construction type	removable screw terminal with integrated test points

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

Function

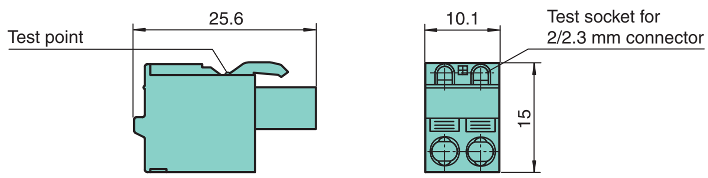
The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

This terminal block has integrated test points for connection of HART communicators.

The terminal block can be coded with the provided coding pins KF-CP.



Terminal Block with Test Points KC-CTT-5GN

Features

- **2-pin cage clamp terminal**
- **For KC modules**
- **Integrated test points for connection of HART communicators**
- **Packaging unit: 5 pieces green**

Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 4 g
Dimensions	10.1 x 15 x 25.6 mm (0.4 x 0.5 x 1 in)
Construction type	removable cage clamp terminal with integrated test points

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

Function

The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

This terminal block has integrated test points for connection of HART communicators.

The terminal block can be coded with the provided coding pins KF-CP.

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Terminal Block with Test Points KF-CTT-5GN

Features

- 3-pin cage clamp terminal
- For KF modules
- Integrated test points for connection of HART communicators
- Packaging unit: 5 pieces green

Function

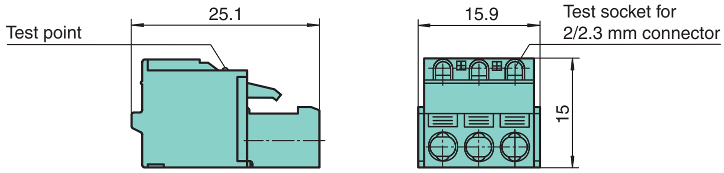
The terminal block is suitable for K-System applications.

The blue terminal block is used for connection of signals from or in the hazardous area.

The green terminal block is used for connection of field signals as well as the connection of control signals.

This terminal block has integrated test points for connection of HART communicators.

The terminal block can be coded with the provided coding pins KF-CP.



Technical data

Mechanical specifications	
Core cross-section	max. 2.5 mm^2
Mass	approx. 5 g
Dimensions	15.9 x 15 x 25.1 mm (0.63 x 0.6 x 1 in)
Construction type	removable cage clamp terminal with integrated test points

Notes

The removable terminals guarantee protection from direct contact by means of a strengthened insulation. This applies to design insulation voltages with the occurrence of maximum overvoltages in accordance with overvoltage category III of EN 50178 (1500 V AC).

The voltage is to be switched off in the case of design insulation voltages greater than 50 V AC before connecting or disconnecting the device connectors.

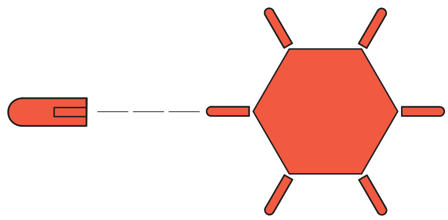
Coding Pins KF-CP

Features

- Coding of K-System terminal blocks
- Packaging unit: 20 x 6 coding pins

Function

The terminals can be coded with an coding pin by inserting the red tab into a particular slot of the terminal block.



Technical data

Mechanical specifications	
Material	red insulating material
Mass	approx. 1 g per coding pin
Dimensions	0.5 x 2 x 8 mm (0.02 x 0.08 x 0.3 in)

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Technical data

Interface	
Connection	adapter with RS 232 interface K-ADP1 or USB interface K-ADP-USB (for K-System) adapter for gateways with RS 232 intrface K-ADP2 (for RPI-System) adapter for gateways with RS 485 interface K-ADP4 (for RPI-System) USB/RS 485 interface converter (for LB-System)
Software	
Hardware requirements	PACTware requires 50 MBytes hard drive memory and a minimum of 40 MBytes main memory. Depending on the complexity of the projects and the DTMs used, the main memory requirement can be greater. A computer with a Pentium IV 450 MHz processor or better is recommended, XGA graphics, and a Microsoft-compatible mouse or equivalent pointing device arealso required.
Software requirements	PACTware runs in operating systems Windows XP/Vista/7. The software .NET Framework 2.0 must be installed. For printing and online help, MS Internet Explorer 4.0 or higher is required
Languages	German, English, French, Spanish, Russian can be selected
Licensing	PACTware does not require licensing. Please take the license conditions of the DTMs out of the data sheets of the corresponding DTMs.
Configuration	
Representation of the system configuration	Graphic representation of all communication and device DTMs in the tree structure. In case of online operation colour code for identification of defective units and simulation operation. Multiple windows can be open simultaneously. It is therefore possible to view the set device parameters, to monitor the measurement value and to display the device diagnostic simultaneously.
System planning, application processing	Generation of a configuration by means of a graphical application processing menu. Editing of available projects. Selection switch markings for each channel. Offline configuration, saving of project data to hard disk or disk. Automatic comparison of the project plan to the actual available system when establishing connections on the device and parameter levels.
Associated products	CD-ROM with PACTware and complete DTM-Collection of all available DTMs of the Pepperl+Fuchs H-, K-, and E-System devices, HART Multiplexers, Remote I/O-Systems, FieldConnex devices, and level devices.

Features

- **Universal DTM host platform**
- **For all DTMs of Pepperl+Fuchs**
- **Approved FDT/DTM technology**
- **Free of charge**
- **Internet download possible**

Function

Manufacturer and fieldbus independent configuration tool with FDT interface (**F**ield **D**evice **T**ool)

- Based on FDT technology
- Device Type Manager (DTMs) available for all Pepperl+Fuchs devices and systems
- Commissioning, configuration and parameter assignment independent of the process control system
- Communication DTMs available for serial interfaces and fieldbus systems
- Maintenance, diagnostics and error correction
- In accordance with VDI/VDE 2187

Accessories

Microsoft .NET

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Features

- **Isolated USB interface cable**
- **Used with K-, E- and H-System devices**
- **Used with PACT*ware*™**

Function

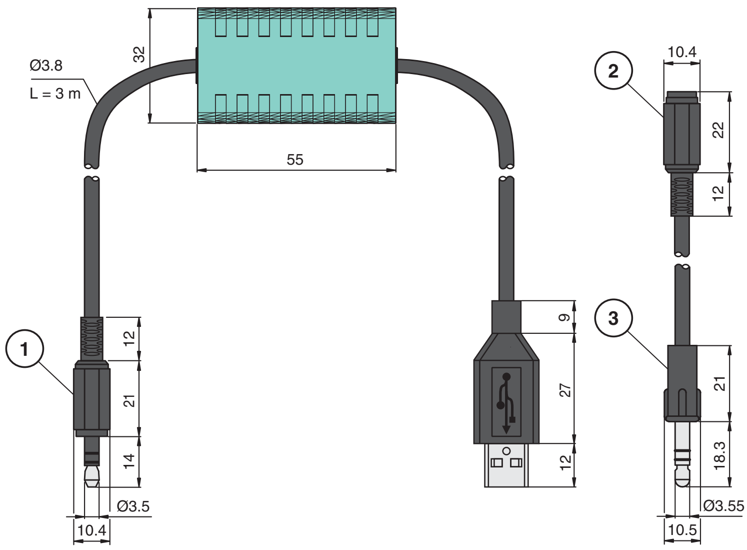
The K-ADP-USB is a programming adapter that connects the USB interface of a PC/notebook for the **PACT*ware*™** configuration software and can be used to program K-, E- and H system barriers via the programming socket on the front panel of these barriers.

As K-, E- and H-System devices have formerly been equipped with programming sockets with different standard dimensions (3.55 mm x 18.3 mm, see drawing, pos. 3 – newer devices 3.5 mm x 14 mm, pos. 1), an adapter (pos. 2) for the parameterisation of all devices is attached to K-ADP-USB.

The 18.3 mm version can still be used for urgent service assignments. However, the user must be aware of the fact that the plug protrudes from new units by approx. 4 mm. Extensive pushing of the plug may lead to damage on units.

For information about programming and software, refer to www.pepperl-fuchs.com.

Dimensions



Technical data

Electrical specifications	
Current consumption	50 mA (via USB)
Electrical isolation	functional insulation acc. to IEC 62103, rated insulation voltage 50 V_{eff}
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Connection	to the PC: USB type A to the device: connector 3.5 mm and 3.55 mm
Cable	
Length L	3 m

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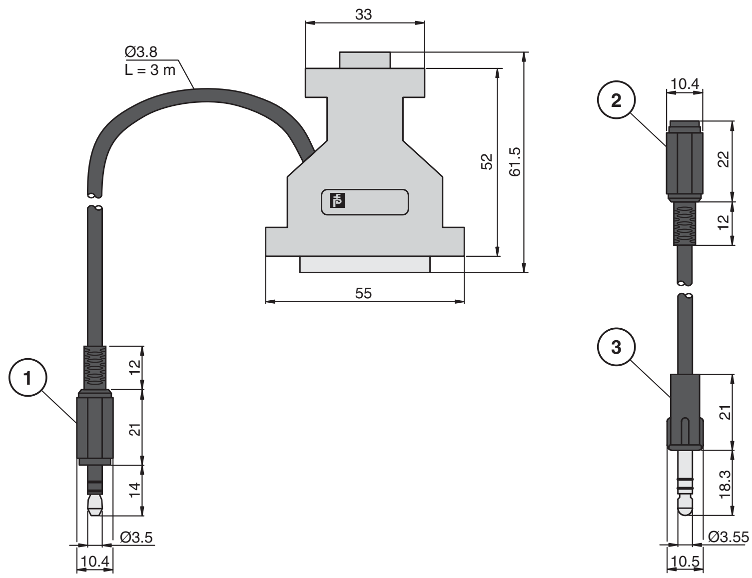
Dimensions



Features

- **Isolated RS 232 interface cable**
- **Used with K-, E- and H-System devices**
- **Used with PACT*ware*™**

Function

The K-ADP1 is an interface adapter that connects the serial interface of a PC/notebook for the **PACT***ware*™ configuration software and can be used to program K-, H-, and E-System barriers via the programming socket on the front panel of these barriers.

As K-, E- and H-System devices have formerly been equipped with programming sockets with different standard dimensions (3.55 mm x 18.3 mm, see drawing, pos. 3 – newer devices 3.5 mm x 14 mm, pos. 1), an adapter (pos. 2) for the parameterisation of all devices is attached to K-ADP1.

The 18.3 mm version can still be used for urgent service assignments. However, the user must be aware of the fact that the plug protrudes from new units by approx. 4 mm. Extensive pushing of the plug may lead to damage on units.

For information about programming and software, refer to www.pepperl-fuchs.com.

Technical data

Electrical specifications	
Electrical isolation	functional insulation acc. to IEC 62103, rated insulation voltage 50 V_{eff}
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Connection	to the PC: 9-pin and 25-pin to the device: connector 3.5 mm and 3.55 mm
Cable	
Length L	3 m

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K-System
Digital Inputs
Digital Outputs
Analog Inputs
Analog Outputs
Accessories

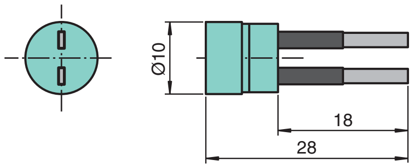
Measuring Resistor
K-500R0%1

Features

- 1-channel
- High precision resistor
- Conversion of 4 mA ... 20 mA/2 V ... 10 V

Function

A 500 Ω 0.1% high-precision resistor that can be used to convert 4 mA ... 20 mA to 2 V ... 10 V.



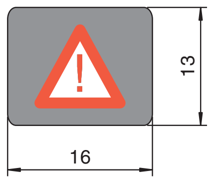
Technical data

Electrical specifications	
Measuring resistor	500 Ω, 0.1 %, TK10
Mechanical specifications	
Dimensions	Ø10 x 28 mm (0.4 x 1.1 in)

Adhesive Sticker
KF-SEAL

Features

- Destructive, removable Scotchmark sticker 3812, white, matte
- Rectangular shape, 16 mm x 13 mm
- For securing front-side programming switches and sockets as well as potentiometers, designed to match the K-system
- Packaging unit: 20 pieces



Technical data

Mechanical specifications	
Dimensions	16 x 13 mm (0.63 x 0.5 in)

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Technical data

Electrical specifications	
Rated voltage	≤ 50 V
Rated current	≤ 2 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X

Features

- **Non-IS K-System place holder module**
- **Housing width 20 mm**
- **Marshalling for field and control side circuits**
- **Jumper configurable**

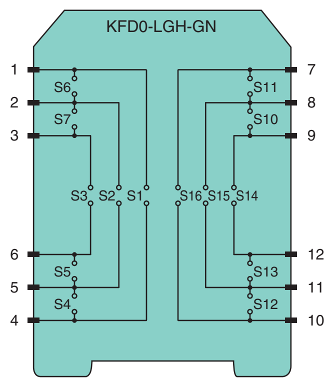
Function

This place holder barrier is a module for use in cable distribution cables. It improves accessibility and compactness within a control cabinet.

Different configurations are possible by using solder bridges.

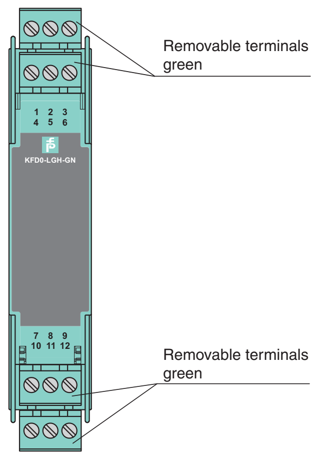
Safe area circuits can be connected to the terminals.

Diagrams



Zone 2

Front view



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Features

- **IS K-System place holder module**
- **Housing width 20 mm**
- **Marshalling for field and control side circuits**
- **No electrical function: empty housing**

Function

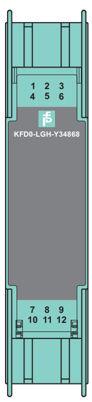
This place holder barrier is an empty housing that fills unused space on DIN rail or Power Rail.

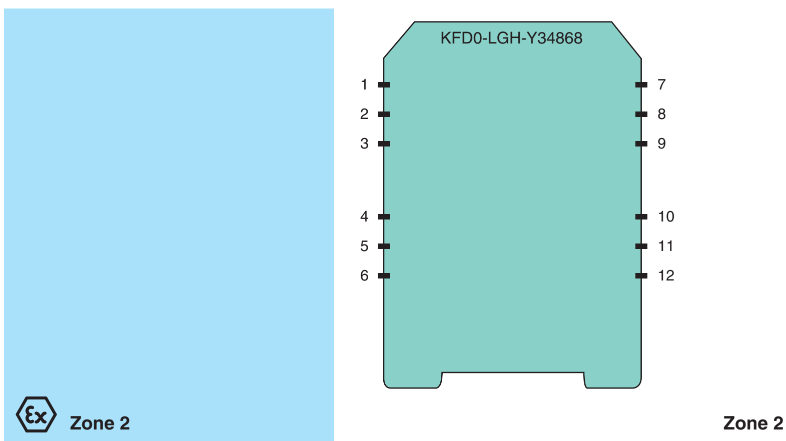
Technical data

Electrical specifications	
Rated voltage	≤ 50 V
Rated current	≤ 2 A
Ambient conditions	
Ambient temperature	-20 ... 60 °C (-4 ... 140 °F)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 100 g
Dimensions	20 x 93 x 115 mm (0.8 x 3.7 x 4.5 in), housing type B1
Data for application in connection with Ex-areas	
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection, temperature classification	Ex II 3G Ex nA II T4 X

Diagrams

Front view





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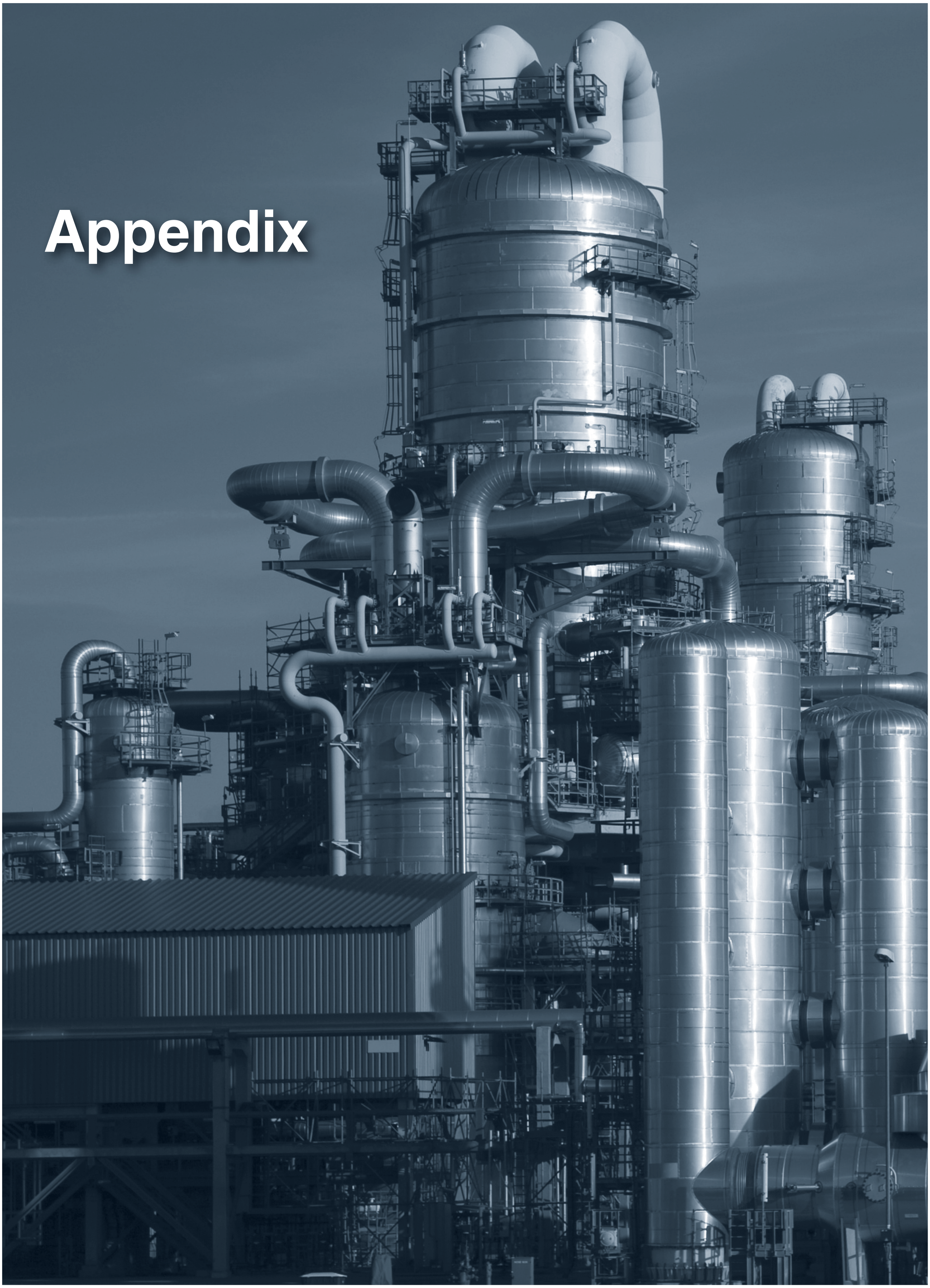
Appendix



