Safety Barriers

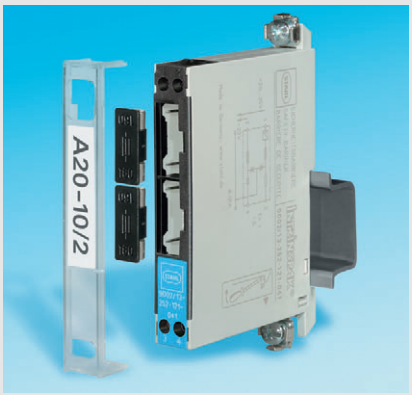
INTRINSPAK

Safety Barriers
Series 9001, 9002, 9004

- Complete product range for all standard applications
- Flexible and space saving - single and dual channel versions on 12 mm only
- Reduced inventory due to uniform exchangeable fuse
- Installation in Zone 2 and Division 2 possible

Safety barriers are used to connect intrinsically safe (Ex i) circuits with non-intrinsically safe circuits. The barriers limit the electrical energy towards the hazardous area by means of a combination of Zener diodes, resistors and fuses.
Safety barriers featuring an extremely broad application area.

Advantages at a Glance:



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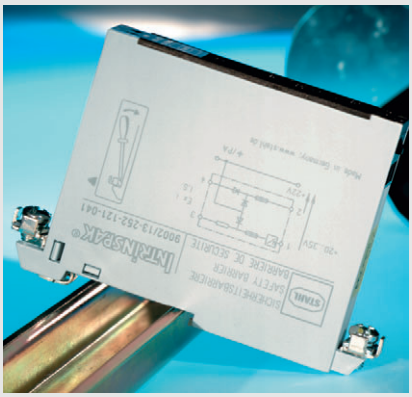
If single or dual channel, the safety barriers offer a low cost and space saving solution on 12 mm foot print.
The transparent cover offers sufficient space for labeling.



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Snapping-on mounts the barrier mechanically, it simultaneously establishes the PE connection.
Therefore only one common PE connection is needed per DIN rail.
Time and energy-intensive wiring is dispensed with, however, manual wiring is still an installation option.
Even if other rails are used, adapters guarantee that the safety barriers possess a high degree of flexibility.

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An easily exchangeable back-up fuse protects the internal fuse and the safety barrier itself.
Only one nominal fuses value is required for all models.
This back-up fuse can be replaced without dismounting the barrier and without deenergizing the circuit.

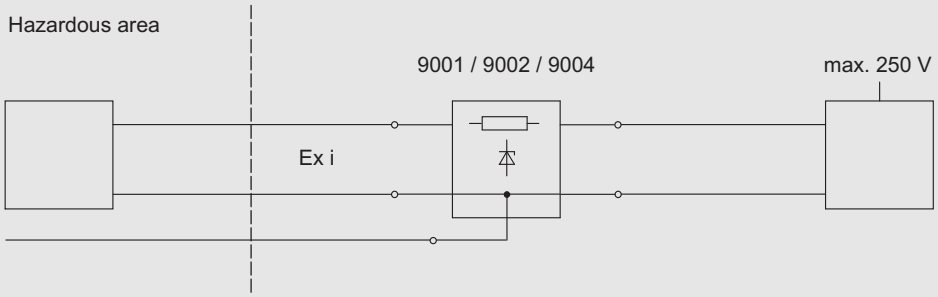
Safety Barriers
Series 9001, 9002, 9004

Introduction

Application

Safety barriers are used as economical interfaces without galvanic isolation between intrinsically safe and non-intrinsically safe circuits. They protect circuits (i. e. cable and apparatus) in hazardous locations.

Safety barriers are so-called associated apparatus:
Since they also contain non-intrinsically circuits they must either be installed in the safe area or if certified in Zone 2 / Division 2. The combination with an further type of explosion protection (e.g. flame proof enclosure) enables the installation in Zone 1.



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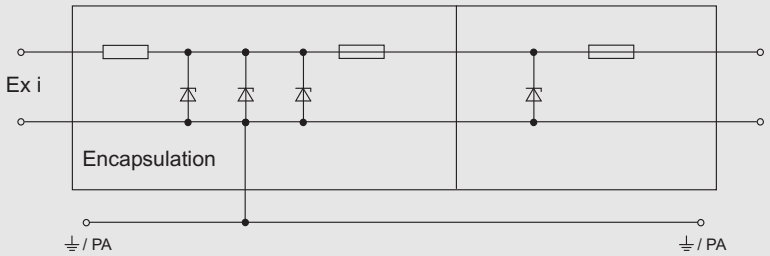
Function

Safety barriers are used to limit the power supply into an intrinsically circuit in such a way that neither sparks nor thermic effects (hot surfaces) can cause an ignition.

A safety barrier thus contains three essential elements:
- Zener diodes for limiting the voltage
- Resistor or components for limiting the current
- Fuse for the protection of zener diodes



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R. STAHL safety barriers Series 9001, 9002 and 9004 also contain a protective circuit with an exchangeable fuse externally accessible, protecting the internally encapsulated non-accessible fues of the safety barrier. The protective circuit prevents both fuses tripping at the same time.

In order to cover the complete spectrum of instrumentation applications a few types of safety barriers include function blocks like e.g. electronic current limitations, amplifier, etc.

Potential Equalisation / Grounding

Differences in potential can delete the intrinsically safety and thus make explosion protection ineffective, since safety barriers have no galvanic isolation between input and output.
All (national) standards for the installation of intrinsically safe circuits thus require:
- the existance of a potential equalisation or grounding system as well as
- the connection of safety barriers to this potential equalisation

R. STAHL safety barriers can alternatively be connected directly via the electrically conducting snap-on mechanism or by means of the ⏚ / PA-terminal to the potential equalisation.

