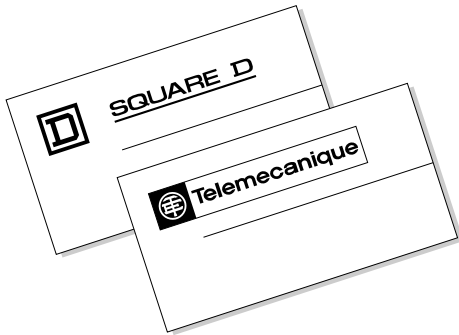


# Intrinsically Safe Barrier Relays NY2 and 8501TO

Class/File 8501



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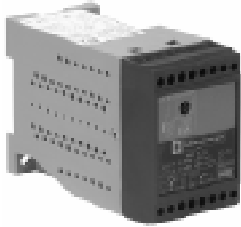


**SQUARE D**  
GROUPE SCHNEIDER

# Intrinsically Safe Barrier Relays

## NY2 – Relays For Hazardous Locations

### General Information



#### Intrinsically Safe (IS)

Explosion prevention is a prime consideration in plants and facilities containing hazardous atmospheres and explosion-proof housings. The main fault with the explosion-proof system is that a single human error could create a high explosion probability. Prime examples are failing to tightly replace covers on explosion-proof housings, failing to shut off the power before removing the covers, and damaging the specially machined surfaces of these covers.

Intrinsically safe (IS) systems are a means of providing automated control functions in explosive environments. Because of the inherent parameters of electronic circuits, no energy is released, under normal or abnormal conditions, of sufficient magnitude to ignite a specified atmosphere mixture.

To design an effective intrinsically safe system, energy that enters the hazardous area must be limited. For electronic instrumentation, this is accomplished by controlling the voltages and currents that may enter the hazardous area. In addition, stored electrical energy in field instruments is limited to levels that cannot ignite a given atmosphere.

Intrinsically safe relays, such as the NY2 and the Class 8501 Type TO relays, act as an energy barrier, limiting the voltage and current available in the hazardous area. They can be connected with any device having a dry contact (limit switch, magnetic switch, pushbutton, pneumatic-electric interfaces, etc.) or with NAMUR sensors. NAMUR sensors (NAMUR is a European standard) are solid state detectors specifically designed to work with such a limited amount of voltage and current. All Telemecanique NAMUR sensors comply with the strict energy limitations imposed by intrinsically safe relays.

NOTE: Compare the sensor characteristics with related input line parameters (page 4) to determine the maximum cable length allowed when using a particular cable brand.

For battery applications, a DC to AC converter (NY2 K10) is used to power up to four IS relays. This solution is safer than using DC barriers since it offers physical isolation between hazardous and non-hazardous areas.

#### Non-incendive switches for hazardous areas

A wide variety of indexing head surface mounted and tubular proximity switches have Factory Mutual approval for installation without any immediate barrier or control relay. Completely solid state and self-contained, these proximity switches have both AC and DC outputs. Factory Mutual approved: Class I, Division 2, Groups A, B, C and D and are suitable for Class II, Group G hazardous locations.

All Telemecanique proximity switches are FM approved for this non-incendive rating.

Non-incendive equipment is defined as unable to release sufficient electrical or thermal energy under normal operating conditions to cause ignition of specific hazardous materials. Non-incendive equipment can be used without additional precautions in Division II hazardous locations where the hazardous materials can be present only in case of accidental rupture or breakdown of the enclosure containing them.

#### Definitions

- Class I** Locations: Are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.
- Class II** Locations: Are those which are hazardous due to the presence of combustible dust.
- Class III** Locations: Are those which are hazardous due to the presence of easily ignitable fibers of flyings, but in which such fibers or flyings are not likely to be in suspension in the air in quantities to produce ignitable mixtures.
- Division I** Locations in which hazardous concentrations in the air exist continuously, intermittently, or periodically under normal operating conditions.
- Division II** Locations in which hazardous concentrations are handled, processed, or used but are normally within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown.
- Group A** Atmospheres containing acetylene.
- Group B** Atmospheres containing hydrogen, or gasses or vapors of equivalent hazard, such as manufactured gas.
- Group C** Atmospheres containing ethyl-ether vapors, ethylene, or cyclo propane.
- Group D** Atmospheres containing gasoline, hexane, naphtha, benzene, butane, alcohol, acetone, benzol, lacquer solvent vapors, or natural gas.
- Group E** Atmospheres containing metal dust, including aluminum, magnesium, and their commercial alloys, and other metals of similarly hazardous characteristics.
- Group F** Atmospheres containing carbon black, coal or cake dust.
- Group G** Atmospheres containing flour, starch, or grain dust.

