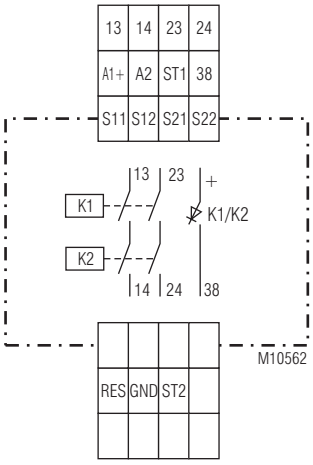
SAFEMASTER C
Multifunctional Safety Module
UG 6980

0269011

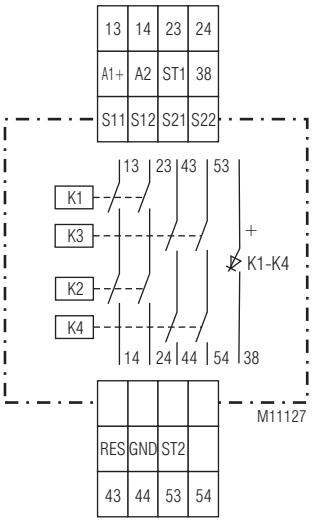
Product Description

The multifunctional safety module UG 6980 provides protection of men and machines by enabling and disabling a safety circuit. It is used together with e-stop buttons, safety gates, light curtains with self testing (type 4) to IEC/EN 61496-1, 2-hand buttons on presses for metal processing and productions machines with dangerous closing movements (type III C to EN ISO 13851) and safety mats, edges and tape switches. Simply select 1 out of 6 safety functions on rotary switches - ready. This reduces divers types of safety modules in stock and simplifies your disposition.

Circuit Diagram



UG 6980.02



UG 6980.04

Connection Terminals

Terminal designation	Signal description
A1 +	DC 24 V
A2	0 V
13, 14, 23, 24, 43, 44, 53, 54	Forcibly guided NO contacts for release circuit
38	Semiconductor monitoring output
GND	Reference potential for Semiconductor monitoring output
S11, S21	Control output
S12, S22, ST1, ST2, RES	Control input

Your Advantage

- **Adjustable safety functions:**
  - E-Stop
  - Safety gate
  - Two-hand control
  - Safety mat / Safety edge
  - Exclusive or contacts
  - Light curtain
- Manual or auto start
- Only one device, different safety functions
- Protection against manipulation by sealable transparent cover

Features

- **According to**
  - **Performance Level (PL) e and category 4 to EN ISO 13849-1**
  - **SIL Claimed Level (SIL CL) 3 to IEC/EN 62061**
  - **Safety Integrity Level (SIL) 3 to IEC/EN 61508 and IEC/EN 61511**
- Acc. to EN 50156-1 for furnaces
- Line fault detection on On-button:
- Manual restart or automatic restart
- With or without cross fault monitoring
- 2-channel
- Forcibly guided output contacts
- Output: max. 4 NO instantaneous semiconductor monitoring output
- LED indicator for operation, safety function and failure
- As option with pluggable terminal blocks for easy exchange of devices
  - With screw terminals
  - Or with cage clamp terminals
- Width: 22.5 mm

Approvals and Markings

CE · TÜVRheinland CERTIFIED Functional Safety Type Approved www.tuv.com ID 0600000000 · c UL us LISTED Canada / USA · UKCA