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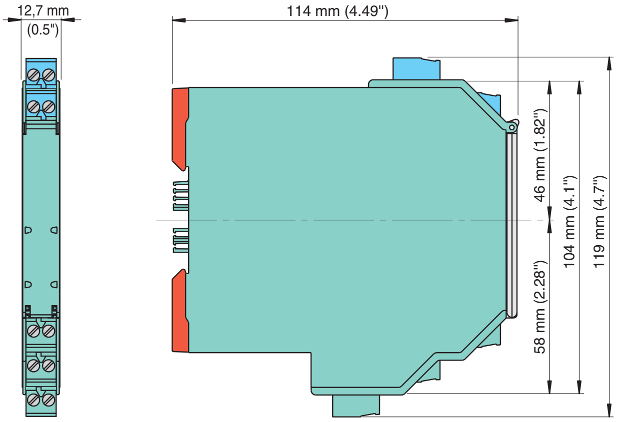
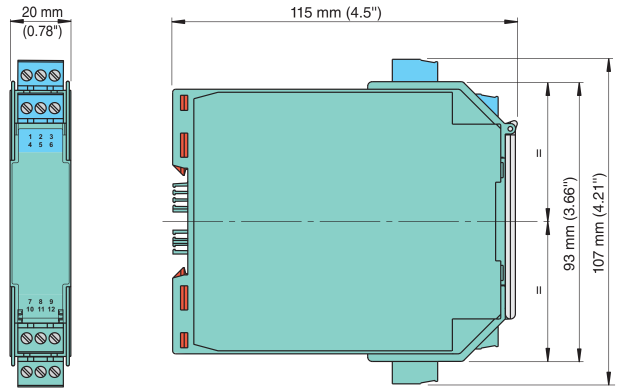
Housing types K-System

Housing type A2



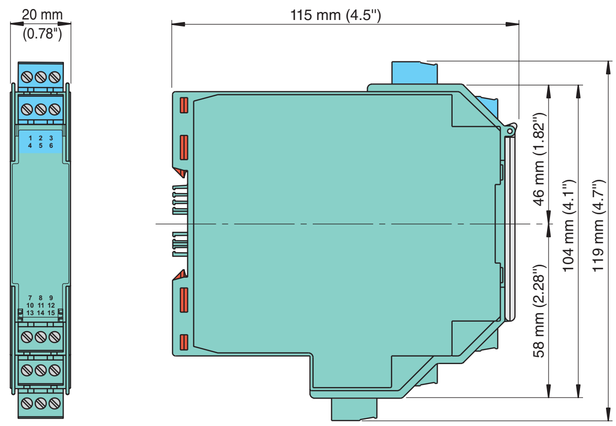
Number of terminals max. 5
When using HART terminals (8.5 mm (0.3 in)) the device is 124 mm (4.9 in) in height.

Housing type B1 (symmetrical version)



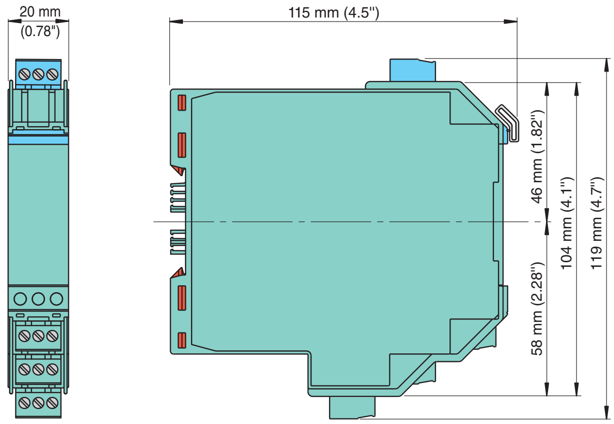
Number of terminals max. 4
When using HART terminals (8.5 mm (0.3 in)) the device is 115 mm (4.6 in) in height.

Housing type B2 (symmetrical version)



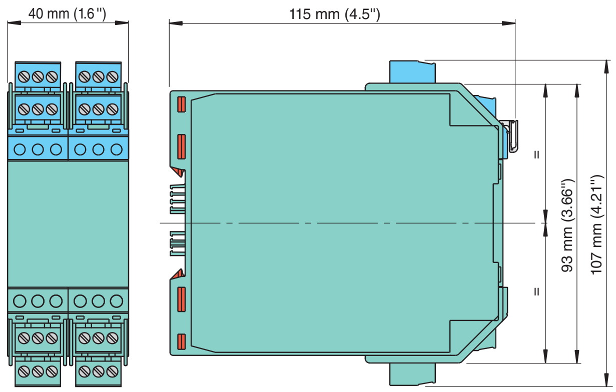
Number of terminals max. 5
When using HART terminals (8.5 mm (0.3 in)) the device is 124 mm (4.9 in) in height.

Housing type B3 (asymmetrical version)



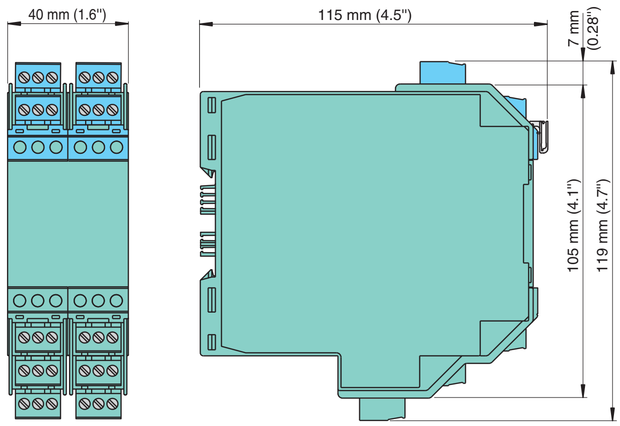
Number of terminals max. 4
When using HART terminals (8.5 mm (0.3 in)) the device is 124 mm (4.9 in) in height.

Housing type C1 (symmetrical version)



Number of terminals max. 8
When using HART terminals (8.5 mm (0.3 in)) the device is 115 mm (4.6 in) in height.

Housing type C2 (symmetrical version)



Number of terminals max. 10
When using HART terminals (8.5 mm (0.3 in)) the device is 124 mm (4.9 in) in height.

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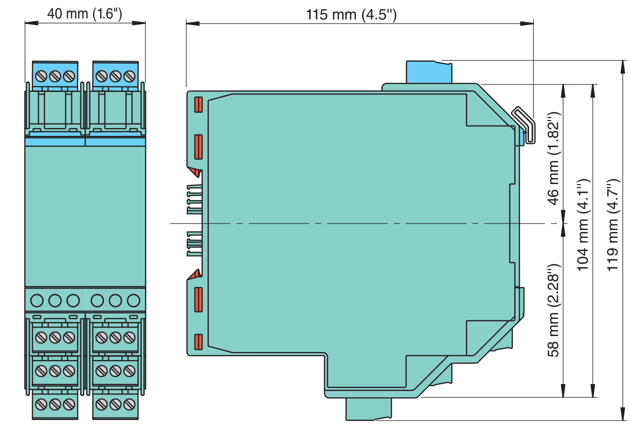
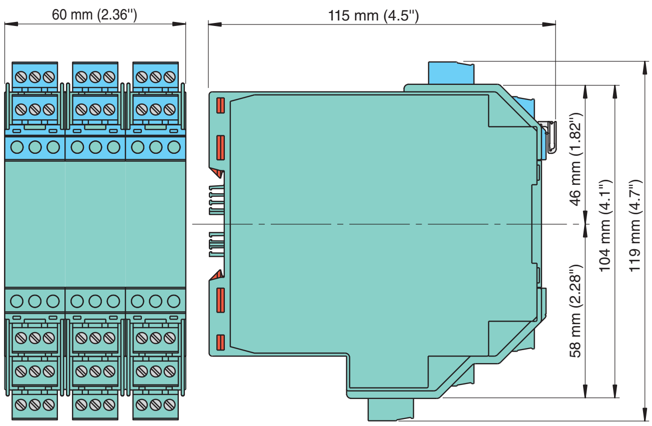
Housing type C3 (asymmetrical version)



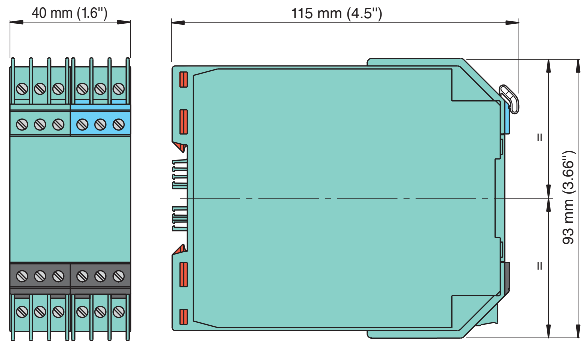
Number of terminals max. 8
When using HART terminals (8.5 mm (0.3 in)) the device is 124 mm (4.9 in) in height.

Housing type D2 (symmetrical version)

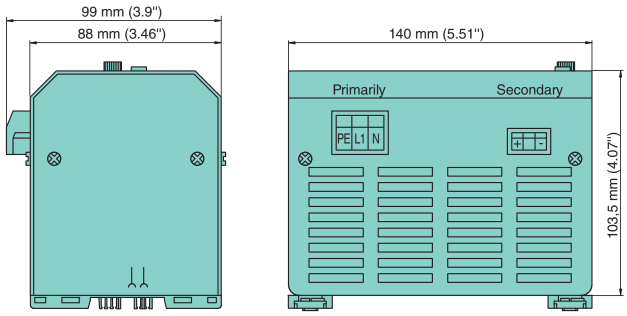


Number of terminals max. 15
When using HART terminals (8.5 mm (0.3 in)) the device is 124 mm (4.9 in) in height.

Housing type E (symmetrical version)



Housing Power Supply 4 A



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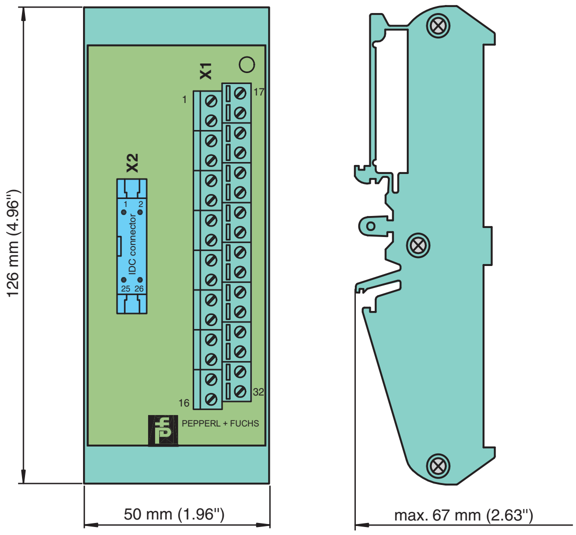
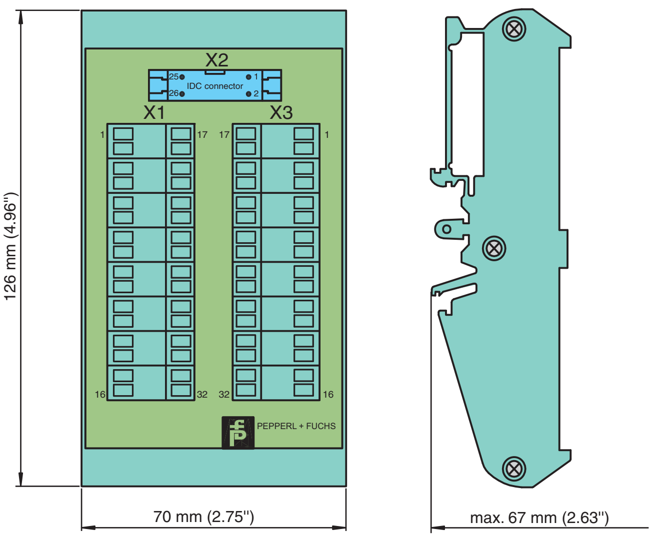
Housing types Termination Boards K-System

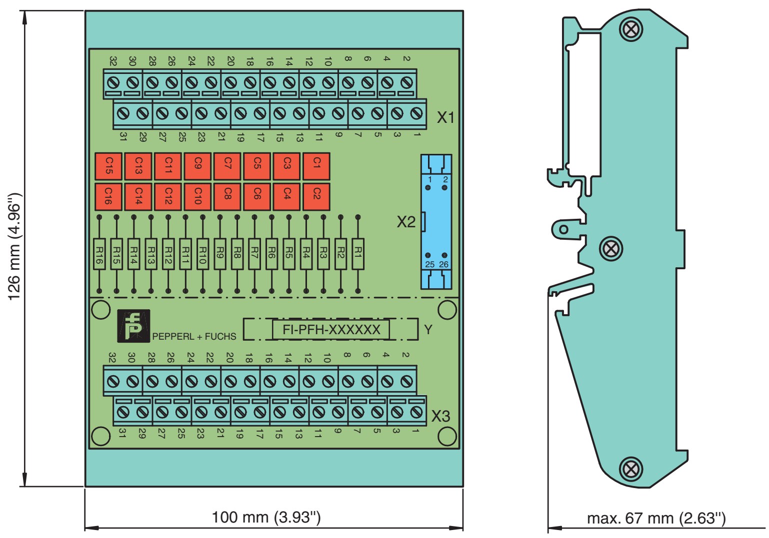
Housing Termination Board FI-DO-Y37023



Housing Termination Board FI-DO-R-Y41610 and FI-DO-R-Y49092



Housing Termination Board FI-PFH-Y110469



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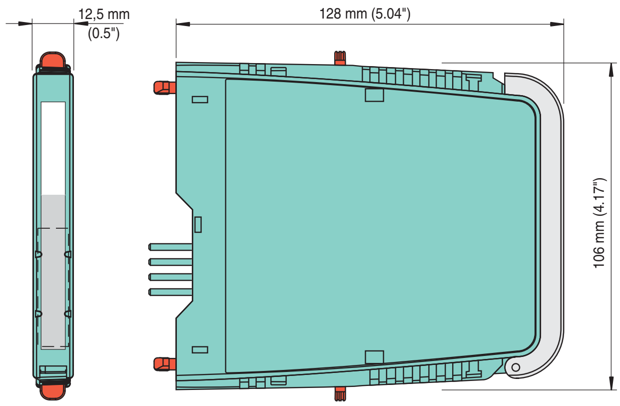
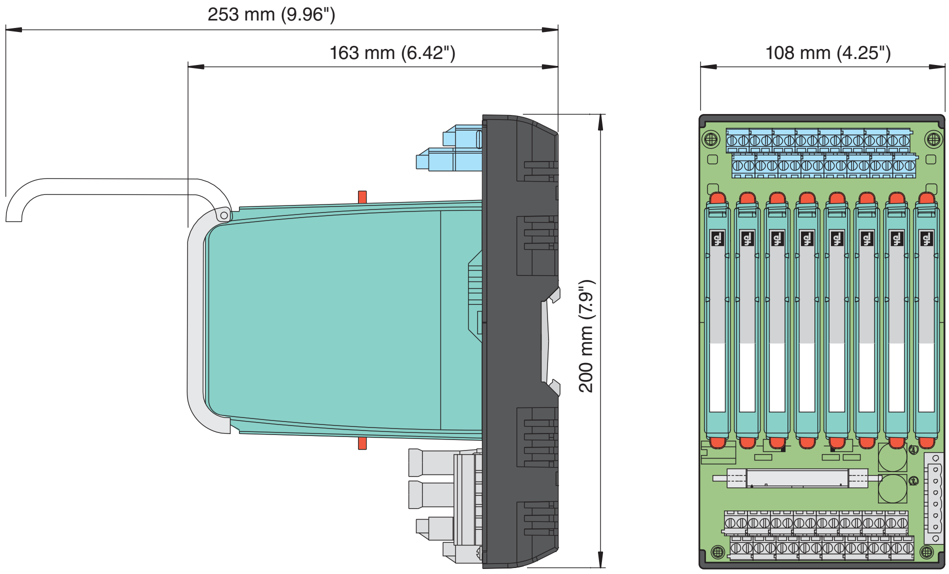
Housing types H-System

