TURCK

FIELDBUS SYSTEMS

sensoplex® 2

sensoplex® 2 Ex

bus stop®

Your fieldbus connection

F 038/07

***Interlink*BT – a BANNER-TURCK Company for Bus Products**

*Interlink*BT was founded by the companies **TURCK** and **BANNER** and combines the experience and know-how of these two pioneers in the field of industrial automation, resulting in one of the most complete and diversified lines of bus products.
The range of products comprises stations, junctions and connection products for all customary industrial fieldbus systems.

***Interlink*BT** is the distributor for the American market.

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sensoplex® 2 – Overview

The Fieldbus System for Factory Automation

In the industrial automation segment, field bus systems are used in industrial manufacturing to cope with increasing competitive pressures and for cost effectiveness. Here too, like in most automated processes, the automotive industry has been a pioneer to new technologies.

Time consuming tool changes and maintenance in more and more complex manufacturing tools are creating wiring nightmares. The conventional connection methods such as hardwiring of hundreds and hundreds of sensors and actuators, one by one, are generating a lot of down-time on the tools (cables break frequently in the first 50 cm). Because these methods are costly and result in delay and disruption, the automotive industry has been searching for a more progressive solution.

Efforts were made to replace the conventional connection methods (point to point wiring) between sensors and actuators with a new alternative by bundling them together in the main control cubicles. This new wiring system consisted of:

- main cabinets on the platform
- auxiliary cabinet boxes on the tools
- plug-in subdistribution boards (junction boxes) on the tools

Although this system did reduce maintenance times, it also proved to be extremely time consuming and expensive (see figure 1).

The next step came logically: A rugged, industrial fieldbus was needed to adjust more flexibly to the prevailing methods and at the same time keep wiring and installation during tooling changes, retrofitting and for new installations cost effective.

For this task, namely the direct field connection of the sensor/actuator level, TURCK developed in 1987 the master-slave fieldbus system *sensoplex*® as a new alternative for networking sensors and actuators with various controls.
Since then, the user friendly and practical approach of the *sensoplex*® remote I/O system has been utilized in numerous applications and is the "fieldbus system" of choice for machine integrated installations.

Not only end users were able to benefit from these advantages; many first time users have jumped on the bus to increase their competitiveness, to lower first time installation costs, and to reduce ever rising general costs.

Meeting User Requirements

sensoplex® removes system limitations for the user by providing all the prerequisites for the use of fieldbusses in machine engineering and production system planning:

1. Connection to the PLC Without Additional Software

The main stations have direct access to the PLC bus structure, they are engineered and developed in conjunction with major control manufacturers (and approved by them). Because of the PLC specific interface of the master stations, no additional software is required and the user can operate with the original programming. In addition, he can benefit from the full support of the PLC manufacturer because no "foreign cards" are used in the PLCs. One master station can have up to 32 substations connected and its modular configuration matches all kinds of different requirements.

2. Sturdy Substations – Suitable for Direct Mounting on the Machine

The substations are compact I/O stations made of die-cast aluminium or stainless steel housings, Protection Class IP67. They can be mounted directly on the machine. Up to 8 sensors or actuators can be linked to each substation.

3. Peripheral Interface - Made Possible Through Simple and Safe Connections

All system components are connected with standard M12 x 1 connectors, so they are easy to install and ensure safe connections.

4. Data Transmission - Reliable - Fast Response Times

To transfer the huge amount of data generated and to provide power supply to the input substations, point-to-point connections between the stations are made by means of a coaxial cable with 75 Ω surge impedance, providing maximum data security against external influences, very low interference susceptibility, and a high data transfer rate.
To eliminate possible transmission errors, s*ensoplex*® operates with the FSK (frequency shift keying) method that provides additional data security through exclusive OR monitoring and time integration.

These safety measures are vital for all devices that reside at the lowest level of the bus hierarchy, where 100% of the data must be available all the time to satisfy the time critical processes of this level.

Depending on the system configuration, *sensoplex*® operates at a response time of max. 5 ms. which meets the requirements for real time processing.

5. Power Supply to Substations - Without Any Additional Wiring

All substations as well as all connected sensors and small loads are powered by the coaxial cable which is also used for data interchange. This eliminates the need for many additional supply cables.

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6. Retrofitting & Expansion – Without Additional Software

Compared to bus systems in ring topology, with *sensoplex*® it is always possible to increase or decrease the number of substations within the network processes without any additional software. The address of each single station is not determined by its physical location - each station is identified by an address programmed by the user with DIP-switches located on the stations itself. This is of special advantage in systems expansions or updates.

7. Implemented System Diagnostics - For Fast "On The Spot" Error Detection

Because of the high mechanical stress on the lowest field level where all sensors, actuators, substations, etc. reside, external faults can occur such as a break in the coaxial cable due to a mechanical disturbance. Therefore, the user has to have a system that allows possible errors to be detected immediately "on the spot" and eliminated through easy replacement of the connected field devices.
sensoplex® provides the following standard diagnostics:

- bus cable malfunction (wire-break/short-circuit)
- configuration error
- wire-break/short-circuit in the sensor/actuator bus
- non reporting substation

sensoplex® Bus Systems – for Limitless Applications

sensoplex® is available in the following versions for a variety of industrial applications:

- ***sensoplex®2***
  The multifunctional bus system for a broad spectrum of applications

- ***sensoplex®2 Ex***
  The intrinsically safe bus system

sensoplex®2 Ex, the intrinsically safe system for use in potentially hazardous areas was developed upon suggestions from large users in the chemical and petrochemical industry after their positive experiences with the standard *sensoplex*®. The intrinsically safe ***sensoplex®2 Ex*** has brought lasting improvements and great cost advantages to the a. m. industry:

Standard Class I intrinsically safe field devices can be directly connected to the bus stations, without any additional safety measures (such as explosion-proof enclosures), thus reducing installation costs to an absolute minimum because there is no need to install the main cabinets into expensive enclosures.
Obviously, ***sensoplex®2 Ex*** offers the same advantages as the basic *sensoplex®2* system.

sensoplex®2 is the natural extension of the *sensoplex*® system. The principal characteristics of the basic system (pages 4 + 5, points 1…7) are the same, but its functionality has been extended thus offering more opportunities such as:

1. Master station with PROFIBUS interface, allowing the user to communicate with different-brand PLCs with a PROFIBUS Master interface.

   Depending on the type used, up to 64 substations can be connected to one of the new master stations. Also, these new master stations can easily be added to already existing installations without reconfiguring the entire system. Their advantage include extended system diagnostics and increased address capabilities.

2. Substations in various configurations, such as:

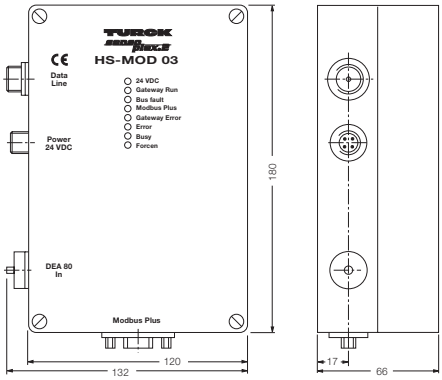
   … Die-cast aluminium housings with Protection Class IP67 with four, six and eight channels. The four channel substations make *sensoplex®2* easier to apply for material handling applications where sensors and actuators are widely distributed.

   … 8 channel terminal versions with Protection Class IP20 for direct mounting in main cabinets (and operator control terminals in the field).

Important Hints Regarding the Compatibility of the Bus Systems:

1. With a few exceptions (see the respective references in the specific sections), all *sensoplex*® components can operate with *sensoplex®2* master stations. That means that additional new components can be added at any time to a *sensoplex*® system that has a *sensoplex®2* master station.
2. *sensoplex®2* substations work only in connection with *sensoplex®2* master stations.

sensoplex®2 – Master Stations



Design and Functions

The *sensoplex®* master station consists of these three primary components:

- The *sensoplex®* master board which conducts continuous cyclic polls of all substations; each master station has the same identical master board.
- Dual Port-Memory (DPM) for data interchange between the PLC and Master.
- PLC specific interface card for communication between the PLC and the master station; this is typically a standard card of the specific manufacturer (for instance the Siemens IM318/IM318M).

Together, the above components make the best possible interface to the specific operative controls and eliminate the need for any special synchronization methods.

Such an arrangement provides **significant advantages** for the user:

- Regardless of what PLC is used, *sensoplex®* always performs in the same manner.
- Communication with the substations occurs according to the standard digital I/O processing level.
- For the most part, the existing PLC specific user program can be used.
- The warranties provided by the PLC manufacturers remain fully effective.

Moreover, the *sensoplex®* system also offers extended system diagnostics:

Example: Normally, an alarm condition or a malfunction such as a short-circuit or wire break in a PLC input card would generate a number of measurements to identify the fault location. All interface terminals would have to be undone to find the source of the fault. - Not so with *sensoplex®.* The *sensoplex®* master can rapidly identify the exact location of the source of the problem.

Therefore:

- No additional measurements - simply replace the defective part (sensor or prewired cable).
- Installation times reduced to a minimum.

Additionally, the master stations are also used as **central power supply** for all connected components; 24 VDC, max. 4 A can be supplied via a M12 x 1 connector, thereby supplying the necessary power to all substations and connected sensors.

The *sensoplex®Ex* system also supplies power via the bus to all connected actuators.

Another remarkable characteristic of the *sensoplex®* system is the **system start-up**.

The *sensoplex®2* master automatically scans the existing configuration to verify whether it is identical to what the user has programmed and checks if the entire system is properly connected right down to the terminating resistor.

At every system start-up (power supply OFF/ON or RESET), all data memory of the master station is cleared and reset to 0. The master station then checks the entire coaxial cable for short-circuit or wire-break as well as the data line terminating resistor and all the connected stations.
If a fault is detected during the first check, the master station will interrupt the restart (indicated by an error LED on the master station). Any malfunctions within the system and the error location, for instance in case of bus errors, is indicated via the handheld diagnostic monitor which identifies the location of the malfunction (wire-break or short-circuit) in the bus segment.

This improved diagnostic function of the master station greatly simplifies fault detection and system restart.

This check procedure makes short transmission/response times of the system possible and allows functional testing of all units to see whether the system configuration is correct.

Configuration

Because of the different address possibilities, a configuration cycle is performed by the master station at system start-up. The master station can execute that in several different ways:

The configuration cycle is initiated by activating the respective function key (accessible after opening the cover) followed by switching the power supply ON. If the supply voltage is already turned ON, a cold start must be effected with the activated function key by pressing RESET.

At each additional start-up, the master station compares the actual status of the system with the memory configuration. For different applications that involve tooling/device changes, up to eight different system configurations can be stored.

The following configuration cycles are possible:

- Auto key: automatic addressing.
- Load key: address allocation via internal assignment EEPROM (part of master station). If a memory card is plugged in, its content is first written to the EEPROM. Then the addresses are assigned.
- Save key: determines the bus configuration at the moment, saves this configuration into the EEPROM, and if available, into the memory card.

sensoplex®*2* – Master Stations

Type	**HS-S5 04**	**HS-DN 03/04**	**HS-MOD 03**	**HS-MB 03/04**
Ident-No.	68 901 12	68 901 35/ 68 901 36	68 901 30	68 0901 19/ 68 0901 20
Type of interface	PROFIBUS-DP	DeviceNet™	Modbus Plus	Modbus RS232 / RS485
Master stations (HS) per PLC	122	63	32	1/32
Input stations (ES) per master (HS)	32	8/32	32	32
Output stations (AS) per master (HS)	32	8/32	32	32
Input stations/output stations (ES/AS) per master (HS)	64	8/64	64	64
I/O points per PLC	62 464	4 032/32 256	16 384	512/16384
Cycle time each ES/AS	150 µs	150 µs	150 µs	150 µs
Housing description	modular	modular	modular	modular
Dimensions (w x h x d)	120 x 180 x 66	120 x 180 x 66	120 x 180 x 66	120 x 180 x 66
Housing material	die-cast aluminium, black, with epoxy resin powder coating	die-cast aluminium, black, with epoxy resin powder coating	die-cast aluminium, black, with epoxy resin powder coating	die-cast aluminium, black, with epoxy resin powder coating
Degree of protection IEC 60529/EN 60925 (DIN 40050-9)	IP65	IP65	IP65	IP65
Operating temperature	0...60 °C	0...60 °C	0...60 °C	0...60 °C
Display/diagnostics	LEDs/hand-held	LEDs/hand-held	LEDs/hand-held	LEDs/hand-held
Operating voltage	24 VDC ± 10 % including ripple	24 VDC ± 10 % including ripple	24 VDC ± 10 % including ripple	24 VDC ± 10 % including ripple
Output current	≤ 4 A	≤ 4 A	≤ 4 A	≤ 4 A
Signal attenuation	≤ 15 dB	≤ 15 dB	≤ 15 dB	≤ 15 dB
Isolation	yes	yes	yes	yes
Accessories	9 pole Sub-D Sinec L2-DP cabel	5 pole 7/8" connector	Modbus Plus connector	9 pole Sub-D

sensoplex®2 – Input/Output stations

Substations for the *sensoplex®* system are separate modules for either input or output functions.

