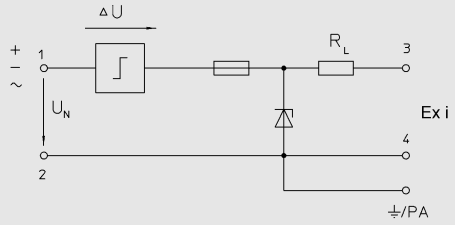
Selection Criteria - Function and Safety

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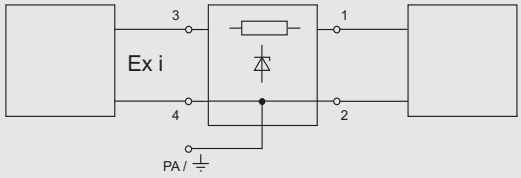
It is furthermore to be examined, if the circuit may be grounded or if an earth-free („floating“) circuit is required due to electrical or measurement reasons.
An earth-free („floating“) circuit can usually be established by using a dual-channel safety barrier or interconnecting two single-channel safety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



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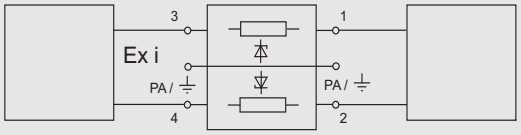
Grounded circuit



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Floating circuit

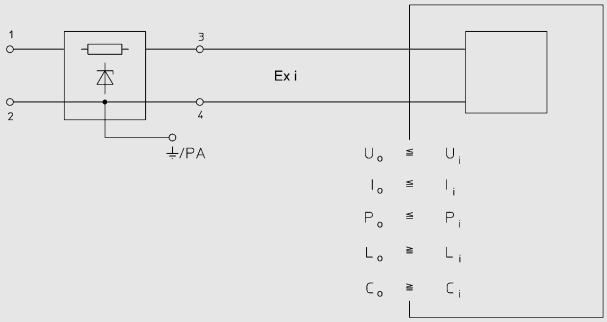
For many standard application in instrumentation special safety barriers are available, which are designed optimally for the respective application according to the criteria mentioned above.

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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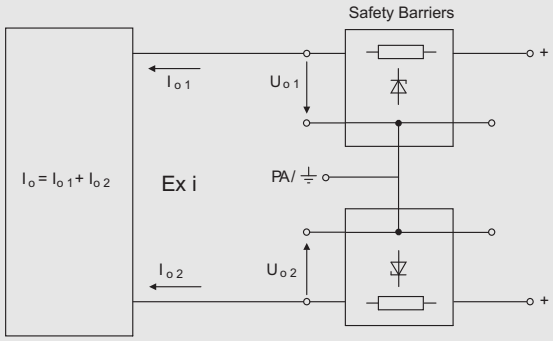
Interconnection of Safety Barriers

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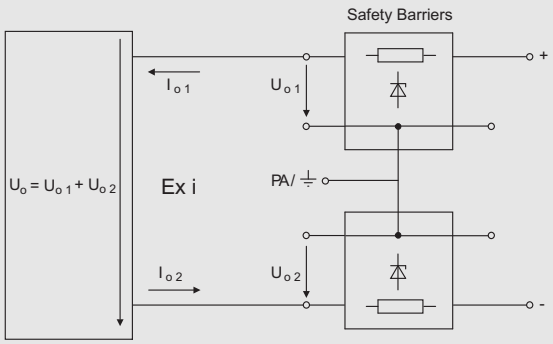
Example 2 — Interconnection of two safety barriers for positive and negative potential.
From a safety point of view a voltage addition results, i.e. $U_o = U_{o1} + U_{o2}$
The new current I_o is assumed to be the higher of the two values I_{o1} and I_{o2}, thus I_o = max. (I_{o1}, I_{o2})



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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

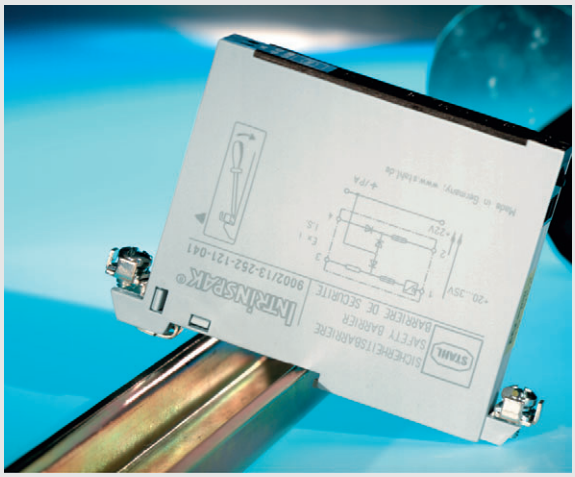
   Example 2:
   Values 24 V / 210 mA are permitted only for IIB