#### Excerpt from the National Electrical Code

Equipment and associated wiring approved as intrinsically safe shall be permitted in any hazardous (classified) location for which it is approved, and the provisions of Articles 500 through 517 shall not be considered applicable to such installation. Means shall be provided to prevent the passage of gasses and vapors. Intrinsically safe equipment and wiring shall not be capable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most easily ignitable concentration.

Abnormal conditions shall include accidental damage to any field installed wiring, failure of electrical components, application of over-voltage, adjustment and maintenance operations, and other similar conditions.

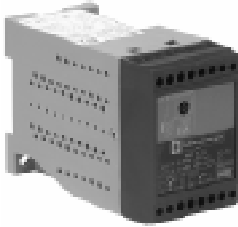


# Intrinsically Safe Barrier Relays

## NY2 – Relays For Hazardous Locations

### Ordering Information

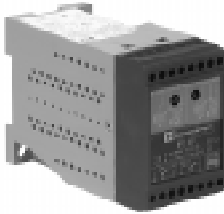
#### NY2 A•1 Single Channel, Dual Relay Output



A single channel relay that will accept either a NAMUR proximity sensor or a dry contact switch input. Two SPDT output relays are ganged to provide two NO and two NC contacts. The housing is glass-reinforced nylon for back plate or DIN rail mounting. Terminals have captive screws with self-lifting clamps. Each relay has an independent LED function indication.

Power Supply	Catalog Number
24/48 Vac	<b>NY2 A11</b>
110/220 Vac	<b>NY2 A21</b>

#### NY2 B•1 Dual Channel, Relay Output



With dual channel relay. Each channel will accept either a NAMUR proximity sensor or a hard contact switch input. Each channel has independent SPDT output relays. The housing is glass-reinforced nylon for back plate or DIN rail mounting. Terminals have captive screws with self-lifting clamps. Each relay has an independent LED function indication.

Power Supply	Catalog Number
24/48 Vac	<b>NY2 B11</b>
110/220 Vac	<b>NY2 B21</b>
120/240 Vac	<b>NY2 B31</b>

#### NY2 F•1 Dual Channel, Transistor Output



Transistor outputs are suitable for DC signal switching or for fast response time (speed, motion, counting, etc.). Each channel will accept either a NAMUR proximity sensor or a hard contact switch input. Each channel has an independent transistor output. The housing is glass reinforced nylon for back plate or DIN rail mounting. Terminals have captive screws with self-lifting clamps. Each output transistor has an independent LED function indication.

Power Supply	Catalog Number
24/48 Vac	<b>NY2 F11</b>
110/220 Vac	<b>NY2 F21</b>
120/240 Vac	<b>NY2 F31</b>

#### NY2 K10 DC/AC Converter For Battery Operation



A DC to AC converter that accepts 24 Vdc or 48 Vdc and provides a selectable output voltage supply of 24 Vac or 48 Vac. The housing is glass-reinforced nylon for back plate or DIN rail mounting. Terminals have captive screws with self-lifting clamps.

The converter can supply three or four NY2 ••11 relays from a DC power supply (battery).

Power Supply	Catalog Number
24/48 Vac	<b>NY2 K10</b>

# Intrinsically Safe Barrier Relays

## NY2 – Relays For Hazardous Locations

### Specifications



General Specifications	
Supply voltage	24/48 Vac, 110/220 Vac, 120/240 Vac (+10%/-15%), 50/60 Hz (for NY2 K10: 24 or 48 Vdc $\pm$ 15%)
Consumption	4 VA
Resistance to shock	Greater than 25 G
Resistance to vibration	0-25 Hz, 2 mm amplitude
Enclosure rating (CENELEC)	IP20, NEMA 1
Operating temperature	-4 to 122 °F (-25 to +50 °C)
Approvals LC1F No. 80223X	CENELEC 3: EN 50014 and 50020; NAMUR and DIN 19234 Factory Mutual approved, CSA certified