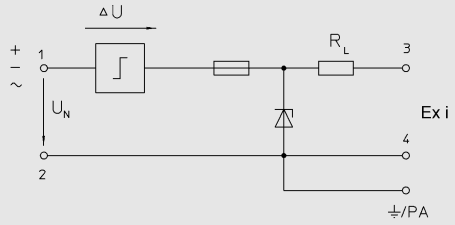
Selection Criteria - Function and Safety

Selection of safety barriers is generally carried out in two steps:
- Functional consideration
- Safety consideration

1. Functional consideration

Safety barriers are first selected according to their electrical requirements. It is therefore necessary to know the electrical data of the connected apparatus.

Further selection criteria:
- Polarity of the voltage at the safety barrier U_N (+, -, ~) in reference to ⏚/PA
- Voltage U_N
- Max. permissible voltage drop across the barrier, caused by the line resistance R_L and / or a constant voltage drop △U
- Type of signal to be transmitted;
  voltage signals can only be transmitted via barriers with purely resistive line resistance; this limitation does not apply to current signals.



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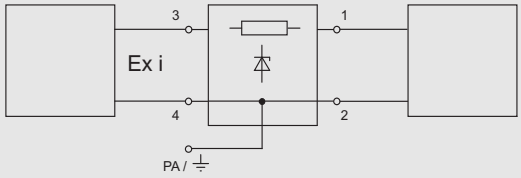
It is furthermore to be examined, if the circuit may be grounded or if an earth-free („floating“) circuit is required due to electrical or measurement reasons.
An earth-free („floating“) circuit can usually be established by using a dual-channel safety barrier or interconnecting two single-channel safety barriers.



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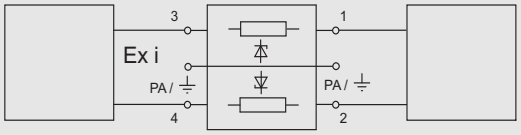
Grounded circuit



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Floating circuit

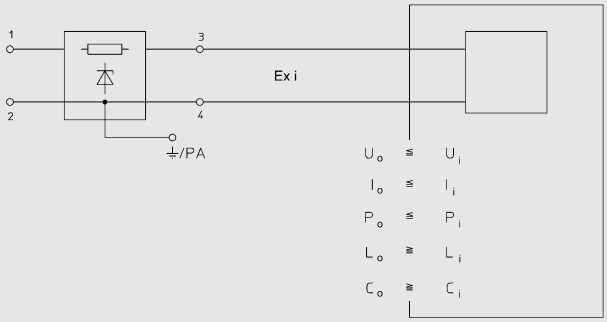
For many standard application in instrumentation special safety barriers are available, which are designed optimally for the respective application according to the criteria mentioned above.

Selection Criteria - Function and Safety

2. Safety consideration

The safe maximum values of an individual safety barrier (single- or dual-channel) are determined by the certification:
- Maximum voltage U_o
- Maximum current I_o
- Maximum power P_o
- Maximum permissible capacity C_o
- Maximum permissible inductance L_o

It is to be tested however, if the permissible safe maximum values of the intrinsically safe apparatus (field apparatus in the hazardous area) are maintained by the selected safety barrier.



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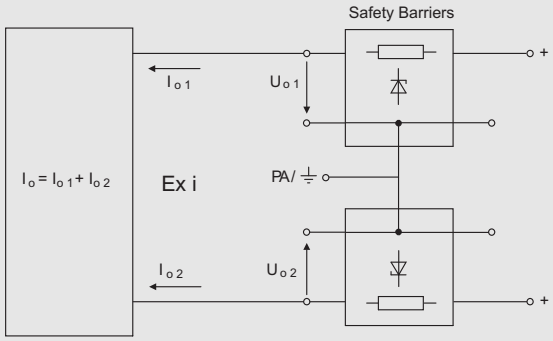
Interconnection of Safety Barriers

If several safety barriers are interconnected, possible current and / or voltage addition is to be taken into consideration from the safety point of view (example 1 and 2).
The maximum values for U_o and I_o permissible for an interconnection as well as the resulting permissible maximum values for C_o and L_o for the various explosion groups can be referred to in the ignition curves (see EN 60079-11).

Example 1 — Interconnection of two safety barriers for positive potential.
From a safety point of view a current addition results, i.e. $I_o = I_{o1} + I_{o2}$
The new voltage U_o is assumed to be the higher of the two values U_{o1} and U_{o2}, thus U_o = max. (U_{o1}, U_{o2})



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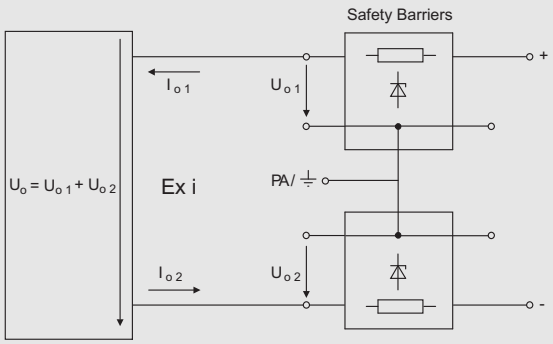
Example 2 — Interconnection of two safety barriers for positive and negative potential.
From a safety point of view a voltage addition results, i.e. $U_o = U_{o1} + U_{o2}$
The new current I_o is assumed to be the higher of the two values I_{o1} and I_{o2}, thus I_o = max. (I_{o1}, I_{o2})



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Interconnection of Safety Barriers

Addition possibilities

I = current addition
U = voltage addition

Example: When interconnecting two safety barriers for alternating potential I + U results, thus a current addition as well as a voltage addition is to be taken into consideration.