Application

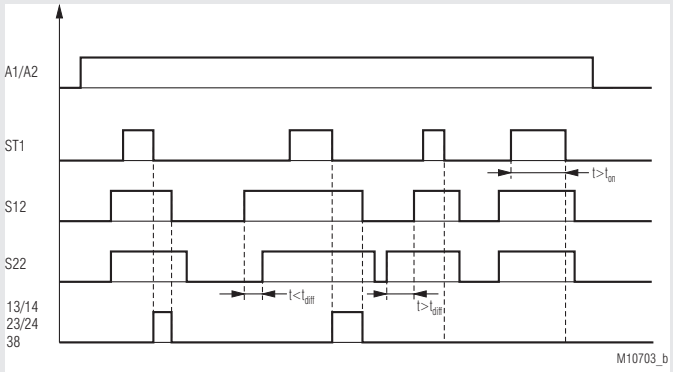
Protection of people and machines

- Emergency stop circuits on machines
- Monitoring of position switches on a safety gate
- Switch gear (FSD) for light bars with selftest (type 4) according to IEC/EN 61496-1
- 2-hand controls for presses as well as other production machinery with dangerous closing action (Type III C to EN ISO 13851)
- Switch gear for safety mats, safety edges and tape switches with a max. switching current of 15 mA.

Indicators

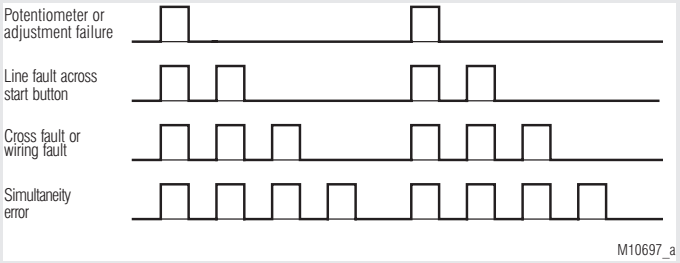
Green LED ON:	On, when supply connected
Red LED ERR:	On, at internal error Flashes at external error
Green LED K1/K2 (.02) e.g. K1-K4 (.04):	On, when relay K1 and K2 (.02) energized, e.g. when relay K1, K2, K3 and K4 (.04) energized Flashes at external error (see flashing codes)

Function Diagram

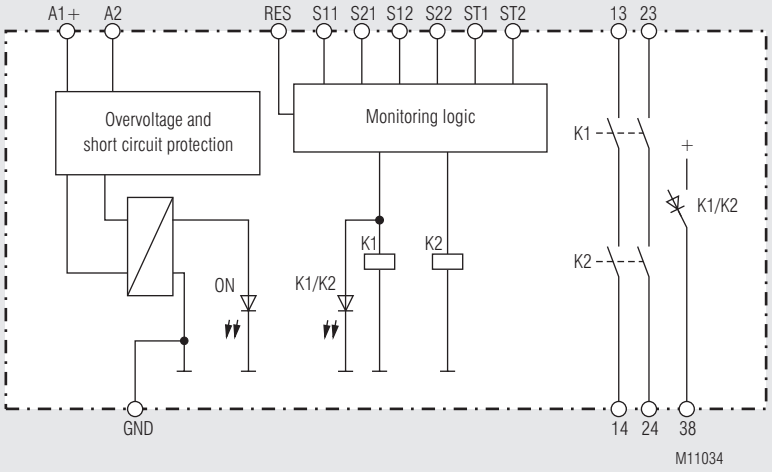


t_{diff}: Simultaneity demand of the safetyfunction (see technical data)
t_{on}: Actuation time of start button (see technical data)

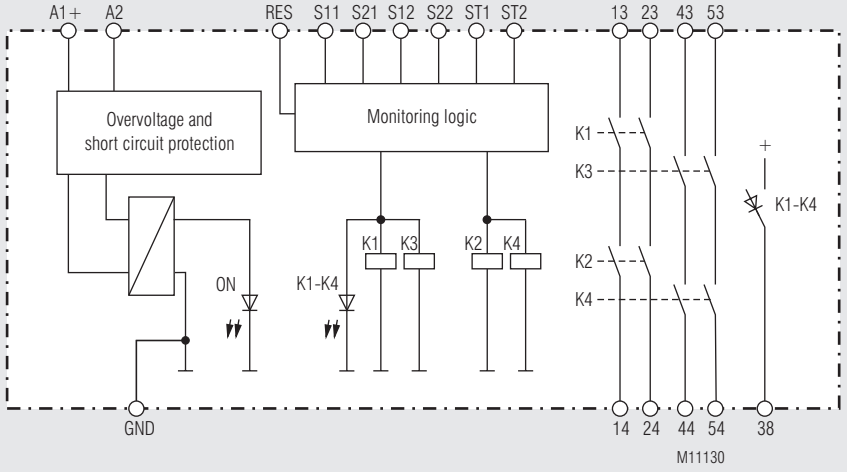
Fault Indication by Flashing Code on K1/K2



