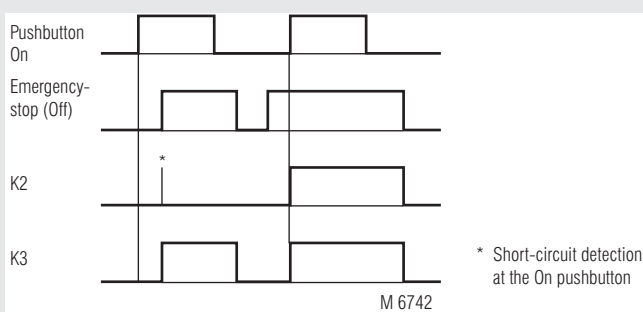


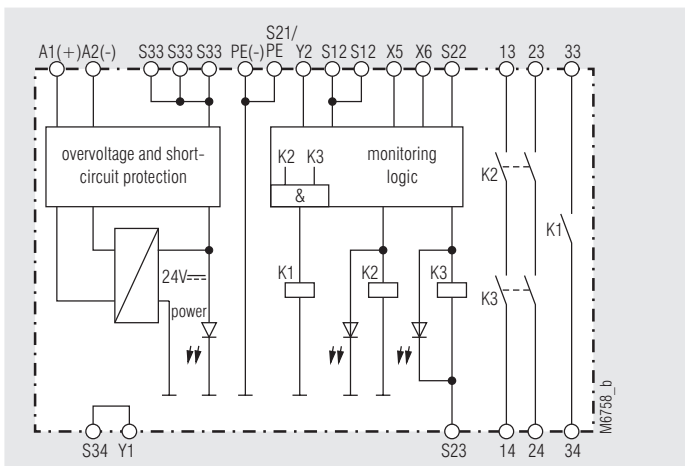
Product Description

The BD 5987 is used to interrupt a safety circuit in a safe way. It can be used to protect people and machines in applications with e-stop buttons and safety gates. The BD 5987.02/301 can be used as electronic replacement of a safety switch according to EN 81-1/-2, section 14.1.2.2.

Function Diagram



Block Diagram



Your Advantages

- Safe disconnection of electrical circuits
- Line fault detection at On pushbutton
- Gold-plated contacts to switch small loads (input for PLC)
- Optionally cross fault detection in emergency stop circuit

Features BD 5987._ _:

- According to
 - Performance Level (PL) e and category 4 to EN ISO 13849-1: 2008
 - SIL Claimed Level (SIL CL) 3 to IEC/EN 62061
 - Safety Integrity Level (SIL) 3 to IEC/EN 61508
- Output: 2 NO contacts for AC 250 V
- 1-channel or 2-channel connection
- LED displays for channels 1 and 2
- Overvoltage and short circuit protection
- Wire connection: also 2 x 1,5 mm² stranded ferruled (isolated), DIN 46 228-1/-2/-3/-4 or 2 x 2.5 mm² stranded ferruled DIN 46 228-1/-2/-3
- Width 45 mm

BD 5987._ _/001: same as BD 5987._ _ but

- Optionally automatic On function or after activation by the On pushbutton
- Optionally cross fault detection in emergency stop circuit

BD 5987.02/301: same as BD 5987.02/001 but

- Suitable also for elevators according to EN 81-1/-2
- Complies to the requirements of the directive 95/16/EG for elevators
- According to
 - Performance Level (PL) d and category 3 to EN ISO 13849-1: 2008
 - SIL Claimed Level (SIL CL) 2 to IEC/EN 62061
 - Safety Integrity Level (SIL) 2 to IEC/EN 61508
- Shorter release time when opening the supply circuit
- Single-channel e-stop circuit

Approvals and Markings



* see variants

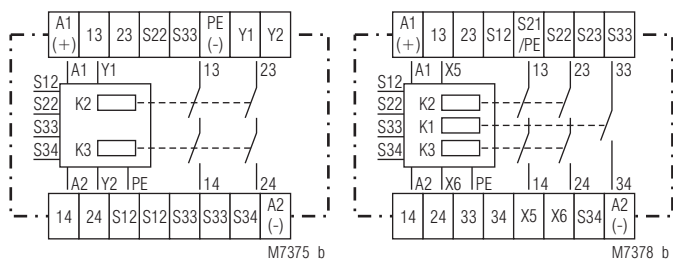
Applications

- Protection of people and machines
- Emergency stop circuits on machines
 - Monitoring of safety gates

Indication

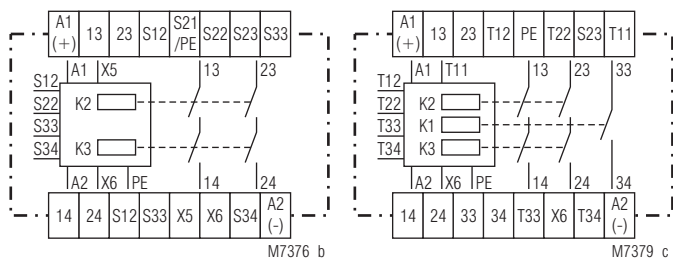
- LED power supply: on when operating voltage present
 LED K2: on when supply on K2
 LED K3: on when supply on K3

