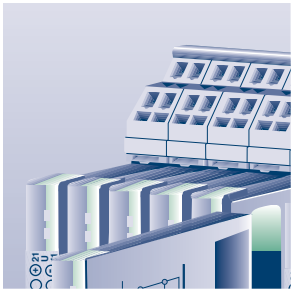
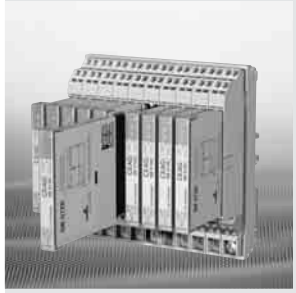
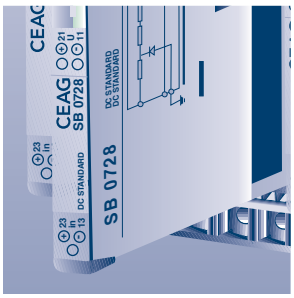
Safety Barriers

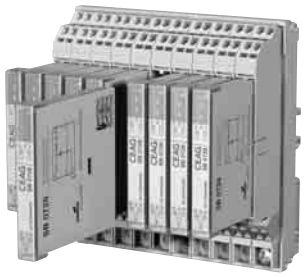






Safety barrier

Single barrier socket



10 fold backplane segment

Grounding rail

Product features

Simple wiring

- save wiring through backplane technology
- The PCB connects all barriers to equipotential earth
- Explosion protection EEx ia/ib IIC
- Mounting in Zone 2 allowed

Simple mounting

- Power supply LED
- plug-in barriers
- cage clamp wiring
- replaceable fuses
- large tagging area
- dual ground
- Backplane mounting by 35 mm top hat rail

Terminology

Operating data

V_N Rated maximum voltage
< 2 µA for $V < V_N$
R_{max} End to end resistance
S_i Internal fuse

Safety parameters
(in intrinsically safe circuits)

V_{oc} Maximum open circuit voltage
I_{sc} Maximum short circuit current
C_a Maximum permissible external capacitance
L_a Maximum permissible external inductance

Technical data:

Leakage current at V_N	< 2 µA
Temperature drift	≤ -250 x 10^{-6} / K
Operating temperature	-40 °C ... +60 °C
Storage temperature range	-40 °C ... +80 °C
Relative humidity	< 75 % (annual averrage) < 95 % (30 d/a), no condensation
Width	see dimensions page 7/16
Weight	approx. 70 g

Explosion protection:

EC-Type Examination	TÜV 99 ATEX 1449 X

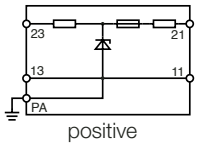
Ordering details

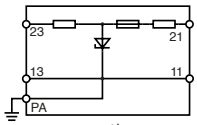
Description	Type	Order No.
Standard socket (backplane) for 1 barrier	**SB-9101**	**GHG 110 0000 W 9101**
Standard socket (backplane) for 6 barriers	**SB-9106**	**GHG 110 0000 W 9106**
Standard socket (backplane) for 10 barriers	**SB-9100**	**GHG 110 0000 W 9100**
Replaceable fuse 0 Ω jumper (10 pcs.)	**SB-9210**	**GHG 110 0000 W 9210**
Replaceable fuse 32 mA (10 pcs.)	**SB-9211**	**GHG 110 0000 W 9211**
Replaceable fuse 50 mA (10 pcs.)	**SB-9212**	**GHG 110 0000 W 9212**
Replaceable fuse 63 mA (10 pcs.)	**SB-9213**	**GHG 110 0000 W 9213**
Replaceable fuse 80 mA (10 pcs.)	**SB-9214**	**GHG 110 0000 W 9214**
Replaceable fuse 100 mA (10 pcs.)	**SB-9215**	**GHG 110 0000 W 9215**
Replaceable fuse 125 mA (10 pcs.)	**SB-9216**	**GHG 110 0000 W 9216**
Grounding rail (20 units)	**SB-9220**	**GHG 110 0000 W 9220**
Grounding rail (10 units)	**SB-9221**	**GHG 110 0000 W 9221**
Grounding rail (6 units)	**SB-9222**	**GHG 110 0000 W 9222**

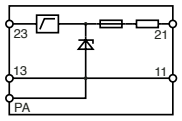
Note

**Barriers will be supplied without sockets.
Please order socket separately.
All barriers can be ordered using the type number or the full order no. GHG....**

Safety barriers

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC Standard, positive  positive	**SB-0613**	6	29	36	8.6	414	-	GHG 111 0000 W 0613
	SB-0614	6	96	103	8.6	100	-	GHG 111 0000 W 0614
	SB-0710	6	85	105	10	200	-	GHG 111 0000 W 0710
	SB-0018	7	109	115	9.6	96	-	GHG 111 0000 W 0018
	SB-3710	8	42	46	10	300	-	GHG 111 0000 W 3710
	SB-1250	12	49	56	15	403	-	GHG 111 0000 W 1250
	SB-3715	12	61	67	15	291	X	GHG 111 0000 W 3715
	SB-0715	12	151	157	15	150	X	GHG 111 0000 W 0715
	SB-1206	12	287	296	16.8	61.9	-	GHG 111 0000 W 1206
	SB-0027	15	574	583	20	36	-	GHG 111 0000 W 0027
	SB-3722	18	117	129	22	213	-	GHG 111 0000 W 3722
	SB-0722	18	187	207	22	150	-	GHG 111 0000 W 0722
	SB-2420	24	147	159	27.3	208	X	GHG 111 0000 W 2420
	SB-3729	24	187	207	28	171	X	GHG 111 0000 W 3729
	SB-3728	24	254	274	28	120	X	GHG 111 0000 W 3728
	SB-0728	24	326	346	28	93	X	GHG 111 0000 W 0728
	SB-2424	24	1223	1243	28.4	24	-	GHG 111 0000 W 2424