- Input stations:
  ES 40, ES 80, ES 82, ESM 80, ESK 80
- Output stations:
  AS 40, AS 80, ASK 80

Mechanical Characteristics

Plug-in substations with M12 x 1 connectors are designed to meet protection class IP67.
They are:
- shock resistant
- impervious to dust, moisture or foreign material
- they offer protection against the immersion in water for 30 minutes at 1 meter (IEC 60529/EN 60529)

They are rated for an operating temperature from -25...+70 °C.

The terminal versions are rated for Protection Class IP20 and are suitable for mounting into control cabinets. They can be used at an operating temperature of 0...60 °C.

Electrical Characteristics

Power (24 VDC) is supplied to all bus components and connected sensors via the coaxial cable. The common of the system is on the external conductor (shield) of the coaxial cable and therefore on the coaxial plugs also. For safety during maintenance and operation, make sure that the entire system is isolated from earth.

The coax receptacles are isolated from the housing of the *sensoplex®* substations, so they can be installed anywhere in the system. To guarantee faultfree operation, a check of isolation between the inner and outer conductor, and of isolation from earth of all coax cables before system start-up is required.

Attenuation

The throughput attenuation of one substation is 0.3 dB. The maximum attenuation of the whole system is 15 dB for each master station, including all components and coaxial cables. If this value is higher, or if the data line distance is greater than 300 m, an amplifier must be installed (see section "Accessories"). The system will not work properly if the attenuation values are too high.

Input Stations

Input stations are used to receive binary signals from the field. Input data is scanned by the master station in a cyclic manner. For proper functioning, each input station must be assigned to a specific address.

Each input station accommodates up to 8 sensors.
- Power supply via the coaxial bus.
- Total current consumption ≤ 150 mA.
- Supply voltage: 10...30 VDC.

The inputs accept current sourcing signals from:
- 3-wire pnp sensors
- 2-wire DC sensors
- dry contacts

The connections are made either with M12 x 1 connectors, or with screw terminals.

The following function parameters of the input stations can be set either automatically or via DIP-switches:
- switching output
  (either 3- or 2 wire DC sensors)
- input delay time

Versions with terminal clamps are used to send binary signals to the coaxial bus via the mother board ESM 80. They are connected by ribbon cables.

Output Stations

The output stations supply binary process signals to the connected loads (actuators). The data received from the master station is retained in the output area of the output station.
Power supply for the output stations is provided through an additional connector. If a power failure occurs, all output circuits are set to 0 (turned off) until new data is transmitted.
Various types of output devices can be connected to each output station.
These include:
- valves
- relays
- indicators

The specifications for all output devices are:
- Operating voltage: 18...30 VDC
- The output current per channel is 0.5 A for all versions.

Each output station has separate, programmable functions that can be set either automatically or via DIP-switches:
- Switching status of outputs
- Double scanning

I/O Allocation

I/O allocation addressing is done manually with built-in DIP-switches or automatically during system start-up (built-in EEPROM - *sensoplex®2* substations only). It is important to make sure that there is only one address in the system for each station (automatic response check with *sensoplex®2*)

Diagnostics

All substations are equipped with status and diagnostic LEDs. These make diagnostics and monitoring during start-up and operation of the system possible (check for wire-break or short-circuit).
In addition, system diagnostics can also be done via the hand-held monitor, DEA 80 for *sensoplex®2* only.

Important:
sensoplex®2 substations work only in connection with *sensoplex®2* master stations!

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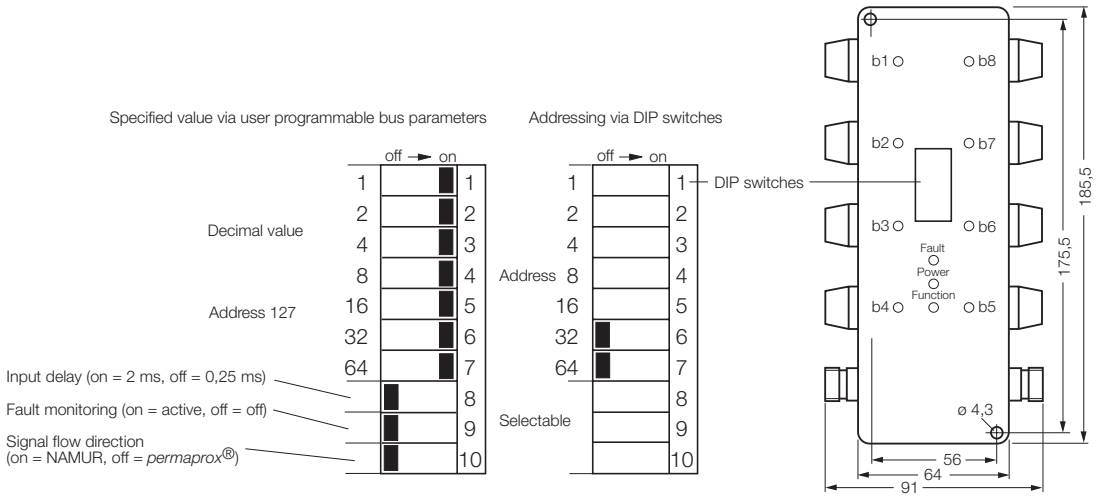
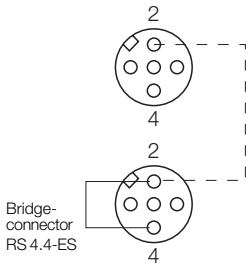
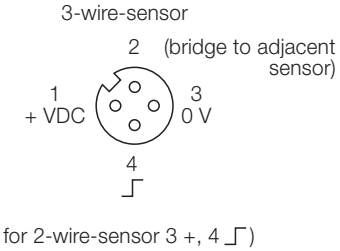
Programming and parameterisation of the ES8...



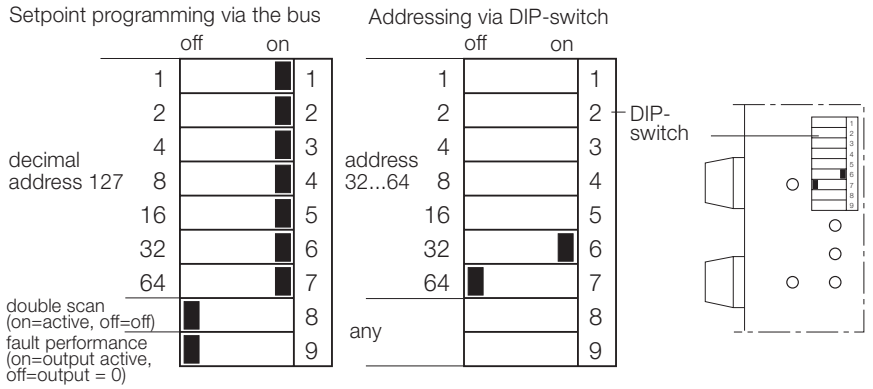
Important:

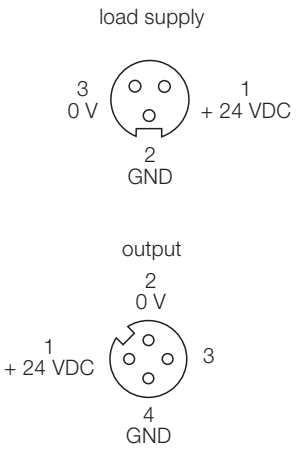
Pins 2 of two adjacent couplings (1/2;3/4;5/6;7/8) are linked internally, see fig.



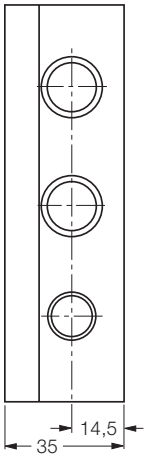


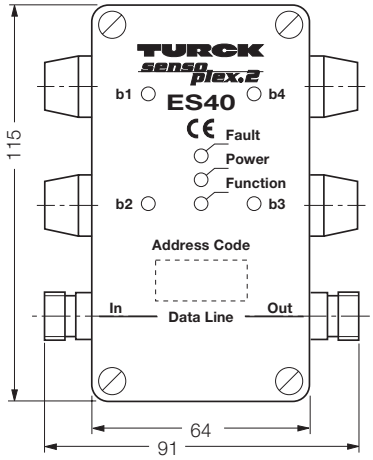
Programming and parameterisation of the AS8...