Polarity	-	+	~
-	I	U	I and U
+	U	I	I and U
~	I and U	I and U	I and U

The EN 60079-11, table A.1 contains the permissible value pairs / combinations of permissible maximum safe values for:

- Voltage U_o
- Current I_o
- External capacitance C_o

The following procedure is to be applied:

1. Test, if the value combination U_o and I_o determined is permitted

   Example 1:
   Values 28 V / 100 mA are permitted, since the current I_o can be up to 120 mA at 28 V for explosion group IIC

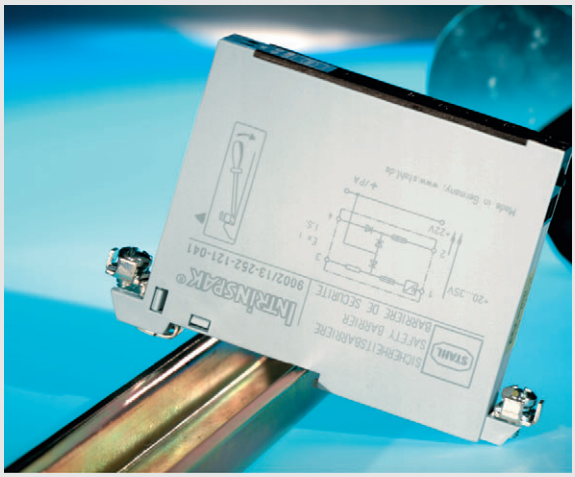
   Example 2:
   Values 24 V / 210 mA are permitted only for IIB

2. Determination of capacitance C_o from voltage U_o

   Example:
   U_o = 27 V. For IIB the result is C_o = 705 nF

It is not allowed to apply the ignition diagrams acc. to EN 60079-11 for the assersment of the intrinsic safety in case that safety barriers with electronic current limitations need to be interconnected.
A suitable procedure is described in the EN 60079-25.

Installation and Grounding



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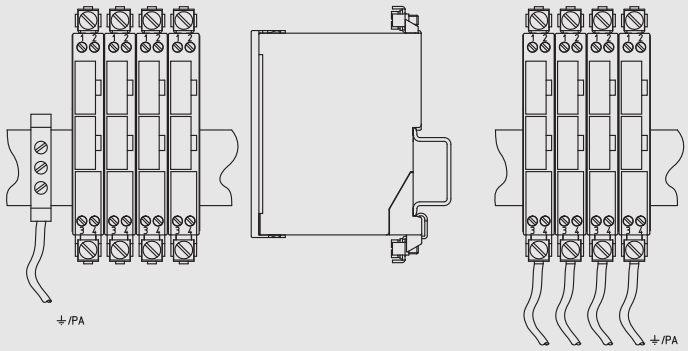
R. STAHL safety barriers Series 9001, 9002 and 9004 excel due to an especially simple mounting mechanism. They snap on to a 35 mm DIN rail (NS35/15 to EN 50 022) directly without a mounting attachment.

At the same time a conducting connection between ⏚ / PA of the barrier and the rail, is established. Grounding several barriers is achieved by connecting the rail with the potential equalisation / grounding system (collective ground).

The safety barriers can alternatively be grounded individually as well by using the ⏚ / PA terminal on the intrinsically safe side of the safety barrier.



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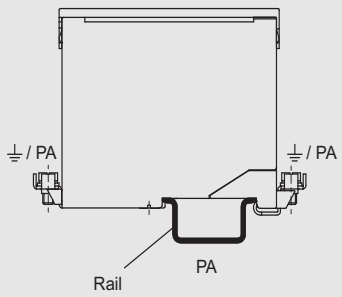
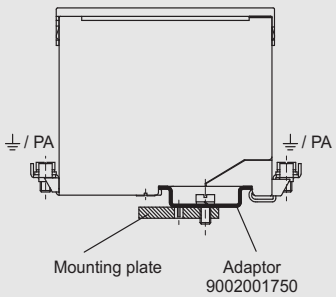
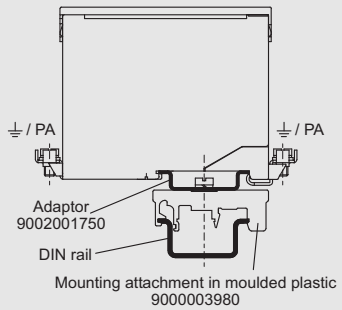
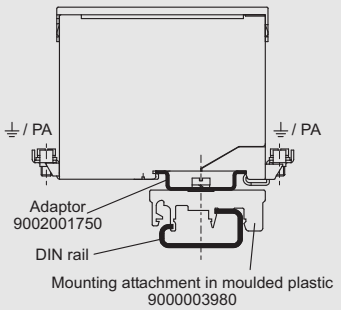
Further Mounting Possibilities

Further mounting possibilities result, when using the attachments supplied as accessories. The mounting attachments can be mounted to the barriers by means of an adaptor. (Mounting accessories please find in table Accessories and Spare parts)

	DIN-rail NS35/15 acc. to EN 50 022	DIN-rail NS32 acc. to EN 50 035	Mounting plate or flat bar
non isolated	 09914E02		 09918E02
isolating	 09915E02	 09917E02	

Exchangeable Back-up Fuse

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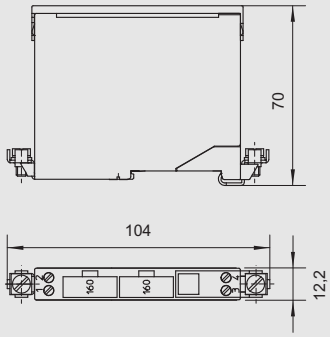
All safety barriers Series 9001, 9002 and 9004 have an exchangeable back-up fuse. Dual-channel safety barriers have a back-up fuse per channel. This fuse backs up the internal, non-accessible fuse. A protective circuit prevents tripping of both fuses at the same time. It is thus ensured that the safety barrier is protected against destruction resulting from reverse polarity of the operating voltage or excessively high operation voltages.

Two advantages are essential for maintenance and repair:

- in case of overload the safety barrier does not have to be exchanged, the exchangeable back-up fuse can be replaced without removing the barrier;

The safety barriers and their back-up fuses are designed in such a way that only one back-up fuse (I = 160 mA) can be used for all barriers Series 9001, 9002 and 9004.
Stocking spare parts is thus reduced to an absolute minimum.