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC Standard,negative  negative	**SB-1613**	-6	29	36	8.6	414	-	GHG 111 0000 W 1613
	SB-1710	-6	85	105	10	200	-	GHG 111 0000 W 1710
	SB-4710	-8	42	46	10	300	-	GHG 111 0000 W 4710
	SB-2250	-12	49	56	15	403	-	GHG 111 0000 W 2250
	SB-4715	-12	61	67	15	291	X	GHG 111 0000 W 4715
	SB-1715	-12	151	157	15	150	X	GHG 111 0000 W 1715
	SB-2206	-12	287	296	16.8	61.9	-	GHG 111 0000 W 2206
	SB-4722	-18	117	129	22	213	-	GHG 111 0000 W 4722
	SB-1722	-18	187	207	22	150	-	GHG 111 0000 W 1722
	SB-3420	-24	147	159	27.3	208	X	GHG 111 0000 W 3420
	SB-4729	-24	187	207	28	171	X	GHG 111 0000 W 4729
	SB-4728	-24	254	274	28	120	X	GHG 111 0000 W 4728
	SB-1728	-24	326	346	28	93	X	GHG 111 0000 W 1728

	Type	V_N (V)	R_{max} (Ω)	I_{max} (mA)	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC Electronic  positive	**SB-8000**	12	24	80	15.8	95	-	GHG 111 0000 W 8000
	SB-8001	9	24	80	12.4	95	-	GHG 111 0000 W 8001

Note

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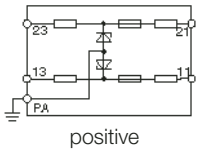
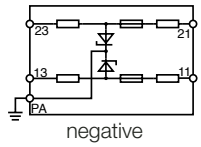
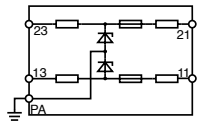
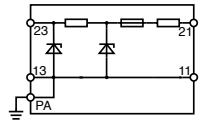
Safety barriers

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC double, positive	**SB-0017**	3/3	573 / 573	576 / 576	5.4/5.4	10/10	-	GHG 111 0000 W 0017
	**SB-0030**	5/5	107 / 107	110 / 110	5.9/5.9	59.4/59.4	-	GHG 111 0000 W 0030
	SB-0035	5/5	1000 / 1000	1000 / 1000	6,3/6.3	6.4/6.4	-	GHG 111 0000 W 0035
positive	**SB-0031**	6/6	590 / 590	597 / 597	8.61/8.61	15.1/15.1	-	GHG 111 0000 W 0031
	SB-1350	10/10	81 / 488	87 / 494	11.7/11.7	174/25	-	GHG 111 0000 W 1350
	SB-1351	10/10	488 / 488	494 / 494	11.7/11.7	25/25	-	GHG 111 0000 W 1351
	SB-0764	10/10	1026 / 1026	1046 / 1046	12/12	12/12	-	GHG 111 0000 W 0764
	SB-3250	12/12	48 / 48	54 / 54	15/15	387/387	X	GHG 111 0000 W 3250
	SB-0020	12/12	93 / 93	100 / 100	15.8/15.8	190/190	-	GHG 111 0000 W 0020
	SB-0767	12/12	157 / 157	163 / 163	15/15	150/150	X	GHG 111 0000 W 0767
	SB-0768	19/19	187 / 187	207 / 207	22/22	147/147	-	GHG 111 0000 W 0768
	SB-0796	23/17	339 / 435	360 / 455	26/20	87/51	-	GHG 111 0000 W 0796
	SB-0788	6/24	85 / 326	105 / 346	10/28	200/93	X	GHG 111 0000 W 0788
	SB-4420	24/24	146 / 146	159 / 159	27.3/27.3	208/208	X	GHG 111 0000 W 4420
	SB-4410	24/24	202 / 202	215 / 215	27.3/27.3	147/147	X	GHG 111 0000 W 4410
	SB-0779	24/24	326 / 326	346 / 346	28/28	93/93	X	GHG 111 0000 W 0779

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC double, negative	**SB-2350**	-10/-10	81 / 488	87 / 494	11.7/11.7	174/25	-	GHG 111 0000 W 2350
	**SB-2351**	-10/-10	488 / 488	494 / 494	11.7/11.7	25/25	-	GHG 111 0000 W 2351
	SB-1764	-10/-10	1026 / 1026	1046 / 1046	12/12	12/12	-	GHG 111 0000 W 1764
negative	**SB-4250**	-12/-12	48 / 48	54 / 54	15/15	387/387	X	GHG 111 0000 W 4250
	SB-1767	-12/-12	157 / 157	163 / 163	15/15	150/150	X	GHG 111 0000 W 1767
	SB-1768	-19/-19	187 / 187	207 / 207	22/22	147/147	-	GHG 111 0000 W 1768
	SB-1796	-23/-17	339 / 435	360 / 455	26/20	87/51	-	GHG 111 0000 W 1796
	SB-1788	-6/-24	85 / 326	105 / 346	10/28	200/93	X	GHG 111 0000 W 1788
	SB-5420	-24/-24	146 / 146	159 / 159	27.3/27.3	208/208	X	GHG 111 0000 W 5420
	SB-5410	-24/-24	202 / 202	215 / 215	27.3/27.3	147/147	X	GHG 111 0000 W 5410
	SB-1779	-24/-24	326 / 326	346 / 346	28/28	93/93	X	GHG 111 0000 W 1779

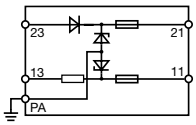
	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC Floating	**SB-0601**	+3/-3	43.3 / 43.3	48 / 48	13.1	206	-	GHG 111 0000 W 0601
	**SB-0033**	+5/-5	36 / 36	43 / 43	7.2/7.2	259/259	-	GHG 111 0000 W 0033
	SB-1301	+6/-6	31.5 / 31.5	38 / 38	17.2	414	-	GHG 111 0000 W 1301
	SB-0021	+7/-7	58 / 58	67 / 67	19.1	203	-	GHG 111 0000 W 0021
	SB-0023	+7/-7	446 / 446	455 / 455	19.1	22	-	GHG 111 0000 W 0023
	SB-1302	+9/-9	584 / 584	604 / 604	25.2	25	-	GHG 111 0000 W 1302
	SB-1303	+12/-12	80 / 80	100 / 100	29.4	248	-	GHG 111 0000 W 1303
	SB-2401	+12/-12	284 / 284	305 / 305	33.6	67	-	GHG 111 0000 W 2401

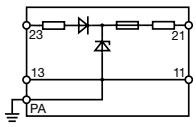
	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
Supply	**SB-0604**	12 / 6	85	94	6.51	246	-	GHG 111 0000 W 0604
								

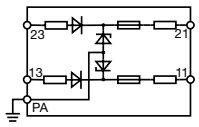
Note

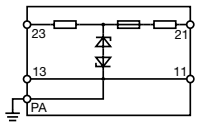
Barriers will be supplied without sockets.
Please order socket separately.
All barriers can be ordered using the type number or the full order no. GHG....