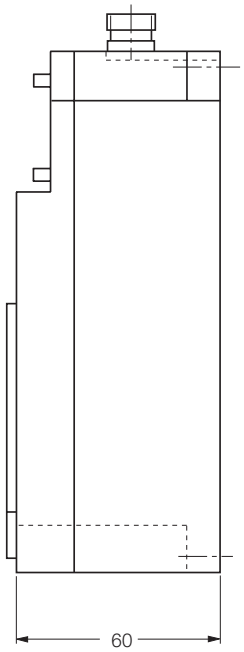


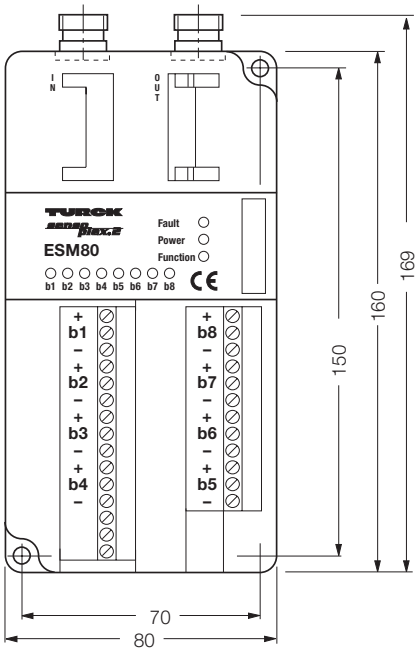


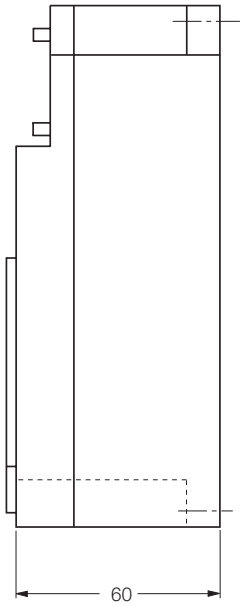
Dimensions – Input Station

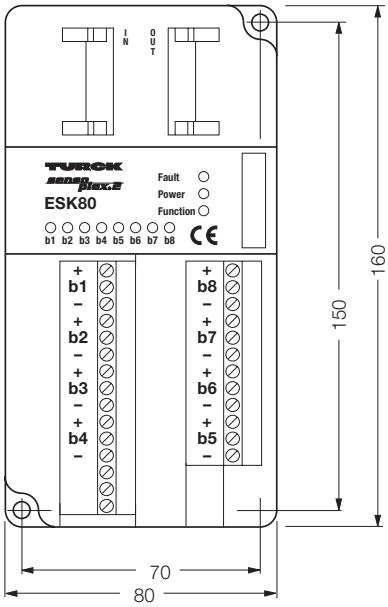












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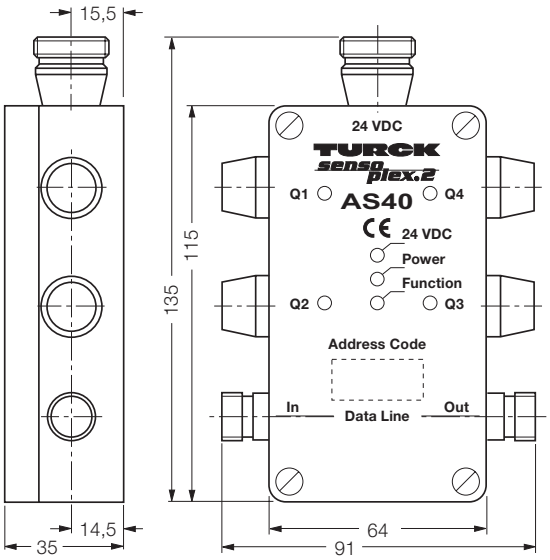
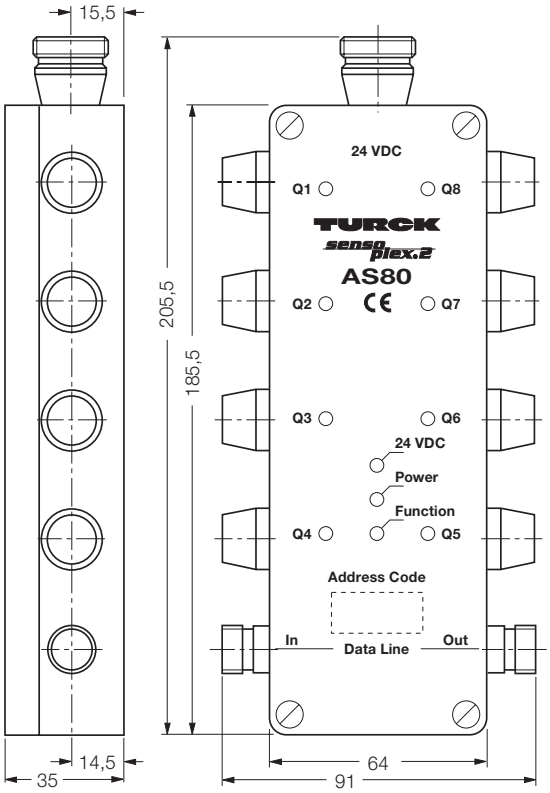
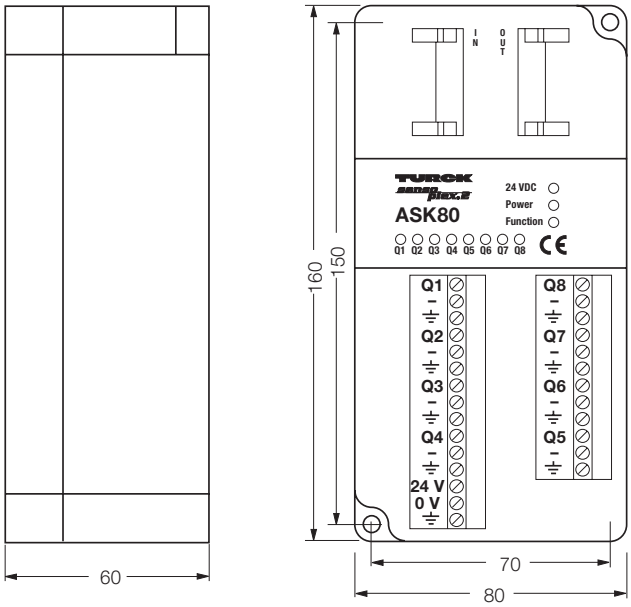
Dimensions – Output Station







sensoplex®2 – Input Stations

Type	**ES 40**	**ES 80/82**	**ESM 80**	**ESK 80**
Ident-No.	68 902 04	68 902 08 / 68 902 11	68 902 01	68 902 03
Housing material	die-cast aluminium, black, with epoxy resin powder coating	die-cast aluminium, black, with epoxy resin powder coating	ABS plastic	ABS plastic
Dimensions (w x h x d)	64 x 115 x 35	64 x 185 x 35	80 x 160 x 60	80 x 160 x 60
Protection class (IEC 60529/EN 60529)	IP67	IP67	IP20	IP20
Mounting	via two through-holes	via two through-holes	via two through-holes, DIN rail	via two through-holes, DIN rail
Operating temperature	-25...+70 °C	-25...+70 °C	0...+60 °C	0...+60 °C
Input circuits	4	8	8	8
Supply voltage	12...30 VDC (via coaxial cable)	12...30 VDC (via coaxial cable)	12...30 VDC (via coaxial cable)	12...30 VDC (ribbon cable)
Load circuits	–	–	–	–
Power/Current consumption	≤ 50 mA	≤ 50 mA	≤ 50 mA	≤ 50 mA
Inputs	4 sensors or mechanical contacts, pnp, 24 VDC	8 sensors or mechanical contacts, pnp, 24 VDC	8 sensors or mechanical contacts, pnp, 24 VDC	8 sensors or mechanical contacts, pnp, 24 VDC
– Supply voltage	10...30 VDC	10...30 VDC	10...30 VDC	10...30 VDC
– Current consumption	≤ 150 mA	≤ 150 mA / 200 mA	≤ 150 mA	≤ 150 mA
– Switching frequency	≤ 500 Hz	≤ 500 Hz	≤ 500 Hz	≤ 500 Hz
Short-circuit protection	electronic	electronic	electronic	electronic
Signal isolation	–	–	–	–
Adjustments and address selection	DIP-switch	DIP-switch	DIP-switch	DIP-switch
Parameter assignment	EEPROM	EEPROM	EEPROM	EEPROM
Signal attenuation	0.2 dB	0.2 dB	0.2 dB	–
Connections:				
– Data line	coaxial plug	coaxial plug	coaxial ribbon cable,	ribbon cable,
– Inputs/outputs	M12 x 1	M12 x 1	screw terminal	screw terminal
– Current supply	–	–	–	–
Diagnostics	LEDs, hand-held DEA 80	LEDs, hand-held DEA 80	LEDs, hand-held DEA 80	LEDs, hand-held DEA 80
Alarm indication for malfunctions, short-circuits and wire-break	both	both	both	both

sensoplex®2 – Output Stations

Type	**AS 40**	**AS 80**	**ASK 80**	
Ident-No.	68 903 04	68 903 08	68 903 03	
Housing material	die-cast aluminium, black, with epoxy resin powder coating	die-cast aluminium, black, with epoxy resin powder coating	ABS plastic	
Dimensions (w x h x d)	64 x 115 x 35	64 x 185 x 35	80 x 160 x 60	
Protection class	IP67	IP67	IP20	
(IEC 60529/EN 60529)				
Mounting	via two	via two	via two	
	through-holes	through-holes	through-holes,	
			DIN rail	
Operating temperature	-25...+70 °C	-25...+70 °C	0...+60 °C	
Input circuits	4	8	8	
Supply voltage	12...30 VDC	12...30 VDC	12...30 VDC	
	(via coaxial cable)	(via coaxial cable)	(ribbon cable)	
Load circuits	18...30 VDC	18...30 VDC	18...30 VDC	
Power/Current consumption	≤ 50 mA	≤ 50 mA	≤ 50 mA	
Outputs	4 actuators,	8 actuators,	8 actuators,	
	24 VDC, 0.5 A	24 VDC, 0.5 A	24 VDC, 1.6 A	
– Output voltage	18...30 VDC	18...30 VDC	18...30 VDC	
– Output current	0.5 A/100 % ED	0.5 A/100 % ED	1.6 A/100 % ED	
– Switching frequency	100 Hz	100 Hz	100 Hz	
Short-circuit protection	electronic	electronic	electronic	
reset	power off/	power off/	power off/	
	disconnecting load	disconnecting load	disconnecting load	
Signal isolation	between supply voltage,	between supply voltage,	between supply voltage,	
	outputs and coaxial	outputs and coaxial	outputs and coaxial	
	cable	cable	cable	
Adjustments	DIP-switch	DIP-switch	DIP-switch	
Parameter assignment	EEPROM	EEPROM	EEPROM	
Signal attenuation	0.2 dB	0.2 dB	–	
Connections:				
– Data line	coaxial plug	coaxial plug	coaxial ribbon	
– Inputs/outputs	M12 x 1	M12 x 1	screw terminal	
– Current supply	M12 x 1	M12 x 1	screw terminal	
Diagnostics	LEDs	LEDs	LEDs	
	hand-held DEA 80	hand-held DEA 80	hand-held DEA 80	
Alarm indication for malfunctions,	short-circuit	short-circuit	short-circuit	
short-circuits and wire-break				

sensoplex®2 Ex – Overview

Fieldbus systems have played an important role in industry for some time now. Most industrial applications which require complex interconnection are realized with bus systems because they offer simple and error-free installation, quick diagnostics and savings in material and installation times.

TURCK has been one of the first manufacturers of bus systems for industrial applications.Today TURCK offers *busstop®* solutions for the entire spectrum of automation, whether you want to integrate binary sensors and actuators into a bus system or plan to network intelligent field devices.

The bus system *sensoplex®2 Ex* is specially designed for installation in hazardous areas. This intrinsically safe bus system is the natural extension of the bus system *sensoplex®* which is widely used in body and assembly lines in the automotive industry as well as in many different and demanding industrial environments.

Having been developed for such demanding applications, the main system characteristics also meet the high requirements of the chemical industry in regards to data security, EMC, RFI etc.

Bus system *sensoplex®2 Ex* system characteristics:

- deterministic master/slave system for intrinsically safe applications
- high noise immunity
- short reaction cycles < 5 ms
- degree of protection IP67
- all components pluggable
- data and power supply via one cable (coaxial cable) - no additional power supply for peripheral components necessary
- I/O-modules can be mounted directly in the hazardous area without additional protective measures.

Bus system *sensoplex®2 Ex* – system configuration

sensoplex®2 was developed for standard applications and is based on the first generation *sensoplex®* system. *sensoplex®2 Ex* offers the extended scope of operations provided by the *sensoplex®2* system including a variety of modules, improved diagnostic features, a comprehensive range of functions and extended cable lengths.

The system configuration of *sensoplex®2 Ex* is shown in Fig. 1 (see page 15).

All *sensoplex®* components are compatible with *sensoplex®2*, i.e. all *sensoplex®* devices apart from the master can be used in *sensoplex®2* installations. The main features of the *sensoplex®2 Ex* master are:

- „force“ functions
- automatic addressing
- wire-break and short-circuit monitoring of the bus line including error localisation
- extended address area (depending on the control system)

The intrinsically safe junction box VB 14-Ex separates the non-intrinsically safe bus line from the intrinsically safe bus line. The non-intrinsically safe bus line is separated into four intrinsically safe branches. Each branch provides connection for up to 8 substations amounting to a total of 32 stations without additional I.S. safety measures.

8-channel I/O modules for binary sensors and actuators are available.
Up to 256 I/O points can be connected via one VB 14-Ex/CS in the hazardous area.

The terminal version, featuring degree of protection IP20, is suitable for use in cabinets. For direct mounting on the machine, the plug-in version, degree of protection IP67, is recommended.

Sensors according to EN 60947-5-6 (NAMUR) or volt-free contacts can be connected to the input stations. The outputs are designed for connection of low-power loads.