#### Input parameters (conforms to NAMUR)

Supply voltage	Max 7.7 to 9 Vdc (provided by the IS relay)
Internal resistance	100 $\Omega$ , $\pm$ 5%
Maximum current	10 mA
Response time	5 ms with relay output, 0.2 ms with transistor output
Maximum line resistance	50 $\Omega$ with a NAMUR sensor
Maximum line capacitance	0.8 $\mu$ F
Maximum line inductance	18 mH

#### Output parameters

##### Relays

Mechanical life	10 million cycles
Response time	Closing: 10 ms
	Opening: 30 ms
Contact ratings	I max. (AC): 5 A
	Power max (AC): 100 VA @ 110 to 240 Vac 50 VA @ 24 to 48 Vac
	V max (AC): 250 Vac
	Frequency (max): 10 Hz
	I max (DC): 0.4 A (L/R < 40 ms)
	Power max (DC): 24 W
	V max (DC): 110 Vdc

##### Transistors

Controlled by opto-isolator and protected against overvoltage and reverse polarity.

Response time	Closing: 0.3 ms
	Opening: 0.7 ms
Output ratings	I max: 100 mA (L/R =0)
	V max: 30 Vdc
Frequency (max)	500 Hz
NY2 K10 load @ 24 Vdc	Three NY2 **1 relays @ 48 Vdc; four NY2 **1 relays

Factory Mutual approved: Intrinsically safe for Class I and Class II, Division I, Groups A, B, C, D, E, F and G. Report 1M4A1.AX.

CSA certified LR 15996 Class 3218 06.

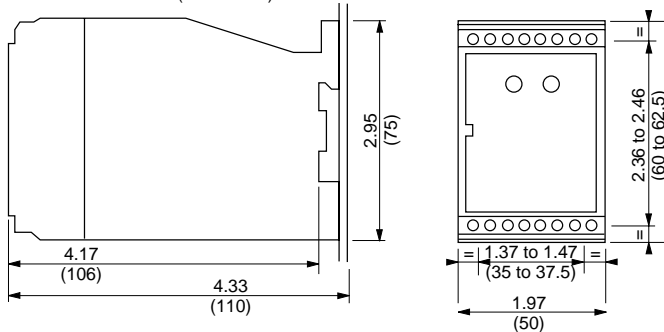


# Intrinsically Safe Barrier Relays NY2 – Relays For Hazardous Locations Dimensions, Wiring Recommendations

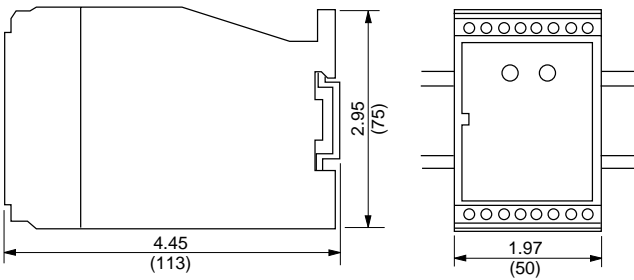
## Approximate Dimensions

### Mounted onto backplate

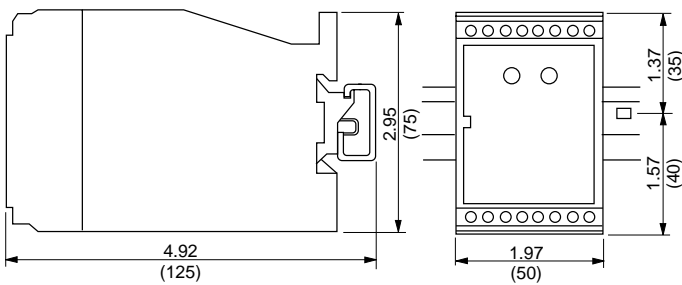
Dimensions in inches (millimeters)



### Mounting on 35 mm DIN3 track

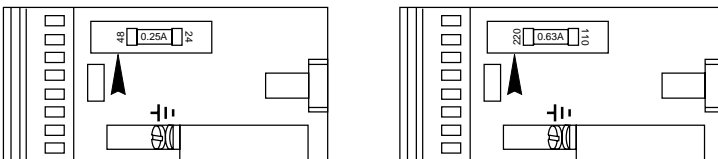


### Mounted onto asymmetrical DIN rail (DZ5 MB) using adaptor RHZ 66



### Line voltage selector

Plug in the fusible holder with the desired line voltage at the tip of the arrow



## Wiring recommendations

### Inductive and capacitive effects

In order to minimize any inductive effects from adjacent cabling, it is recommended that individual IS circuits be run out and back by a pair of conductors contained within the same sheath.