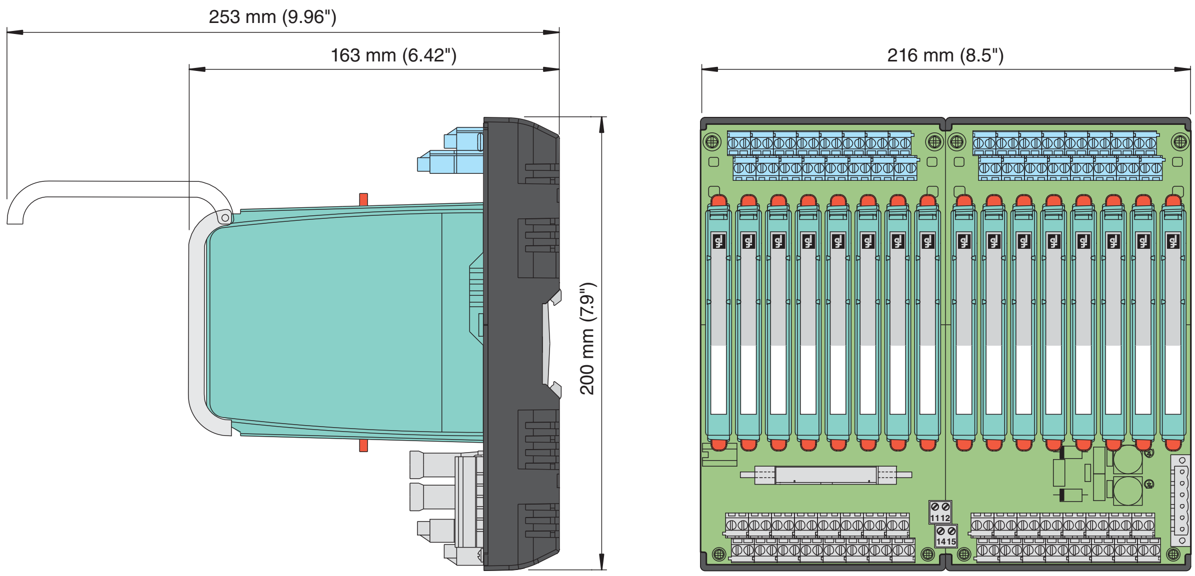
Housing type HiC modules



Housing Termination Boards HiCTB08



Housing Termination Boards HiCTB16



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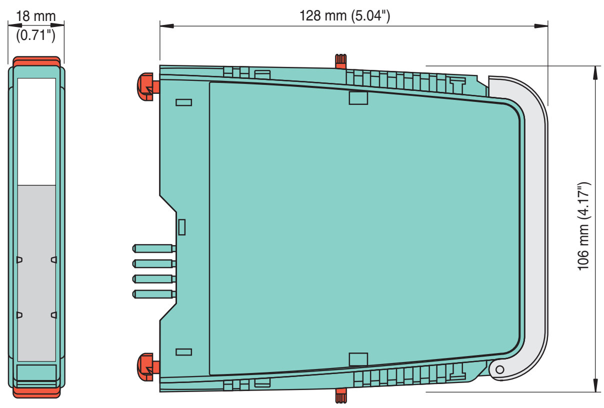
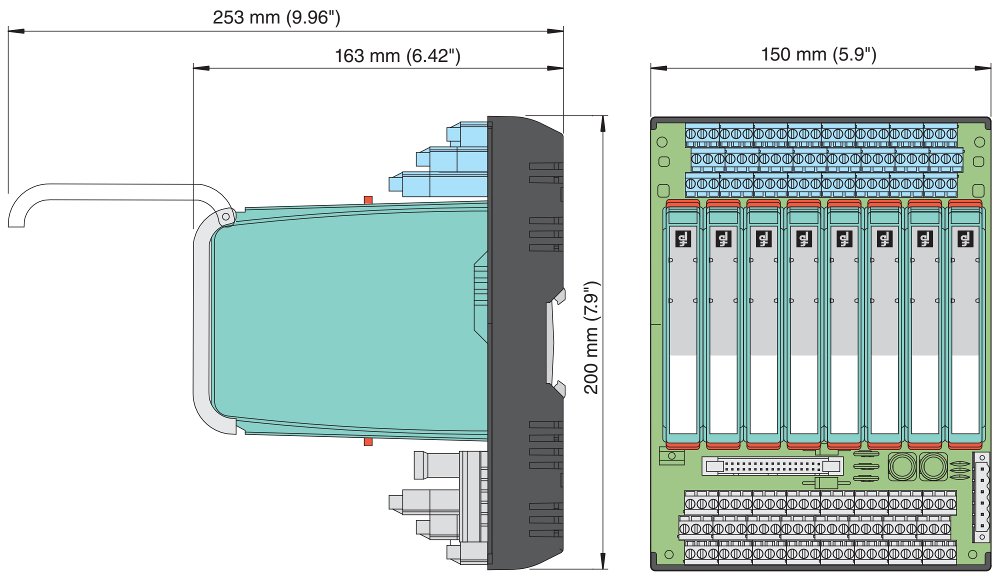
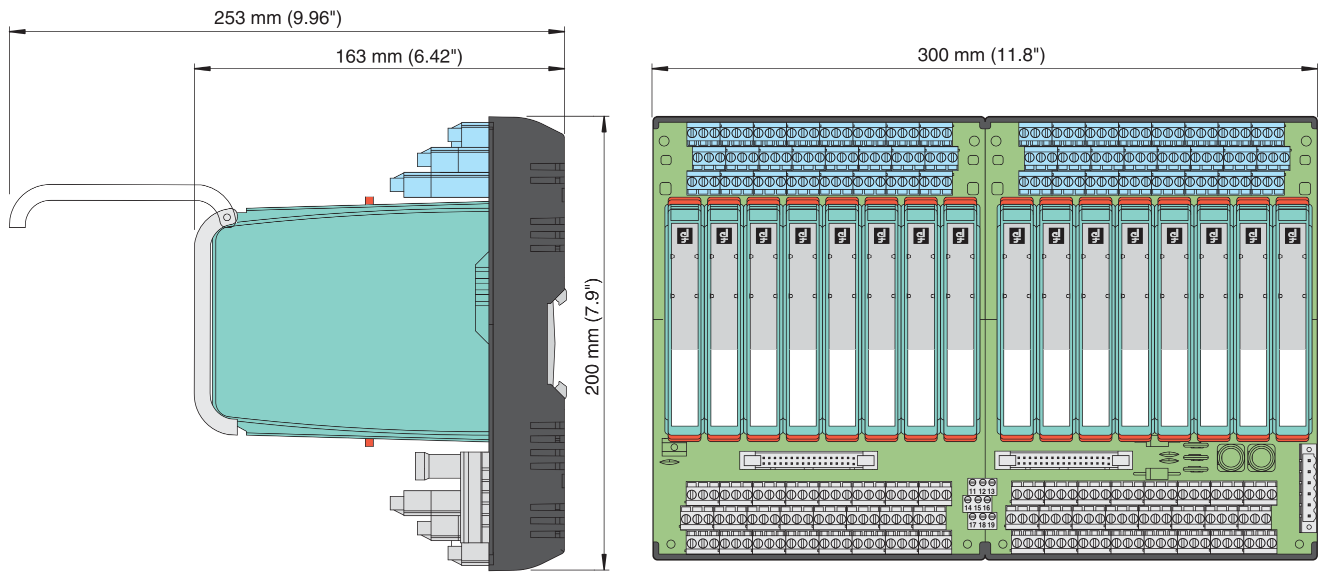
Housing type HiD modules



Housing Termination Boards HiDTB08



Housing Termination Boards HiDTB16



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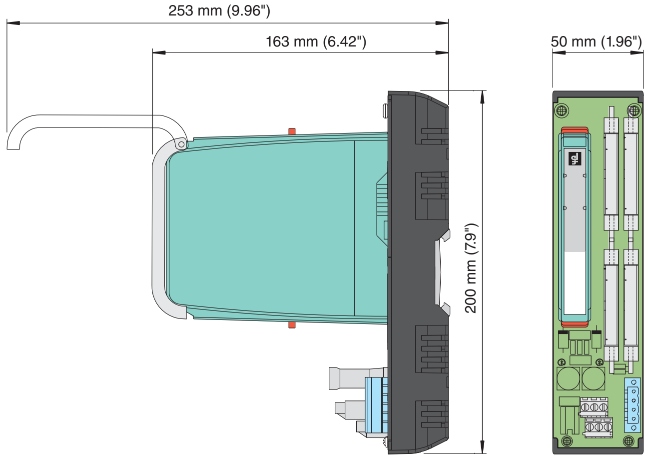
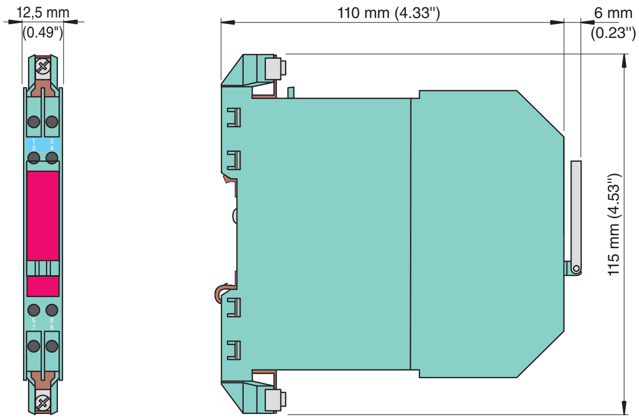
Housing Termination Boards HiATB

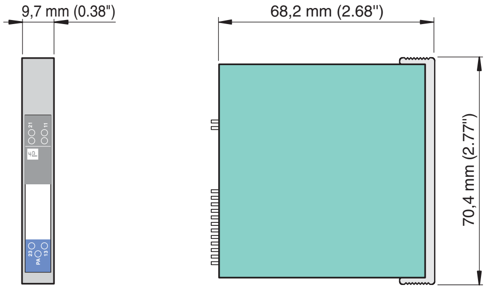


Housing types Zener Barriers

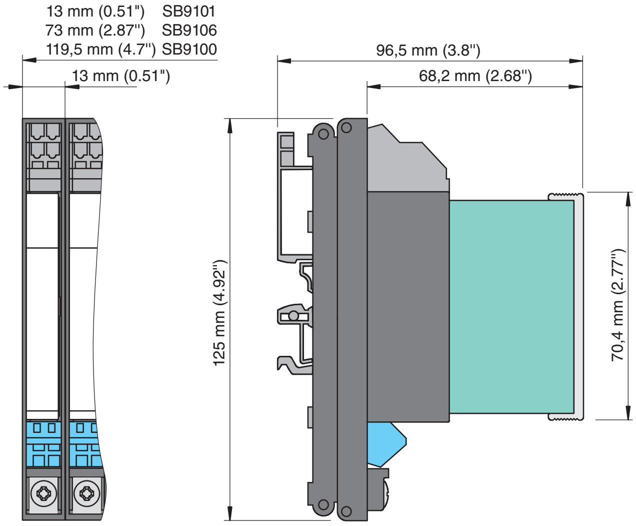
Housing type Z1 (Z-System)



Housing type Z2 (SB-System)



Housing Termination Boards SB91**



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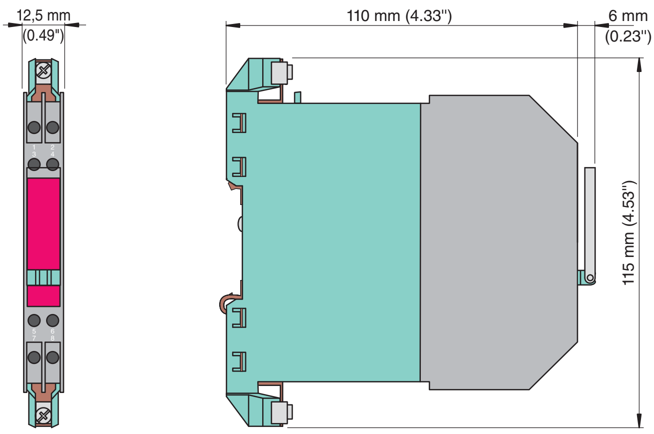
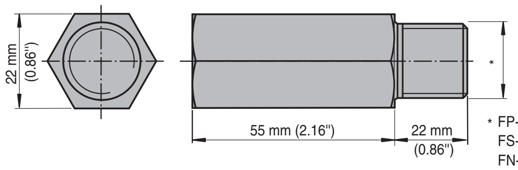
Housing types Surge Protection

Housing type Z3 (DIN rail mount modules)

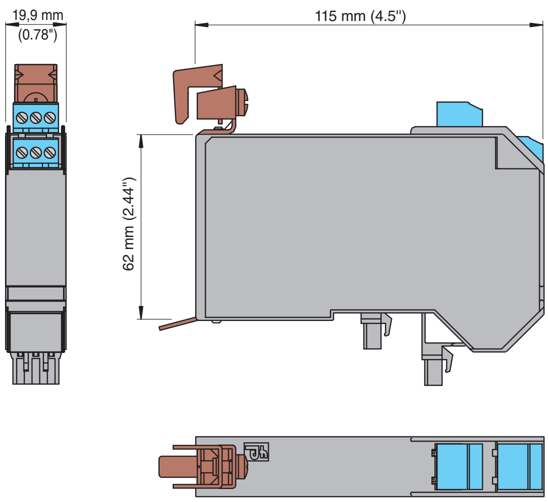


Housing field mount modules



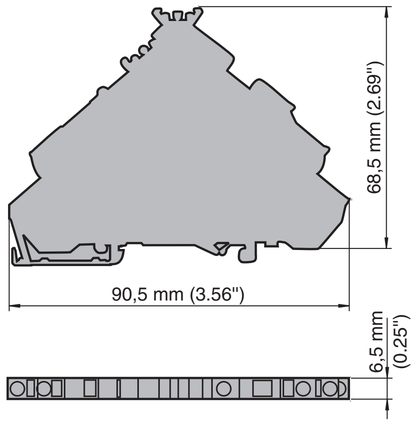
* FP-LB-I: PG13.5
FS-LB-I: M20 x 1.5
FN-LB-I: ½NPT

Housing plug-in modules

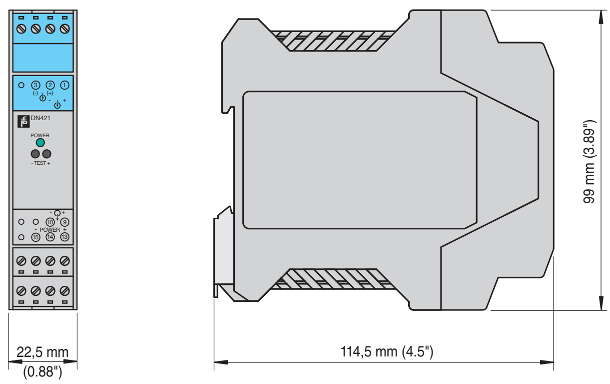


Housing types special devices

Housing diode modules



Housing of SMART Transmitter Power Supply DN421



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Interface Technology

Model Number	Function		SIL	Remark
K-System, Isolated Barriers and Signal Conditioners				
KCD2-SR-***.**	DI	Switch Amplifier	2	exida report
KF**-SR2-***.**.**	DI	Switch Amplifier	2	exida report
KFD2-ST2-***.**	DI	Switch Amplifier	2	exida report
KF**-SOT2-***.**	DI	Switch Amplifier	2	exida report
K***-SH-Ex1.*.**	DI	Switch Amplifier	3	exida report
KFD2-SR2-**2.W.SM	DI	Standstill Monitor	2	exida report
KF**-DWB-***.*	DI	Speed Monitor	2	exida report
KF**-UFC-***.*	DI	Frequency Converter with Trip Values	2	exida report
KCD0-SD-Ex1.1245	DO	Solenoid Driver	3	exida report
KFD0-SD2-***.*****	DO	Solenoid Driver	3	exida report
KFD2-RCI-Ex1	DO	Solenoid Driver	3	exida report
KFD2-SL2-***.**.****	DO	Solenoid Driver	2	exida report
KFD2-SL-4	DO	Solenoid Driver	2	exida report
KFD0-RSH-1*	DO	Relay Module	3	exida report
KCD2-STC-**1	AI	SMART Transmitter Power Supply	2	exida report
KFD2-STC4-***	AI	SMART Transmitter Power Supply	2	exida report
KFD2-STC4-***.2O*	AI	SMART Transmitter Power Supply	3	exida report
KFD2-STV4-***	AI	SMART Transmitter Power Supply	2	exida report
KFD2-STV4-***.2O*	AI	SMART Transmitter Power Supply	3	exida report
KFD2-CR4-***	AI	Transmitter Power Supply	2	exida report
KFD2-CR4-***.2O	AI	Transmitter Power Supply	3	exida report
KF**-CRG2-***.*	AI	Transmitter Power Supply	2	exida report
KFD2-UT2-***-*-*	AI	Universal Temperature Converter	2	exida report
KF**-GUT-***.*	AI	Temperature Converter with Trip Values	2	exida report
KCD2-SCD-**1	AO	SMART Current Driver	2	exida report
KFD2-SCD*-***.**	AO	SMART Current Driver	2	exida report
KFD2-CD*-***.**-**	AO	Current Driver	2	exida report
KFD0-SCS-***.**	AO	SMART Current Driver	2	exida report
KFD0-CS-***.***	AO	Current Driver	2	exida report
H-System, Isolated Barriers				
HiC282*	DI	Switch Amplifier	2	exida report
HiC284*	DI	Switch Amplifier	2	exida report
HiC2851	DI	Switch Amplifier	3	exida report
HiD282*	DI	Switch Amplifier	2	exida report
HiD284*	DI	Switch Amplifier	2	exida report
HiC2871	DO	Solenoid Driver	2	exida report
HiD2871, HiD2872	DO	Solenoid Driver	3 [1]	exida report
HiD2875, HiD2876	DO	Solenoid Driver	3 [1]	exida report
HiD2881	DO	Solenoid Driver	3 [1]	exida report
HiC2025	AI	SMART Transmitter Power Supply	2	exida report
HiD2025**, HiD2026**	AI	SMART Transmitter Power Supply	2	exida report
HiD2029**, HiD2030**	AI	SMART Transmitter Power Supply	2	exida report
HiC2031	AO	Current Driver	2	exida report
HiD2033, HiD2034	AO	Current Driver	2	exida report
HiD2037, HiD2038*	AO	SMART Current Driver	2	exida report