The optimised electronics allow for cable lengths of up to 250 m per branch even with a fully configured system.

sensoplex®2 Ex – System configuration

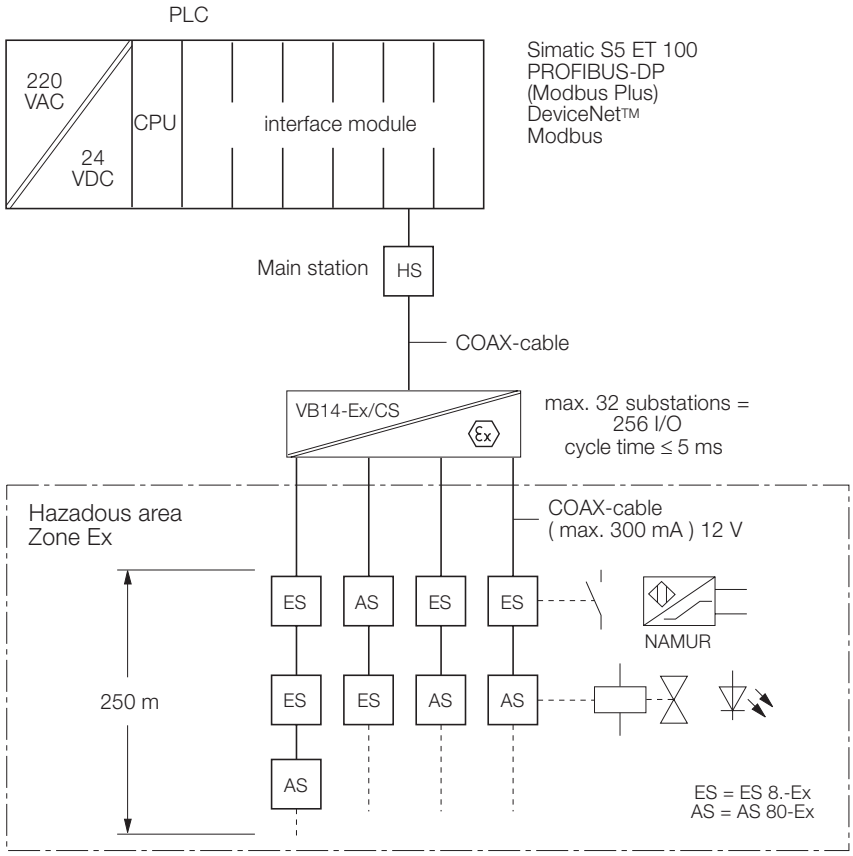
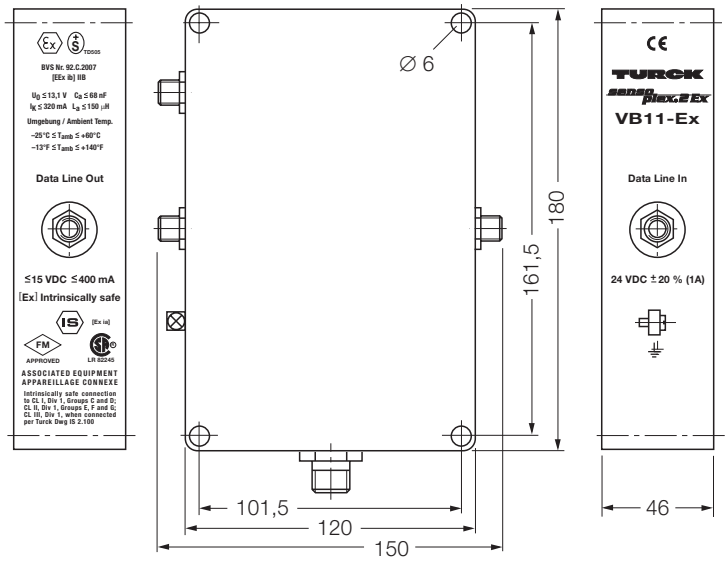


Fig. 1 System configuration bus system *sensoplex®2 Ex*

sensoplex®2 Ex – Intrinsically safe junction boxes

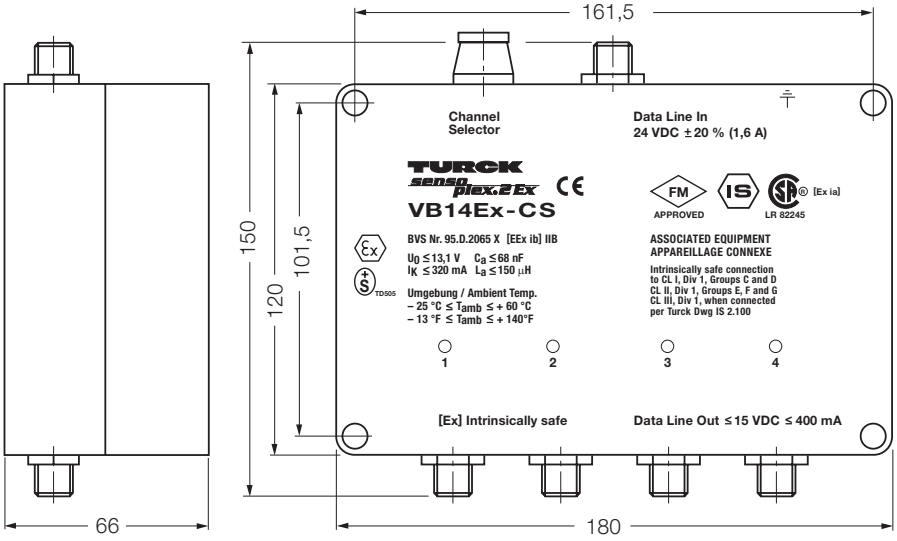
- **1- or 4-channel junction boxes for separation of the coax-bus into one or four intrinsically safe branches**
- **Die-cast aluminium housing, degree of protection IP67**
- **1 up to 4 intrinsically safe outputs [EEx ib] IIB**
- **Intrinsically safe bus lines switched individually**



Intrinsically safe junction box VB 11-Ex

The intrinsically safe VB 11-Ex serves for current- and voltage reduction on the coax-bus branch to provide an intrinsically safe bus line.
The intrinsically safe junction-box is an associated apparatus and must be installed in the safe area.

The max. cable lenght off the intrinsically safe bus line is limited to 250 m. Up to eight 8-channel substations can be connected to the intrinsically safe bus line.



Intrinsically safe junction-box VB 14-Ex/CS

The junction-box VB 14-Ex/CS separates the coax-bus into four intrinsically safe coax-bus branches for installation in the hazardous area. The intrinsically safe junction-box is an associated apparatus and must be installed in the safe area.

The intrinsically safe junction-box VB 14-Ex/CS provides full *sensoplex®2* functionality including automatic addressing of the substations, error localisation on the coaxial-bus and bus operations such as parameterisation, configuration and forcing via the handheld DEA 80 (see page 28) test and service unit.
The max. length of the coax-cable in the hazardous area is 250 m when the system is fully configured with 8 substations per branch. If 8-channel *sensoplex®2 Ex* substations (input stations ES 8.-Ex and output station AS 80-Ex) are used, a maximum of 256 signals can be collected by each intrinsically safe junction-box VB 14-Ex/CS.

To provide the full range of the *sensoplex®2* functions, 8-channel substations must be used. Complete compatibility to the *sensoplex®*-system enables 8-channel *sensoplex®2 Ex* substations. The LEDs assigned to the according outputs ensure voltage supply monitoring. Each branch can optionally be switched individually by means of the channel-selector (5-pole-M12 x 1 connector).

The last *sensoplex®2 Ex*-substation of each branch must be equipped with the smart terminating resistor **KOAX-75/671-Ex**.

Unused outputs of the intrinsically safe junction-box VB 14-Ex/CS should be terminated with the *sensoplex® 2Ex*-**KOAX-75/67-Ex**.

For correct system set-up, it is essential to configure the number of the installed smart terminating resistors **KOAX-75/671-Ex** via the DIP-switch at the *sensoplex®2* main station.

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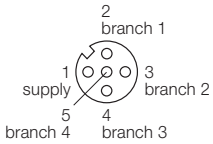
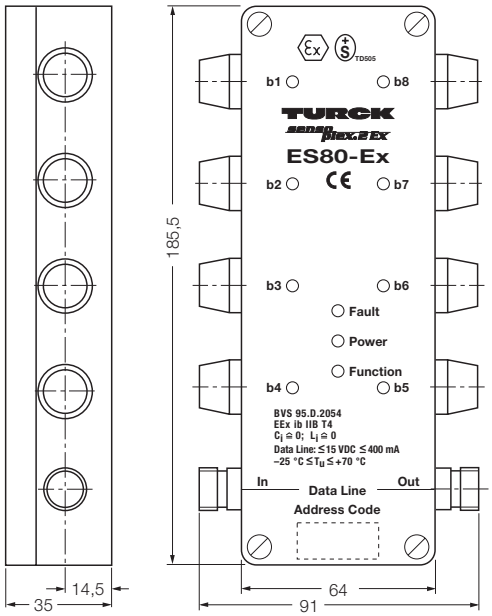
sensoplex®2 Ex – Intrinsically safe junction boxes

Type Ident-No.	**VB 11-Ex** 68 831 11		**VB 14-Ex/CS** 68 904 18	
Pin Connection seen from the view of the contacts			channel selector  	
Specification	1-channel intrinsically safe junction-box		4-channel intrinsically safe junction-box	
Bus	*sensoplex®2*		*sensoplex®2*	
Operating voltage U_B	24 VDC ± 15%		24 VDC ± 15%	
	via coaxial cable		via coaxial cable	
Current- /total current consumption	–		–	
Output Data (operation values)	1 intrinsically safe output		4 intrinsically safe outputs	
Output voltage	12 VDC		12 VDC	
Output current per channel	300 mA		300 mA	
Throughput attenuation	1 dB		8 dB	
Decoupling of outputs	–		30 dB	
Short-circuit protection per channel	electronic		electronic	
Short-circuit threshold per channel	320 mA		320 mA	
Hazardous Area Approvals (max. values)				
BVS No.	BVS No. 92.C.2007		BVS No. 95.D.2065 X	
Type of protection	[EEx ib] IIB		[EEx ib] IIB	
Open-circuit voltage	13.1 VDC		13.1 VDC	
Short-circuit current	320 mA current limited		320 mA current limited	
External inductivities/capacitances	150 µH / 68 nF		150 µH / 68 nF	
Internal inductivities/capacitances	negligible		negligible	
LED Indications				
Availability of data outputs	–		4 x green	
Mechanical Features				
Housing Material	black die-cast		black die-cast	
	aluminium		aluminium	
	powder coated		powder coated	
Weight	1750 g		1500 g	
Dimensions (w x h x d) [mm]	180 x 120 x 45		180 x 120 x 66	
Degree of protection (IEC 60529/EN 60529)	IP67		IP67	
Temperature rating	-25...+60 °C		-25...+60 °C	
Mounting	4 through-holes		4 through-holes	
Bus connection	coaxial connectors		coaxial connectors	
Channel selector	–		5-pole, M12 x 1	

sensoplex®2 Ex – Input modules

- **8-channel (ES 8.-Ex) input modules**
- **Connection of 8 sensors accord. to EN 60947-5-6 (NAMUR) or volt-free contacts**
- **Die-cast aluminium housing, degree of protection IP67**
- **Protection to EEx ib IIB T4**
- **Input short-circuit and wire-break monitoring**
- **Programming and parameterisation via the bus (int. EEPROM, ES8.-Ex) or integrated DIP-switches**
- **LEDs for status and fault indication**



The input stations ES 8.-Ex are classified for protection type EEx ib IIB T4 and can be mounted directly in the hazardous area without additional I.S. protective measures. The input stations are equipped 8 (ES 8.-Ex) inputs for connection of sensors according to EN 60947-5-6 (NAMUR) or volt-free contacts.

Two sensors or a dual sensor can be connected to the ES 81-Ex or the ES 83-Ex via one connector. For this, always two adjacent connectors are internally linked (for configuration refer to technical data section). If this method is applied, do not use the linked unused connector. For connection of the dual sensor type Ni4-DS20-2Y1X2-H1141 use the cable types RK4.4T...RS4.41T.

The ES 82-Ex provides a supply current of up to 2.5 mA for some types of NAMUR sensors which have increased current requirements but please observe the admissible total current consumption of 300 mA/per branch of a VB 14-Ex/CS.

The sensor circuits are monitored for wire-breakage and short-circuit. Circuit-monitoring can be disabled via the integrated DIP-switches. Should circuit-monitoring be required when volt-free contacts are connected, the standard resistor circuit must be implemented (see page 15). If wire-break and short-circuit monitoring is activated, unused inputs must be equipped with the resistive connector RS4.2-DB (see chapter „Accessories“).

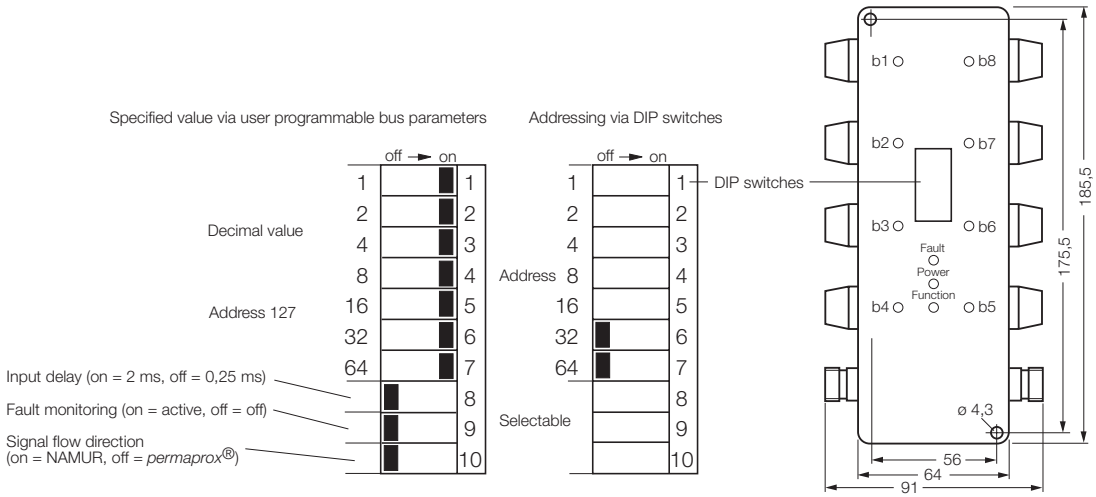
The substation ES 8.-Ex, providing the complete range of *sensoplex®2* functions, must be used in the hazardous area in conjunction with the intrinsically safe *sensoplex®2* junction-box VB 14-Ex/CS.