Check cable inductance and capacitance for long cable runs against NY2 input line parameters to determine maximum cable length. For long cable runs, twisted pairs are recommended.

### Terminals

Where the same set of terminal blocks are used to connect both IS and non IS circuits, a minimum spacing of 2 in. (50 mm) should be observed between the different circuits, or if possible, a grounded screen should be mounted between them.

In a hazardous area such an arrangement would require an explosion proof junction box, due to the presence of non IS cabling. Separate terminal blocks are often used.

### Junction boxes

Where a junction box is being used only for IS cabling, there is no need to use an explosion proof type, and any type of standard box can be used provided that it has a minimum degree of protection.

### Interconnection between circuits being fed from the same IS relay

The use of a common link between two IS circuits on the same relay is not allowed.

**No interconnection between two or more IS relays or channels is allowed** due to the adverse effects on the input parameters of the relay, and the fact that the cumulative effects of voltage and current would increase the risks of sparking above those of the normal IS levels.

### Series/Parallel

Combinations are allowed for mechanical/dry contacts only.

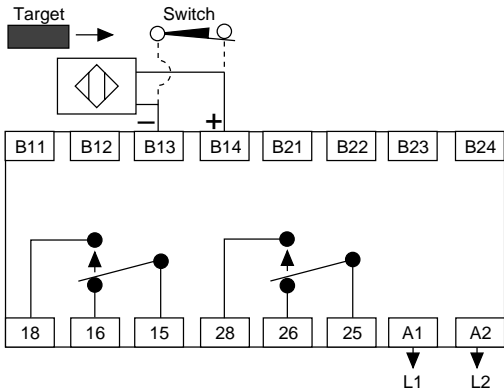
### Grounding

Do not ground devices in the hazardous areas at the same ground as the ones in non-hazardous areas. Floating or separate grounds are recommended.

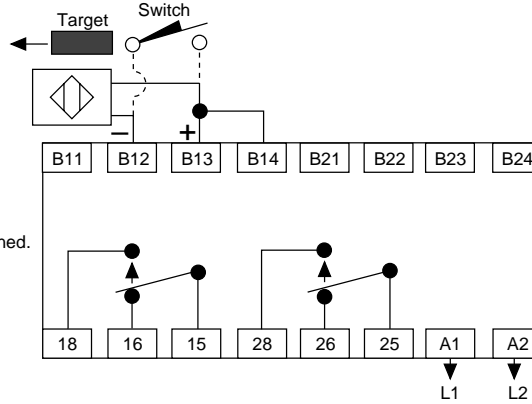
# Intrinsically Safe Barrier Relays

## NY2 – Relays For Hazardous Locations

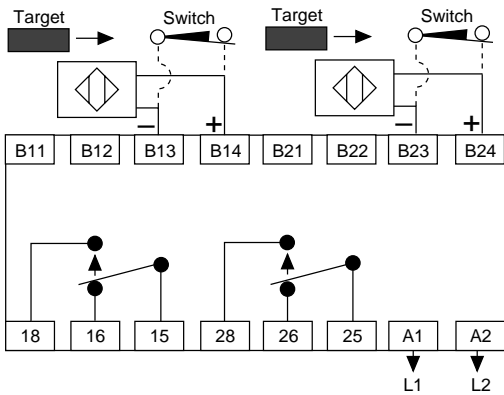
### Wiring Diagrams



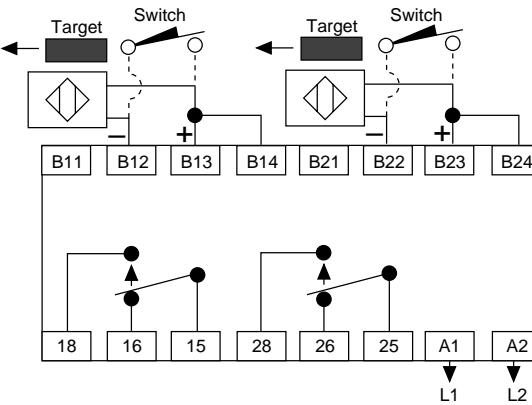
**NY2 A•1**  
Both relays are energized when target is sensed or switch is opened.