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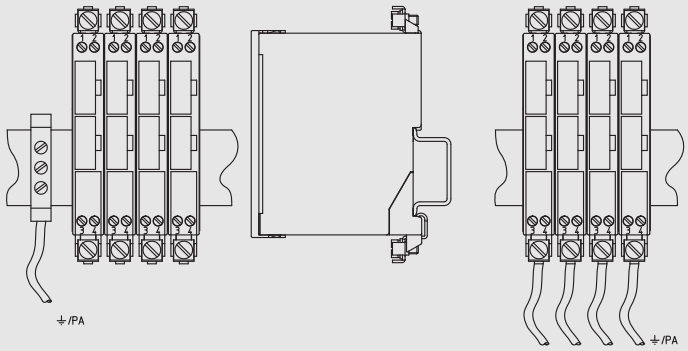
R. STAHL safety barriers Series 9001, 9002 and 9004 excel due to an especially simple mounting mechanism. They snap on to a 35 mm DIN rail (NS35/15 to EN 50 022) directly without a mounting attachment.

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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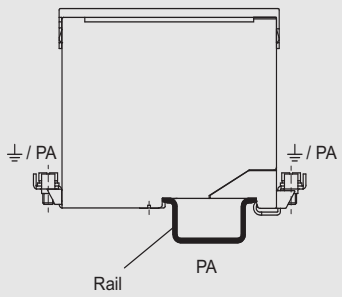
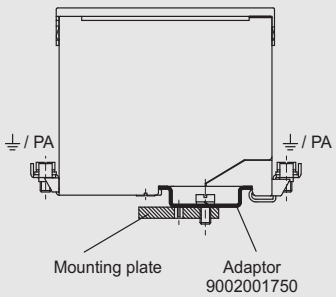
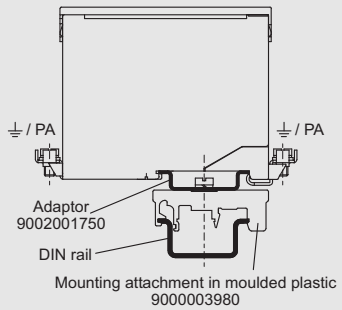
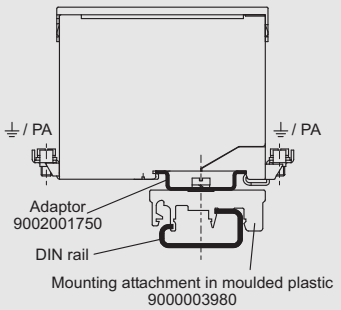
Further Mounting Possibilities

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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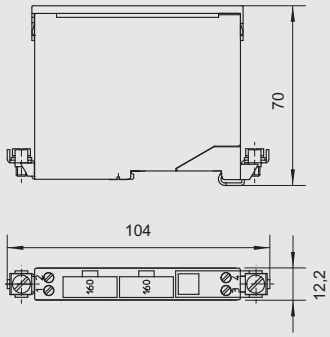
All safety barriers Series 9001, 9002 and 9004 have an exchangeable back-up fuse. Dual-channel safety barriers have a back-up fuse per channel. This fuse backs up the internal, non-accessible fuse. A protective circuit prevents tripping of both fuses at the same time. It is thus ensured that the safety 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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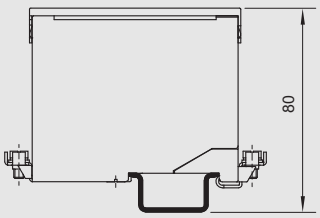
Safety barriers 9001, 9002, 9004



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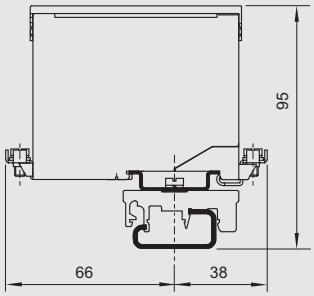
Safety barriers 9001, 9002, 9004
mounting on
DIN rail NS 35/15 (acc. to EN 50 022)



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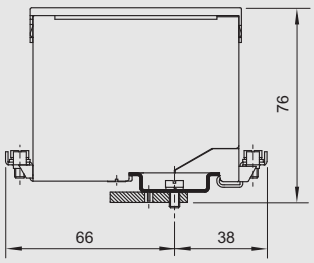
Safety barriers 9001, 9002, 9004
mounting on
DIN rail NS 32 (acc. to EN 50 035)
by means of adaptor and
mounting attachment, moulded plastic



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