Block Diagrams



UG 6980.02



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Practical Notes

Operating mode
Manual or auto start is chosen by wiring. On manual start S21 has to be connected to ST1! via an NO push button. For auto start S21 is connected to ST2. If both inputs are connected to S21 the unit goes into safe failure mode. A restart or new start of the device has to be made. When selecting the safety function 2-hand control (3), only automatic start is possible.

Line fault detection e.g. monitoring of ON-button
If the On-button pressed more than 3 s the adequate output contacts of the safety function can't be switch. The output contacts can be energized when the On-button pressed again (0.1 s < t_{ON} < 3 s).
A line fault is detected if the On-button more than 10 s is actuated. The output contacts of the adeauate safety function can only be energized with a reset or re-start with on an off switching of power supply.

Reset and external failures:
The reset input is used to reset external failures (application failures or removable external failures as e.g. a line fault on reset button). If the reset signal is connected to the input for more than 3 sec the unit makes a reset. A new reset is only possible when the reset signal had been switched off temporarily.
If an external failure occurs because both input channels of a safety function did not switch on or off within the simultanious time, a reset is only possible if both channels are switched to off state after removing failure cause.

Setting
On the variant /0_ _ the safety function can be set via rotary switch.
Possible functions:

Fct.	Safety function	
1	E-Stop	cross fault detection
2	Safety gate	
3	Two-hand control	
4	Safety mat / Safety edge	
5	Exclusive or contacts	
6	E-Stop	without cross fault detection
7	Safety gate	
8	Light curtain	

Operating Potentiometer

Poti "Fkt"	Adjustment of safety function

Technical Data

Input

Nominal voltage U_N:	DC 24 V
Voltage range:	0.8 ... 1.1 U_N
Nominal consumption:	typ. 1.9 W
Short-circuit protection:	Internal PTC
Overvoltage protection:	Internal VDR
Duty-cycle ON button:	0.1 s < t_{EIN} < 3 s
Duty-cycle Reset button:	> 3 s
Safety function	
Safety mat / safety edge (4)	
max. permitted safety edge contact resistance:	1000 Ω
switching current at short circuit:	Typ. 15 mA at U_N
Light curtains (8)	
control current via S12, S22:	Typ. 8 mA at U_N
Min. voltage on terminals S12, S22 when relay activated:	DC 10 V

Output

Contacts

UG 6980.02	2 NO contacts
UG 6980.04	4 NO contacts

The NO contacts can be used for safe braking.

Thermal current I_{th}:	Max. 8 A (see quadratic total current limit curve)
Safety function	
E-Stop (1) (6), Safety gate (2) (7), Exclusive or contacts (5)	
Start up at U_N:	< 65 ms
Release delay at U_N and disconnecting the supply:	< 40 ms
Release delay at U_N and disconnecting S12,S22:	< 60 ms
Simultaneity demand:	< 3 s
Two-hand control (3)	
Start up at U_N:	< 110 ms
Release delay at U_N and disconnecting the supply:	< 40 ms
Release delay at U_N and disconnecting S12,S22:	< 60 ms
Simultaneity demand:	< 0,5 s
Safety mat (4)	
Start up at U_N:	< 85 ms
Release delay at U_N and disconnecting the supply:	< 40 ms
Release delay at U_N and disconnecting S12,S22:	< 60 ms
Light curtains (8)	
Start up at U_N:	< 35 ms
Release delay at U_N and disconnecting the supply:	< 40 ms
Release delay at U_N and disconnecting S12,S22:	< 25 ms
Simultaneity demand:	< 1 s
Switching capacity	
to AC 15	3 A / AC 230 V IEC/EN 60947-5-1
to DC 13	
contacts 13/14, 23/24:	2 A / DC 24 V IEC/EN 60947-5-1
contacts 43/44, 53/54:	3 A / DC 24 V IEC/EN 60947-5-1
to DC 13	
contacts 13/14, 23/24:	4 A / DC 24 V at 0.1 Hz
Electrical life	
at 5 A, AC 230 V cos φ = 1:	> 1.5 x 10^5 switching cycles
Zulässige Schalthäufigkeit	
UG 6980.02:	Max. 1800 switching cycles / h
UG 6980.04:	Max. 360 switching cycles / h
Short circuit strength	
max. fuse rating:	6 A gG / gL IEC/EN 60947-5-1
Mechanical life:	10 x 10^6 switching cycles
Semiconductor monitoring output (not safety):	max. 50 mA DC 24 V, plus switching (see current limit curve)