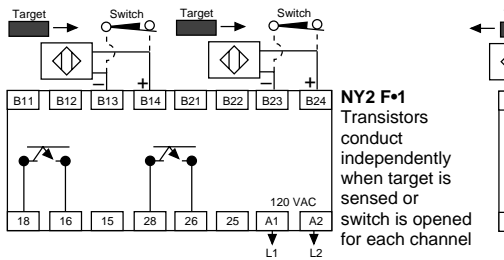
**NY2 A•1**  
Both relays are energized when target is removed or switch is closed.



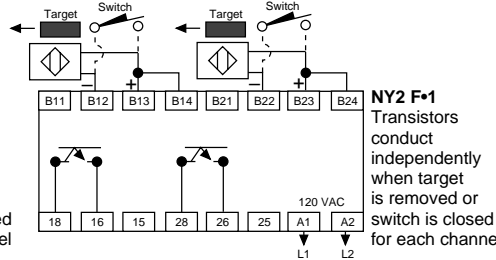
**NY2 B•1**  
Relays are independently energized when target is sensed or switch is opened for each channel.



**NY2 B•1**  
Relays are independently energized when target is removed or switch is closed for each channel.

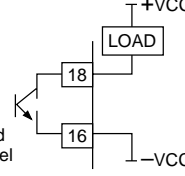


**NY2 F•1**  
Transistors conduct independently when target is sensed or switch is opened for each channel

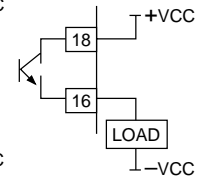


**NY2 F•1**  
Transistors conduct independently when target is removed or switch is closed for each channel

The output transistors can be wired either in the sinking or sourcing mode as illustrated below

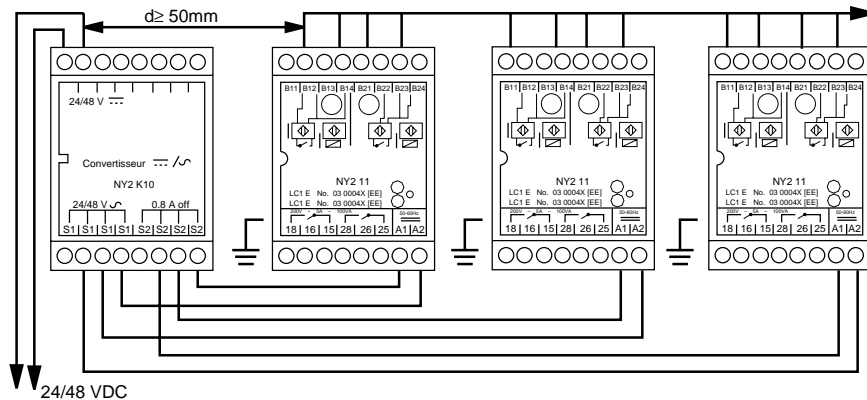


**Sinking mode**



**Sourcing mode**

### Battery operated system

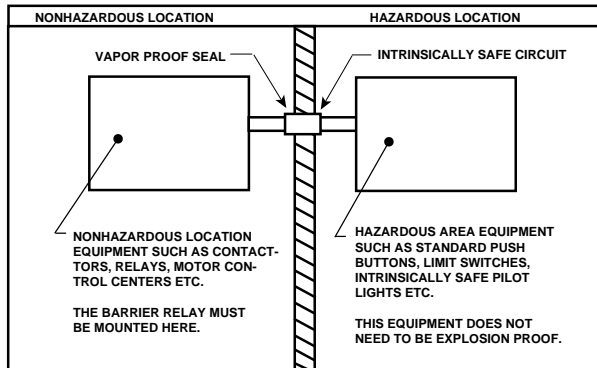


# Intrinsically Safe Barrier Relays Class 8501 – Type TO General Information

## General

The Class 8501 Type TO barrier relays must be installed in a non-hazardous location. However, intrinsically safe equipment and the associated wiring can be installed in the hazardous location for which the devices are approved, without the need for an explosion-proof housing or similar protection.