Safety barriers

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC Double with return channel 	**SB-0019**	12/12	16+1.2V/ 191	23+1.2V / 197	15.8/15.8	0/88	-	GHG 111 0000 W 0019
	SB-2787	24/24	21+1.2V / 254	41+1.2V / 274	28/28	0/120	X	GHG 111 0000 W 2787
	SB-2427	24/24	21+1.2V / 278	41+1.2V / 298	26.3/26.3	0/102	X	GHG 111 0000 W 2427
	SB-1787	24/24	31+1.2V / 326	51+1.2V / 346	28/28	0/93	X	GHG 111 0000 W 1787

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC Return 	**SB-1502**	12	21 + 1.2 V	41 + 1.2 V	16.8	0	-	GHG 111 0000 W 1502

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
DC Double return 	**SB-0786**	24/24	31+1.2 V/31+1.2V	51+1.2V/51+1.2V	28/28	0/0	-	GHG 111 0000 W 0786

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
AC Standard 	**SB-0026**	1	35	39	6.3	225	-	GHG 111 0000 W 0026
	SB-2710	6	85	105	10	200	-	GHG 111 0000 W 2710
	SB-0034	6	3100	3100	8.1	3	-	GHG 111 0000 W 0034
	SB-1602	12	54	60	16.8	390	-	GHG 111 0000 W 1602
	SB-0024	12	166	176	16.8	118	-	GHG 111 0000 W 0024
	SB-0028	15	96	105	20.1	258	-	GHG 111 0000 W 0028
	SB-0029	15	220	229	20.1	106	-	GHG 111 0000 W 0029
	SB-1203	18	464	476	27.1	66	-	GHG 111 0000 W 1203

Note

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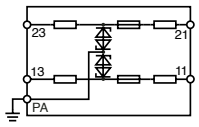
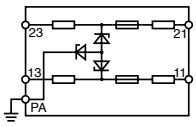
Safety barriers

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
AC Double 	**SB-0751**	0.35/0.35	10.8 / 10.8	14 / 14	1.2/1.2	238 / 238	-	GHG 111 0000 W 0751
	SB-0305	1.25/1.25	402 / 402	405 / 405	4.4/4.4	11.5/11.5	-	GHG 111 0000 W 0305
	SB-0201	2/2	35 / 35	39 / 39	5.3/5.3	178/178	-	GHG 111 0000 W 0201
	SB-0022	2.5/2.5	801 / 801	804 / 804	4.4/4.4	6/6	-	GHG 111 0000 W 0022
	SB-0015	5/5	71 / 71	75 / 75	7.5/7.5	120/120	-	GHG 111 0000 W 0015
	SB-0016	6/6	100 / 100	106 / 106	8.8/8.8	97.8/97.8	-	GHG 111 0000 W 0016
	SB-0761	6/6	142 / 142	149 / 149	9/9	100/100	-	GHG 111 0000 W 0761
	SB-0014	6.5/6.5	1766 / 1766	1772 / 1772	9.51/9.51	5.52/5.52	-	GHG 111 0000 W 0014
	SB-1761	7/7	385 / 385	405 / 405	9/9	25/25	-	GHG 111 0000 W 1761
	SB-1766	9.8/9.8	90 / 90	110 / 110	12/12	160/160	-	GHG 111 0000 W 1766
	SB-0766	10/10	183 / 183	203 / 203	12/12	80/80	-	GHG 111 0000 W 0766
	SB-2764	10/10	1077 / 1077	1096 / 1096	12/12	12/12	-	GHG 111 0000 W 2764

	Type	V_N (V)	R_{max} without replaceable fuse (Ω)	R_{max} with replaceable fuse	V_{OC} (V)	I_{SC} (mA)	LED	Order No.
Universal 	**SB-0036**	5/5	3300 / 3300	3300 / 3300	9.5/9.5	3/3	-	GHG 111 0000 W 0036
	SB-0760	6/6	85 / 85	105 / 105	10/10	200/200	-	GHG 111 0000 W 0760
	SB-0765	12/12	135 / 135	155 / 155	15/15	150/150	-	GHG 111 0000 W 0765
	SB-0772	18/18	343 / 343	363 / 363	22/22	73/73	-	GHG 111 0000 W 0772
	SB-0778	24/24	656 / 656	676 / 676	28/28	47/47	-	GHG 111 0000 W 0778

Note

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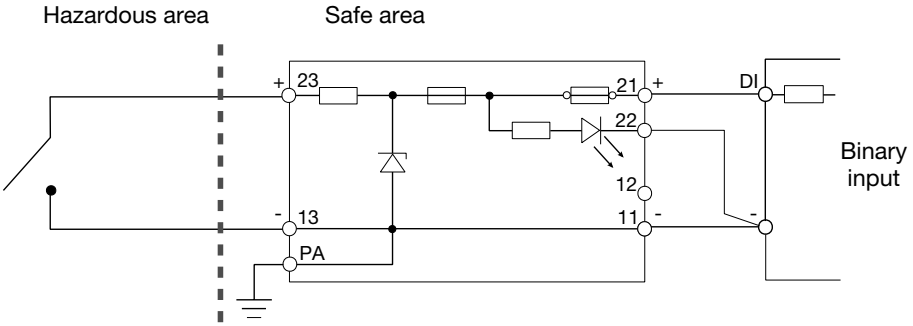
Mechanical contact, current sinking