Technical Data

General Data

Nominal operating mode:	Continuous operation
Temperature range	
Operation:	- 25 ... + 60 °C (see quadratic total current limit curve) At an altitude of > 2000 m the maximum permissible temperature reduces by 0.5°C / 100 m
Storage:	- 40 ... + 85 °C
Altitude,	
Clearance and creepage distance	
rated impulse voltage / pollution degree:	IEC 60664-1 ≤ 2000 m > 2000 m up to ≤ 4000 m 4 kV / 2 2,5 kV / 2
EMC	IEC/EN 61326-3-1, IEC/EN 62061
Interference suppression:	Limit value class B EN 55011
Degree of protection	
Housing:	IP 40 IEC/EN 60529
Terminals:	IP 20 IEC/EN 60529
Housing:	Thermoplastic with VO behaviour according to UL subj. 94
Vibration resistance:	Amplitude 0,35 mm Frequency 10 ... 55 Hz,IEC/EN 60068-2-6
Klimate resistance:	25 / 060 / 04 IEC/EN 60068-1
Terminal designation:	EN 50005
Wire fixing:	Captive slotted screw or cage clamp terminals
Mounting:	DIN rail IEC/EN 60715
Weight:	Approx. 210 g

Dimensions

Width x height x depth:	
UG 6980 PS:	22.5 x 110 x 120.3 mm
UG 6980 PC, PT:	22.5 x 120 x 120.3 mm

UL-Data

The safety functions were not evaluated by UL. Listing is accomplished according to requirements of Standard UL 508, "general use applications"

Ambient temperature:	- 15 … + 55 °C
Altitude:	≤ 2000 m
Switching capacity for .02:	Pilot duty B300, R300 8A 250Vac Resistive or G.P. 8A 24Vdc Resistive
Switching capacity for .04	
Ambient temperature 55°C	Pilot duty B300, R300 5A 250Vac Resistive or G.P. 5A 24Vdc Resistive
Ambient temperature 40°C:	Pilot duty B300, R300 8A 250Vac Resistive or G.P. 8A 24Vdc G.P.
Wire connection::	60°C / 75°C copper conductors only
PS-terminal:	AWG 28 - 12 Sol/Str Torque 0.5 Nm
PC-terminal:	AWG 24 - 12 Sol/Str
PT-terminal:	AWG 24 - 16 Sol/str

Technical data that is not stated in the UL-Data, can be found in the technical data section.

Standard Type

UG 6970.04PS/61 DC24V

Article number:	0065426
• 1st Safety function:	Adjustable
• 2nd Safety function:	Adjustable
• Output:	2 NO contacts per safety function
• Nominal voltage:	DC 24 V
• Width:	22.5 mm