Dimensional Drawings (All Dimensions in mm) - Subject to Alterations



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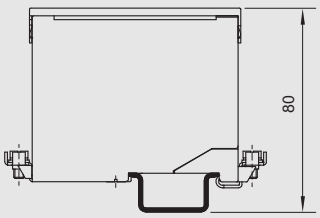
Safety barriers 9001, 9002, 9004



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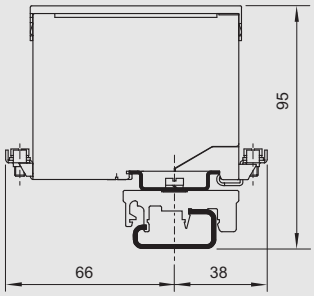
Safety barriers 9001, 9002, 9004
mounting on
DIN rail NS 35/15 (acc. to EN 50 022)



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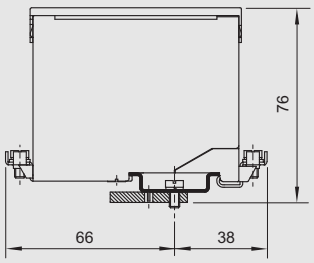
Safety barriers 9001, 9002, 9004
mounting on
DIN rail NS 32 (acc. to EN 50 035)
by means of adaptor and
mounting attachment, moulded plastic



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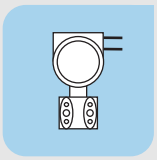
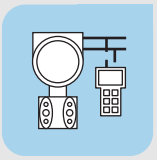
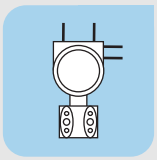
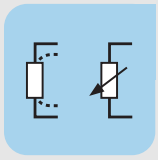
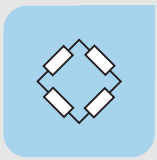
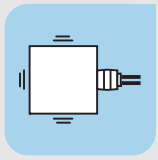
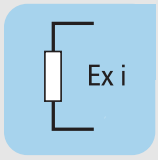
Safety barriers 9001, 9002, 9004
mounting on
mounting plate by means of adaptor

Overview application Safety Barrieres

Symbol	Application	INTRINSPAK Type
 06861E00	**2-, 3-wire transmitter**	9002/13-280-110-001 9001/51-280-091-141
 06329E00	**2-wire transmitter HART**	9002/13-280-110-001 9001/51-280-091-141
 07648E00	**4-wire transmitter, current source** Field circuit floating	9002/34-280-000-001
 07649E00	**4-wire transmitter HART** Field circuit floating	9002/34-280-000-001
 07650E00	**i/p converter, control valve, indicator** Field circuit grounded	9001/01-280-110-101 9002/13-280-110-001
 06321E00	**i/p converter, HART control valve** Field circuit grounded	9001/01-280-110-101 9002/13-280-110-001
 06333E00	**Contact, optocoupler output** Switch (load at +) Field circuit grounded Switch (load grounded) Field circuit grounded	9001/01-252-057-141 9001/01-252-060-141
 06324E00	**Solenoid valve, LED indicator** Field circuit grounded Field circuit grounded	9001/01-252-100-141 9001/13-252-121-041

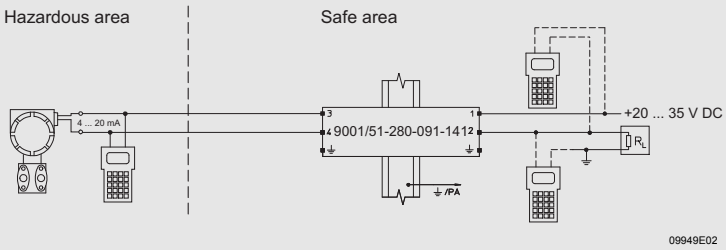
Overview application Safety Barrieres

 06332E00	**Thermocouple, mV signals** Field circuit floating	9002/77-093-300-001
 06331E00	**Resistance thermometer (RTD), Potentiometer** Pt100, 2-wire connection Field circuit floating Pt100, 3-wire connection Field circuit floating Pt100, 4-wire connection Field circuit floating	 9002/22-032-300-111 9002/22-032-300-111 9002/22-032-300-111 9002/77-093-040-001
 07428E00	**Strain gauge load cells** 350 Ω or 700 Ω 6-wire ± 7.5 V (15 V) Field circuit floating 350 Ω 6-wire + 10 V Field circuit floating 350 Ω or 700 Ω 6-wire + 16 V Field circuit floating	 9002/10-187-270-001 9002/10-187-020-001 9002/77-093-040-001 9002/11-130-360-001 9002/11-120-024-001 9002/13-199-225-001 9002/11-199-030-001
 06327E00	**Fire & gas detection**	9001/01-280-165-101
 06892E00	**Vibration sensor**	9002/00-260-138-001
 06318E00	**Intrinsically safe power feed of a load**	9004

Selection Table

Description		Order number
Application	**Analog input with transmitter Smart Field circuit grounded**	**9001/51-280-091-141**

Diagram



Nominal values

Operating voltage	U_N = + 20 V ... 35 V	
Operating current	I_N = 3.6 mA ... 22 mA	
Load	R_L ≤ 350 Ω	
Operating voltage of transmitter	U_{min} (I_N= 20 mA)	U_N
	U_N - 9.5 V 14 V	≤ 23.5 V > 23.5 V

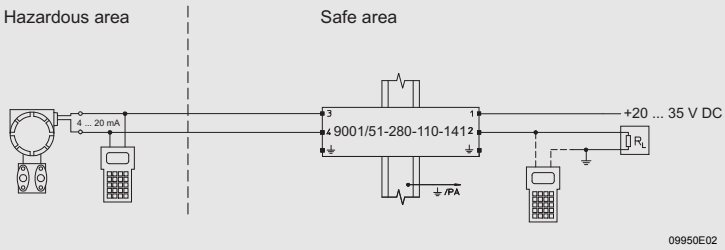
Safety values

Maximum voltage	U_o = 28 V		
Maximum current	I_o = 91 mA		
Maximum permissible external inductance	L_o	IIC 2.2 mH	IIB 14 mH
Maximum permissible external capacitance	C_o	IIC 0.083 µF	IIB 0.65 µF
Maximum power	P_o = 637 mW		
Application note	This safety barrier enables 2-way communication between Smart transmitter to / from a hand held communicator or DCS. Compatible to: • Honeywell DE Protokoll • All HART compatible transmitter		
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Analog input with standard transmitter Field circuit grounded**	**9001/51-280-110-141**