DI = digital input, DO = digital output, AI = analog input, AO = analog output
[1] if loop powered

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Model Number	Function		SIL	Remark
HART Interface Solutions				
HiDMux2700	HART	HART Multiplexer Master	3	exida report
KFD2-HMM-16	HART	HART Multiplexer Master	3	exida report
KFD0-HMS-16	HART	HART Multiplexer Slave	3	exida report
Surge Protection				
P-LB-*.*.******	SURGE	Surge Protection Barriers	3	exida calculation

Field Devices

Model Number	Function		SIL	Remark
LHC-M20/M40	A	Hydrostatic pressure sensor	2	Declaration of conformity
LTC***	A	Guided microwave	2	Declaration of conformity
PPC-M**	A	Process pressure transmitter	2	Declaration of conformity
LVL-M* with FEL51 ... FEL58	D	Vibration limit switch	2	Declaration of conformity
NCB2-12GM35-N0	D	Inductive sensor	2	Declaration of conformity
NCB2-V3-N0	D	Inductive sensor	2	exida report
NCB5-18GM40-N0	D	Inductive sensor	2	Declaration of conformity
NCN3-F25*-SN4***	D	Inductive sensor	3 [2]	exida report
NCN4-12GM35-N0	D	Inductive sensor	2	Declaration of conformity
NCN4-V3-N0	D	Inductive sensor	2	exida report
NCN8-18GM40-N0	D	Inductive sensor	2	Declaration of conformity
NJ10-30GK-SN***	D	Inductive sensor	3 [2]	exida report
NJ15-30GK-SN***	D	Inductive sensor	3 [2]	exida report
NJ15S+U*+N***	D	Inductive sensor	3 [2]	exida report
NJ20S+U*+N***	D	Inductive sensor	3 [2]	exida report
NJ2-11-SN***	D	Inductive sensor	3 [2]	exida report
NJ2-11-SN-G***	D	Inductive sensor	3 [2]	exida report
NJ2-12GK-SN***	D	Inductive sensor	3 [2]	exida report
NJ3-18GK-S1N***	D	Inductive sensor	3 [2]	exida report
NJ40-FP-SN***	D	Inductive sensor	3 [2]	exida report
NJ4-12GK-SN***	D	Inductive sensor	3 [2]	exida report
NJ5-18GK-SN***	D	Inductive sensor	3 [2]	exida report
NJ5-30GK-S1N***	D	Inductive sensor	3 [2]	exida report
NJ6-22-SN***	D	Inductive sensor	3 [2]	exida report
NJ6-22-SN-G***	D	Inductive sensor	3 [2]	exida report
NJ6S1+U*+N1***	D	Inductive sensor	3 [2]	exida report
NJ8-18GK-SN***	D	Inductive sensor	3 [2]	exida report
SC3.5-N0	D	Inductive sensor	2	exida report
SJ2-N	D	Inductive sensor	2	exida report
SJ2-S1N***	D	Inductive sensor	3 [2]	exida report
SJ2-SN***	D	Inductive sensor	3 [2]	exida report
SJ3.5-N	D	Inductive sensor	2	exida report
SJ3.5-S1N***	D	Inductive sensor	3 [2]	exida report
SJ3.5-SN***	D	Inductive sensor	3 [2]	exida report

A = analog sensor, D = digital sensor
[2] SIL3 in connection with K**-SH-Ex1.* and HiC2851 switch amplifiers

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Selection table solenoid driver/valve combinations

Increasingly, explosion-protected solenoid valves are being produced in compliance with the intrinsic safety specification. The control circuits for such valves must also be intrinsically safe.

The solenoid drivers must be matched in accordance with the various approval and function data of the intrinsically safe valves. The following table can be used for matching valves to suitable solenoid drivers.

Other applications for solenoid drivers are the control of optical and audible alarms in the hazardous area.

In these cases also, the corresponding approval data must be taken into account.

Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
ASCO							
IS-M12-I	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	H-System	HiD2881	> 1 km				> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			> 300 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			277 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				> 300 Ω
Series 195	H-System	HiC2871	> 1 km	970 m			131 Ω
	H-System	HiD2871	> 1 km	900 m			108 Ω
	H-System	HiD2872	> 1 km	900 m			108 Ω
	H-System	HiD2873	> 1 km	900 m			108 Ω
	H-System	HiD2874	> 1 km	900 m			108 Ω
	H-System	HiD2875	> 1 km	900 m			108 Ω
	H-System	HiD2876	> 1 km	900 m			108 Ω
	H-System	HiD2877	> 1 km	900 m			108 Ω
	H-System	HiD2878	> 1 km	900 m			108 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			124 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				87 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			87 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			87 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			136 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			93 Ω
Series 302 (12 V type)	H-System	HiC2871	> 1 km	970 m			77 Ω
	H-System	HiD2871	> 1 km	900 m			55 Ω
	H-System	HiD2872	> 1 km	900 m			55 Ω
	H-System	HiD2873	> 1 km	900 m			55 Ω
	H-System	HiD2874	> 1 km	900 m			55 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	H-System	HiD2875	> 1 km	900 m			55 Ω
	H-System	HiD2876	> 1 km	900 m			55 Ω
	H-System	HiD2877	> 1 km	900 m			55 Ω
	H-System	HiD2878	> 1 km	900 m			55 Ω
	H-System	HiD2881	> 1 km				55 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			70 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				33 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			33 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			50 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				165 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			33 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			83 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			40 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				117 Ω
Series 302 (24 V type)	K-System	KFD0-SD2-Ex1.1180	> 1 km				51 Ω
Series 302 (Low Power)	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	H-System	HiD2881	> 1 km				> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				273 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			273 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			126 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			60 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			273 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			300 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				269 Ω
Series 630: Piezotronic 12 V/12 mW	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2874 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2878 [3]	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
Series 630: Piezotronic 12 V/32 mW	H-System	HiC2871	> 1 km	970 m			232 Ω
	H-System	HiD2871	> 1 km	900 m			170 Ω
	H-System	HiD2872	> 1 km	900 m			170 Ω
	H-System	HiD2873 [3]	> 1 km	900 m			170 Ω
	H-System	HiD2874 [3]	> 1 km	900 m			170 Ω
	H-System	HiD2875	> 1 km	900 m			170 Ω
	H-System	HiD2876	> 1 km	900 m			170 Ω
	H-System	HiD2877 [3]	> 1 km	900 m			170 Ω
	H-System	HiD2878 [3]	> 1 km	900 m			170 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			225 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				188 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			188 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			188 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			198 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			170 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			60 Ω
Series 630: Piezotronic 24 V/46 mW	K-System	KFD2-SL2-Ex*	> 1 km	750 m			28 Ω
Series 630: Piezotronic 6 V/3 mW	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
Series 630: Piezotronic 8 V/22 mW	H-System	HiC2871	> 1 km	970 m			62 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			55 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				18 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			18 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			18 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			28 Ω
ATOS							
OW-18/H	K-System	KFD0-SD2-Ex1.1180	> 1 km				25 Ω
OW-18/H	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				29 Ω
BC							
BC-x.8.12.25	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			79 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			25 Ω
BC-x.8.12.30	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			55 Ω
BC-x.8.12.35	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			38 Ω
BC-x.8.12.40	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			24 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
BC-x.8.12.45	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			14 Ω
Buerkert							
Coil AC10 EEXi for valve: 0590EExi, 6014EExi, 6518EExi, 6519EExi	H-System	HiC2871	> 1 km	970 m			159 Ω
	H-System	HiD2871	> 1 km	900 m			140 Ω
	H-System	HiD2872	> 1 km	900 m			140 Ω
	H-System	HiD2873	> 1 km	900 m			140 Ω
	H-System	HiD2874	> 1 km	900 m			140 Ω
	H-System	HiD2875	> 1 km	900 m			140 Ω
	H-System	HiD2876	> 1 km	900 m			140 Ω
	H-System	HiD2877	> 1 km	900 m			140 Ω
	H-System	HiD2878	> 1 km	900 m			140 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			152 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				115 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			115 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			115 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			168 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			123 Ω
Coil AC21 EEXi for valve: 0450EExi, 5470EExi, 6106EExi, 6516EExi, 6517EExi	H-System	HiC2871	> 1 km	970 m			185 Ω
	H-System	HiD2875	> 1 km	900 m			168 Ω
	H-System	HiD2876	> 1 km	900 m			168 Ω
	H-System	HiD2877	> 1 km	900 m			168 Ω
	H-System	HiD2878	> 1 km	900 m			168 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			178 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				141 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			141 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			141 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			150 Ω
Coil G1 642735 EExi; 6104 EExi, 6510 EExi, 6511 EExi, 6524 EExi, 6525 EExi, 8631EExi	H-System	HiC2871	> 1 km	970 m			174 Ω
	H-System	HiD2871	> 1 km	900 m			157 Ω
	H-System	HiD2872	> 1 km	900 m			157 Ω
	H-System	HiD2873	> 1 km	900 m			157 Ω
	H-System	HiD2874	> 1 km	900 m			157 Ω
	H-System	HiD2875	> 1 km	900 m			157 Ω
	H-System	HiD2876	> 1 km	900 m			157 Ω
	H-System	HiD2877	> 1 km	900 m			157 Ω
	H-System	HiD2878	> 1 km	900 m			157 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			167 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				130 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			130 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			70 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			130 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			185 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			139 Ω
FESTO							
CPV10-EX-VI	H-System	HiC2871	> 1 km	970 m			116 Ω
	H-System	HiD2871	> 1 km	900 m			138 Ω
	H-System	HiD2872	> 1 km	900 m			138 Ω
	H-System	HiD2873	> 1 km	900 m			138 Ω
	H-System	HiD2874	> 1 km	900 m			138 Ω
	H-System	HiD2875	> 1 km	900 m			138 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	H-System	HiD2876	> 1 km	900 m			138 Ω
	H-System	HiD2877	> 1 km	900 m			138 Ω
	H-System	HiD2878	> 1 km	900 m			138 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			109 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				72 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			72 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			72 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			106 Ω
MFVH... (coil: GBXE 022...)	H-System	HiC2871	> 1 km	970 m			90 Ω
	H-System	HiD2871	> 1 km	900 m			58 Ω
	H-System	HiD2872	> 1 km	900 m			58 Ω
	H-System	HiD2873	> 1 km	900 m			58 Ω
	H-System	HiD2874	> 1 km	900 m			58 Ω
	H-System	HiD2875	> 1 km	900 m			58 Ω
	H-System	HiD2876	> 1 km	900 m			58 Ω
	H-System	HiD2877	> 1 km	900 m			58 Ω
	H-System	HiD2878	> 1 km	900 m			58 Ω
	H-System	HiD2881	> 1 km				58 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			83 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				46 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			46 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			109 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			68 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				178 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			46 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			86 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			47 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				155 Ω
Herion							
20102014	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			67 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			29 Ω
20152016	H-System	HiC2871	> 1 km	970 m			14 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			23 Ω
2050	H-System	HiC2871	> 1 km	970 m			207 Ω
	H-System	HiD2871	> 1 km	900 m			185 Ω
	H-System	HiD2872	> 1 km	900 m			185 Ω
	H-System	HiD2873	> 1 km	900 m			185 Ω
	H-System	HiD2874	> 1 km	900 m			185 Ω
	H-System	HiD2875	> 1 km	900 m			185 Ω
	H-System	HiD2876	> 1 km	900 m			185 Ω
	H-System	HiD2877	> 1 km	900 m			185 Ω
	H-System	HiD2878	> 1 km	900 m			185 Ω
	H-System	HiD2881	> 1 km				185 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			200 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				163 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			163 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			180 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			134 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				295 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			163 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			213 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			170 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				247 Ω
2051	H-System	HiC2871	> 1 km	970 m			238 Ω
	H-System	HiD2871	> 1 km	900 m			230 Ω
	H-System	HiD2872	> 1 km	900 m			230 Ω
	H-System	HiD2873	> 1 km	900 m			230 Ω
	H-System	HiD2874	> 1 km	900 m			230 Ω
	H-System	HiD2875	> 1 km	900 m			230 Ω
	H-System	HiD2876	> 1 km	900 m			230 Ω
	H-System	HiD2877	> 1 km	900 m			230 Ω
	H-System	HiD2878	> 1 km	900 m			230 Ω
	H-System	HiD2881	> 1 km				230 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			231 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				194 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			194 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			137 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			82 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			194 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			258 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			209 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				238 Ω
2052	H-System	HiC2871	> 1 km	970 m			215 Ω
	H-System	HiD2871	> 1 km	900 m			229 Ω
	H-System	HiD2872	> 1 km	900 m			229 Ω
	H-System	HiD2873	> 1 km	900 m			229 Ω
	H-System	HiD2874	> 1 km	900 m			229 Ω
	H-System	HiD2875	> 1 km	900 m			229 Ω
	H-System	HiD2876	> 1 km	900 m			229 Ω
	H-System	HiD2877	> 1 km	900 m			229 Ω
	H-System	HiD2878	> 1 km	900 m			229 Ω
	H-System	HiD2881	> 1 km				229 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			208 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				171 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			171 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			171 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			257 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			200 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				155 Ω
2053	H-System	HiC2871	> 1 km	970 m			47 Ω
	H-System	HiD2871	> 1 km	900 m			85 Ω
	H-System	HiD2872	> 1 km	900 m			85 Ω
	H-System	HiD2873	> 1 km	900 m			85 Ω
	H-System	HiD2874	> 1 km	900 m			85 Ω
	H-System	HiD2875	> 1 km	900 m			85 Ω
	H-System	HiD2876	> 1 km	900 m			85 Ω
	H-System	HiD2877	> 1 km	900 m			85 Ω
	H-System	HiD2878	> 1 km	900 m			85 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	H-System	HiD2881	> 1 km				85 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			40 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				135 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			113 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			46 Ω
2080/2082	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
2081/2082	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
2084	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
Hoerbiger							
P8 381-RF-C	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
PN61	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2874 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2878 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2881 [3]	> 1 km				> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			> 300 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			> 300 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
PN65	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2874 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2878 [3]	> 1 km	900 m			> 300 Ω
	H-System	HiD2881 [3]	> 1 km				> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			> 300 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			> 300 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
Honeywell-Lucifer							
Coil with 295 Ω	H-System	HiC2871	> 1 km	970 m			131 Ω
	H-System	HiD2871	> 1 km	900 m			114 Ω
	H-System	HiD2872	> 1 km	900 m			114 Ω
	H-System	HiD2873	> 1 km	900 m			114 Ω
	H-System	HiD2874	> 1 km	900 m			114 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	H-System	HiD2875	> 1 km	900 m			114 Ω
	H-System	HiD2876	> 1 km	900 m			114 Ω
	H-System	HiD2877	> 1 km	900 m			114 Ω
	H-System	HiD2878	> 1 km	900 m			114 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			124 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				87 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			87 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			87 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			142 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			97 Ω
Coil with 340 Ω	H-System	HiC2871	> 1 km	970 m			16 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			9 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			19 Ω
KVAutomation							
KVEX131	H-System	HiC2871	> 1 km	970 m			125 Ω
	H-System	HiD2871	> 1 km	900 m			100 Ω
	H-System	HiD2872	> 1 km	900 m			100 Ω
	H-System	HiD2873	> 1 km	900 m			100 Ω
	H-System	HiD2874	> 1 km	900 m			100 Ω
	H-System	HiD2875	> 1 km	900 m			100 Ω
	H-System	HiD2876	> 1 km	900 m			100 Ω
	H-System	HiD2877	> 1 km	900 m			100 Ω
	H-System	HiD2878	> 1 km	900 m			100 Ω
	H-System	HiD2881	> 1 km				100 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			118 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				81 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			81 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			109 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			64 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				213 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			81 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			128 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			86 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				171 Ω
Nass Magnet							
Coil 1259	K-System	KFD2-SL2-Ex*	> 1 km	750 m			8 Ω
Norgren							
Coil 06129(2086)	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω