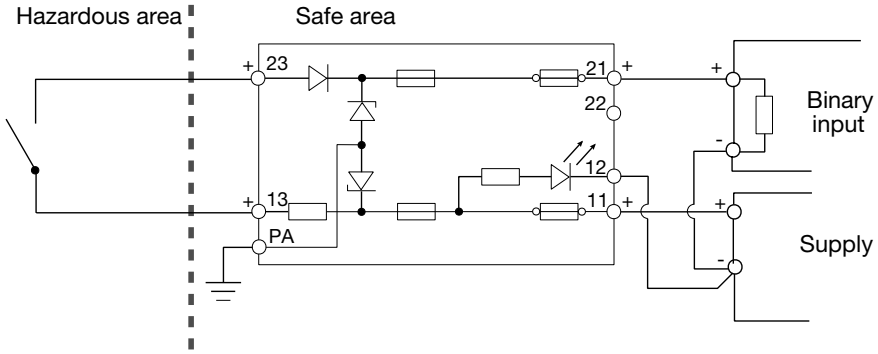


SB-0728

Voltage drop:
Barrier input influences input voltage:
$U_{DI} = U_L \times 346 / (346\ \Omega + R_{DI})$
U_L = open contact voltage
R_{DI} = Input impedance

System safety parameters:
contacts do not require certification

Mechanical contact, current sourcing



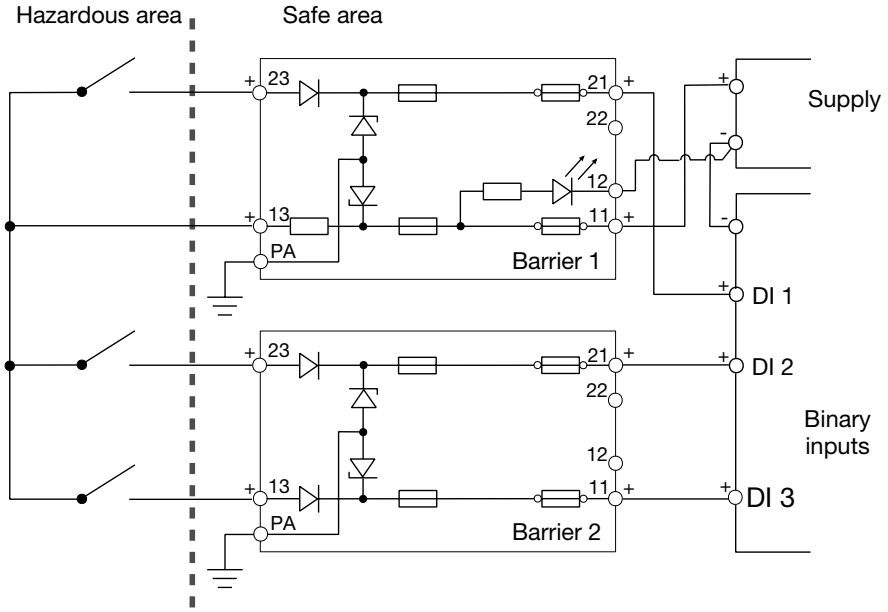
SB-1787

Wiring:
if LED is to be used, connect terminal 12 to (–) of power supply.

Voltage drop:
$R_B = 397\ \Omega + 1.2\ V$
$I = (24\ V - 1.2\ V) / (397\ \Omega + R_{DI})$
$V_{DI} = R_{DI} \times I$

System safety parameters:
contacts do not require certification

Mechanical contacts



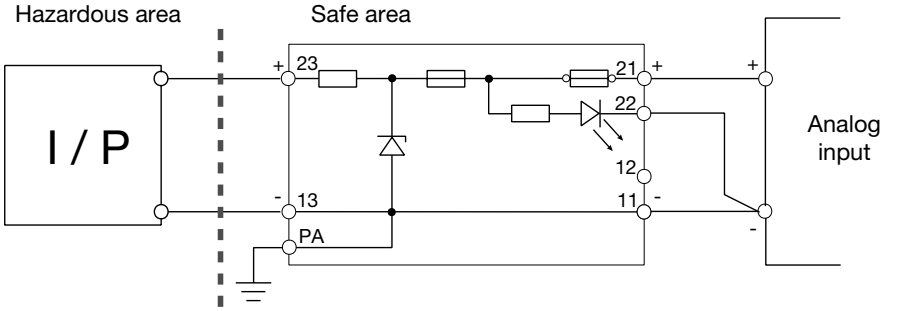
Barrier 1: **SB-1787**
Barrier 2: **SB-0786**

Wiring:
if LED is to be used, connect terminal 12 to (–) of power supply.

Binary input voltage 24 V DC:
Worst case if all switches are closed.
U_{In} = 22.8 V x R_{DI} / (1089 Ω + R_{DI})

System safety parameters:
Contacts do not require certification

I/P converter

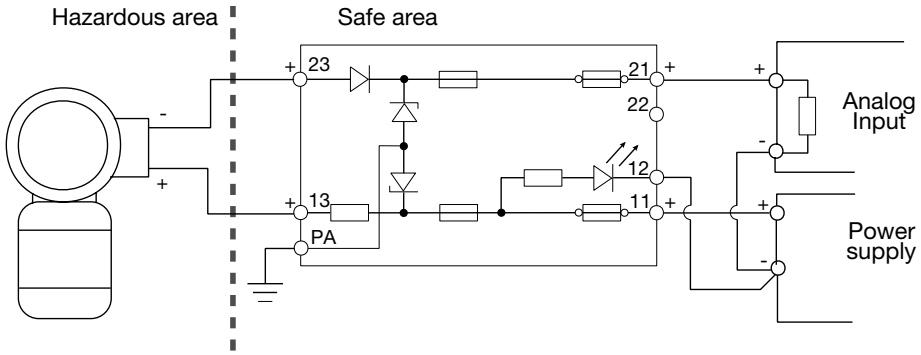


SB-0728

Load calculation:
Analog output must be able to drive a load of R = $R_{I/P}$ + 346 Ω.