Diagram



Nominal values

Operating voltage	U_N = + 20 V ... 35 V		
Operating current	I_N = 3.6 mA ... 22 mA		
Load	$R_L \leq 500\ \Omega$ ($U_N \leq 23.5$ V) $R_L \leq 750\ \Omega$ ($U_N > 23.5$ V)		
Operating voltage of transmitter	U_{min} (I_N= 20 mA) U_N - 8.5 V 15 V	U_N ≤ 23.5 V > 23.5 V	

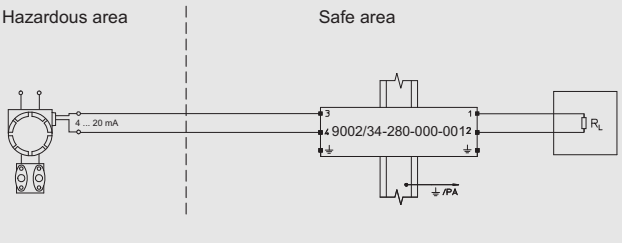
Safety values

Maximum voltage	U_o = 28 V		
Maximum current	I_o = 110 mA		
Maximum permissible external inductance	L_o	IIC 1.2 mH	IIB 9 mH
Maximum permissible external capacitance	C_o	IIC 0.083 µF	IIB 0.65 µF
Maximum power	P_o = 770 mW		
Application note	With regulated power supply $U_N \leq 26$ V safety barrier 9002/13-280-110-001 can be used. Operating voltage of transmitter is $U_{min} \geq 12.1$ V (at U_N = 24 V; I_N = 20 mA; R_L = 250 Ω). The safety barriers enables 2-way communication from / to a HART transmitter to / from a hand held communicator or DCS. Compatible to all HART transmitters.		
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**4-wire transmitter** **Field circuit floating**	**9002/34-280-000-001**

Diagram



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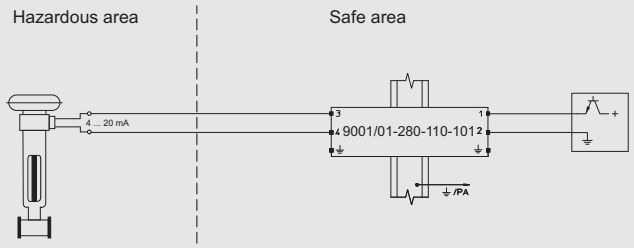
Nominal values

Operating current	I_N = 0 ... 22 mA
Load	$R_L \leq 750\ \Omega$
Maximum voltage drop of the safety barrier	$\triangle U_{max} \leq 3.5$ V

Safety values

Maximum voltage	U_o = 28 V		
Maximum current	I_o = 0 mA		
Maximum permissible external inductance	The inductance is determined by the maximum current of the transmitter		
Maximum permissible external capacitance	C_o	IIC 0.083 µF	IIB 0.65 µF
Maximum power	P_o = 0 mW		
Application note	This circuit requires an isolated input. For non-isolated inputs (R_L connected to PA) use the safety barrier 9001/03-280-000-001.		
Note	Further technical data see page		

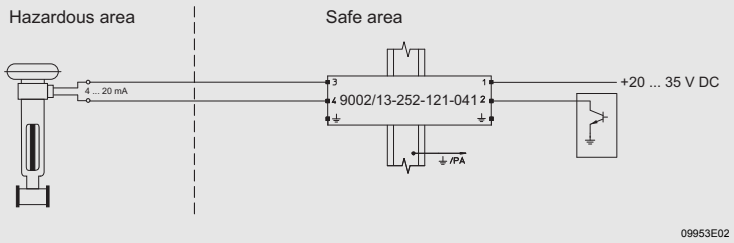
Selection Table

Description		Order number
Application	**Analog output (sourcing) for i/p converter etc. Field circuit grounded**	**9001/01-280-110-101**
Diagram	 11331E02	
Nominal values		
Operating voltage	U_N = + 24 V	
Operating current	I_N = 0 ... 22 mA	
Maximum voltage drop of the safety barrier	$\triangle U_{max} \leq$ 6.5 V	
Safety values		
Maximum voltage	U_o = 28 V	
Maximum current	I_o = 110 mA	
Maximum permissible external inductance	L_o IIC 1.2 mH IIB 9 mH	
Maximum permissible external capacitance	C_o IIC 0.08 µF IIB 0.65 µF	
Maximum power	P_o = 770 mW	
Note	Further technical data see page	

Selection Table

Description		Order number
Application	**Analog output (sourcing) for i/p converter etc. Field circuit floating**	**9002/13-252-121-041**

Diagram



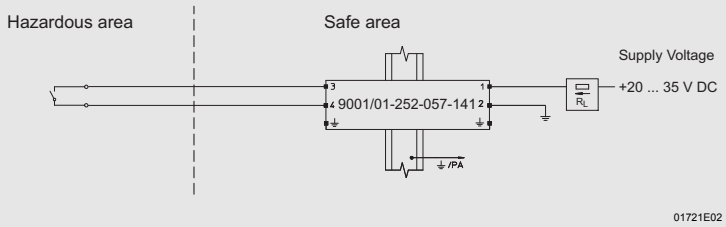
Nominal values

Operating voltage	U_N = + 20 V ... 35 V		
Operating current	I_N = 0 ... 22 mA		
Maximum voltage drop of the safety barrier	$\triangle U_{max} \leq$ 8.9 V		