Variants

UG 6980 ._ _ _ _ / _ 00 /61 DC 24 V

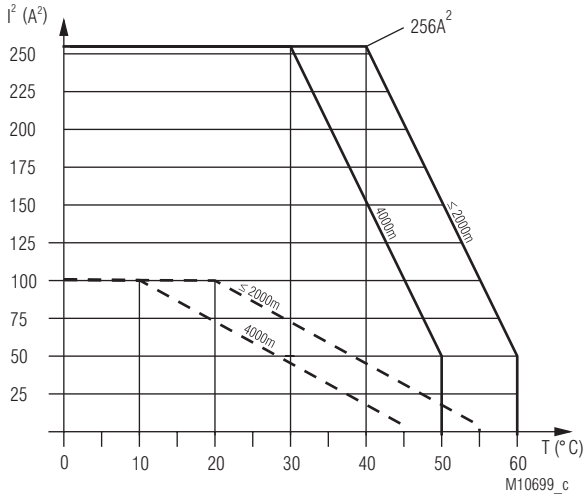
- Nominal voltage
- UL-approval
- Safety function
  0 = Adjustable
  8 = Light curtains (Safety Module, Light Curtain)
- Type of terminals
  PC (plug in cage clamp): pluggable terminal blocks, with cage clamp terminals
  PS (plug in screw): pluggable terminal blocks, with screw terminals
  PT (plug in Twin cage clamp) pluggable terminal blocks with cage clamp terminals 2-wire
- Contacts
- Type

Troubleshooting

Failure	Potential cause
LED "ON" does not light up	- Power supply A1+/A2 not connected
LED "ERR" flashes in relation 1:1	- Under- or overvoltage (check power supply A1+/A2)
LED "ERR" flashes in relation 4:1	- External failure (see flashing code)
LED "ERR" continuously on	- System error (if cannot be removed after restart unit must be replaced)

Maintenance and Repairs

- The device contains no parts that require maintenance.
- In case of failure, do not open the device but send it to manufacturer for repair.



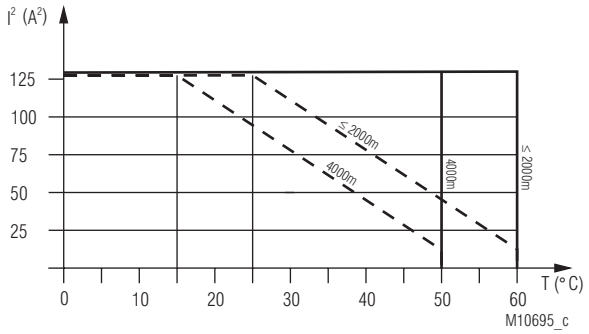
Device free-standing.
Max. current at 60°C(≤ 2000m) or 50 °C (4000m) over
4 contact path = 3,5A ≙ $4x3{,}5^2A^2 = 100A^2$

Device mounted without distance heated by
devices with same load.
Max. current at 55°C(≤ 2000m) or 45 °C (4000m) over
4 contact path = 1A ≙ $4x1^2A^2 = 4A^2$

$$\Sigma I^2 = I_1^2 + I_2^2 + I_3^2 + I_4^2$$

I_1, I_2, I_3, I_4 - Current in contact paths

Quadratic total current limit curve output contacts UG 6980.04.
From an altitude of > 2000 m the curve is adjusted by - 0,5 °C / 100 m
(see example for 4000 m).



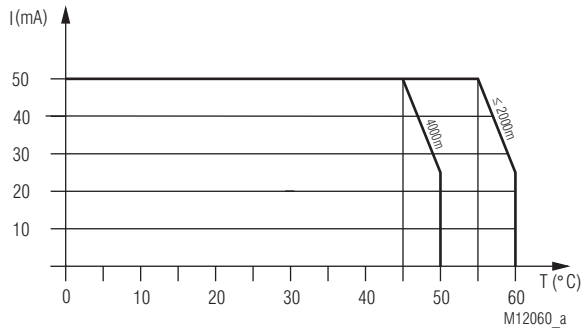
Device free-standing.
Max. current at 60°C (≤ 2000m) or 50°C (4000m) over
2 contact path = 8A ≙ $2x8^2A^2 = 128A^2$