System safety parameters:
$U_{MAX\ (I/P)}$ = ≥ 28 V
$I_{MAX\ (I/P)}$ = ≥ 93 mA

4 - 20 mA Transmitter Supply: 2-wire, HART



SB-1787 (Standard)
SB-2787 (low voltage drop)
SB-2427 (low voltage drop)

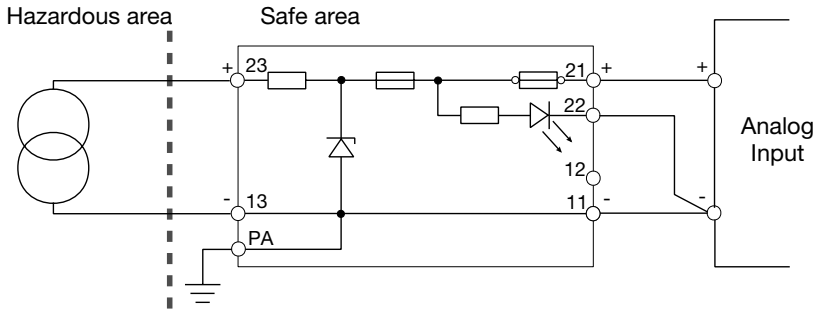
If LED is to be used connect terminal to (–) of power supply.
Transmitter voltage calculation:
$V_{Transmitter} = V_{Supply} - V_{Barrier} - V_{Input}$
Worst case voltage drop for I = 20 mA

Voltage drop:
V_{Input}: 20 mA x R_{Input}
Barrier: $R_{Barrier}$ x 20 mA + V_{Diode}
– SB-1728: min. 8.34 V
– SB-2787: min. 6.70 V
– SB-2427: min. 7.18 V

System safety parameters:

V_{max} (Transmitter)	SB-1728: min. 28 V
	SB-2787: min. 28 V
	SB-2427: min. 26.3 V
I_{max} (Transmitter)	SB-1728: min. 93 mA
	SB-2787: min. 120 mA
	SB-2427: min. 120 mA

4-20 mA Current Input



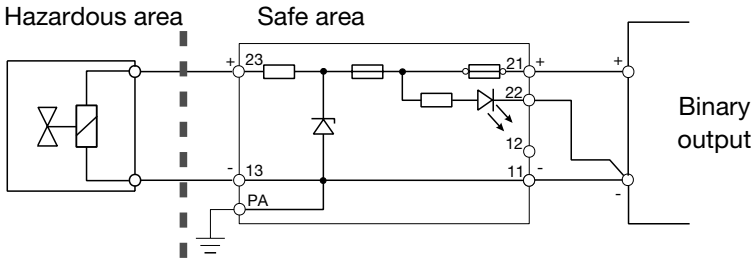
SB-0728

Load:
Current source must be able to drive a load of min. > R = R_{AI} + 346 Ω.

V = (346 Ω + R_{AI}) x I

System safety parameters:
V_{max} (current source) ≥ 28 V
I_{max} (current source) ≥ 93 mA

Solenoid value



SB-0728 (Standard) or
SB-3729 (low internal resistance)

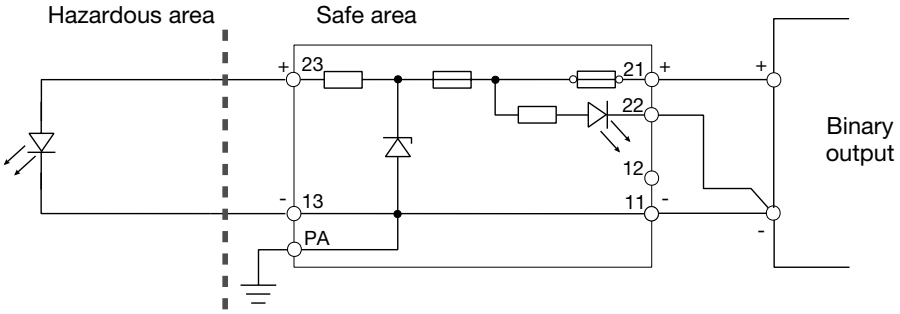
Wiring:
If LED is to be used, connect terminal 12 to (–) of power supply

Voltage at solenoid (with 24 V supply):
SB-0728: V_{sol} = 24 V x R_{sol} / (R_{sol} + 346 Ω)
SB-3729: V_{sol} = 24 V x R_{sol} / (R_{sol} + 207 Ω)

System safety parameters:

V_{max} (sol)	SB-0728: ≥ 28 V
	SB-3729: ≥ 28 V
I_{max} (sol)	SB-0728: ≥ 93 mA
	SB-3729: ≥ 171 mA

LED



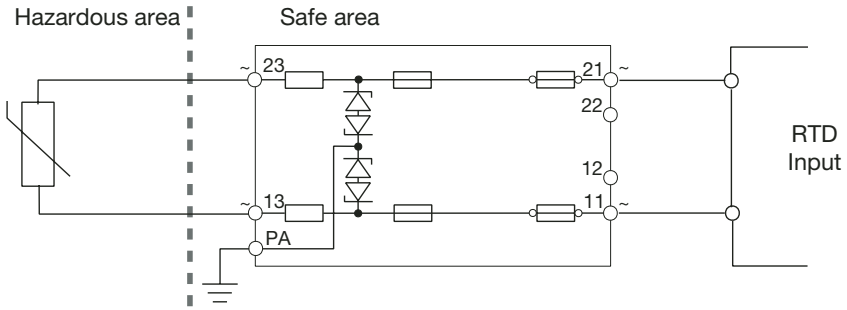
SB-0728

Wiring:
If LED is to be used, connect terminal 12 to (–) of power supply.

Voltage drop:
Barrier resistance used for LED current limitation. For a 24 V DC application, use LED with low nominal voltage:
U_{LED} = 12 V: I = 35 mA
U_{LED} = 15 V: I = 26 mA
U_{LED} = 18 V: I = 17 mA

System safety parameters:
LED does not require certification

2-wire RTD

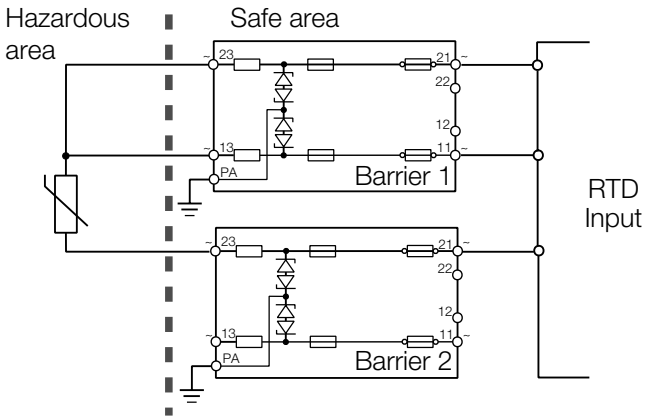


SB-0201

To check:
Barrier resistance may influence accuracy.