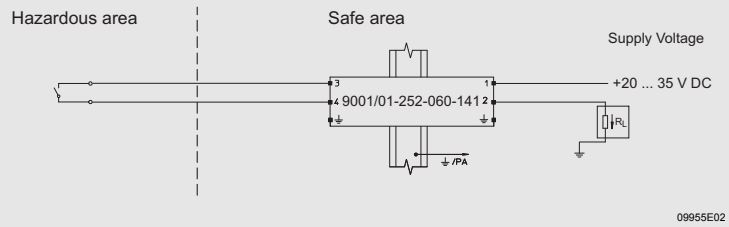
Safety values

Maximum voltage	U_o = 25.2 V		
Maximum current	I_o = 121 mA		
Maximum permissible external inductance	L_o	IIC 1.25 mH	IIB 7.35 mH
Maximum permissible external capacitance	C_o	IIC 0.104 µF	IIB 0.8 µF
Maximum power	P_o = 763 mW		
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Digital input with switch (load at +) Field circuit grounded**	**9001/01-252-057-141**
Diagram		
Nominal values		
Operating voltage	U_N = + 20 V ... 35 V	
Operating current	I_N = 40 mA	
Voltage at load	$U_L \geq U_N$ - 3 V	
Safety values		
Maximum voltage	U_o = 25.2 V	
Maximum current	I_o = 57 mA	
Maximum permissible external inductance	L_o IIC 6.3 mH IIB 25 mH	
Maximum permissible external capacitance	C_o IIC 0.107 µF IIB 0.82 µF	
Maximum power	P_o = 359 mW	
Application note	This safety barrier is particularly suited to drive a relay. Also it is possible to drive a digital input (optocoupler) of an automation system as load.	
Note	Further technical data see page	

Selection Table

Description		Order number
Application	**Digital input with switch (load grounded) Field circuit grounded**	**9001/01-252-060-141**
Diagram		

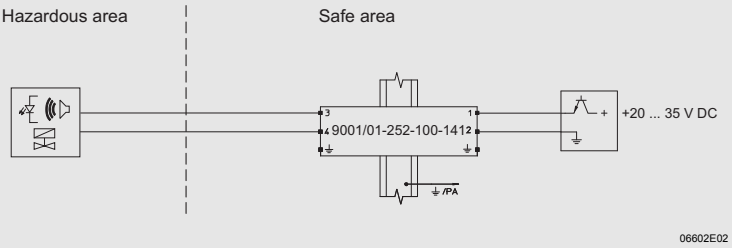
Nominal values

Operating voltage	U_N = + 20 V ... 35 V		
Operating current	I_N = 40 mA		
Voltage at load	$U_L \geq U_N$ - 3 V		

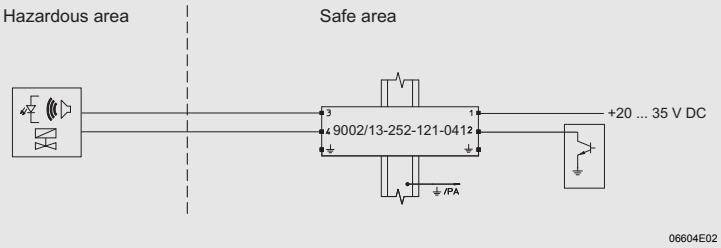
Safety values

Maximum voltage	U_o = 25.2 V		
Maximum current	I_o = 60 mA		
Maximum permissible external inductance	L_o	IIC 6.2 mH	IIB 25 mH
Maximum permissible external capacitance	C_o	IIC 0.107 µF	IIB 0.82 µF
Maximum power	P_o = 378 mW		
Application note	This safety barrier is particularly suited to drive a relay. Also it is possible to drive a digital input (optocoupler) of an automation system as load.		
Note	Further technical data see page		

Selection Table

Description				Order number
Application	**Digital output (sourcing) for solenoid valves, LED etc. Field circuit grounded**			**9001/01-252-100-141**
Diagram				
Nominal values				
Operating voltage	U_N = + 20 V ... 35 V			
Open circuit output voltage (terminal 3 -> 4, I_N = 0)	$U_L \geq$	$U_N \leq 24$ V U_N - 3 V	$U_N > 24$ V 21 V	
Operating current	$I_N = U_L / 268\ \Omega + R_L$			
Safety values				
Maximum voltage	U_o = 25.2 V			
Maximum current	I_o = 100 mA			
Maximum permissible external inductance	L_o	IIC 2 mH	IIB 11 mH	
Maximum permissible external capacitance	C_o	IIC 0.107 µF	IIB 0.82 µF	
Maximum power	P_o = 630 mW			
Note	Further technical data see page			

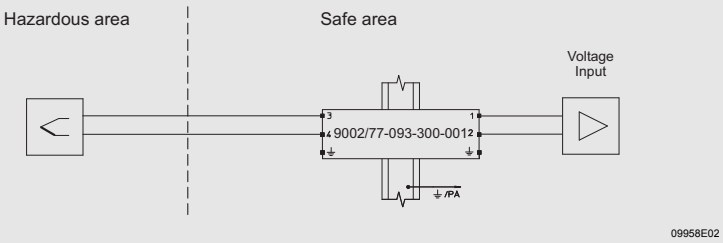
Selection Table

Description				Order number
Application	**Digital output (sinking) for solenoid valves, LED etc. Field circuit floating**			**9002/13-252-121-041**
Diagram				
Nominal values				
Operating voltage	U_N = + 20 V ... 35 V			
Open circuit output voltage (terminal 3 -> 4, I_N = 0)	$U_L \geq$	$U_N \leq 24$ V U_N - 3.5 V	$U_N > 24$ V 21 V	
Operating current	$I_N = U_L / 243\ \Omega + R_L$			
Safety values				
Maximum voltage	U_o = 25.2 V			
Maximum current	I_o = 121 mA			
Maximum permissible external inductance	L_o	IIC 1.25 mH	IIB 7.35 mH	
Maximum permissible external capacitance	C_o	IIC 0.104 µF	IIB 0.8 µF	
Maximum power	P_o = 760 mW			
Note	Further technical data see page			

Selection Table

Description		Order number
Application	**Thermocouples, AC-sensors Field circuit floating**	**9002/77-093-300-001**