The LEDs indicate input status, defect stations, missing power supply as well as wire-breakage and short-circuits in the input circuits.

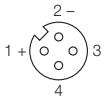
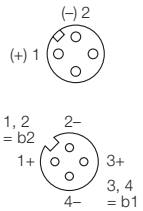
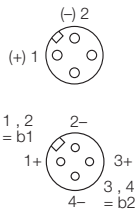
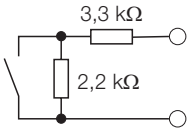
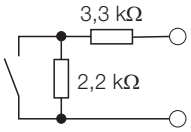
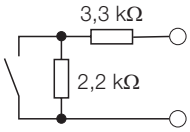
The ES 8.-Ex) can be addressed automatically and its paramters cannot be changed via the bus. Diagnostic features (status indication and force-functions via the handheld) are available.

The DIP-switches for adjusting the addresses and functions are located in the station and are easily accessible after removing the station’s cover.

Programming and parameterisation of the ES 8.-Ex



Pin connection (seen from the view of the contacts)

ES 80/82	ES 81	ES 83
	 b1 b3 b6 b8 PIN 1/2 PIN 3/4 b2 b1 b4 b3 b5 b6 b7 b8	 b2 b4 b6 b8 PIN 1/2 PIN 3/4 b1 b2 b3 b4 b5 b6 b7 b8
resistor circuit for volt-free contacts: 	resistor circuit for volt-free contacts: 	resistor circuit for volt-free contacts: 

sensoplex®2 Ex – Input Modules

Type Ident-No.	**ES 80-Ex** 68 902 09	**ES 81-Ex** 68 902 12
Specification	NAMUR 8-channel input station	NAMUR 8-channel input station
Bus	*sensoplex®*	*sensoplex®*
Operating voltage U_B	9.5...30 VDC [2]	9.5...30 VDC [2]
	via coaxial cable	via coaxial cable
Current-/total current consumption	≤ 36 mA/12 V (all inputs	≤ 36 mA/12 V (all inputs
	short-circuited)	short-circuited)
Input Data (operation values)	for 8 NAMUR inputs	for 8 NAMUR inputs
Switching threshold	1.55 mA	1.55 mA
Hysteresis	0.2 mA	0.2 mA
Voltage	8 V	8 V
Short-circuit /wire-breaking monitoring	per EN 60947-5-6 (NAMUR)	per EN 60947-5-6 (NAMUR)
Current limitation	1.9 mA	1.9 mA
Throughput attenuation	≤ 0.2 dB	≤ 0.2 dB
Hazardous Area Approval (max. values)		
BVS No.	BVS No. 95.D.2054	BVS No. 95.D.2054
Type of protection	EEx ib IIB T4	EEx ib IIB T4
Open-circuit voltage	14.7 V	14.7 V
Short-circuit current	16 mA	16 mA
External inductivities/capacitances	15 mH/2.1 µF	15 mH/2.1 µF
Internal inductivities/capacitances	negligible	negligible
LED-Indications		
Power supply	green	green
Availability (data exchange with the master o.k.)	yellow	yellow
Switching status	8 x yellow	8 x yellow
Fault indication (short-circuit / wire-breakage in the input circuit)	red	red
Mechanical Features/Operating Elements		
Housing material/colour	die-cast aluminium/black, powder coated	die-cast aluminium/black, powder coated
Weight	800 g	800 g
Dimensions (w x h x d) [mm]	64 x 185 x 35	64 x 185 x 35
Degree of protection (IEC 60529/EN 60529)	IP67	IP67
Temperature rating	-25...+70°C	-25...+70°C
Mounting	2 through-holes	2 through-holes
Bus connection	coaxial connector	coaxial connector
Input circuit connection	4-pole M12 x 1	4-pole M12 x 1
Adjustment of addresses and functions	10-pole DIP-switch	10-pole DIP-switch

[1]) ≤ 15 VDC for hazardous area applications via VB 13-Ex/CS [2]) ≤ 15 VDC for hazardous area applications via VB 14-Ex/CS

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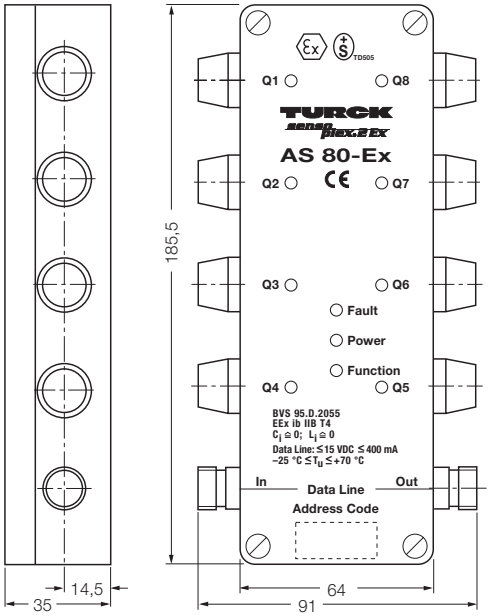
sensoplex®2 Ex – Input Modules

Type Ident-No.	**ES 82-Ex** 68 902 14	**ES 83-Ex** 68 902 16
Specification	NAMUR 8-channel input station	NAMUR 8-channel input station
Bus	*sensoplex®*	*sensoplex®*
Operating voltage U_B	9.5...30 VDC [1]	9.5...30 VDC [2]
	via coaxial cable	via coaxial cable
Current- /total current consumption	≤ 40 mA/12 V (all inputs short-circuited)	≤ 36 mA/12 V (all inputs short-circuited)
Input Data (operation values)	for 8 NAMUR inputs	for 8 NAMUR inputs
Switching threshold	1.55 mA	1.55 mA
Hysteresis	0.2 mA	0.2 mA
Voltage	8 V	8 V
Short-circuit /wire-breaking monitoring	per EN 60947-5-6 (NAMUR)	per EN 60947-5-6 (NAMUR)
Current limitation	2.3 mA	1.9 mA
Throughput attenuation	≤ 0.2 dB	≤ 0.2 dB
Hazardous Area Approval (max. values)		
BVS No.	BVS No. 95.D.2054	BVS No. 95.D.2054
Type of protection	EEx ib IIB T4	EEx ib IIB T4
Open-circuit voltage	14.7 V	14.7 V
Short-circuit current	16 mA	16 mA
External inductivities/capacitances	15 mH/2.1 µF	15 mH/2.1 µF
Internal inductivities/capacitances	negligible	negligible
LED-Indications		
Power supply	green	green
Availability (data exchange with the master o.k.)	yellow	yellow
Switching status	8 x yellow	8 x yellow
Fault indication (short-circuit / wire-breakage in the input circuit)	red	red
Mechanical Features/Operating Elements		
Housing material/colour	die-cast aluminium/black, powder coated	die-cast aluminium/black, powder coated
Weight	800 g	800 g
Dimensions (w x h x d) [mm]	64 x 185 x 35	64 x 185 x 35
Degree of protection (IEC 60529/EN 60529)	IP67	IP67
Temperature rating	-25...+70°C	-25...+70°C
Mounting	2 through-holes	2 through-holes
Bus connection	coaxial connector	coaxial connector
Input circuit connection	4-pole M12 x 1	4-pole M12 x 1
Adjustment of addresses and functions	10-pole DIP-switch	10-pole DIP-switch

[1]) ≤ 15 VDC for hazardous area applications via VB 13-Ex/CS [2]) ≤ 15 VDC for hazardous area applications via VB 14-Ex/CS

sensoplex®2 Ex – Output modules

- **8-channel (AS 80-Ex) output modules**
- **Connection of 8 low load actuators (8 VDC, 2.7 mA)**
- **Die-cast aluminium housing, degree of protection IP67**
- **Protection to EEx ib IIB T4**
- **Short-circuit and wire-break monitoring of the outputs**
- **Programming and parameterisation via the bus (int. EEPROM, AS 80-Ex) or integrated DIP-switch**
- **LEDs for status and fault indication**



The output station AS 80-Ex is classified for protection type EEx ib IIB T4 and can be mounted directly in the hazardous area without additional I.S. safety precautions. The output stationis equipped with 8 outputs (AS 80-Ex) and enable connection of low power consumers (8 VDC, 2.7 mA). Separate voltage supply is not necessary because the whole system is supplied via the coaxial line.

The output station AS 80-Ex providing the complete range of *sensoplex®2* functions (see page 15) must be used in the hazardous area in conjunction with the intrinsically safe *sensoplex®2* junction-box VB 14-Ex/CS.

The output circuits are monitored for wire-breakage and short-circuit. Circuit-monitoring can be disabled via the integrated DIP-switches. Should sensor circuit-monitoring be required when volt-free contacts are connected, the standard resistor circuit must be implemented.
If wire-break and short-circuit monitoring is activated unused inputs must be equipped with the resistive connector RS4.2-DB (see page 36).

The LEDs indicate output status, defect stations, missing power supply as well as wire-breakage and short-circuits in the output circuits.

The AS 80-Ex cant be addressed automatically and its parameters cannot be changed via the bus. Diagnostic features (status indication and force-functions via the handheld) are available. The DIP-switches for adjusting the addresses and functions are located in the station and are easily accessible after removing the station's cover.

Programming and parameterisation of the AS 80-Ex

Specified settings for programming via the bus

		off	on	
decimal value address 127	1		■	1
	2		■	2
	4		■	3
	8		■	4
	16		■	5
	32		■	6
	64		■	7
Double request (on=active, off= de-activ.)		■		8
Output status after bus error (on=output active, off=output=0)		■		9
Wire-break monit. (on=active, off=de-activ.)		■		10

Addressing via DIP-switches

		off	on	
address 32...64	1			1
	2			2
	4			3
	8			4
	16			5
	32		■	6
	64	■		7
unused				8
				9
				10

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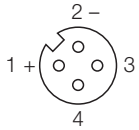
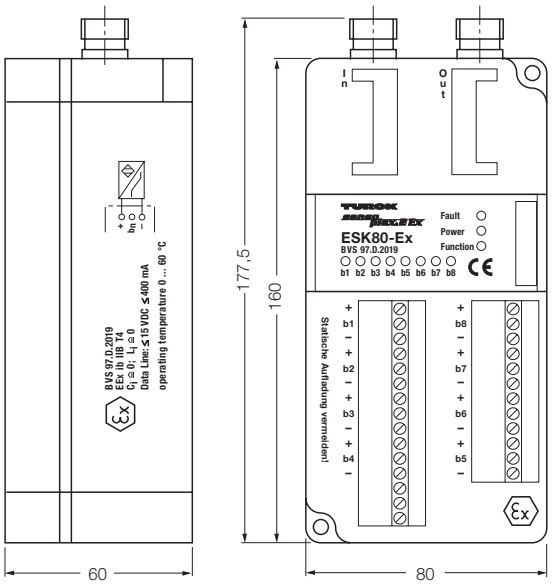
sensoplex®2 Ex – Output Modules

Type Ident-No.	**AS 80-Ex** 68 903 09
Pin connection seen from the view of the contacts	
Specification	8-channel output station for low power consumers
Bus	*sensoplex®2*
Operating voltage U_B	10...30 VDC[2]) via coaxial cable
Current- /total current consumption	≤ 40 mA/12 V (rated load current)
Output data (operation values)	for 8 low power consumers
Output voltage	8 V (I_L = 2.7 mA)
Rated load current	2.7 mA
Short-circuit protection	electr., current limited
Short-circuit threshold	3.5 mA
Wire-break threshold	100 µA
Delay-time (from signal 0 to 1 or 1 to 0)	ca. 100 µs
Throughput attenuation	≤ 0.2 dB
Hazardous Area Approval (max. values)	
BVS No.	BVS No. 95.D.2055
Type of protection	EEx ib IIB T4
open-circuit voltage	14.7 V
Short-circuit current	≤ 20 mA
External inductivities/capacitances	15 mH/2.1 µF
Internal inductivities/capacitances	negligible
LED-Indications	
Operation voltage	green
Availability (data exchange with master o.k.)	yellow
Switching status	8 x yellow
Fault indication (short-circuit/wire-breakage in the output circuit)	red
Mechanical features/Operating elements	black die-cast
Housing material	aluminium powder coated
Weight	800 g
Dimension (w x h x d) [mm]	64 x 150 x 35
Degree of protection (IEC 60529/EN 60529)	IP67
Temperature rating	-25...+70 °C
Mounting	2 through-holes
Bus connection	coaxial connectors
Connection input circuit	4-pole M12 x 1
Adjustment of Addresss and functions	10-pole DIP-switch

[1]) ≤ 15 VDC for hazardous area applications via VB13-Ex/CS [2]) ≤ 15 VDC for hazardous area applications via VB14-Ex/CS

sensoplex®2 Ex – Terminal modules

- **8-channel input-/output modules for cabinet mounting**
- **Connection of 8 sensors according to EN 60947-5-6 (NAMUR) or low power loads (8 VDC, 2.7 mA)**
- **ABS-plastic housing, degree of protection IP20**
- **Protection to EEx ib IIB T4**
- **Input and output monitoring for short-circuit and wire breakage**
- **Programming and parameter adjustment via the bus (int. EEPROM) or integrated DIP-switch**
- **LEDs for status and fault monitoring**



The substations ESK 80-Ex and ASK 80-Ex are classified for protection type EEx ib IIB T4 and can be mounted directly in the hazardous area. The input station ESK 80-Ex enables connection of 8 sensors according to EN 60947-5-6 (NAMUR) or dry contacts.