System safety parameters:
RTD does not require certification.

3-wire RTD



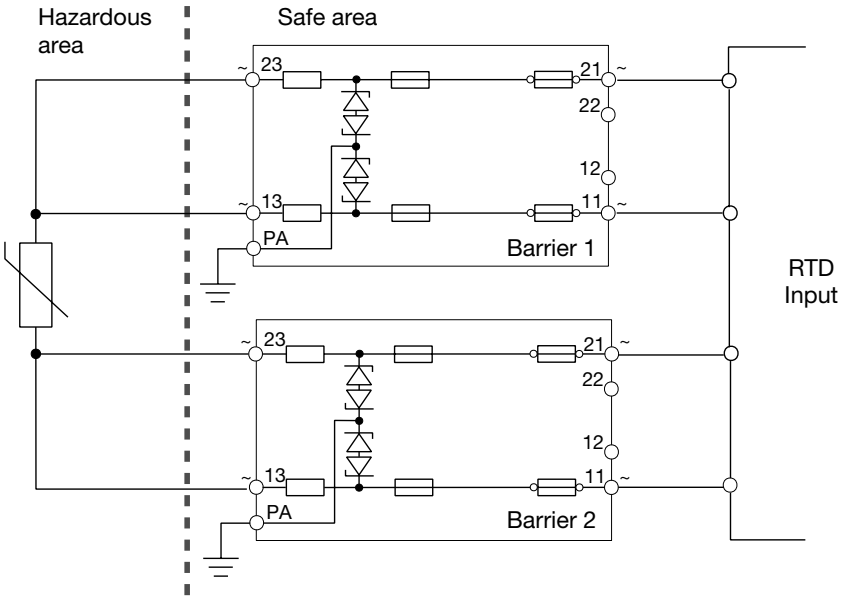
Barriers: SB-0201

Barrier resistance:
For constant current loop use the same barrier type.

System safety parameters:
RTD does not require certification

System parameters:
U_o: 10.6 V
I_o : 534 mA

4-wire RTD



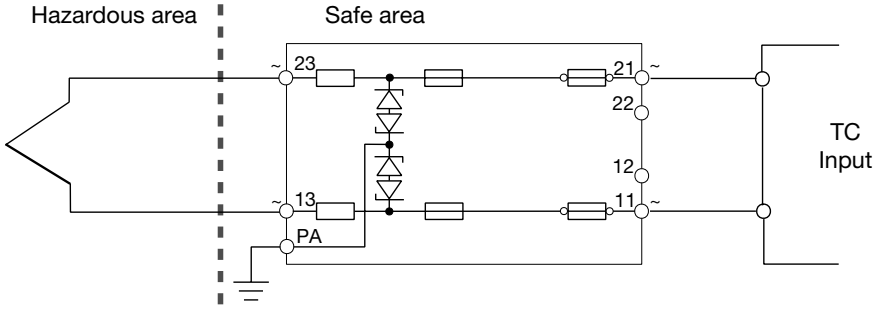
Both barriers: **SB-0201**

Barrier resistance:
Both channels MUST have the same barrier resistance

System safety resistance:
RTD does not require certification

System parameters:
U_o: 10.6 V
I_o : 712 mA

Thermocouple

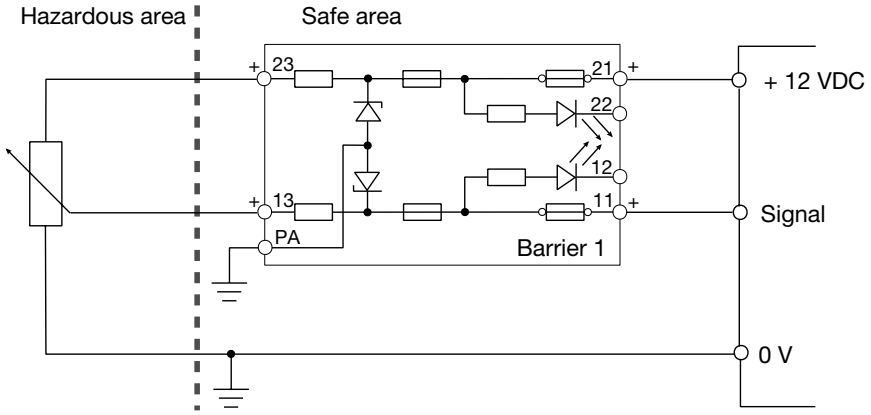


SB-0201

To check:
Barrier resistance must be below minimum line break detection resistance.