Diagram



Nominal values

Maximum end-to-end resistance of the safety barrier	R_{max} = 2 x 82.1 Ω		
Voltage of sensor	U ≤ ± 4 V_{eff} / 6 V_{pp}		

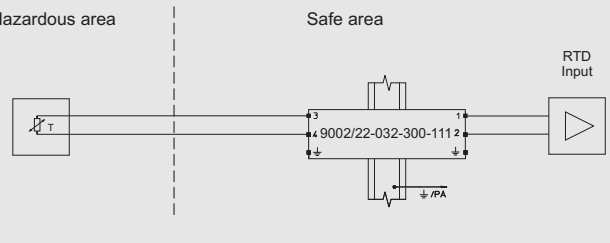
Safety values

Maximum voltage	U_o = 9.3 V		
Maximum current	I_o = 300 mA		
Maximum permissible external inductance	L_o	IIC 0.2 mH	IIB 1.8 mH
Maximum permissible external capacitance	C_o	IIC 4.1 µF	IIB 31 µF
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Pt100, 2-wire-connection Field circuit floating**	**9002/22-032-300-111**

Diagram



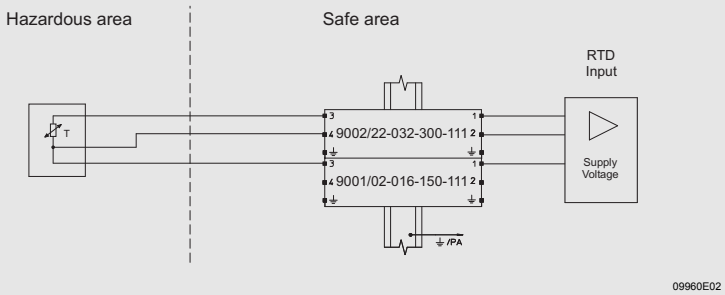
Nominal values

Operating voltage	$U_N \leq 1.4$ V		
End-to-end resistance of the safety barrier	R = 2 x (20 Ω ± 0.1 Ω)		
Measuring range	≤ 400 °C ($I_N \leq 5$ mA) ≤ 850 °C ($I_N \leq 3$ mA)		

Safety values

Maximum voltage	U_o = 3.2 V		
Maximum current	I_o = 300 mA		
Maximum permissible external inductance	L_o	IIC 0.2 mH	IIB 1.8 mH
Maximum permissible external capacitance	C_o	IIC 100 µF	IIB 1000 µF
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Pt100, 3-wire-connection Field circuit floating**	**9002/22-032-300-111 9001/02-016-150-111**
Diagram		

Nominal values

Operating voltage	$U_N \leq 1.4$ V		
End-to-end resistance of the safety barrier	R = 2 x (20 Ω ± 0.1 Ω)		
Measurement range	≤ 400 °C ($I_N \leq 5$ mA) ≤ 850 °C ($I_N \leq 3$ mA)		

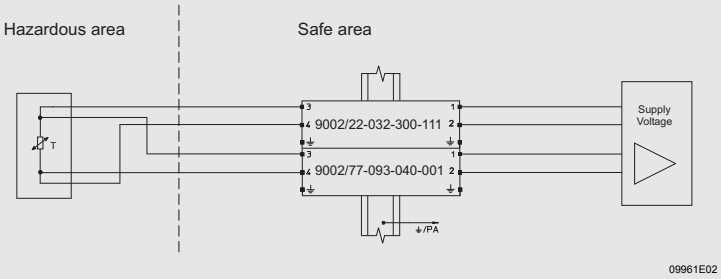
Safety values

Maximum voltage	U_o = 3.2 V		
Maximum current	I_o = 450 mA		
Maximum permissible external inductance	L_o	IIC 0.12 mH	IIB 0.5 mH
Maximum permissible external capacitance	C_o	IIC 100 µF	IIB 1000 µF
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Pt100, 4-wire-connection Field circuit floating**	**9002/22-032-300-111 9002/77-093-040-001**

Diagram



Nominal values

Operating voltage	$U_N \leq 1.4$ V		
End-to-end resistance of the safety barrier	R = 2 x (20 Ω ± 0.1 Ω)		
Measurement range	≤ 400 °C ($I_N \leq 5$ mA) ≤ 850 °C ($I_N \leq 3$ mA)		

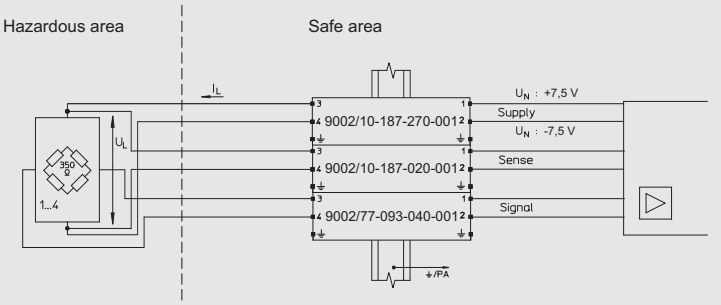
Safety values

Maximum voltage	U_o = 10.9 V		
Maximum current	I_o = 340 mA		
Maximum permissible external inductance	L_o	IIC 0.18 mH	IIB 1.45 mH
Maximum permissible external capacitance	C_o	IIC 2.05 µF	IIB 14.4 µF
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Strain gauge load cell 350 Ω or 700 Ω 6 wire ± 7.5 V (15 V) field circuit floating**	**9002/10-187-270-001 9002/10-187-020-001 9002/77-093-040-001**

Diagram



Nominal values

Operating voltage	$U_N \leq \pm 7.5$ V (15 V)
Voltage for strain gauge load cell and wire	U_L (at $U_N \leq \pm 7.5$ V)
Current for strain gauge load cell	I_L (at $U_N \leq \pm 7.5$ V) Strain gauge load cell

Number	Resistance R_L 350 Ω		700 Ω	
	U_L (V)	I_L (mA)	U_L (V)	I_L (mA)
1	11.6	35	13.2	19
2	9.6	55	11.6	35
3	8	70	10.6	45
4	7	80	9.6	55