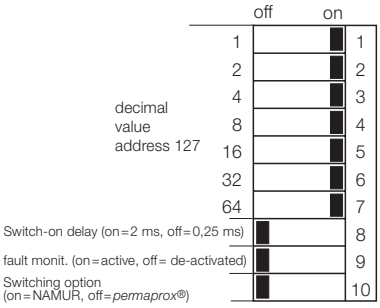
The output station ASK 80-Ex serves for connection of low power loads (8 VDC, 2.7 mA). The signals are transferred via removable screw-terminals so that the stations can be mounted in a cabinet or integrated in an operator desk.

All *sensoplex®2* functions are available, e.g. automatic addressing, error locali-sation on the bus line and bus operations such as parameterisation, configuration and force-functions via the handheld DEA 80 service unit (see page 15).
The input- or output stations are moni-tored for wire-breakage and short-circuit. Monitoring can be de-activated via the DIP-switch in the station or via the bus by means of the handheld. (Input station ESK 80-Ex: monitoring is required with volt-free contacts, a double resistor circuit is required).
The LEDs indicate input or output status, defect stations, missing power supply as well as wire-breakage and short-circuits.

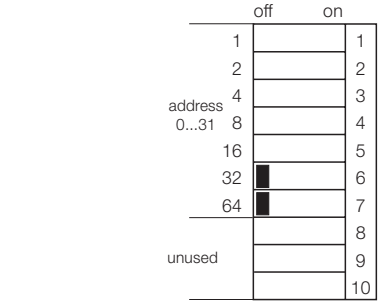
DIP-switches for setting of addresses and functions are located under the display. To provide the full range of the *sensoplex®2* features in the hazardous area the substations can only be used in conjunction with the *sensoplex®2 Ex* junction-box VB 14-Ex/CS.

Programming and parameterisation of the ESK 80-Ex

Specified settings for programming via the bus

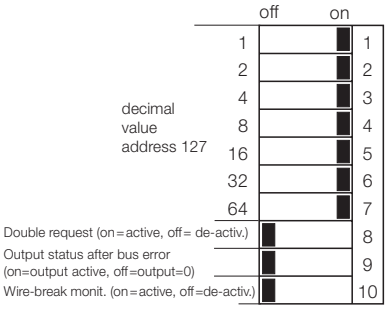


Addressing via DIP-switches

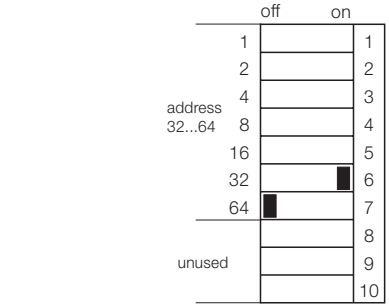


Programming and parameterisation of the ASK 80-Ex

Specified settings for programming via the bus

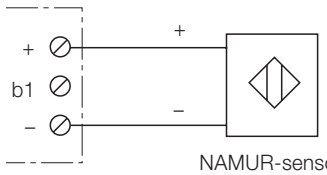
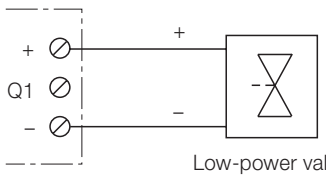


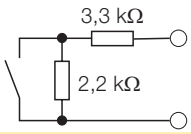
Addressing via DIP-switches



Hans Turck GmbH & Co.KG • D–45466 Mülheim/Ruhr • Tel. 0208/4952-0 • Fax 0208/4952-264 • E-Mail: turckmh@mail.turck-globe.de • www.turck.com

sensoplex®2 Ex – Terminal modules

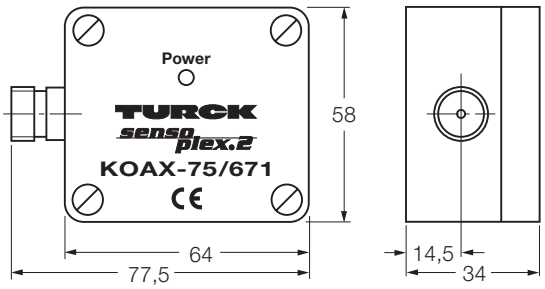
Type Ident-No.	**ESK 80-Ex** 68 902 02		**ASK 80-Ex** 6890302
Pin Connection seen from the view of the contacts	Input circuits  NAMUR-sensor		Output circuits  Low-power valve
Specification	8-channel NAMUR input station		8-channel output station for low-power loads
Bus	*sensoplex®*		*sensoplex®2*
Operating voltage U_B	9.5...30 VDC[1])		9.5...30 VDC[1])
	via coaxial cable		via coaxial cable
Current- /total current consumption	≤ 36 mA/12 V (all inputs		≤ 40 mA/12 V (rated output
	short-circuited)		current)
Input-/output data (operation values)	for 8 NAMUR inputs	resistor circuit for volt-free contacts:	for 8 low power loads
			8 V (I_L = 2.7 mA)
Switching threshold/output voltage	1.55 mA		–
Hysteresis/rated load current	0.2 mA		2.7 mA
Short-circuit/wire-breaking monitoring	per EN 60947-5-6 (NAMUR)		electr., current limited
Current limitation/short-circuit threshold	1.9 mA		3.5 mA
Wire-breakage threshold	–		100 µA
Delay-time (from signal 0 to 1 or from 1 to 0)	–		ca. 100 µs
Throughput attenuation	≤ 0.2 dB		≤ 0.2 dB
Hazardous Area Approval (max. values)			
BVS. No.	BVS No. 97.D.2019		BVS No. 97.D.2019
Type of protection	EEx ib IIB T4		EEx ib IIB T4
Open-circuit voltage	14.3 V		14.7 V
Short-circuit current	15.6 mA		≤ 20 mA
External inductivities/capacitances	15 mH/2.8 µF		15 mH/2.1 µF
Internal inductivities/capacitances	negligible		negligible
LED-Indications			
Supply voltage	green		green
Availability (data exchange with	yellow		yellow
master o.k.)			
Switching status	6 x yellow		8 x yellow
Fault indication (short-circuit /wire-breakage	red		red
in the input circuit)			
Mechanical features/Operating elements			
Housing material	ABS-plastic		ABS-plastic
Weight	350 g		350 g
Dimension (w x h x d) [mm]	80 x 160 x 60		80 x 160 x 60
Degree of protection (IEC 60529/EN 60529)	IP20		IP20
Temperature rating	0...60 °C		0...60 °C
Mounting	2 through-holes		2 through-holes
	or hat-rail mounting		or hat-rail mounting
Bus connection	coaxial connectors		coaxial connectors
Connection of input-/output circuits	4-pole M12 x 1		4-pole M12 x 1
Adjustment of addresses and functions	10-pole DIP-switch		



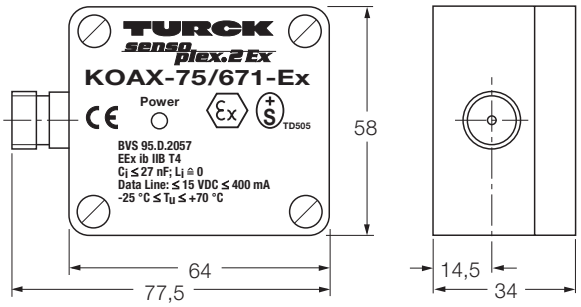
[1]) ≤ 15 VDC for hazardous area applications via VB 14-Ex/CS

Terminating resistors

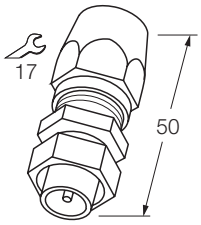
- **Die-cast aluminium housing, with nickel-plated brass connector, degree of protection IP67**
- **Protection to EEx ib IIB T4**
- **75 Ω terminating resistor for the bus systems *sensoplex*® and *sensoplex*®*2***
- **Connection via coaxial connector or plug-in connectors at the substation**
- **LED for bus voltage indication (KOAX-75/671-Ex only)**



KOAX-75/671



KOAX-75/671-Ex



KOAX-75/67-Ex

Terminating resistor

Each *sensoplex*® line must be terminated (at the last substation) with a coaxial terminating resistor.

Incorrectly terminated or open lines will cause signal distortions or standing waves. Only if the lines are terminated with the original terminating resistor standing waves can be avoided.

Unused VB 14-Ex/CS outputs must also be equipped with the terminating resistor KOAX-75/67-Ex.
The treminating resistor is plugged directly into thr unused output

Terminating resistor KOAX-75/671

The smart terminating resistor KOAX-75/671 serves for termination of *sensoplex*®*2 Ex* lines. The terminating resistor is identified by the *sensoplex*®*2* master and so special *sensoplex*®*2* features such as automatic addressing of *sensoplex*®*2* substations are provided.

The resistor is connected via a coaxial cable to the last *sensoplex*® substation in each safe line.

Terminating resistor KOAX-75/671-Ex

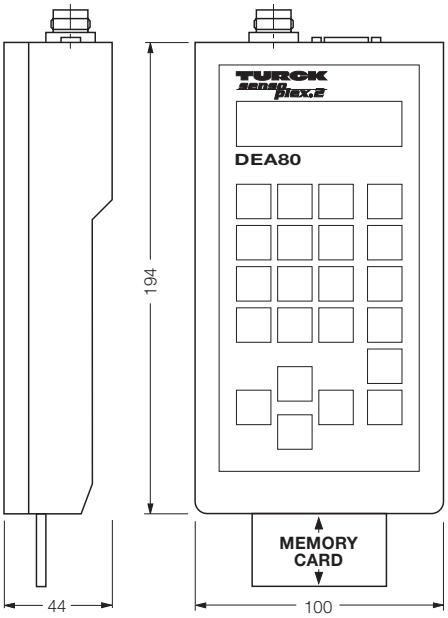
The smart terminating resistor KOAX-75/671-Ex must only be used in conjunction with the *sensoplex*® *Ex* junction-box VB 11-Ex and VB 14-Ex/CS.
To assure *sensoplex*® *2* functionality, a smart terminating resistor KOAX-75/671-Ex must be connected to each of the last stations in the line. This refers to *sensoplex*®2 stations only.