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			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
Parker							
483580.01/03_483960.01/03	H-System	HiC2871	> 1 km	970 m			11 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			14 Ω
488650.01/03_488660.01/03_488670.01/03	H-System	HiC2871	> 1 km	970 m			148 Ω
	H-System	HiD2871	> 1 km	900 m			131 Ω
	H-System	HiD2872	> 1 km	900 m			131 Ω
	H-System	HiD2873	> 1 km	900 m			131 Ω
	H-System	HiD2874	> 1 km	900 m			131 Ω
	H-System	HiD2875	> 1 km	900 m			131 Ω
	H-System	HiD2876	> 1 km	900 m			131 Ω
	H-System	HiD2877	> 1 km	900 m			131 Ω
	H-System	HiD2878	> 1 km	900 m			131 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			141 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				104 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			104 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			104 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			159 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			114 Ω
490885_490890_490895	H-System	HiD2875	> 1 km	900 m			131 Ω
	H-System	HiD2876	> 1 km	900 m			131 Ω
	H-System	HiD2877	> 1 km	900 m			131 Ω
	H-System	HiD2878	> 1 km	900 m			131 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			104 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			114 Ω
492965.01/02	H-System	HiC2871	> 1 km	970 m			247 Ω
	H-System	HiD2871	> 1 km	900 m			250 Ω
	H-System	HiD2872	> 1 km	900 m			250 Ω
	H-System	HiD2873	> 1 km	900 m			250 Ω
	H-System	HiD2874	> 1 km	900 m			250 Ω
	H-System	HiD2875	> 1 km	900 m			250 Ω
	H-System	HiD2876	> 1 km	900 m			250 Ω
	H-System	HiD2877	> 1 km	900 m			250 Ω
	H-System	HiD2878	> 1 km	900 m			250 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			240 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				203 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			203 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			203 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			278 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			225 Ω
495910	H-System	HiC2871	> 1 km	970 m			190 Ω
	H-System	HiD2871	> 1 km	900 m			200 Ω
	H-System	HiD2872	> 1 km	900 m			200 Ω
	H-System	HiD2873	> 1 km	900 m			200 Ω
	H-System	HiD2874	> 1 km	900 m			200 Ω
	H-System	HiD2875	> 1 km	900 m			200 Ω
	H-System	HiD2876	> 1 km	900 m			200 Ω
	H-System	HiD2877	> 1 km	900 m			200 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1] Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	Max. Lead Resistance R_L [2]
	H-System	HiD2878	> 1 km	900 m			200 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			183 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				146 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			146 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			146 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			228 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			172 Ω
495910N7	H-System	HiC2871	> 1 km	970 m			184 Ω
	H-System	HiD2871	> 1 km	900 m			178 Ω
	H-System	HiD2872	> 1 km	900 m			178 Ω
	H-System	HiD2873	> 1 km	900 m			178 Ω
	H-System	HiD2874	> 1 km	900 m			178 Ω
	H-System	HiD2875	> 1 km	900 m			178 Ω
	H-System	HiD2876	> 1 km	900 m			178 Ω
	H-System	HiD2877	> 1 km	900 m			178 Ω
	H-System	HiD2878	> 1 km	900 m			178 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			177 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				140 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			140 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			140 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			206 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			157 Ω
RGS							
Coil EP100/ia	H-System	HiC2871	> 1 km	970 m			101 Ω
	H-System	HiD2871	> 1 km	900 m			80 Ω
	H-System	HiD2872	> 1 km	900 m			80 Ω
	H-System	HiD2873	> 1 km	900 m			80 Ω
	H-System	HiD2874	> 1 km	900 m			80 Ω
	H-System	HiD2875	> 1 km	900 m			80 Ω
	H-System	HiD2876	> 1 km	900 m			80 Ω
	H-System	HiD2877	> 1 km	900 m			80 Ω
	H-System	HiD2878	> 1 km	900 m			80 Ω
	H-System	HiD2881	> 1 km				80 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			94 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				57 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			57 Ω
	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			68 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km	730 m			21 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				189 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			57 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			108 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			64 Ω
	K-System	KFD2-SL2-Ex1.LK.1270	> 1 km				138 Ω
Samson							
658108	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω

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			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
658138	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
3701-13	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
3775-13	H-System	HiC2871			> 1 km	970 m	> 300 Ω
	H-System	HiD2871			> 1 km	900 m	> 300 Ω
	H-System	HiD2872			> 1 km	900 m	> 300 Ω
	H-System	HiD2873			> 1 km	900 m	> 300 Ω
	H-System	HiD2874			> 1 km	900 m	> 300 Ω
	H-System	HiD2875			> 1 km	900 m	> 300 Ω
	H-System	HiD2876			> 1 km	900 m	> 300 Ω
	H-System	HiD2877			> 1 km	900 m	> 300 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	H-System	HiD2878			> 1 km	900 m	> 300 Ω
	K-System	KCD0-SD-Ex*.1245			> 1 km	970 m	> 300 Ω
	K-System	KFD0-SD0-Ex2.1245			> 1 km		> 300 Ω
	K-System	KFD0-SD2-Ex*.1045			> 1 km	970 m	> 300 Ω
	K-System	KFD0-SD2-Ex2.1245				970 m	> 300 Ω
	K-System	KFD2-SL2-Ex*			> 1 km	750 m	> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045			> 1 km	900 m	> 300 Ω
	K-System	KFD2-VM-Ex1.35*			> 1 km	970 m	> 300 Ω
3962-13	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
3962-17	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
3963-13	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
3963-17	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
754958	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
754989	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1] Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	Max. Lead Resistance R_L [2]
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
755017	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
Seitz							
PV 12F73 Ci oh	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
PV 12F73 Xi oh 2	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
Type 11G52 part. no. 121 113 01	H-System	HiC2871	> 1 km	970 m			243 Ω
	H-System	HiD2871	> 1 km	900 m			262 Ω
	H-System	HiD2872	> 1 km	900 m			262 Ω
	H-System	HiD2873	> 1 km	900 m			262 Ω
	H-System	HiD2874	> 1 km	900 m			262 Ω
	H-System	HiD2875	> 1 km	900 m			262 Ω
	H-System	HiD2876	> 1 km	900 m			262 Ω
	H-System	HiD2877	> 1 km	900 m			262 Ω
	H-System	HiD2878	> 1 km	900 m			262 Ω
	H-System	HiD2881	> 1 km				262 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			236 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				199 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			199 Ω
	K-System	KFD0-SD2-Ex1.1180	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			199 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			290 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			231 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			28 Ω
SMC							
52-SY5000	H-System	HiC2871	> 1 km				75 Ω
	H-System	HiD2871	> 1 km				47 Ω
	H-System	HiD2872	> 1 km				47 Ω
	H-System	HiD2873	> 1 km				47 Ω
	H-System	HiD2874	> 1 km				47 Ω
	H-System	HiD2875	> 1 km				47 Ω
	H-System	HiD2876	> 1 km				47 Ω
	H-System	HiD2877	> 1 km				47 Ω
	H-System	HiD2878	> 1 km				47 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km				68 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				31 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km				31 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km				31 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	K-System	KFD0-SD2-Ex2.1245	970 m				31 Ω
	K-System	KFD2-SL2-Ex*	> 1 km				75 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km				34 Ω
52-SY7000	H-System	HiC2871	> 1 km				75 Ω
	H-System	HiD2871	> 1 km				47 Ω
	H-System	HiD2872	> 1 km				47 Ω
	H-System	HiD2873	> 1 km				47 Ω
	H-System	HiD2874	> 1 km				47 Ω
	H-System	HiD2875	> 1 km				47 Ω
	H-System	HiD2876	> 1 km				47 Ω
	H-System	HiD2877	> 1 km				47 Ω
	H-System	HiD2878	> 1 km				47 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km				68 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				31 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km				31 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km				31 Ω
	K-System	KFD0-SD2-Ex2.1245	970 m				31 Ω
	K-System	KFD2-SL2-Ex*	> 1 km				75 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km				34 Ω
52-SY9000	H-System	HiC2871	> 1 km				75 Ω
	H-System	HiD2871	> 1 km				47 Ω
	H-System	HiD2872	> 1 km				47 Ω
	H-System	HiD2873	> 1 km				47 Ω
	H-System	HiD2874	> 1 km				47 Ω
	H-System	HiD2875	> 1 km				47 Ω
	H-System	HiD2876	> 1 km				47 Ω
	H-System	HiD2877	> 1 km				47 Ω
	H-System	HiD2878	> 1 km				47 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km				68 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				31 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km				31 Ω
	K-System	KFD0-SD2-Ex1.1065	> 1 km				31 Ω
	K-System	KFD0-SD2-Ex2.1245	970 m				31 Ω
	K-System	KFD2-SL2-Ex*	> 1 km				75 Ω
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km				34 Ω
Telektron							
Coil L (12 ... 24 V)	H-System	HiC2871	> 1 km	970 m			> 300 Ω
	H-System	HiD2871	> 1 km	900 m			> 300 Ω
	H-System	HiD2872	> 1 km	900 m			> 300 Ω
	H-System	HiD2873	> 1 km	900 m			> 300 Ω
	H-System	HiD2874	> 1 km	900 m			> 300 Ω
	H-System	HiD2875	> 1 km	900 m			> 300 Ω
	H-System	HiD2876	> 1 km	900 m			> 300 Ω
	H-System	HiD2877	> 1 km	900 m			> 300 Ω
	H-System	HiD2878	> 1 km	900 m			> 300 Ω
	K-System	KCD0-SD-Ex*.1245	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD0-Ex2.1245	> 1 km				> 300 Ω
	K-System	KFD0-SD2-Ex*.1045	> 1 km	970 m			> 300 Ω
	K-System	KFD0-SD2-Ex2.1245		970 m			> 300 Ω
	K-System	KFD2-SL2-Ex*	> 1 km	750 m			> 300 Ω

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Valve	System	Solenoid Driver	Max. Cable Length L [1]				Max. Lead Resistance R_L [2]
			Ex ia IIB	Ex ia IIC	Ex ib IIB	Ex ib IIC	
	K-System	KFD2-SL2-Ex1.LK.1045	> 1 km	900 m			> 300 Ω
	K-System	KFD2-VM-Ex1.35*	> 1 km	970 m			> 300 Ω
Wandfluh							
ISI 4401-03	K-System	KFD0-SD2-Ex1.10100	> 1 km	480 m			12 Ω

1 The average cabling values were used in determining the max. cable length:

Capacitance: 110 nF/km

Inductance: 1 mH/km

In accordance with EN 60079-14, the exact characteristics of the cable must be considered as a basis when configuring the installation.
Thus it is necessary to compare the given cable characteristics with the limiting values of the solenoid driver.

2 Cable resistance (out and return) as a function of conductor cross-section area:

$0.6\ mm^2$ 59 Ω/km

$1.0\ mm^2$ 35 Ω/km

$1.5\ mm^2$ 24 Ω/km

All calculations refer to an operating temperature of 60 °C (333K)

3 no line fault detection (LFD)

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A

Active Transistor Output

A transistor that has either the emitter or the collector connected to an internal power source.

Active Zener Barrier

A Zener Barrier with additional active components (i. e., transistors, integrated circuits, etc.) that provides special functions or features.

AIT

Abbreviation for autogenous ignition temperature.

Amplifier

A device that enables an input signal to control power from a source independent of the signal and thus be capable of delivering an output that bears some relationship to, and is generally greater than, the input signal.

Analog Device

An automatic computing device that operates in terms of continuous variation of some physical quantities, such as electrical voltages and currents, mechanical shaft rotations or displacements, and which is used primarily to solve differential equations.

Analog Input

Analog type signal from a hazardous area instrument (i. e., transmitter) to the safe area controller.

Analog Output

Analog type signal from the safe area controller to the hazardous area instrument (i. e., I/P positioner).

ANSI

Acronym for American National Standards Institute.

API

Acronym for American Petroleum Institute.

Approved

Acceptable to the authority having jurisdiction.

Arcing Device

A device, such as make/ break component, that under normal conditions produces an arc with energy sufficient to cause ignition of an ignitable mixture. See also "non-incendive circuit."

Associated Apparatus

Apparatus in which the circuits are not necessarily intrinsically safe themselves, but which affect the energy in the intrinsically safe circuits and are relied upon to maintain intrinsic safety. Associated electrical apparatus may be either

1. electrical apparatus that have an alternative type of protection, for use in the appropriate hazardous (classified) location; or
2. electrical apparatus that are not protected and therefore cannot be used within a hazardous (classified) location.

Associated Non-incendive Field Wiring Apparatus

Apparatus in which the circuits are not necessarily non-incendive themselves but that affect the energy in non-incendive field wiring circuits and are relied upon to maintain non-incendive energy levels.

Associated Safe-Location Equipment

Equipment designed to form part of an intrinsically safe system, in which not all the circuits are of an intrinsically safe system, in which not all the circuits are intrinsically safe, but which affects the safety of the intrinsically safe system of which it forms a part. Such equipment may not be installed in a hazardous location unless provided with appropriate protection, such as the installation of an explosion-proof enclosure in a Class I hazardous location. Examples of associated safe-location equipment are

1. a line-connected power unit supplying power to intrinsically safe equipment in a hazardous location and
2. a recorder in a safe location actuated by a transducer situated in a hazardous location.

Authority Having Jurisdiction

The organization, office, or individual that has the responsibility and authority for approving equipment, installations, or procedures.

Autogenous Ignition Temperature

The temperature at which a mixture of a specified gas or vapor in air will spontaneously ignite under specified test conditions, without any source of ignition.

Automation System

The system that provides overall control and monitoring functions of a specific process or application. Generally consists of a network of computers, controllers, and I/O modules.

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B

Barrier Specification

The typical way of describing a barrier, for example 28 V, 300 Ω, 93 mA. This is a reference to the maximum voltage of the terminating zener diode during the period of time it takes for the fuse to break, the minimum value of the terminating resistor and the resulting maximum short circuit current. The description does not refer to the working voltage or the end-to-end resistance, but is purely an indication of the potential fault energy that could be generated in the hazardous area.

BASEEFA

Acronym for British Approvals Service for Electrical Equipment in Flammable Atmospheres. A governmental body in the United Kingdom that has the authority to accept or reject the design of an electrical apparatus based on recognized safety standards.

BSI

Acronym for British Standards Institute.

C

Capacitance

The property of a system of conductors and dielectrics that permits the storage of electrically separated charges when potential differences exist between the conductors. The greater the capacitance, the greater the charge that can be stored. The practical difference between capacitance and inductance in an intrinsically safe circuit is minimal. Both store energy but a capacitor will release energy when a circuit is made and an inductor will release energy when the circuit is broken.

CENELEC

Acronym for European Electrotechnical Committee for Standardization. The standard for the European Economic Community (EEC) nations and the European Free Trade Association. Legally, certification to the CENELEC standard is sufficient to permit sale in any European country. If IEC standards are available, CENELEC tries to utilize them because these standards are already adopted by the European community.

Certified Equipment

Equipment that has been evaluated by a recognized testing agency and confirmed to be in compliance with the applicable standard(s).

CESI

Acronym for Centro Elettronico Sperimentale Italiano. A governmental body in Italy that has the authority to accept or reject the design of an electrical apparatus based on recognized safety standards.

Class I Location

A location in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

Class I, Division 1 Location

A location (1) in which ignitable concentrations of flammable gases or vapors can exist under normal operating conditions; (2) in which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or (3) in which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors and might also cause simultaneous failure of electrical equipment that could act as a source of ignition.

Class I, Division 2 Location

A location (1) in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; (2) in which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation and might become hazardous through failure or abnormal operation of the ventilating equipment; or (3) that is adjacent to a Class I, Division 1 location and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. Electrical conduits and their associated enclosures separated from process fluids by a single seal or barrier are classified as a Class I, Division 2 location if the outside of the conduit and enclosures is a non-hazardous (unclassified) location.

Class II Location

A location that is hazardous because of the presence of combustible dust.

Class II, Division 1 Location

A location (1) in which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures; (2) in which mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced and might also provide a source of ignition through simultaneous (the word "simultaneous" is not included in the Canadian definition) failure of electric equipment, operation of protection devices, or from other causes; or (3) in which combustible dusts of an electrically conductive nature may be present in hazardous quantities.

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Class II, Division 2 Location

A location in which combustible dust is not normally in the air in quantities sufficient to produce explosive or ignitable mixtures and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but combustible dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment and where combustible dust accumulations on, in, or in the vicinity of the electrical or may be ignitable by abnormal operation or failure of electrical equipment.

Class III Location

A location that is hazardous because of the presence of easily ignitable fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures.

Class III, Division 1 Location

A location in which easily ignitable fibers or materials producing flyings are handled, manufactured, or used.

Class III, Division 2 Location

A location in which easily ignitable fibers are stored or handled (except in the process of manufacture).

Clearance Distance

The shortest distance measured in air between conductive parts.

Code of Practice

An international term referring to a document that describes basic safety features and methods of protection and recommends the selection, installation, and maintenance procedures that should be followed to ensure the safe use of electrical apparatus.

Converter

A type of isolated barrier that receives a signal from the hazardous area instrument (i. e. transmitter, thermocouples, etc.) and converts it into an equivalent signal (i. e. 4 mA ... 20 mA, 1 V ... 5 V, etc.).

Control Drawing

A drawing or other document provided by the manufacturer of the intrinsically safe or associated apparatus that details the allowed interconnections between the intrinsically safe and associated apparatus.

CSA

Acronym for Canadian Standards Association. A third party certification agency headquartered in Canada and recognized by OSHA as a Nationally Recognized Test Laboratory in the United States. The presence of CSA, UL, or FM certification marks on equipment is normally sufficient to the local inspector that the product is designed to recognized safety standards.

D

Definition of contamination level 2 per EN 50178

Under normal circumstances, only non-conductive contamination occurs. Occasionally however, short-term conductance may be expected through condensation when the device is not being operated. This applies to the immediate surrounding conditions of the electronic device.

Discrete Input

Signal from a hazardous area instrument that is an on/off type electrical input to the safe area (i. e., contact closure, proximity sensor).

Discrete Output

On/Off type signal from the safe area to the hazardous area (i. e., signal to a solenoid or LED cluster).

Distance Through Casting Compound

The shortest distance between two conductive parts separated by a casting compound.

Distance Through Solid Insulation

The shortest distance between two conductive parts separated by solid insulation.

Driver

A type of active or transformer isolated barrier that receives a signal from a safe area source (i. e., DCS, process controller, etc.) and drives that signal to the hazardous area instrument (i. e., I/P positioner).

Dust, Combustible

Dust that (when mixed with air in certain proportions) can be ignited and will propagate a flame. The combustible properties of dust are dependent upon test conditions and dust particle size, chemical structure, and other particle characteristics.

Dust-Ignitionproof

A term used in the United States to describe an enclosure that will exclude ignitable amounts of dusts that might affect performance or rating and that, when installed and protected in accordance with the original design intent, will not permit arcs, sparks, or heat otherwise generated or liberated inside the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust.