**Diagram of a Typical Intrinsically Safe Installation**



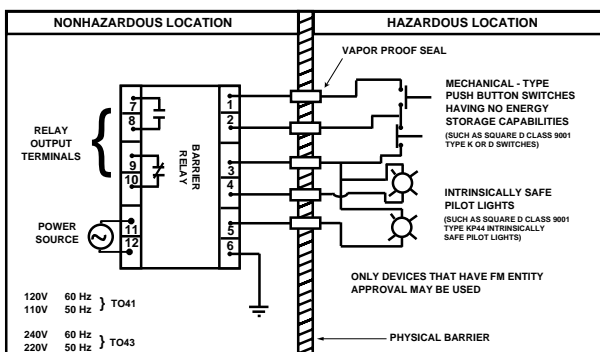
Terminals 1 through 6 of the barrier relay are the intrinsically safe terminals. The input devices and intrinsically safe pilot lights that are located in the hazardous location are wired to these terminals. This is called the maximum open circuit voltage ( $V_{OC}$ ). The maximum current available to these terminals is 115mA. This is called the maximum short circuit current ( $I_{SC}$ ).

If the barrier relay is to be controlled by a 2-wire pilot device, such as a proximity switch or limit switch, the switch is then wired to terminals 2 and 3 and a jumper is placed between terminals 1 and 2.

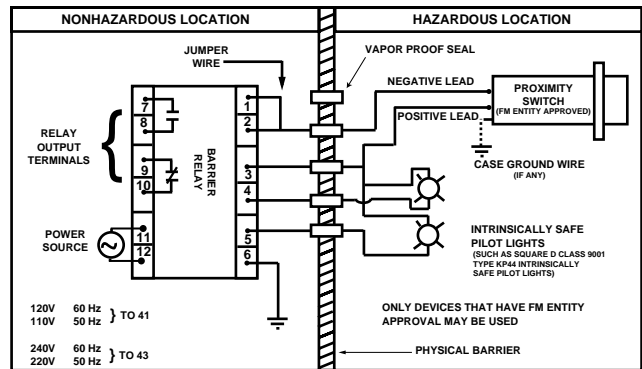
Only devices that have been approved as intrinsically safe and meet the requirements of Factory Mutual's entity approval should be connected to this relay. Refer to the section on "Connection."

Intrinsically safe equipment is suitable only for the specific hazardous location classes, divisions and groups for which it has been designed and investigated. **The relay can be used with such devices that are installed in hazardous locations designated as Class I, Division 1 or 2, Groups A, B, C, D; Class II, Division 1 or 2, Groups E & G; and Class III locations** dependent upon the hazardous location rating which must be marked on these devices.

Example 1



Example 2



## Connection:

The maximum voltage and current rating of each device in the hazardous locations which are connected to the Class 8501 Type TO41/TO43 barrier relay must be greater than or equal to the maximum open circuit voltage ( $V_{OC}$ ) and maximum short circuit current ( $I_{SC}$ ) that the relay can deliver.

The sum of the total capacitance and total inductance of all the intrinsically safe devices connected to the relay, including field wiring, must not exceed the values shown in Table 1.

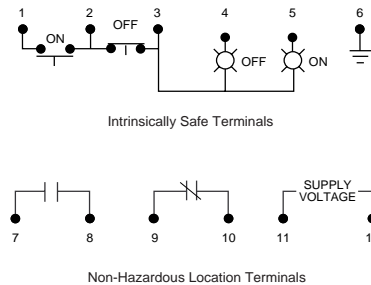
**Table 1**

Total inductance and capacitance which may be connected to the intrinsically safe terminals.

Max. $C_a$ uF	Max. $L_a$ mH	Groups
0.12	2.7	A, B
0.36	11.0	C, E
0.96	22.0	D, G

$C_a$  Maximum allowable connected capacitance.  
 $L_a$  Maximum allowable connected inductance.

## Connection Diagram



It is very important that terminal 6 be properly grounded, before power is applied.