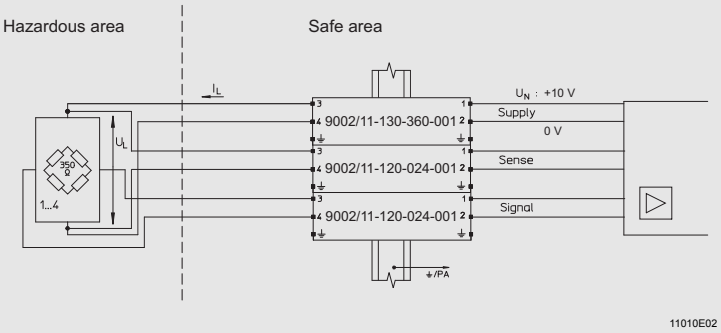
Safety values

Maximum voltage	U_o = 18.7 V		
Maximum current	I_o = 330 mA		
Maximum permissible external inductance	L_o	IIC 0.18 mH	IIB 1.45 mH
Maximum permissible external capacitance	C_o	IIC 0.270 µF	IIB 1.64 µF
Maximum power	P_o = 1.45 W		
Application note	With 4-wire connection (without sense) the respective safety barrier is not needed. Nominal values remain unchanged; safety maximum current is reduced to I_o = 310 mA and maximum power to P_o = 1.36 W.		
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Strain gauge load cell 350 Ω 6 wire + 10 V field circuit floating**	**9002/11-130-360-001 9002/11-120-024-001**

Diagram



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Nominal values

Operating voltage	$U_N \leq +10$ V		
Voltage for strain gauge load cell and wire	U_L (at $U_N = +10$ V)		
Current for strain gauge load cell	I_L (bei $U_N = +10$ V) Strain gauge load cell		
	Number	Resistance R_L 350 Ω	
		U_L (V)	I_L (mA)
	1	7.7	22
	2	6.2	35
	3	5.2	44,5
	4	4.5	51

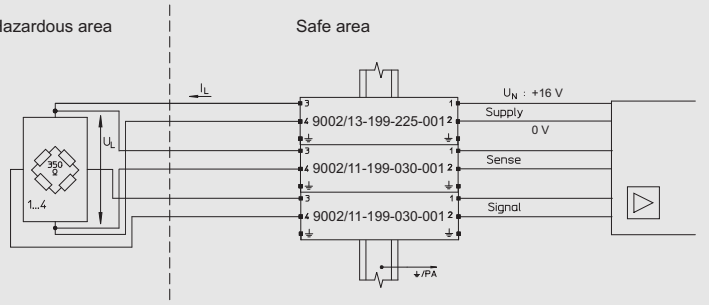
Safety values

Maximum voltage	$U_o = 13$ V		
Maximum current	$I_o = 408$ mA		
Maximum permissible external inductance	L_o	IIC 0.18 mH	IIB 0.7 mH
Maximum permissible external capacitance	C_o	IIC 1.0 µF	IIB 6.2 µF
Maximum power	$P_o = 1.2$ W		
Application note	With 4-wire connection (without sense) the respective safety barrier is not needed. Nominal values remain unchanged; safety maximum current is reduced to $I_o = 384$ mA, and maximum power to $P_o = 1.13$ W.		
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Strain gauge load cell 350 Ω or 700 Ω 6 wire + 16 V field circuit floating**	**9002/13-199-225-001** **9002/11-199-030-001**

Diagram



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Nominal values

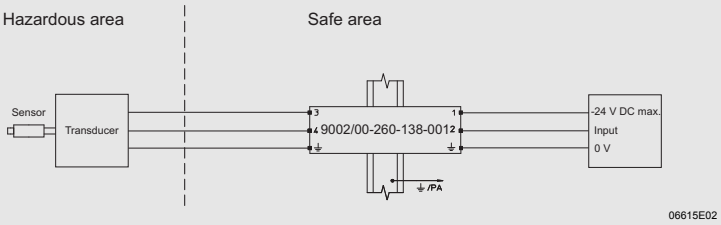
Operating voltage	$U_N \leq +16$ V
Voltage for strain gauge load cell and wire	U_L (at $U_N = +16$ V)
Current for strain gauge load cell	I_L (at $U_N = +16$ V) Strain gauge load cell

Number	Resistance R_L			
	350 Ω		700 Ω	
	U_L (V)	I_L (mA)	U_L (V)	I_L (mA)
1	10.4	30	12.1	17
2	8.3	47	10.4	30
3	6.9	60	9.5	41
4	5.9	67	8.3	47

Safety values

Maximum voltage	$U_o = 19.9$ V		
Maximum current	$I_o = 285$ mA		
Maximum permissible external inductance	L_o	IIC 0.2 mH	IIB 1.8 mH
Maximum permissible external capacitance	C_o	IIC 0.223 µF	IIB 1.42 µF
Maximum power	$P_o = 1.42$ W		
Application note	With 4-wire connection (without sense) the respective safety barrier is not needed. Nominal values remain unchanged; safety maximum current is reduced to $I_o = 255$ mA and maximum power to $P_o = 1.3$ W.		
Note	Further technical data see page		

Selection Table

Description		Order number
Application	**Vibration sensor**	**9002/00-260-138-001**
Diagram		
Nominal values		
Operating voltage	U_N = - 24 V	
End-to-end resistance of the safety barrier	R = 358 Ω	
Safety values		
Maximum voltage	U_o = 26 V	
Maximum current	I_o = 138 mA	
Maximum permissible external inductance	L_o IIC 0.81 mH IIB 5.1 mH	
Maximum permissible external capacitance	C_o IIC 0.087 µF IIB 0.67 µF	
Maximum power	P_o = 850 mW	
Application note	This barrier is for use with either a Bentley Nevada or Metrix displacement sensor. The potential of the above barrier is negative. If a positive potential is required then it may be possible to use the 9002/11-260-138-001.	
Note	Further technical data see page	