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Dust-Protected Enclosure

An international term describing an enclosure in which the ingress of dust is not totally prevented, but dust does not enter in sufficient quantity to interfere with the safe operation of the equipment or accumulate in a position within the enclosure where it is possible to cause an ignition hazard.

Dust-Tight

An enclosure so constructed that dust will not enter the enclosing case under specified test conditions.

E

EC-Type Examination Certificate

The manufacturer certifies that the product meets the fundamental safety requirements under EC regulations by the application of a registration number to this product.

The following apply to Pepperl+Fuchs products:

Regulations:

73/23/EWG	Low Voltage Directive
89/336/EWG	EMC Directive
89/392/EWG	Machine Directive
94/9/EG	Devices and Safety Systems for Hazardous Areas

Encapsulation

An international term describing a type of protection in which the parts that could ignite an explosive atmosphere by either sparking or heating are enclosed in an encapsulant in such a way that this explosive atmosphere cannot be ignited. This type of protection is referred to by CENELEC as Ex m in Standard EN 60079-18.

End-to-End Resistance

The resistance between both ends of a barrier channel. It is the sum of the resistor itself and the resistance of the fuse at an ambient temperature of 20 °C.

Entity Concept

The entity concept provides more flexibility in selecting equipment to form an intrinsically safe system. The entity concept allows the user to identify acceptable combinations of intrinsically safe apparatus and associated apparatus that have not been examined as a system.

Entity Parameters

The four categories that are set by the certification agency in order to properly match the intrinsic safety barrier to the hazardous area instrument. These four parameters are voltage, current, capacitance and inductance.

Ex d

Designation for the flame-proof (explosion containment) method of protection.

Ex e

Designation for the increased safety (prevention) method of protection.

Ex i

Designation for the intrinsic safety (prevention) method of protection. This method consists of two categories – ia and ib.

Ex ia

This intrinsic safety category is limited to low power circuits and is suitable for process instrumentation. Up to two faults are allowed and can be used in Zones 0, 1, and 2.

Ex ib

This intrinsic safety category is similar to the Ex ia method, except that category ib allows only one fault and can only be used in Zones 1 and 2.

Ex m

Designation for the encapsulation (segregation) method of protection.

Ex n

Designation for the simplified (prevention) method of protection.

Ex o

Designation for the oil-immersion (segregation) method of protection.

Ex p

Designation for the pressurization (segregation) method of protection.

Ex q

Designation for the powder-filling (segregation) method of protection.

Ex s

Designation for the special (special protection) method of protection. This method is standardized only in Great Britain and Germany.

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Explosion-Proof Enclosure

An enclosure that is capable of withstanding an explosion of a gas or vapor within it and of preventing the ignition of an explosive gas or vapor that may surround it and that operates at such an external temperature that a surrounding explosive gas or vapor will not be ignited. This type of enclosure is similar to a flame-proof enclosure.

Explosion-Proof Equipment (apparatus)

Equipment or apparatus enclosed in an explosion-proof enclosure.

F

Fault

A defect or electrical breakdown of any component, spacing or insulation that alone or in combination with other faults may adversely affect the electrical or thermal characteristics of the intrinsically safe circuit. If a defect or breakdown leads to defects or breakdowns in other components, the primary and subsequent defects and breakdowns are considered to be a single fault.

Countable Fault

A fault that is applied to a part of the electrical apparatus that meets the constructional requirements of this standard.

Uncountable Fault

A fault that is applied to areas of the electrical apparatus that do not meet the constructional requirements of this standard. If application of a countable fault leads to subsequent defects and breakdowns, they are considered to be uncountable faults.

Fibers And Flyings, Easily Ignitable

Fibers and flyings that are easily ignitable including rayon, cotton (including cotton linters and cotton waste), sisal or henequen, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, spanish moss, excelsior, and other materials of similar nature.

Flame-Proof Enclosure

An International term describing an enclosure that can withstand the pressure developed during an internal explosion of an explosive mixture and that prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure and that operates at such an external temperature that a surrounding explosive gas or vapor will not be ignited. This enclosure is similar to an explosion-proof enclosure. This type of protection is referred to by IEC as Ex d.

FM

Acronym for Factory Mutual Approvals, a third party certification agency that is recognized by OSHA as a Nationally Recognized Testing Laboratory in the United States. It is a division of Factory Mutual Global, which specializes in property insurance. For marketing in the U.S., FM, CSA, and UL provide testing, listing and labeling services for industrial and safety products. Generally, certifications by FM, CSA, and UL are recognized in most jurisdictions; however, there are exceptions.

Fuse Rating

This is the maximum current that can flow continuously through the fuse (approx. 1,000 hours at 35 °C (95 °F)). The rated current may be exceeded for short periods at temperatures up to approximately 55 °C (131 °F).

Fuse-Protected Shunt Diode Barrier Assembly (Zener Barrier)

A network consisting of a fuse, voltage-limiting shunt diodes, and a current-limiting resistor or other current-limiting components designed to limit current and voltage. The fuse protects the diodes from open circuiting when high fault current flows.

G

Galvanic Isolation

A form of isolation that meets stringent standards for intrinsically safe circuits.

Grounding Device

An impedance device used to connect conductors of an electric system to ground for the purpose of controlling the ground current or voltages to ground, or a non-impedance device used to temporarily ground conductors for the purpose of the safety of workmen. The grounding device may consist of a grounding transformer or a neutral grounding device, or a combination of these. Protective devices, such as surge arresters, may also be included as an integral part of the device.

Group

A classification of flammable materials of similar hazard. Consists of Groups A, B, C, D, E, F, and G to NEC and CEC standards and Groups I, IIA, IIB, and IIC to IEC standards.

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H

Hazardous (Classified) Location

A location where fire or explosion hazards may exist due to the presence of flammable gases or vapors, flammable liquids, combustible dust, or easily ignitable fibers or flyings.

Hazardous Materials

Gases, vapors, combustible dusts, fibers, or flyings that are explosive under certain conditions.

Hermetically Sealed Device

A device that is sealed against the entrance of an external atmosphere and in which the seal is made by fusion. Continuous soldering, brazing, welding, and the fusion of glass to metal are examples of recognized methods.

I

I/O Module

A module that provides basic input and output functions between the automation system and the field devices. Disregarding specialty modules, there are four basic types available from various vendors - analog input, analog output, discrete input, and discrete output.

IEC

Acronym for International Electrotechnical Commission. An international commission of which most nations are members. IEC standards directly affect equipment for sale internationally. The benefit of participation in the IEC is that costly differences in plant or equipment design can be avoided by designing equipment consistent with IEC documents where feasible.

Ignitable Gas Mixture

A gas -air mixture that is capable of being ignited by an open flame, arc or spark or high temperature.

Ignition (Autoignition) Temperature

The minimum uniform temperature required to initiate or cause self-sustained combustion of a solid, liquid, or gaseous substance (independent of any other ignition source).

Increased Safety

An international term that describes a type of protection in which various measures are applied so as to reduce the probability of excessive temperatures and the occurrence of arcs or sparks in the interior and on the external parts of electrical apparatus that do not produce them in normal service. This type of protection is referred to by IEC as Ex e.

Inductance

The property of an electric circuit by virtue of which a varying current induces an electromotive force in that circuit or in a neighboring circuit. The practical difference between capacitance and inductance in an intrinsically safe circuit is minimal. Both store energy, but an inductor will release energy when a circuit is broken, and a capacitor will release energy when the circuit is made.

Insulation coordination

The assignment of the insulation characteristics of an apparatus in accordance with:

1. The expected overvoltages,
2. The characteristic values of the overvoltage precautions,
3. The expected surrounding conditions,
4. The protective measures against contamination.

Insulator

A material that conducts electrons slowly. The importance to intrinsic safety is that air (a spatial distance) is often an insulator.

Internal Wiring

Wiring and electrical connections that are made within the apparatus by the manufacturer. Within racks or panels, interconnections between separate pieces of apparatus made in accordance with detailed instructions from the apparatus manufacturer are considered to be internal wiring.

Intrinsic Safety Barrier

A component containing a network designed to limit the energy (voltage and current) available to the protected circuit in the hazardous (classified) location under specified fault conditions.

Intrinsic Safety Ground Bus

A grounding system that has a dedicated conductor separate from the power system so that ground currents will not normally flow and that is reliably connected to a ground electrode (e. g., in accordance with Article 250 of NEC, ANSI/NFPA 70, or Section 10 of CEC Part I, CSA C22.1).

Intrinsic Safety

A type of protection in which a portion of the electrical system contains only intrinsically safe equipment (apparatus, circuits, and wiring) that is incapable of causing ignition in the surrounding atmosphere. No single device or wiring is intrinsically safe by itself (except for battery-operated self-contained apparatus such as portable pagers, transceivers, gas detectors, etc., which are specifically designed as intrinsically safe self-contained devices) but is intrinsically safe only when employed in a properly designed intrinsically safe system. This type of protection is referred to by IEC as Ex i.

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Intrinsically Safe Apparatus

Apparatus in which all the circuits are intrinsically safe.

Intrinsically Safe Circuit

A circuit in which any spark or thermal effect, produced either normally or in specified fault conditions, is incapable, under the prescribed test conditions, of causing ignition of a mixture of flammable or combustible material in air in the mixture's most easily ignited concentration.

Intrinsically Safe Equipment

Equipment that may be installed in a hazardous location, in which all the circuits are intrinsically safe, or that is designed to form part of an intrinsically safe system.

Intrinsically Safe Ground

A clearly identified conductor of not less than 4 mm^2 (12 AWG) cross-sectional area with a total impedance from barrier ground bus bar to main power system earth of not more than 1 Ω.

Intrinsically Safe System

An assembly of interconnected intrinsically safe apparatus, associated apparatus, and interconnecting cables in which those parts of the system that may be used in hazardous (classified) locations are intrinsically safe circuits.

IS Ground

A dedicated ground system to which Zener Barriers are connected. The resistance to ground path must be less than or equal to 1 Ω from any Zener Barrier to designated ground electrode.

IS

Abbreviation for intrinsic safety.

ISA

Acronym for the Instrumentation, Systems and Automation Society. ISA Committee SP12, established in 1949, has been influential in establishing the recognition of intrinsic safety and non-incendive circuits in the NEC.

Isolated Barriers

A type of barrier with additional active components and galvanic isolation to separate the hazardous area instrument from the safe area controller providing advantages over the traditional Zener Barrier.

K

Knockout

A portion of the wall of an enclosure so fashioned that it may be removed readily by a hammer, screwdriver, and pliers at the time of installation in order to provide a hole for the attachment of an auxiliary device or raceway, cable, or fitting.

L

Labeled Equipment

Equipment or materials, to which has been attached a label, symbol, or other identifying mark of an organization concerned with product evaluation, that may maintain periodic inspection of the production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

LEL

Abbreviation for lower explosive limit (lower flammable limit).

Listed

Equipment or materials, included in a list published by an organization concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or materials meets appropriate standards or has been tested and found suitable for use in the specified manner.

M

Maintenance, Corrective

Any maintenance activity that is not normal in the operation of the equipment and requires access to the equipment's interior. Such activities are expected to be performed by qualified personnel who are aware of the hazards involved. Such activities typically include locating causes of faulty performance, replacement of defective components, adjustment of internal controls, and the like.

Maintenance, Operational

Any maintenance activity, excluding corrective maintenance, intended to be performed by the operator and required in order for the equipment to serve its intended purpose. Such activities typically include the correcting of "zero" on a panel instrument, changing charts, record keeping, adding ink, and the like.

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Make/Break Components

Components having contacts that can interrupt a circuit (even if the interruption is transient in nature). Examples of make/break components are relays, circuit breakers, servopotentiometers, adjustable resistors, switches, connectors, and motor brushes.

Maximum External Capacitance (C_o, C_a)

Maximum capacitance in an intrinsically safe circuit that can be connected to the connection facilities of the apparatus without invalidating intrinsic safety.

Maximum External Inductance (L_o, L_a)

Maximum value of inductance in an intrinsically safe circuit that can be connected to the connection facilities of the apparatus without invalidating intrinsic safety.

Maximum External Inductance to Resistance Ratio (L_o/R_o)

Ratio of inductance (L_o) to resistance (R_o) of any external circuit that can be connected to the connection facilities of the electrical apparatus without invalidating intrinsic safety.

Maximum Inductance to Resistance Ratio (L/R)

As an alternative value to L_a, the ratio of inductance (L) to resistance (R) of any external circuit that can be connected to the terminals of intrinsically safe apparatus without invalidating the intrinsic safety of the apparatus.

Maximum Input Current (I_i, I_{max})

Maximum current (peak AC or DC) that can be applied to the connection facilities for intrinsically safe circuits without invalidating intrinsic safety.

Maximum Input Power (P_i)

The maximum power that can be applied to the terminals of an intrinsically safe device without invalidating the intrinsic safety of the device.

Maximum Input Voltage (U_i, V_{max})

Maximum voltage (peak AC or DC) that can be applied to the connection facilities for intrinsically safe circuits without invalidating intrinsic safety.

Maximum Internal Capacitance (C_i)

The total unprotected internal capacitance of the intrinsically safe apparatus that must be considered as appearing across the terminals of the intrinsically safe apparatus.

Maximum Internal Inductance (L_i)

The total unprotected internal inductance of the intrinsically safe apparatus that must be considered as appearing across the terminals of the intrinsically safe apparatus.

Maximum Internal Inductance to Resistance Ratio (L_i/R_i)

Ratio of inductance (L_i) to resistance (R_i) which is considered as appearing at the external connection facilities of the electrical apparatus.

Maximum Output Current (I_o, I_{sc})

Maximum current (peak AC or DC) in an intrinsically safe circuit that can be taken from the connection facilities of the apparatus.

Maximum Output Power (P_o)

Maximum electrical power in an intrinsically safe circuit that can be taken from the apparatus.

Maximum Output Voltage (U_o, V_{oc})

Maximum output voltage (peak AC or DC) in an intrinsically safe circuit that can appear under open circuit conditions at the connection facilities of the apparatus at any applied voltage up to the maximum voltage, including U_m and U_i.

Maximum r.m.s. AC or DC Voltage (U_m)

Maximum voltage that can be applied to the non-intrinsically safe connection facilities of associated apparatus without invalidating intrinsic safety. The value of U_m may be different at different sets of connection facilities.

Maximum Surface Temperature

The highest temperature attained by a surface accessible to flammable gases, vapors, or combustible dusts under conditions of operation within the ratings of the apparatus (including recognized overloads and defined fault conditions.

MEIC

Abbreviation for most easily ignited concentration.

MESG

Abbreviation for maximum experimental safe gap.

MIC

Abbreviation for minimum ignition current.

MIE

Abbreviation for minimum ignition energy.

Minimum Igniting Voltage

Minimum voltage of capacitive circuits that causes the ignition of the explosive test mixture in the spark-test apparatus.

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N

NEMA

Acronym for National Electrical Manufacturers Association. Provides a rating system to identify an enclosure's ability to repel the outside environment. Unlike organizations such as UL, FM, and CSA, NEMA does not require independent testing and leaves compliance to its rating system completely up to the manufacturer.

NFPA

Acronym for National Fire Protection Association. The NFPA has acted as a sponsor and publisher of the National Electrical Code since 1911. Most of the NFPA standards tend to emphasize recommendations for the safe use of electrical apparatus, area classification, fire protection, and hazards of materials.

Non-hazardous Location

A location utilizing drying, curing, or fusion apparatus and provided with positive mechanical ventilation adequate to prevent accumulation of flammable concentrations of vapors, and provided with effective interlocks to deenergize all electric equipment (other than equipment approved for Class I locations) in case the ventilating equipment is inoperative, shall be permitted to be classified as non-hazardous where the authority having jurisdiction so judges.

Non-incendive Circuit

A circuit in which any arc or thermal effect produced in normal operating conditions of the equipment is not capable, under prescribed conditions, of igniting the specified flammable gas, vapor-in-air mixture, combustible dusts, or ignitable fibers or flyings.

Non-incendive Component

A component having contacts for making or breaking a specified incendive circuit in which the contacting mechanism is constructed so that the component is not capable of ignition of the specified flammable gas or vapor-in-air mixture when tested as specified by appropriate test procedure. The housing of a non-incendive component is not intended to exclude the flammable atmosphere or contain an explosion.

Non-incendive Equipment

Equipment having electrical/electronic circuitry and components that are incapable under normal conditions, of causing ignition of a specified flammable gas or vapor-in-air mixture due to arcing or thermal effect.

Non-incendive Field Wiring

Wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment, is not capable, due to arcing or thermal effects, of igniting a specified flammable gas or vapor-in-air mixture or combustible dust-in-air mixture. Normal operation includes opening, shorting, or grounding the field wiring.

Non-incendive Field Wiring Apparatus

Apparatus intended to be connected to non-incendive field wiring.

Normal Operational Conditions

Conditions that conform electrically and mechanically with its design specifications and is used within the limits specified by the manufacturer.

NRTL

Acronym for Nationally Recognized Testing Laboratory. This recognition indicates that the Occupational Safety & Health Administration has accredited certain organizations to evaluate products according to consensus based safety standards.

O

Operational Maintenance

Any maintenance activity, other than corrective maintenance, intended to be performed by the operators and which is required in order for the equipment to serve its intended purpose. Such activities typically include the correcting of "zero" on a panel instrument, changing charts, making records, adding ink, etc.

OSHA

Acronym for Occupational Safety and Health Administration. The OSHA Act was passed by the U.S. Congress in 1971. Part 1910 of the OSHA regulations adopted the 1968 NEC and defined "approved" to mean "listed by UL or FM." "Approved" was redefined in 1972, providing exceptions to FM or UL listing; however, in practice the emphasis on listing remained unchanged. Listing requirements increased interest in developing standards for certain categories of apparatus, such as process control instrumentation. Third-party approval agencies (e. g., UL, FM, CSA) for electrical equipment must be accredited by OSHA.