System safety parameters:
TC does not require certifcation

0 ... 10 V Potentiometer, 1 kΩ



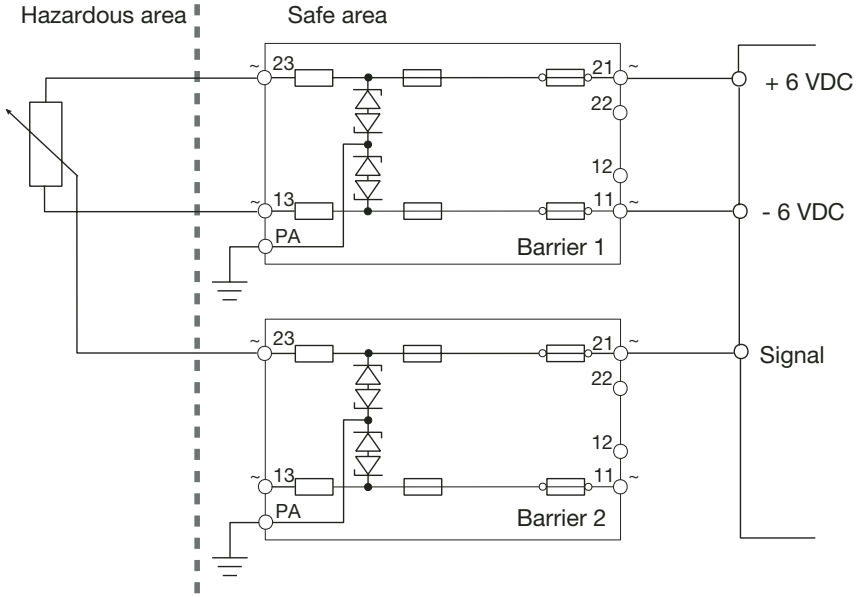
SB-0767

Potentiometer voltage:
10.3 V

System safety parameters:
Potentiometer does not require certification

System parameters:
U_o: 15 V
I_o: 300 mA
P_o: 1.13 W

– 6 V ... + 6 V Potentiometer, 1 kΩ



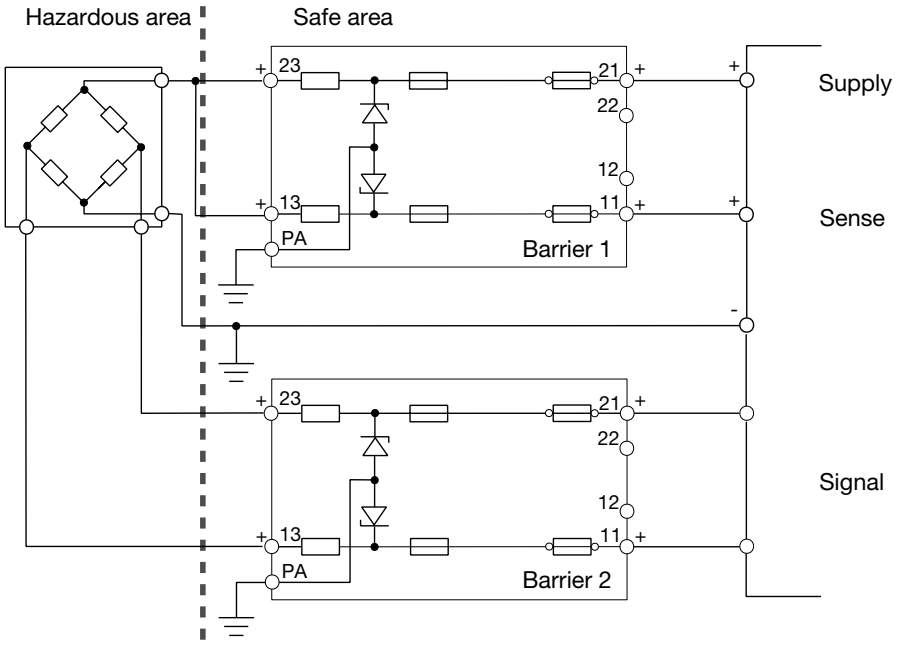
Both barriers: SB-0761

Potentiometer voltage:
– 4.67 V ... + 4.67 V

System safety parameters:
Potentiometer does not require certification

System parameters:
U_o: 18 V
I_o: 300 mA
P_o: 1.35 W

Load cell, + 10 V/0 V, Sense



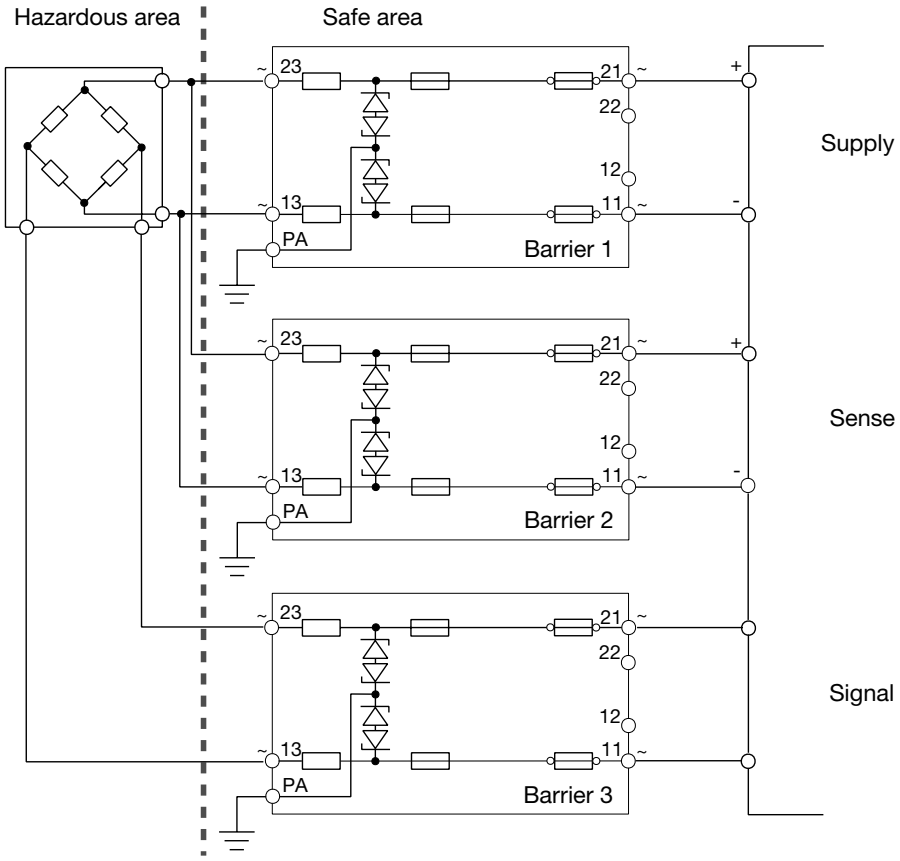
Barrier selection
Barrier 1: **SB-1350**
Barrier 2: **SB-1351**

Calculation (DMS = strain gauge bridge)
$U_{DMS} = U_{Supply} \times R_{DMS} / (R_{DMS} + 81\ \Omega)$
for 350 Ω load cells and DC 10 V supply (n = 1-4 number of cells in parallel):
n = 1 : U_{DMS} = 8.1 V
n = 2 : U_{DMS} = 6.8 V
n = 3 : U_{DMS} = 5.9 V
n = 4 : U_{DMS} = 5.2 V

System safety parameters
Load cells do not require certification. However certified load cell arrangements may be available.
Often P_{MAX} a critical parameter.