Terminating resistors

Type Ident-No.	**KOAX-75/671** 68 909 20	**KOAX-75/67-Ex** 68 824 02	**KOAX-75/671-Ex** 68 909 19	
Specification	terminating resistor for *sensoplex®2 Ex-* components	Terminating resistor for *sensoplex® Ex-* components	terminating resistor for *sensoplex®2 Ex-* components	
Bus	*sensoplex®2*	*sensoplex®*	*sensoplex®2*	
Operating voltage U_B	10...30 VDC[1]) via coaxial cable	10...30 VDC[1]) via coaxial cable	9.5...15 VDC[2]) via coaxial cable	
Contact rating				
Nominal voltage	–	30 VDC	–	
Plug-in connectors				
Coupling nut material/plating	–	brass, nickel-plated	–	
Gaskets	–	Polyurethane	–	
Conductor insulation	–	PTFE	–	
Mechanical data				
Dimension (w x h x l) [mm]	64 x 58 x 35	–	64 x 58 x 35	
Housing material	black die-cast aluminium powder coated	–	black die-cast aluminium powder coated	
Temperature rating	-25 ... +70 °C	-25 ... +70 °C	-25 ... +70 °C	
Degree of protection (IEC 60529/EN 60529) (if connected)	IP67	IP67	IP67	
Surge impedance	75 Ω	75 Ω	75 Ω	
Capacity	–	11 nF	–	
Weight	240 g	50 g	240 g	
Bus connection	coaxial-connector	–	coaxial-connector	
LED-Indications		–		
Supply voltage	green	–	green	
Hazardous Area Approval (max. values)				
BVS No.	BVS No. 95.D.2057	–	BVS No. 95.D.2057	
Type of protection	EEx ib IIB T4	–	EEx ib IIB T4	
Voltage	max. 15 VDC	–	max. 15 VDC	
Current	max. 400 mA	–	max. 400 mA	
Effective internal capacitances	≤ 27 nF	–	≤ 27 nF	
Effective internal inductances	negligible	–	negligible	

[1]) ≤ 15 VDC for hazardous are applications via VB 13-Ex/CS [2]) ≤ 15 VDC for hazardous area applications via VB 14-Ex/CS

System Accessories



The accessories for the *sensoplex*® system include all the hardware used to expand the system such as system components for diagnostics, amplification and auxiliary power supplies, as well as a variety of wiring components for the electrical connections of the system.

System Components

Diagnostic Station DEA 80

The hand-held monitor DEA 80 is available to monitor the *sensoplex*® system (only in connection with *sensoplex*®*2* master) as well as *sensoplex*®*2*. Further, the DEA 80 is used to write the EEPROM of the *sensoplex*®*2* master station for start-up verification. That is, the actual network (type of stations and address) must match the respective EEPROM configuration.

Wiring Devices

Wiring devices, or connecting cables and cordsets, are the hardware that is needed to wire up the *sensoplex*® system.
These are all coaxial components that are exclusively used for point to point connection of *sensoplex*® components, and prewired connection cables (M12 x 1)for sensors and actuators.

Coaxial Components

Coaxial Cable:
Coaxial cables are available in two versions: pre-assembled or field-wireable. In the *sensoplex*® system, the coaxial cable is used to provide data transfer and power supply to the connected *sensoplex*®*2* components. Because the *sensoplex*®*2* system is used at the field level of an automated process where it is exposed to the roughest of operating conditions, the cable must be rugged, both electrically and mechanically, and withstand the effects of disturbances. The coaxial cable allows power to be sent at the same time as it transfers high speed signals.
Coaxial Connector KOAX-12/67:
To connect field-wireable coaxial cables to all data line components, the field selectable coaxial connector KOAX-12/67 must be used.

Coaxial Accessories:

- Terminating resistor KOAX-75/67:
  Each *sensoplex*® branch must be terminated with a coaxial termination resistor. Branches that are open, or not properly terminated, can cause signal distortions or stationary waves. Operation of the system without stationary waves can only be ensured if all branches are terminated with a self surge impedance.
- Terminating resistor KOAX-75/671:
  For faultless operation of the *sensoplex*®*2* system, this termination resistor must be used to terminate *sensoplex*®*2* lines.
- KOAX-KV01:
  The KOAX-KV01 is an in-line double sided female connector used to couple two coaxial cables with male connectors.
- KOAX-FB:
  The coaxial flanged field-wireable receptacle KOAX-FB is used to connect foreign components to the *sensoplex*® system.

Connector components

The connector system is used for the connection of field devices (sensors and actuators) and to connect the power supply of the *sensoplex*®*2* system. The system consists of molded extension cordsets, cables, receptacles and field wireable connectors.

The cordsets have a connector on either one or both ends and a molded-on cable in different lengths and cable materials.

Field-wireable connectors can be connected to existing cables.

System Accessories

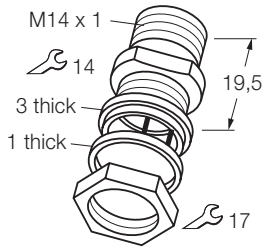
Type	DEA 80	
Ident-No.	68 904 10	
Application	hand-held monitor	
Housing material	ABS plastic	
Dimensions (w x h x d)	101 x 195 x 44	
Degree of protection	IP20	
(IEC 60529/EN 60529)		
Mounting	portable	
	or plug-in	
Operating temperature	0...+60 °C	
Input circuits	–	
Supply voltage	5 VDC	
Power/Current consumption	≤ 250 mA (via IM 01)	
Output voltage	5 VDC (IM 01 logic)	
Output current	50 mA	
Isolation	–	
Short-circuit protection	–	
Diagnostics	LCD display	
Adjustments	membrane keyboard	
Alarm indications	power	
	address absent	
	type of station	
	no check back	
	transmission error	
	short-circuit/	
	wire-break	
	status	
	addressing	
	“forced passing”	
	configuration cycle	
	docum. via RS232	
	save data with	
	MEM-CARD	
Connections:	via IM 01 or Master	
	12 pin circ. connector	
– Data line	RS232 (9 pin Sub-D)	
– Interface	RS485 (12 pin circ. connector)	
– Current supply	–	
Accessories	12 conductor cable	
	DEA 80-AK-5 (5 m),	
	IM 01 interface module, MEM-Card	
Capacity/features	MEM-Card with	
	“forced passing”	

Coaxial Components

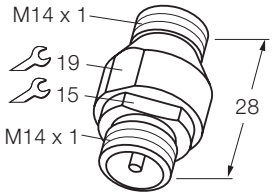
Type	KOAX-FB	KOAX-KV01		KOAX-12/67
Ident-No.	68 817 03	68 817 02		68 822 00
Application	coaxial flanged receptacle	coupling and extension of coaxial cables		straight or right angle coaxial connector
Length	–	–		–
Material		–		
– Inner conductor	–			–
		–		
– Outer conductor/housing	–	–		–
– Cable jacket	–	–		–
– Conductor insulation	PTFE	PTFE.		PTFE
– Contact carrier	copper alloy, silv. plat.	copper alloy, silv. plat.		copper alloy, silv. plat.
– Cable sleeve/grip material	–	copper alloy, silv. plat.		copper alloy, silv. plat.
– Contact material/plating	–	copper alloy, silv. plat.		copper alloy, silv. plat.
– Coupling nut material/plating	brass,silver	copper alloy, silv. plat.		copper alloy, silv. plat.
– Gaskets	Polyurethane/PTFE	–		PUR, soft copper, silver plated
Conductor insulation/color	white	white		–
Cable jacket/color	–	–		–
Outer diameter	–	–		–
Dimensions	M14 x 1, 19.5 mm long	M14 x 1, 28 mm long		42 x 35 (right angle)
Number of conduct./cross section	–	–		–
Number of strands/size	–	–		–
Minimum bending radius	–	–		–
Operating temperature	-25...+70 °C	-25...+70 °C		-25...+70 °C
Heat resistance (VDE 0472, Part 609/6.85)	–	–		–
Short term rating (when in contact with hot objects > 140 °C)	–	–		–
Short-circuit resistance according to VDE 0298	–	–		–
Chemicals-resistant	–	–		–
Impedance	75 Ω	75 Ω		75 Ω
Signal attenuation/100 m	–	–		–
Degree of shielding (f ≥ 470 MHz)	–	–		–
Ohmic resistance	–	–		–
Inductance	–	–		–
Capacitance	–	–		–
Pulse shortening factor	–	–		–
Current rating	4 A	4 A		4 A
Voltage rating	30 VDC	30 VDC		30 VDC
Protection Class (IEC 60529/EN 60529) – connected	IP67	IP67 fixing dimensions		IP67
Meets other specifications	–	accord. to IEC 169-2		–
Connections	–			IEC 169-2

Dimensions – Coaxial Components

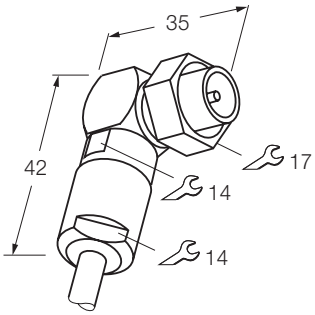
KOAX-FB



KOAX-KV01

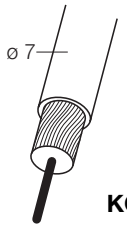


KOAX-12/67

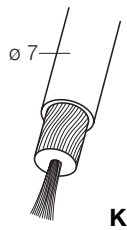


Coaxial Cable

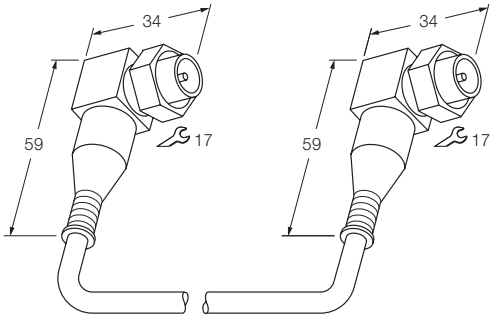
- **Coaxial cable for data and power supply**
- **Versions with rigid or flexible inner conductor**
- **Pre-assembled or field-wireable cable (in meters) available**
- **Temperature and chemicals resistant TPE-cable jacket**
- **75 Ω impedance**



KOAX-75/B



KOAX-75/B-FLEX



KOAX-WS-…BFLEX-WS

Pre-assembled coaxial cables as well as coaxial cables by the meter are available and are used to provide data transfer and power supply to the connected *sensoplex®2* components.
Because bus systems are used at the field level of an automated process, the coaxial cable has to meet special requirements with regards to its mechanical and electrical characteristics.

The coaxial cables KOAX-75/B-FLEX and KOAX-WS-…B-FLEX-WS are equipped with a highly resistant and flexible copper alloy inner conductor which withstands high levels of mechanical stress. The inner conductor of the coaxial cable KOAX-75/B is inflexible and made of a solid copper alloy allowing for longer cable lengths due to reduced attenuation.

The coaxial cable jacket is made of TPE (Thermoplastic Elastomer) and is resistant to heat, contact with hot objects and chemicals. In accordance with its installation in hazardous areas, the cable jacket of the coaxial cable is blue.

Cable installation

The installed coaxial cable should not be exposed to extreme bending or deformation. The min. bending radius of 70 mm must be observed. A strongly deformed cable changes the wave impedance and can cause reflections and standing waves. Standing waves will disturb bus communication and lead to faulty messages within the *sensoplex®* system.

Earth-free operation of the system must be ensured with regards to the outer conductor of the coaxial cable. The outer conductor is connected to system ground and must not be damaged to avoid ground loops, i.e. the outer conductor plaid should not come into contact with grounded objects.
For connection of the field-wireable coaxial cable to *sensoplex®2* components (e.g. substation ES 80-Ex or AS 80-Ex), the field wireable coaxial plug-in connector KOAX-12/67 (Ident-No. 68 822 00) should be used.
Please note: the outer conductor of the coaxial cable is connected to the connector housing and must not come into contact with any earthed object.