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Appendix
Housing Styles
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Overvoltage category

The assignment of an electrical apparatus in accordance with the expected overvoltage.

Table:

The assignment of rated operating voltages to the rated surge voltages

Rated operating voltage (V) for alternating voltage systems in accordance with DIN IEC 38	Rated surge voltages (V) for overvoltage category			
	I	II	III	IV
230/400/277/480[1)] 400/690 1000	1500 2500 4000	2500 4000 6000	4000 6000 8000	6000 8000 1200 0
[1)] Rated operating voltage of 500 V is set.				

P

Passive Transistor Output

A transistor in which the emitter and collector are not connected to an internal power source. Only the base is connected so that it may be switched on and off. The emitter and collector may be connected to the customer's power source.

Polarity

Zener barriers are available in polarized (DC) and non-polarized (AC) versions. Positive polarity types have the negative side of the circuit grounded, while negative polarity types have the positive side of the circuit grounded. Non-polarized barriers have zener diodes connected in inverse series pairs and can be used in both AC and DC circuits.

Protective (Infallible) Component or Assembly

A component or assembly which is so unlikely to become defective in a manner that will lower the intrinsic safety of the circuit it may be considered not subject to fault when analysis or tests for intrinsic safety are made. Examples of this type of component or assembly are:

PTB

Acronym for Physikalisch-Technische Bundesanstalt. An approval agency in Germany that has the authority to accept or reject the design of an electrical apparatus based on recognized safety standards.

R

Repeater

A type of active or transformer isolated barrier that receives a signal from the hazardous area instrument (i. e., transmitter, thermocouple, etc.) and repeats that signal into the safe area while providing Intrinsic Safety.

Resistance Temperature Detector (RTD)

A resistor made of some material for which the electrical resistivity is a known function of the temperature and that is intended for use with a resistance thermometer. It is usually in such a form that it can be placed in the region where the temperature is to be determined.

Resistance

That physical property of an element, device, branch, network or system that is the factor by which the mean-square conduction current must be multiplied to give the corresponding power lost by dissipation as heat or as other permanent radiation or loss of electromagnetic energy from the circuit.

RS 232

An EIA standard that specifies the electrical, mechanical, and functional characteristics for serial communications. Used in point-to-point applications.

RS 485

An EIA standard that specifies the electrical characteristics of a balanced-voltage digital interface. Used in multi-point applications.

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S

Safe Area

A non-hazardous location.

Seal, Cable, Explosionproof

A cable terminator filled with compound and designed to contain an explosion in the enclosure to which it is attached or to minimize passage of flammable gases or vapors from one location to another. A conduit seal may also be used as a cable seal. This method differs from the international practice, which requires cable glands.

Seal, Conduit, Explosionproof

A sealed fitting, poured with a cement-like potting compound, designed to contain an explosion in the enclosure to which it is attached and to minimize passage of flammable gases or vapors from one location to another.

Serial Interface

A method of digitally transmitting data between devices over a pair of conductors. See RS 232 and RS 485.

Short-Circuit Proof

The ability of an intrinsic safety barrier or isolator to withstand the shorting of its' intrinsically safe connections to ground. Determined by dividing the rated voltage by its' internal resistance. If the resulting value is less than the fuse rating, the barrier is said to be short-circuit proof.

Short-Circuit Protection

The ability of the solid-state output to withstand a direct short without damage to itself.

Shunt Diode Barrier Assembly

A fuse- or resistor- protected diode barrier.

Simple Apparatus

An electrical component or combination of com-ponents of simple construction with well-defined electrical parameters that is compatible with the intrinsic safety of the circuit in which it is used. A device that will neither generate nor store more than 1.5 V, 0.1 A and 25 mW. Examples are switches, thermocouples (TCs), light-emitting diodes (LEDs), and resistance temperature devices (RTDs).

SIT

Abbreviation for spontaneous ignition temperature.

Switch Isolator

Term used for the type of transformer isolated barrier that is used to repeat signals from discrete inputs (i. e., contact closures, proximity sensors.)

T

Temperature Code (Temperature Classification)

A system of classification by which one of 14 temperature identification numbers (internationally, six temperature classes) is allocated to an electrical apparatus. The temperature code represents the maximum surface temperature of any component that may come in contact with the flammable gas or vapor mixture.

Termination Panel

A mechanical assembly that resides in front of the I/O system and performs signal conditioning, electrical isolation, and other functions.

Thermistor

An electron device that makes use of the change of resistivity of a semiconductor with change in temperature.

Thermocouple (TC)

A pair of dissimilar conductors so joined at two points that an electromotive force is developed by the thermoelectric effects when the junctions are at different temperatures.

TIB

Acronym for Transformer Isolated Barrier. A term used to describe an isolated intrinsic safety barrier used for hazardous area applications. Although a typical TIB will employ multiple means of isolation, the term TIB is used to generically describe this type of barrier.

Transmitter (Tx)

A device for transmitting a coded signal when operated by any one of a group of actuating devices.

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U

UEL

Abbreviation for upper explosive limit (upper flammable limit).

UL

Acronym for Underwriters Laboratories, Inc, a third party certification agency that is an independent, self-supporting, non-profit testing laboratory and standards developer. It is recognized by OSHA as a Nationally Recognized Testing Laboratory in the United States. The presence of UL, CSA, or FM certification labels on equipment is normally sufficient evidence to the local inspector that the product is designed to meet recognized safety standards.

Z

Zener Barrier

A combination of components that limits energy to the hazardous area to a level below that which would ignite a specific gas/air mixture.

Zener Diode

A class of silicon diodes that exhibit in the avalanche breakdown region a large change in reverse current over a very narrow range of reverse voltage. This characteristic permits a highly stable reference voltage to be maintained across the diode despite a relatively wide range of current through the diode.

Zone

The international method of specifying the probability that a location is made hazardous by the presence, or potential presence, of flammable concentrations of gases and vapors. The term Division is used in the United States and Canada.

Zone 0

An area in which an explosive gas-air mixture is continuously present or present for long periods. Equal to a Class I, Division 1 hazardous location.

Zone 1

An area in which an explosive gas-air mixture is likely to occur in normal operation. Equal to a Class I, Division 1 hazardous location.

Zone 2

An area in which an explosive gas-air mixture is not likely to occur and if it does occur, will only exist for a short time. Equal to a Class I, Division 2 hazardous location.

Zone 20

An area in which a combustible dust cloud is part of the air permanently, over long periods of time or frequently. Equal to a Class II, Division 1 hazardous location.

Zone 21

An area in which a combustible dust cloud in air is likely to occur in normal operation. Equal to a Class II, Division 1 hazardous location.

Zone 22

An area in which a combustible dust cloud in air may occur briefly or during abnormal operation. Equal to a Class II, Division 2 hazardous location.

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Digital Inputs

Model Number	Isolated Barriers	Signal Conditioners	System	Page
Switch Amplifiers				
HiC2821	■		H-System	324
HiC2822	■		H-System	325
HiC2841	■		H-System	326
HiC2842	■		H-System	327
HiC2851	■		H-System	328
HiD2821	■		H-System	329
HiD2822	■		H-System	330
HiD2824	■		H-System	331
HiD2842	■		H-System	332
HiD2844	■		H-System	333
KCD2-SR-1.LB		■	K-System	579
KCD2-SR-2		■	K-System	580
KCD2-SR-Ex1.LB	■		K-System	127
KCD2-SR-Ex2	■		K-System	134
KFA5-DU-Ex1.D	■		K-System	156
KFA5-SOT2-Ex2	■		K-System	149
KFA5-SR2-Ex1.W	■		K-System	129
KFA5-SR2-Ex1.W.LB	■		K-System	132
KFA5-SR2-Ex2.W	■		K-System	136
KFA5-SR2-Ex2.W.IR	■		K-System	138
KFA6-DU-Ex1.D	■		K-System	157
KFA6-SOT2-Ex2	■		K-System	150
KFA6-SR-2.3L		■	K-System	583
KFA6-SR2-Ex1.W	■		K-System	130
KFA6-SR2-Ex1.W.LB	■		K-System	133
KFA6-SR2-Ex2.W	■		K-System	137
KFA6-SR2-Ex2.W.IR	■		K-System	139
KFD2-DU-Ex1.D	■		K-System	155
KFD2-SH-Ex1	■		K-System	152
KFD2-SH-Ex1.T.OP	■		K-System	153
KFD2-SOT2-Ex1.LB	■		K-System	145
KFD2-SOT2-Ex1.LB.IO	■		K-System	146
KFD2-SOT2-Ex1.N	■		K-System	147
KFD2-SOT2-Ex2	■		K-System	148
KFD2-SOT2-Ex2.IO	■		K-System	151
KFD2-SR-Ex1.4S.LK	■		K-System	142
KFD2-SR2-2.2S		■	K-System	581

Model Number	Isolated Barriers	Signal Conditioners	System	Page
KFD2-SR2-Ex1.W	■		K-System	128
KFD2-SR2-Ex1.W.LB	■		K-System	131
KFD2-SR2-Ex2.2S	■		K-System	140
KFD2-SR2-Ex2.W	■		K-System	135
KFD2-SRA-Ex4	■		K-System	141
KFD2-ST2-Ex1.LB	■		K-System	143
KFD2-ST2-Ex2	■		K-System	144
KFU8-SR-1.3L.V		■	K-System	582
KHA6-SH-Ex1	■		K-System	154
Frequency Converters				
HiD2891	■		H-System	334
KFA5-DWB-Ex1.D	■		K-System	160
KFA6-DWB-Ex1.D	■		K-System	161
KFD2-DWB-1.D		■	K-System	585
KFD2-DWB-Ex1.D	■		K-System	159
KFD2-SR2-2.W.SM		■	K-System	584
KFD2-SR2-Ex2.W.SM	■		K-System	158
KFD2-UFC-1.D		■	K-System	587
KFD2-UFC-Ex1.D	■		K-System	162
KFD2-UFT-2.D		■	K-System	589
KFD2-UFT-Ex2.D	■		K-System	164
KFU8-DWB-1.D		■	K-System	586
KFU8-UFC-1.D		■	K-System	588
KFU8-UFC-Ex1.D	■		K-System	163
KFU8-UFT-2.D		■	K-System	590
KFU8-UFT-Ex2.D	■		K-System	165
Conductivity Switch Amplifiers				
KFA5-ER-1.5		■	K-System	593
KFA5-ER-1.6		■	K-System	594
KFA5-ER-1.W.LB		■	K-System	599
KFA5-ER-2.W.LB		■	K-System	600
KFA5-ER-Ex1.W.LB	■		K-System	167
KFA6-ER-1.5		■	K-System	595
KFA6-ER-1.6		■	K-System	596
KFA6-ER-1.W.LB		■	K-System	601
KFA6-ER-2.W.LB		■	K-System	602
KFA6-ER-Ex1.W.LB	■		K-System	168
KFD2-ER-1.5		■	K-System	591
KFD2-ER-1.6		■	K-System	592

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KFD2-ER-1.W.LB		■	K-System	597
KFD2-ER-2.W.LB		■	K-System	598
KFD2-ER-Ex1.W.LB	■		K-System	166
Ground Fault Detections				
KFD2-ELD-Ex16	■		K-System	169
Interface Modules				
KFD2-FF-Ex2.RS232	■		K-System	170

Digital Outputs

Model Number	Isolated Barriers	Signal Conditioners	System	Page
Solenoid Drivers				
HiC2871	■		H-System	338
HiD2871	■		H-System	339
HiD2872	■		H-System	340
HiD2873	■		H-System	341
HiD2874	■		H-System	342
HiD2875	■		H-System	343
HiD2876	■		H-System	344
HiD2877	■		H-System	345
HiD2878	■		H-System	346
HiD2881	■		H-System	347
KCD0-SD-Ex1.1245	■		K-System	178
KFD0-SD2-Ex1.10100	■		K-System	182
KFD0-SD2-Ex1.1045	■		K-System	176
KFD0-SD2-Ex1.1065	■		K-System	180
KFD0-SD2-Ex1.1180	■		K-System	181
KFD0-SD2-Ex2.1045	■		K-System	177
KFD0-SD2-Ex2.1245	■		K-System	179
KFD2-RCI-Ex1	■		K-System	190
KFD2-SL2-Ex1	■		K-System	183
KFD2-SL2-Ex1.B	■		K-System	184
KFD2-SL2-Ex1.LK	■		K-System	185
KFD2-SL2-Ex1.LK.1045	■		K-System	186
KFD2-SL2-Ex1.LK .1270	■		K-System	187
KFD2-SL2-Ex2	■		K-System	188
KFD2-SL2-Ex2.B	■		K-System	189

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KFD2-SL-4		■	K-System	604
KFD2-VM-Ex1.35.L	■		K-System	191
Relay Outputs				
HiD2862	■		H-System	348
KFD0-RO-Ex2	■		K-System	192
KFD0-RSH-1		■	K-System	605
KFD0-RSH-1.4S.PS2		■	K-System	606
KFD0-RSH-1-Y2		■	K-System	607
Interface Modules				
KFD2-FF-Ex2.RS232	■		K-System	193

Analog Inputs

Model Number	Isolated Barriers	Signal Conditioners	System	Page
Transmitter Power Supplies				
DN421	■		K-System	219
HiC2025	■		H-System	353
HiD2024	■		H-System	362
HiD2025	■		H-System	354
HiD2025SK	■		H-System	356
HiD2026	■		H-System	355
HiD2026SK	■		H-System	357
HiD2029	■		H-System	358
HiD2029SK	■		H-System	360
HiD2030	■		H-System	359
HiD2030SK	■		H-System	361
KCD2-STC-1		■	K-System	612
KCD2-STC-Ex1	■		K-System	201
KFD2-CR4-1		■	K-System	616
KFD2-CR4-1.2O		■	K-System	619
KFD2-CR4-2		■	K-System	624
KFD2-STC3-Ex1	■		K-System	216
KFD2-STC4-1		■	K-System	613
KFD2-STC4-1-3		■	K-System	614
KFD2-STC4-1.2O		■	K-System	617
KFD2-STC4-1.2O-3		■	K-System	618
KFD2-STC4-2		■	K-System	621

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KFD2-STC4-2-3		■	K-System	622
KFD2-STC4-Ex1	■		K-System	202
KFD2-STC4-Ex1.2O	■		K-System	207
KFD2-STC4-Ex1.2O.H	■		K-System	209
KFD2-STC4-Ex1.2O-Y122582	■		K-System	208
KFD2-STC4-Ex1.H	■		K-System	204
KFD2-STC4-Ex1-Y122583	■		K-System	203
KFD2-STC4-Ex2	■		K-System	212
KFD2-STC4-Ex2-Y203646	■		K-System	213
KFD2-STV3-Ex1-1	■		K-System	217
KFD2-STV3-Ex1-2	■		K-System	218
KFD2-STV4-1-1		■	K-System	615
KFD2-STV4-2-1		■	K-System	623
KFD2-STV4-Ex1.2O-1	■		K-System	210
KFD2-STV4-Ex1.2O-2	■		K-System	211
KFD2-STV4-Ex1-1	■		K-System	205
KFD2-STV4-Ex1-2	■		K-System	206
KFD2-STV4-Ex2-1	■		K-System	214
KFD2-STV4-Ex2-2	■		K-System	215
KFU8-VCR-1		■	K-System	620
Transmitter Power Supplies with Trip Values				
KFD2-CRG2-1.D		■	K-System	625
KFD2-CRG2-Ex1.D	■		K-System	220
KFU8-CRG2-1.D		■	K-System	626
KFU8-CRG2-Ex1.D	■		K-System	221
Transmitter Power Supplies with HART Communication				
KFD2-HLC-Ex1.D	■		K-System	222
KFD2-HLC-Ex1.D.2W	■		K-System	223
KFD2-HLC-Ex1.D.4S	■		K-System	224
Current Repeaters				
HiD2035	■		H-System	363
HiD2036	■		H-System	364
KFD0-CS-1.50		■	K-System	628
KFD0-CS-2.50		■	K-System	629
KFD0-CS-2.51P		■	K-System	630
KFD0-CS-Ex1.50P	■		K-System	226
KFD0-CS-Ex1.51P	■		K-System	227
KFD0-CS-Ex1.52	■		K-System	228
KFD0-CS-Ex1.54	■		K-System	229

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KFD0-CS-Ex2.50P	■		K-System	230
KFD0-CS-Ex2.51P	■		K-System	231
KFD0-CS-Ex2.52	■		K-System	232
KFD0-CS-Ex2.54	■		K-System	233
KFD0-SCS-1.55		■	K-System	627
KFD0-SCS-Ex1.55	■		K-System	225
Voltage Repeaters				
HiC2065	■		H-System	365
HiC2068	■		H-System	367
HiC2095	■		H-System	368
HiD2096	■		H-System	366
KFD2-VR-Ex1.12	■		K-System	236
KFD2-VR-Ex1.18	■		K-System	237
KFD2-VR-Ex1.19	■		K-System	238
KFD2-VR-Ex1.19-Y109129	■		K-System	239
KFD2-VR2-Ex1.50M	■		K-System	234
KFD2-VR2-Ex1.500M	■		K-System	235
KFD2-VR4-Ex1.26	■		K-System	240
Current and Voltage Converters				
HiD2012	■		H-System	369
KFD0-CC-1		■	K-System	631
KFD0-CC-Ex1	■		K-System	241
KFD0-VC-1.10		■	K-System	636
KFD2-GS-1.2W		■	K-System	634
KFD2-USC-1.D		■	K-System	632
KFD2-WAC2-1.D		■	K-System	635
KFD2-WAC2-Ex1.D	■		K-System	242
KFU8-USC-1.D		■	K-System	633
Temperature Converters and Repeaters				
HiD2061	■		H-System	370
HiD2062	■		H-System	371
HiD2071	■		H-System	372
HiD2072	■		H-System	373
HiD2081	■		H-System	374
HiD2082	■		H-System	375
KCD2-RR-Ex1	■		K-System	249
KFD0-TR-1		■	K-System	641
KFD0-TR-Ex1	■		K-System	247
KFD0-TT-1		■	K-System	642