Device mounted without distance heated by
devices with same load.
Max. current at 60°C (≤ 2000m) or 50°C (4000m) over
2 contact path = 2,5A ≙ $2x2{,}5^2A^2 = 12{,}5A^2$

$$\Sigma I^2 = I_1^2 + I_2^2$$

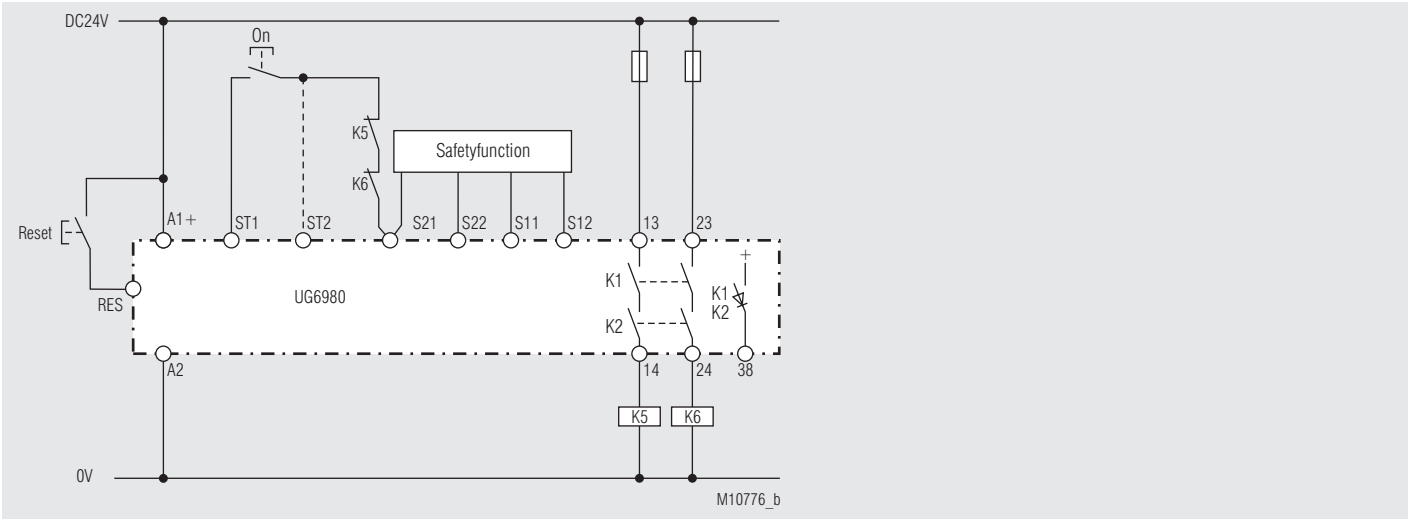
I_1, I_2 - Current in contact paths

Quadratic total current limit curve output contacts UG 6980.02.
From an altitude of > 2000 m the curve is adjusted by - 0,5 °C / 100 m
(see example for 4000 m).

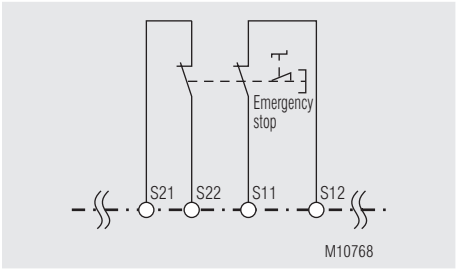


Current limit curve semiconductor monitoring output.
From an altitude of > 2000 m the curve is adjusted by - 0,5 °C / 100 m
(see example for 4000 m).