Terminals 7 through 12 of the barrier relay are the non-hazardous location terminals. Terminals 7-8 and 9-10 are hard contact relay outputs N.O. and N.C., respectively. These contacts change state when the barrier relay input is activated. This is indicated by the illumination of an LED located on the front face of the barrier relay. This LED is labeled "Relay Output Status."

Terminals 11 - 12 are connected to the supply voltage (120V - 60Hz/110V - 50Hz for the 8501 TO41 and 240V - 60Hz/220V - 50Hz for the 8501 TO43).

# Intrinsically Safe Barrier Relays

## Class 8501 – Type TO

### Order Information, Application Data and Approximate Dimensions



Equipment that is intrinsically safe is suitable for use in specific hazardous locations because of the reduced electrical and thermal energy of the equipment.

The Class 8501 Type TO barrier relays are Factory Mutual approved for use with approved equipment mounted in Class I, Class II and Class III locations (see page 7). See page 2 for a summary of classification chart. The barrier relay is used in applications where a load (motor starter, control relay, etc.) in a nonhazardous location must be controlled by input devices or sensors in a hazardous area. With the barrier relay interposed between the input devices and the load, the input devices will not need to be the explosion-proof type. An example application would be a combination starter in a non-hazardous area controlled by push buttons located in the hazardous area.

- Provides an alternative to explosion-proof enclosures
- Reduces equipment costs
- Provides easy maintenance
- Saves on wiring
- Factory Mutual approved. Report 0J6A4.AX.
- Ideal for spray paint lines, petrochemical plants, petroleum refineries, and grain elevator arsenals

#### Barrier Relay

Supply Voltage	Type	Voltage
120V/60 Hz 110V/50 Hz	TO41	V20
240V/60 Hz 220V/50 Hz	TO43	V24

The Type TO Barrier Relay mounts on Class 8501 Type XM mounting track.

#### Mounting Track

Description	Class 8501 Type
9" long for 4 relays	XM4
18" long for 8 relays	XM8
27" long for 12 relays	XM12

#### Output Contacts:

1 N.O., 1 N.C.  
5 Amperes resistive @ 30 Vdc or 120 Vac  
1/6 HP @ 120 Vac

**Nominal Output Voltage:** 24 Vdc

**Maximum Open Circuit Voltage (V<sub>OC</sub>):** 28 Vdc

**Maximum Short Circuit Current (I<sub>SC</sub>):** 115 mA

**Minimum Trip Current at 25°C:** 52 mA if the internal relay is not energized; 40 mA if the internal relay is energized.

#### Operating Information:

If the relay output protection circuit is triggered due to an overload condition, input power to the relay (terminal 11 and 12) must be interrupted for a minimum of six seconds to reset.

**Burden:** 3 VA nominal.

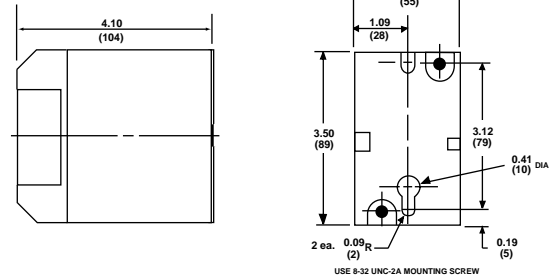
**Wire Size:** Terminals will accept one or two #22 to #12 AWG wires. Terminals should be tightened to 6 to 9 in-lb.

Wires must be sized in accordance with the requirements of the National Electrical Code.

**Operating Temperature Range:** -20 to +60°C (-4 to 140°F)

The relay is **NOT** repairable. Substitution of components may impair the intrinsic safety of the device.

#### Approximate Dimensions



Dimensions are in inches (millimeters)

**Burden:** 3 VA nominal.

**Wire Size:** Terminals will accept one or two #22 to #12 AWG wires. Terminals should be tightened to 6 to 9 in-lb.

Wires must be sized in accordance with the requirements of the National Electrical Code.

**Operating Temperature Range:** -20 to +60°C (-4 to 140°F)

The relay is **NOT** repairable. Substitution of components may impair the intrinsic safety of the device.

#### How To Order:

To Order Specify:	Catalog Number		
● Class Number	Class	Type	Voltage Code
● Type Number			
● Voltage Code			
	8501	TO41	V20