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KFD0-TT-Ex1	■		K-System	248
KFD2-UT2-1		■	K-System	637
KFD2-UT2-1-1		■	K-System	638
KFD2-UT2-2		■	K-System	639
KFD2-UT2-2-1		■	K-System	640
KFD2-UT2-Ex1	■		K-System	243
KFD2-UT2-Ex1-1	■		K-System	244
KFD2-UT2-Ex2	■		K-System	245
KFD2-UT2-Ex2-1	■		K-System	246
Temperature Converters with Trip Values				
KFD2-GU-1		■	K-System	643
KFD2-GU-Ex1	■		K-System	250
KFD2-GUT-1.D		■	K-System	644
KFD2-GUT-Ex1.D	■		K-System	251
KFU8-GUT-1.D		■	K-System	645
KFU8-GUT-Ex1.D	■		K-System	252
Potentiometers and Resistor Converters				
KCD2-RR-Ex1	■		K-System	249
KFD0-RC-Ex1	■		K-System	257
KFD2-PT2-Ex1	■		K-System	253
KFD2-PT2-Ex1-1	■		K-System	254
KFD2-PT2-Ex1-4	■		K-System	255
KFD2-PT2-Ex1-5	■		K-System	256
KFD2-UT2-Ex1	■		K-System	243
KFD2-UT2-Ex1-1	■		K-System	244
KFD2-UT2-Ex2	■		K-System	245
KFD2-UT2-Ex2-1	■		K-System	246

Analog Outputs

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Current Drivers				
HiC2031	■		H-System	380
HiD2031	■		H-System	381
HiD2032	■		H-System	382
HiD2033	■		H-System	383
HiD2034	■		H-System	384
HiD2035	■		H-System	385
HiD2036	■		H-System	386
HiD2037	■		H-System	387
HiD2038	■		H-System	388
HiD2038Y	■		H-System	389
KCD2-SCD-1		■	K-System	648
KCD2-SCD-Ex1	■		K-System	264
KFD0-CS-1.50		■	K-System	652
KFD0-CS-2.50		■	K-System	653
KFD0-CS-2.51P		■	K-System	654
KFD0-CS-Ex1.50P	■		K-System	274
KFD0-CS-Ex1.51P	■		K-System	275
KFD0-CS-Ex1.53	■		K-System	276
KFD0-CS-Ex2.50P	■		K-System	277
KFD0-CS-Ex2.51P	■		K-System	278
KFD0-CS-Ex2.53	■		K-System	279
KFD0-SCS-1.55		■	K-System	651
KFD0-SCS-Ex1.55	■		K-System	273
KFD2-CD2-Ex1	■		K-System	268
KFD2-CD2-Ex2	■		K-System	272
KFD2-CD-Ex1.32.**	■		K-System	269
KFD2-SCD-Ex1.LK	■		K-System	265
KFD2-SCD2-1.LK		■	K-System	649
KFD2-SCD2-2.LK		■	K-System	650
KFD2-SCD2-Ex1.LK	■		K-System	266
KFD2-SCD2-Ex1-Y1	■		K-System	267
KFD2-SCD2-Ex2.LK	■		K-System	270
KFD2-SCD2-Ex2-Y1	■		K-System	271

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Termination Boards

Model Number	Housing Type	System	Page
HiATB01-FAULT-01	HiD	H-System	403
HiATB01-HART-2X16	HiD	H-System	404
HiATB01-HART-4X8	HiD	H-System	405
HiCTB08-UNI-SC-SC	HiC	H-System	392
HiCTB08-UNI-SD37-SC	HiC	H-System	394
HiCTB16-UNI-SC-SC	HiC	H-System	393
HiCTB16-UNI-SD37-SC	HiC	H-System	395
HiCTB16-UNI-SD37R-SC	HiC	H-System	396
HiDTB08-UNI-DA16-SD37-SC	HiD	H-System	399
HiDTB08-UNI-DA32-SD37-SC	HiD	H-System	400
HiDTB08-UNI-SC-SC	HiD	H-System	397
HiDTB16-UNI-DA32-SD37-SC	HiD	H-System	401
HiDTB16-UNI-DA64-SD37-SC	HiD	H-System	402
HiDTB16-UNI-SC-SC	HiD	H-System	398

Zener Barriers

Model Number	DC Versions, positive Polarity	DC Versions, negative Polarity	DC Versions, floating	DC Versions with Diode Return	AC Versions	Page
SB-System						
SB0014					■	477
SB0015					■	477
SB0016					■	477
SB0017	■					467
SB0018	■					464
SB0019				■		470
SB0020	■					467
SB0021			■			475
SB0022					■	477
SB0023			■			475
SB0024					■	476
SB0026					■	476
SB0027	■					464
SB0028					■	476
SB0029					■	476
SB0030	■					467
SB0031	■					467
SB0033			■			475
SB0035	■					467
SB0036					■	478
SB0037					■	476
SB0040	■					467
SB0041	■					467
SB0042	■					467
SB0043	■					464
SB0044					■	477
SB0045					■	477
SB0201					■	477
SB0305					■	477
SB0601			■			475
SB0604						479
SB0613	■					464
SB0614	■					464
SB0710	■					464
SB0715	■					465
SB0722	■					464
SB0728	■					465
SB0751					■	477
SB0760					■	478
SB0761					■	477
SB0764	■					467
SB0765					■	478
SB0766					■	477
SB0767	■					468
SB0768	■					467
SB0772					■	478
SB0778					■	478
SB0779	■					468
SB0786				■		471
SB0788	■					468
SB0796	■					467
SB1203					■	476

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SB1206	■					464
SB1250	■					464
SB1301			■			475
SB1302			■			475
SB1303			■			475
SB1350	■					467
SB1351	■					467
SB1502				■		466
SB1602					■	476
SB1613		■				472
SB1710		■				472
SB1715		■				473
SB1728		■				473
SB1761					■	477
SB1766					■	477
SB1767		■				474
SB1787				■		469
SB2206		■				472
SB2250		■				472
SB2401			■			475
SB2420	■					465
SB2424	■					464
SB2427				■		469
SB2710					■	476
SB2764					■	477
SB2787				■		469
SB3250	■					468
SB3420		■				473
SB3710	■					464
SB3715	■					465
SB3722	■					464
SB3728	■					465
SB3729	■					465
SB4250		■				474
SB4410	■					468
SB4420	■					468
SB4710		■				472
SB4715		■				473
SB4722		■				472
SB5410		■				474
SB5420		■				474

Model Number	DC Versions, positive Polarity	DC Versions, negative Polarity	AC Versions	Page
Z-System				
Z705	■			425
Z710	■			425
Z713	■			425
Z715	■			425
Z715.1K	■			425
Z715.F	■			426
Z722	■			425
Z728	■			425
Z728.F	■			426
Z728.H	■			425
Z728.H.F	■			426
Z755	■			427
Z757	■			427
Z764	■			427
Z765	■			427
Z765.F	■			431
Z772	■			427
Z778	■			427
Z779	■			427
Z779.F	■			431
Z779.H	■			428
Z779.H.F	■			431
Z786	■			427
Z787	■			428
Z787.F	■			432
Z787.H	■			428
Z787.H.F	■			432
Z788	■			428
Z788.H	■			428

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Model Number	DC Versions, positive Polarity	DC Versions, negative Polarity	AC Versions	Page
Z788.R	■			429
Z789	■			430
Z796	■			428
Z810		■		433
Z813		■		433
Z815		■		433
Z822		■		433
Z828		■		433
Z828.H		■		433
Z857		■		434
Z864		■		434
Z865		■		434
Z865.F		■		436
Z872		■		434
Z878		■		434
Z879.H.F		■		436
Z886		■		434
Z887		■		434
Z887.H.F		■		436
Z888		■		435
Z888.H		■		435
Z896		■		435
Z905			■	437
Z910			■	437
Z915			■	437
Z915.1K			■	437
Z928			■	437
Z954			■	442
Z955			■	438
Z960			■	439
Z960.F			■	440
Z961			■	438
Z961.F			■	441
Z961.H			■	438
Z964			■	438
Z965			■	439
Z966			■	438
Z966.F			■	441
Z966.H			■	438
Z967			■	439
Z972			■	439
Z978			■	439

Surge Protection Barriers

Model Number	DIN Rail Mount Modules	Field Mount Modules	Plug-In Modules	System	Page
FN-LB-I		■		Surge	509
FP-LB-I		■		Surge	511
FS-LB-I		■		Surge	510
K-LB-1.30	■			Surge	501
K-LB-1.30G	■			Surge	505
K-LB-1.6	■			Surge	503
K-LB-1.6G	■			Surge	507
K-LB-2.30	■			Surge	502
K-LB-2.30G	■			Surge	506
K-LB-2.6	■			Surge	504
K-LB-2.6G	■			Surge	508
P-LB-1.A.13			■	Surge	512
P-LB-1.B.12			■	Surge	514
P-LB-1.C.123			■	Surge	516
P-LB-1.D.1234			■	Surge	520
P-LB-1.E.23			■	Surge	518
P-LB-1.F.1236			■	Surge	521
P-LB-2.A.1346			■	Surge	513
P-LB-2.B.1245			■	Surge	515
P-LB-2.C.2356			■	Surge	519
P-LB-2.D.123456			■	Surge	517

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HART Interface Solutions

Model Number	Multiplexer	Converters	Termination Boards	System	Page
HART Multiplxers					
HiDMux2700	■			H-System	558
KFD0-HMS-16	■			K-System	538
KFD2-HMM-16	■			K-System	537
Termination Boards					
FI-DO-Y37023			■	K-System	539
FI-DO-R-Y41610			■	K-System	540
FI-DO-R-Y49092			■	K-System	541
FI-PFH-108874			■	K-System	542
FI-PFH-110469			■	K-System	543
FI-PFH-127720			■	K-System	544
HiATB01-HART-2X16			■	H-System	559
HiATB01-HART-4X8			■	H-System	560
HISHPSM/32/MM-01			■	H-System	561
HISHPSM/32/TB-02/HF32			■	H-System	562
HART Loop Converters					
KFD2-HLC-Ex1.D		■		K-System	545
KFD2-HLC-Ex1.D.2W		■		K-System	546
KFD2-HLC-Ex1.D.4S		■		K-System	547

Accessories

Model Number	Isolated Barriers	Signal Conditioners	Zener Barriers	Surge Protection Barriers	HART Interface Solutions	System	Page
E/AL-NS35	■	■				K-System	296 666
F-KD-Ex2	■					K-System	305
F-KDR-Ex2	■					K-System	306
F-NR-Ex1	■					K-System	307
HiALC-HiCTB-SET-108	■					H-System	408
HiALC-HiDTB-SET-150	■					H-System	408
HiACA-UNI-FLK34-FLK34-0M5					■	H-System	408 563
HiACA-UNI-FLK34-FLK34-2M0					■	H-System	408 563
HiACA-UNI-FLK34-FLK34-3M0					■	H-System	408 563
HiACA-UNI-FLK34-FLK34-6M0					■	H-System	408 563
HiC2000 Blank	■					H-System	406
HiD2000 Blank	■					H-System	407
HiSHF-AI-02					■	K-System	548
HiSHF-AO-02					■	K-System	548
IS01	■					K-System	304
K-22µ					■	K-System	549
K-500R0%1	■	■				K-System	308 674
K-ADP1	■	■				K-System	303 673
K-ADP-USB	■	■				K-System	302 672
K-CJC-BK	■	■				K-System	297 667
K-CJC-BU	■					K-System	297
K-DUCT-BU-UPR-03	■					K-System	291
K-DUCT-BU-UPR-05	■					K-System	292
K-DUCT-GY-UPR-03	■	■				K-System	293 663
K-DUCT-GY-UPR-05	■	■				K-System	294 664
K-HM14					■	K-System	549
K-HM26					■	K-System	549

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Model Number	Isolated Barriers	Signal Conditioners	Zener Barriers	Surge Protection Barriers	HART Interface Solutions	System	Page
K-MS	■	■				K-System	295 665
KC-CTT-5BU	■					K-System	299
KC-CTT-3GN2BU	■					K-System	299
KC-CTT-5GN	■	■				K-System	299 669
KC-ST-5BU	■					K-System	297
KC-ST-5GN	■	■				K-System	297 667
KC-STP-5BU	■					K-System	298
KC-STP-5GN	■	■				K-System	298 668
KCD0-LGH	■					K-System	309
KF-CP	■	■				K-System	300 670
KF-CTT-5BU	■					K-System	300
KF-CTT-3GN2BU	■					K-System	300
KF-CTT-5GN	■	■				K-System	300 670
KF-SEAL	■	■				K-System	308 674
KF-ST-5BU	■					K-System	298
KF-ST-5GN	■					K-System	298 668
KF-STP-5BU	■					K-System	299
KF-STP-5GN	■	■				K-System	299 669
KFA6-STR-1.24.4	■	■				K-System	286 658
KFA6-STR-1.24.500	■	■				K-System	285 657
KFD0-LGH	■					K-System	310
KFD0-LGH-GN	■	■				K-System	311 675
KFD0-LGH-Y34868	■	■				K-System	312 676
KFD2-EB2	■	■				K-System	287 659
KFD2-EB2.R4A.B	■	■				K-System	288 660
NS 35/7.5			■	■		Z-System SPB	451 523
PACT*ware* TM 4.X	■	■				K-System	301 671

Model Number	Isolated Barriers	Signal Conditioners	Zener Barriers	Surge Protection Barriers	HART Interface Solutions	System	Page
SB9100			■			SB-System	484
SB9101			■			SB-System	484
SB9106			■			SB-System	484
SB9220			■			SB-System	484
SB9221			■			SB-System	484
SB9222			■			SB-System	484
TS 35 Typ 12	■	■				K-System	296 666
UPR-03-*	■	■				K-System	289 661
UPR-05-*	■	■				K-System	290 662
UPR-E	■	■				K-System	289 290 661 662
UPR-I	■	■				K-System	295 665
USLKG5			■	■		Z-System SPB	451 523
Z799			■			Z-System	450
ZH-ES/LB			■	■		Z-System SPB	451 523
ZH-Z.AB/NS			■			Z-System	451
ZH-Z.AB/SS			■	■		Z-System SPB	451 523
ZH-Z.AK16			■	■		Z-System SPB	451 523
ZH-Z.AR.85				■		SPB	523
ZH-Z.AR.125			■			Z-System	451
ZH-Z.BT			■	■		Z-System SPB	451 523
ZH-Z.ES			■			Z-System	451
ZH-Z.LL			■			Z-System	451
ZH-Z.NLS-Cu3/10			■	■		Z-System SPB	451 523

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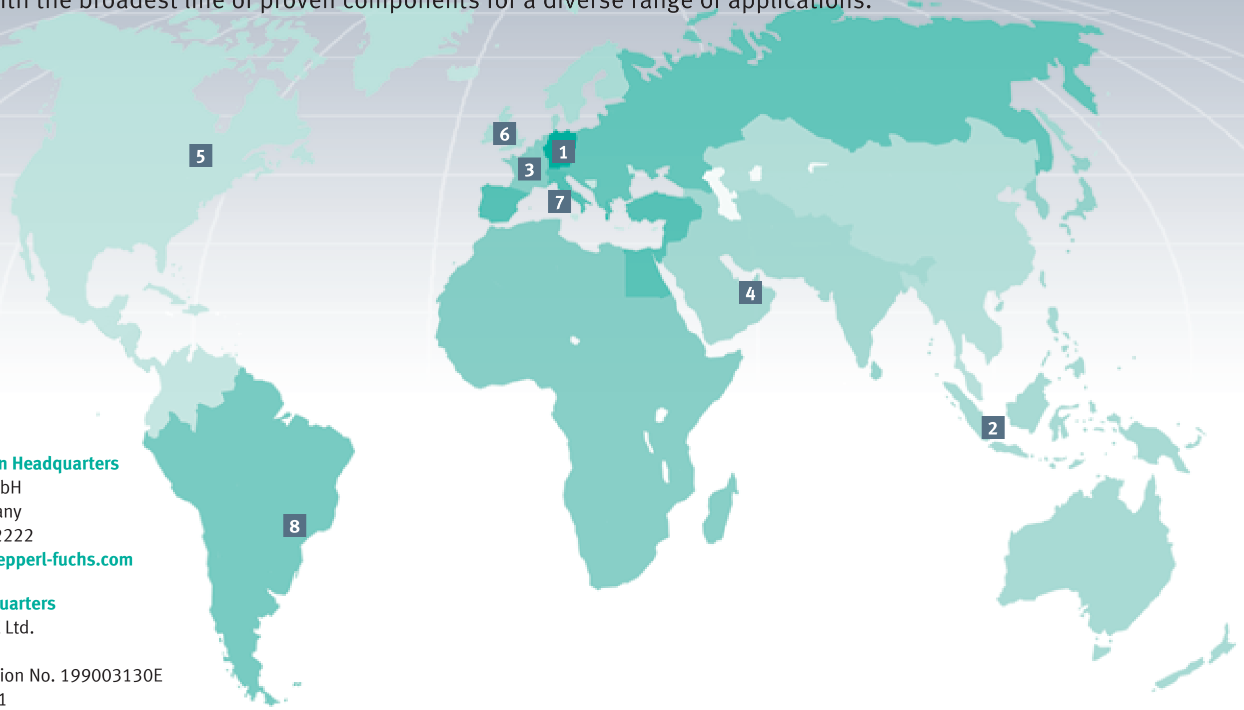

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