System parameters:
V_0: 11.7 V
I_0: 249 mA
P_{MAX}: 0.73 W

Load cell, + 6 V/-6 V, Sense



Barrier selection
Barrier 1: **SB-0761**
Barrier 2: **SB-1761**
Barrier 3: **SB-1761**

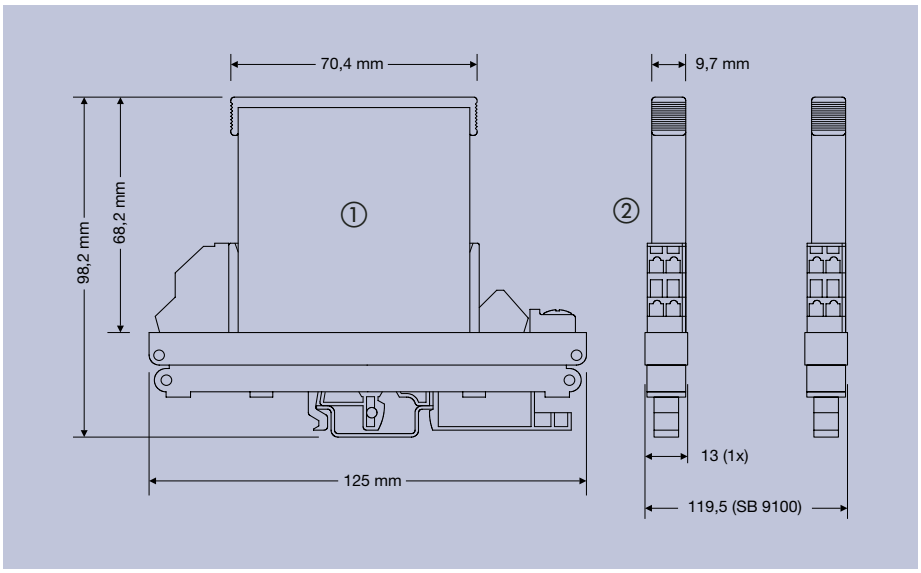
Calculation (DMS = strain gauge bridge)
$U_{DMS} = U_{Supply} \times R_{DMS} / (R_{DMS} + 284\ \Omega)$
for 350 Ω load cells and DC +6 V/ -6 V (n = 1-4 number of cells in parallel):
n = 1 : U_{DMS} = 6.6 V
n = 2 : U_{DMS} = 4.5 V
n = 3 : U_{DMS} = 3.5 V
n = 4 : U_{DMS} = 2.8 V

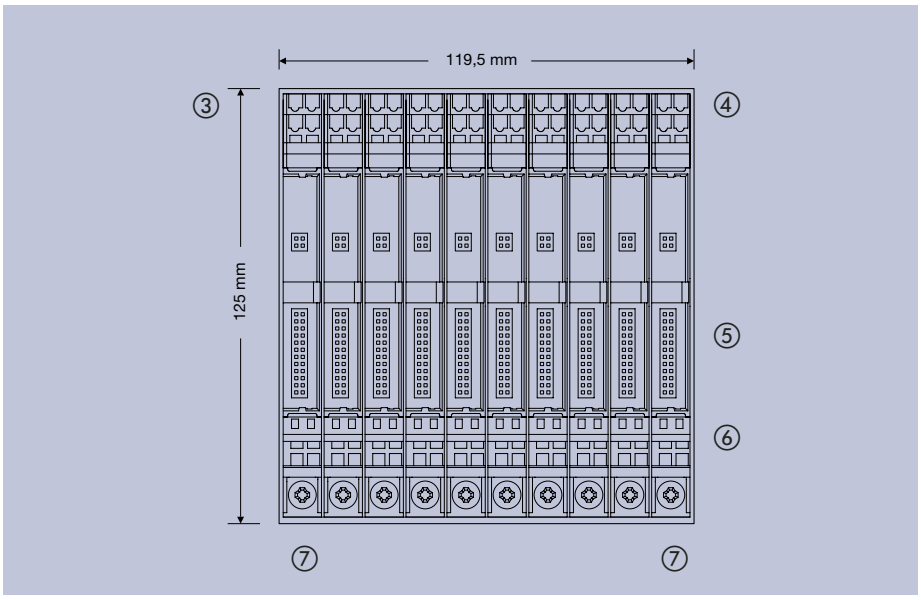
System safety parameters
Load cells do not require certification. However certified load cell arrangements may be available.
Often P_{MAX} a critical parameter.

System parameters:
V_0: 18 V
I_0: 300 mA
P_{MAX}: 1.35 W

Dimensions

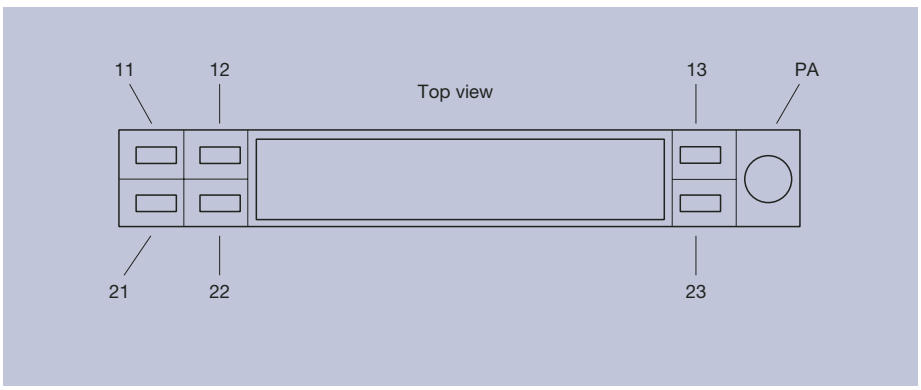
Safety barriers





Glossary
① Barrier
② Socket for 1 barrier
③ Socket for 10 barriers
④ Fast-on terminals
⑤ Backplane sockets
⑥ Fast-on IS terminals
⑦ Equipotential earth

Terminal connections
See operating instruction



To activate LED, connect 12/22 with (–).
(See block diagram in product description)