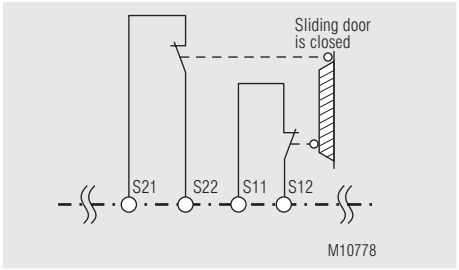
Application Examples with safety function



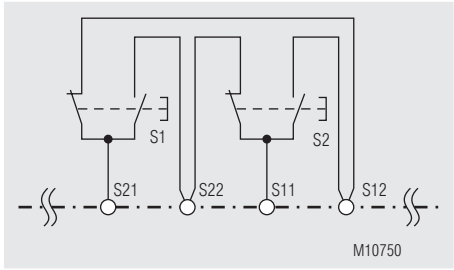
Safetyfunction: see below, Manual-Start (for automatic start make a bridge to ST2 instead of ON button).
Contact reinforcement by external contactors. The correct function of the external contactors is monitored by connecting the NC contacts into the start circuit (manual start: terminals S21-ST1, auto start: S21-ST2)



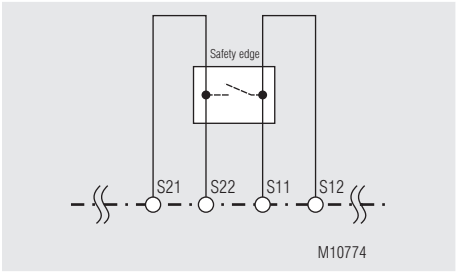
Fct.: E-stop (1),
with cross fault detection
SIL 3, PL e, Cat. 4



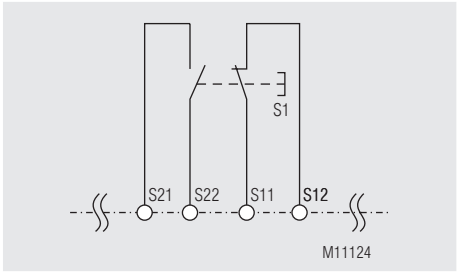
Fct.: Safety gate (2),
with cross fault detection
SIL 3, PL e, Cat. 4



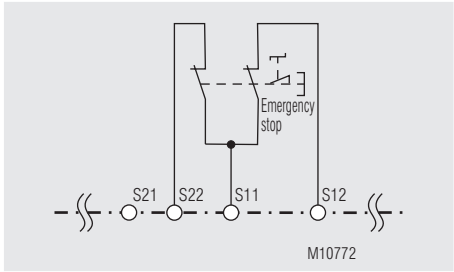
Fct.: Two-hand control (3),
with cross fault detection
SIL 3, PL e, Cat. 4
Type III C to EN ISO 13851



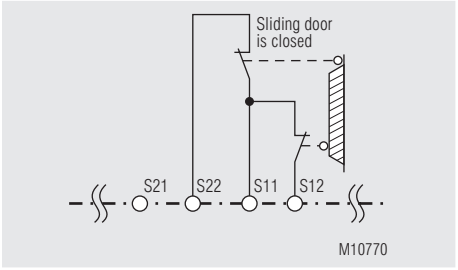
Fct.: Safety mat / Safety edge (4),
with cross fault detection
SIL 3, PL e, Cat. 4



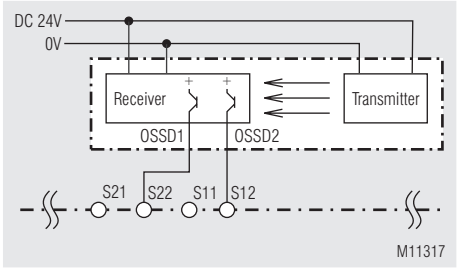
Fct.: Exclusive or contacts (5),
with cross fault detection
SIL 3, PL e, Kat. 4



Fct.: E-Stop (6),
without cross fault detection
SIL 3, PL e, Cat. 4 [1]



Fct.: Safety gate (7),
without cross fault detection
SIL 3, PL e, Cat. 4 [1]



Fct.: Light curtain (8),
without cross fault detection
SIL 3, PL e, Cat. 4 [2]

[1] To achieve the stated safety classification the wiring has to be done with crossfault monitoring.
[2] To achieve the stated safety classification light curtains with selftest (type 4) according to IEC/EN 61496-1 have to be used.