Pre-assembled coaxial cable KOAX-WS-...BFLEX-WS

Pre-assembled flexible coaxial cables are also available in several lengths. Both ends of the flexible coaxial cables are equipped with moulded right-angle connectors coated with Polyurethane. The preassem-bled coaxial cables can be ordered in the following lengths:

0.3 m	KOAX-WS-0.3BFLEX-WS Ident-No. 68 825 21
0.6 m	KOAX-WS-0.6BFLEX-WS Ident-No. 68 825 22
1.0 m	KOAX-WS-1.0BFLEX-WS Ident-No. 68 825 23
1.5 m	KOAX-WS-1.5BFLEX-WS Ident-No. 68 825 24
2.0 m	KOAX-WS-2.0BFLEX-WS Ident-No. 68 825 25
3.0 m	KOAX-WS-3.0BFLEX-WS Ident-No. 68 825 29
5.0 m	KOAX-WS-5.0BFLEX-WS Ident-No. 68 825 28

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Coaxial Cable

Type Ident-No.	**KOAX-75/B-FLEX** 68 82701	**KOAX-75/B** 68 827 02	**KOAX-WS...BFLEX-WS** see chart page 30
Specification	coaxial cable with flexible inner conductor	coaxial cable with rigid inner conductor	pre-assembled coaxial cable
Bus	*sensoplex®* *sensoplex®2*	*sensoplex®* *sensoplex®2*	*sensoplex®* *sensoplex®2*
Cable			
Length	by the meter	by the meter	0.3 - 5.0 m
Inner conductor material	special high resistance flexible copper alloy	solid copper alloy	special high resistance flexible copper alloy
Outer conductor material	Al-PP-Al-foil, 100 % cover tin-plated copper braid cover > 45 %	Al-PP-Al-foil 100 % cover tin-plated copper braid cover > 45 %	Al-PP-Al-foil, 100 % cover tin-plated copper braid cover > 45 %
Cable jacket material/colour	TPE (Thermoplastic Elastomer), blue	TPE (Thermoplastic Elastomer), blue	TPE (Thermoplastic Elastomer), blue
Outer diameter	7 mm ± 0.2 mm	7 mm ± 0.2 mm	7 mm ± 0.2 mm
Conductor insulation material/colour	Cell-PE, white	Cell-PE, white	Cell-PE, white
Number of strands	1 / 1	1 / 1	1 / 1
Conductor cross section	19 x 0.22 mm Ø	1.1 mm Ø	19 x 0.22 mm Ø
Minimum bending radius	70 mm	70 mm	70 mm
Electrical data			
Impedance	75 Ω	75 Ω	75 Ω
Signal attenuation (pro 100 m)	2.7 dB (8/12 MHz)	1.9 dB (8/12 MHz)	2.7 dB (8/12 MHz)
Ohmic resistance	43 m Ω/m	43 m Ω/m	43 m Ω/m
Inductances	450 nH/m	450 nH/m	450 nH/m
Capacitance	55 pF/m	55 pF/m	55 pF/m
Pulse shortening factor	0.78	0.78	0.78
Degree of shielding (f ≥ 470 MHz)	75 dB	75 dB	75 dB
General data			
Ambient temperature range (when not moved)	-25...+80 °C	-25...+80 °C	-25...+80 °C
Heat resistance (VDE 0472, part 609/6.85)	110 °C	110 °C	110 °C
Short term rating (when in contact with hot objects > 140 °C)	up to 250 °C no distortion, no melting, no short-circuit	up to 250 °C no distortion, no melting, no short-circuit	up to 250 °C no distortion, no melting, no short-circuit
Short-circuit resistance (VDE 0298)	test temperature 250 °C	test temperature 250 °C	test temperature 250 °C
Chemical resistance	resistant to solvents and oils, no swelling	resistant to solvents and oils, no swelling	resistant to solvents and oils, no swelling
Weight	50 g/m	50 g/m	50 g/m
Right-angle plug-in connectors			
Contact carrier material	–	–	copper alloy, silver-plated
Cable sleeve/grip material	–	–	Polyurethane
Contact material/plating	–	–	copper alloy, silver-plated
Coupling nut material/plating	–	–	copper alloy, nickel-plated
Gaskets			Polyurethane

Coaxial cable

Type	KOAX-75/OR-FLEX		KOAX-WS-0,3/0,6/ 1,0/1,5/2,0 XOR/ BFLEX-WS	
Ident-No.	68 827		68 825...BFLEX	
Application	coaxial cable for data transfer and power supply		coaxial cable for data transfer and power supply	
Length	any		0.3/0.6/1.0/1.5/2.0 m	
Material				
– Inner conductor	highly flexible and resistant, special copper alloy		highly flexible and resistant, special copper alloy	
– Outer conductor/housing	Al-PP-Al foil 100 % cover tin plated copper braid, > 45% cover		Al-PP-Al foil 100 % cover tin plated copper braid, > 45% cover	
– Cable jacket	TPE Elastomer thermopl.		TPE Elastomer thermopl.	
– Conductor insulation	Cell-PE		halide-free PVC	
– Contact carrier	–		copper alloy, silv. plat.	
– Cable sleeve/grip material	–		Polyurethane	
– Contact material/plating	–		copper alloy, silv. plat.	
– Coupling nut material/plating	–		copper alloy, silv. plat.	
– Gaskets	–		Polyurethane	
Conductor insulation/color	white		white	
Cable jacket/color	orange		orange/blue	
Outer diameter	7 mm ± 0.2 mm		7 mm ± 0.2 mm	
Dimensions	–		–	
Number of conduct./cross section	19 x 0.22 mm Ø		19 x 0.22 mm Ø	
Number of strands/size	1/1		1/1	
Minimum bending radius	70 mm		70 mm	
Operating temperature	-25...+80 °C		-25...+80 °C	
Heat resistance (VDE 0472, Part 609/6.85)	110 °C up to 250 °C		110 °C up to 250 °C	
Short term rating (when in contact with hot objects > 140 °C)	resistance to melting, no distortion, no short-circuit		resistance to melting, no distortion, no short-circuit	
Short-circuit resistance according to VDE 0298	test temperature 250 °C		test temperature 250 °C	
Chemicals-resistant	resistant to solvents and oils, no distortion		resistant to solvents and oils, no distortion	
Impedance	75 Ω		75 Ω	
Signal attenuation/100 m	2.7dB (8/12 MHz)		2.7dB (8/12 MHz)	
Degree of shielding (f ≥ 470 MHz)	75 dB		75 dB	
Ohmic resistance	43 mΩ/m		43 mΩ/m	
Inductance	450 nH/m		450 nH/m	
Capacitance	55 pF/m		55 pF/m	
Pulse shortening factor	0.78		0.78	
Current rating	4 A		4 A	
Voltage rating	30 VDC		30 VDC	
Protection Class (IEC 60529/EN 60529) – connected	–		IP67	
Meets other specifications	–		–	

Special Cables

Type Ident-No.	**FBK-TCP 01** 68 909 21	**FBK-0,06** 68 904 13	**DEA 80-AK-5** 68 904 14	
Application	terminating code plug for *sensoplex®2* terminal versions ESM, ESK, ASK 80	ribbon connection cable (Subbus) for *sensoplex®2* terminal versions ESM, ESK, ASK 80	12 conductor circular connector (to connect the DEA 80 with IM 01 or master station, RS485)	
Length	–	0.06 m	5.0 m	
Material				
– Inner conductor	Cu	Cu	Cu	
– Outer conductor/housing	–	–	–	
– Cable jacket	–	–	–	
– Conductor insulation	–	–	–	
Conductor insulation/color	–	–	–	
Cable jacket/color	–	–	–	
Outer diameter	–	–	–	
Dimensions	–	–	–	
Number of conduct./cross section	–	–	–	
Number of strands/size	–	–	–	
Minimum bending radius	–	–	–	
Operating temperature	0...60 °C	0...60 °C	0...60 °C	
Heat resistance (VDE 0472, part 609/6.85)	–	–	–	
Short term rating (when in contact with hot objects > 140 °C)	–	–	–	
Short-circuit resistance according to VDE 0298	–	–	–	
Chemicals-resistant	–	–	–	
Impedance				
Signal attenuation (8/12 MHz)	–	–	–	
Degree of shielding (f ≥ 470 MHz)	–	–	–	
Ohmic resistance	–	–	–	
Inductance	–	–	–	
Capacitance	–	–	–	
Pulse shortening factor	–	–	–	
Current rating	–	1.2 A	–	
Voltage rating	–	12...30 VDC	–	
Degree of protection (IEC 60529/EN60529) – connected	IP20	IP20	IP20	TURCK WORLD-WIDE HEADQUARTERS
Meets other specifications	–	–		
Connections	plug-in connector for ribbon cable	plug-in connector for ribbon cable		

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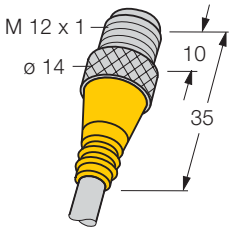
Special Plugs

- **Jumper plug for supply voltage distribution for all output branches (accessory for the intrinsically safe junction boxes VB 14-Ex/CS)**
- **Resistive connector for termination of unused inputs and outputs**
- **Plug-in connector M12 x 1**
- **Degree of protection IP67**



Jumper Plug RS4.5-VB

The jumper plug RS4.5-VB links the contacts of the „channel selector" input at the intrinsically safe VB 14-Ex/CS. The jumper plug is an easy to handle plug-in component and supplies the four output branches of the intrinsically safe junction-box with voltage.

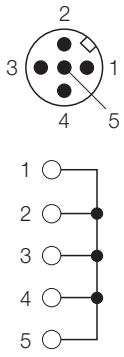
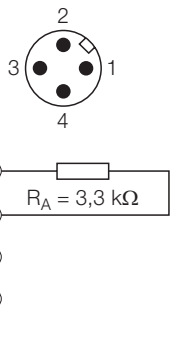
All intrinsically safe junction-boxes are supplied together with the jumper plug. The channel-selector of the junction-box enables individual decoupling of single output branches from power supply, e.g. for emergency stops.

Resistive Connector RS4.2-DB

The resistive connector RS4.2-DB is used to terminate unused inputs and outputs of *sensoplex®* and *sensoplex®2 Ex* substations.

If short-circuit and wire-breakage monitoring is activated (via DIP-switch in the stations or programmable via the bus) the resistive connector will suppress error messages. The resistive plug-in connector is connected to the M12 x1-connector of the substation.

Special Plugs

Type Ident-No.	**RS4.5-VB** 68 817 09	**RS4.2-DB** 68 817 01	
Pin connection seen from the view of the contacts			
Specification	Jumper plug for junction-box VB 14-Ex/CS	Resistive connector for unused inputs/outputs	
Bus	*sensoplex®*	*sensoplex®* *sensoplex®2*	
Plug-in connector			
Contact carrier material	PA12-GF30	PA12-GF30	
Contact carrier colour	yellow (like RAL 1021)	yellow (like RAL 1021)	
Cable sleeve/grip material	thermopl. PUR	thermopl. PUR	
Cable sleeve/grip colour	yellow (like RAL 1021)	yellow (like RAL 1021)	
Contact material/plating	CuZn, nickel- and gold-plated	CuZn, nickel- and gold-plated	
Coupling nut material/plating	CuZn, nickel-plated	CuZn, nickel-plated	
General data			
Insulation resistance	≥ 10^9 Ω	≥ 10^9 Ω	
Temperature rating of connector	-25...+80 °C	-25...+80 °C	
Temperature rating of cable	-25...+80 °C	-25...+80 °C	
Degree of protection (IEC 60529/EN 60529)	IP67	IP67	
Clearences and creepage distances (VDE 0110b)	250 VAC/300 VDC Gr. C	250 VAC/300 VDC Gr. C	

Notes

Bitte senden Sie mir Unterlagen:

Sensortechnik
- ❑ Induktive Sensoren
- ❑ Induktive Sensoren für Schwenkantriebe
- ❑ *uprox*® induktive Sensoren
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- ❑ Opto-Sensoren
- ❑ Geräte für den Personenschutz
- ❑ Ultraschall-Sensoren
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- ❑ Steckverbinder
- ❑ CD-ROM Sensortechnik

Interfacetechnik
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  Allgemeine Informationen
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- ❑ CD-ROM Interfacetechnik

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- ❑ Bussystem DeviceNet™
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- ❑ *levelprox* level sensors
- ❑ flow controls
- ❑ pressure controls
- ❑ temperature controls
- ❑ linear position sensors
- ❑ rotary position sensors
- ❑ connectors
- ❑ CD-ROM Sensors

Interface technology
- ❑ devices in modular housings
  - – *multimodul* style
  - – *multisafe*® style

  general information
- ❑ devices on 19" card
  - – *multicart*® style
- ❑ miniature relays, industrial relays, time cubes, sockets
- ❑ programmable relays and timers
- ❑ explosion protection – basics for practical application (overview poster)
- ❑ CD-ROM Interface technology

Fieldbus technology
- ❑ *busstop*® fieldbus components
- ❑ bus system *sensoplex*®*2*
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- ❑ bus system *piconet*®
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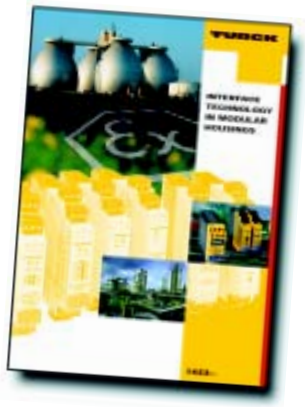
- ❑ .....



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