Circuit Diagrams



BD 5987.02

BD 5987.03/001



BD 5987.02/001 + /301

BD 5987.03/201

Connection Terminals

Terminal designation	Signal designation
A1 (+)	+ / L
A2 (-)	- / N
S12, S22, S23, S34, X6, Y2 T12, T22, T34	Inputs
PE (-), S21/PE, S33, X5, Y1 T11, T12, T33	Outputs
13, 14, 23, 24	Forcibly guided NO contacts for release circuit
33, 34	Indicator output

Notes

Line fault detection at the On pushbutton:

The output contacts cannot be closed if the On pushbutton is already closed before the voltage is applied to S12, S22 (also in the event of a line fault at the On pushbutton).

A line fault at the On pushbutton which occurs after activation of the device is recognized when switching- on takes place again and closing of the output contacts is then prevented.

If a line fault occurs at the On pushbutton after the voltage is already present at S12, S22 undesired activation will take place, because this line fault does not differ from the normal closing function.

The gold-plated contacts of the BD 5987 mean that this module is also suitable for switching small loads of 1 mVA ... 7 VA, 1 mW ... 7 W in the range 0.1 ... 60 V, 1 ... 300 mA. The contacts also permit the maximum switching current. However, since the gold plating will be burnt off at this current level, the device is no longer suitable for switching small loads after this.

The PE terminal permits operation of the device in IT systems with insulation monitoring and also serves as a reference point for testing the control voltage. The internal short-circuit protection will be bridged on DC devices, if the protective ground is connected to terminal PE.

One or more extension modules BN 5989 or external contactors with forcibly guided contacts may be used to multiply the number of contacts of the emergency stop module BD 5987.

For automatic restart:

S22 must be connected before S12. S12 initiates the automatic restart. With manual restart it is not necessary to follow this order.

ATTENTION - AUTOMATIC START!



According to IEC/EN 60 204-1 part 9.2.5.4.2 it is not allowed to restart automatically after emergency stop. Therefore the machine control has to disable the automatic start after emergency stop.

Technical Data

Input

Nominal voltage U_N:	AC 24, 42, 48, 110, 127, 230, 240 V ¹⁾ DC 24 V
Voltage range:	AC 0.8 ... 1.1 U_N DC 0.9 ... 1.2 U_N
at 10% residual ripple:	approx. 5.5 VA
at 48% residual ripple:	approx. 5.5 VA
Nominal consumption:	50 / 60 Hz
Nominal frequency:	DC 24 V
Control voltage at S33:	

Control current

BD 5987.02:	typ. DC 55 mA
BD 5987.02/001 + /301:	typ. DC 45 mA

Minimum voltage at terminals S12, S22:

Recovery time:	DC 21 V with activated device 0.5 s after release of the emergency stop pushbutton
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Output

Contacts

BD 5987.02:	2 NO contacts
BD 5987.03:	2 NO contacts, 1 NO contact used for monitoring

ATTENTION! The NO contact 33-34 can only be used for monitoring.

Operate time:

BD 5987.02/001 + /301:	max. 100 ms with automatic restart approx. 1 s
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Release time

Opening in secondary circuit (S12-S22):	50 ms ± 25 %
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Opening in supply circuit

BD 5987.02:	350 ms ± 50 %
BD 5987.02/001:	120 ms ± 50 %
BD 5987.02/301:	40 ms ± 50 %

Contact type:

relay, forcibly guided

Nominal output voltage:

AC 250 V ¹⁾	
DC:	see limit curve for arc-free operation see continuous current limit curve (max. 10 A in one contact path)

Thermal current I_{th} :

Switching capacity

contacts 13/14, 23/24:		
to AC 15:	5 A / AC 230 V ¹⁾	IEC/EN 60 947-5-1
to DC 13:	4 A / DC 24 V	IEC/EN 60 947-5-1
contacts 33/34:		
to AC 15:	3 A / AC 230 V	IEC/EN 60 947-5-1

Electrical life:

to AC 15 at 2 A, AC 230 V:	10 ⁵ switching cycles IEC/EN 60 947-5-1
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Permissible operating frequency:

	600 switching cycles / h
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¹⁾ max. AC 160 V or DC 160V for the variant BD 5987.02/301 when used in an elevator control according to elevator directive 95/16/EG, if the BD 5987.02/301 is not installed in a cabinet with protection degree IP 54 or better.

Short circuit strength

max. fuse rating:	6 A gL	IEC/EN 60 947-5-1
Mechanical life:	10 x 10 ⁶ switching cycles	

General Data

Operating mode:

Continuous operation

Temperature range

operation:	- 15 ... + 55 °C
at max. 90 % humidity	
storage :	- 25 ... + 85 °C
altitude:	< 2.000 m

Clearance and creepage distances

rated impuls voltage / pollution degree:	4 kV / 2 (basis insulation) IEC 60 664-1
EMC:	IEC/EN 62 061

Interference suppression:

Limit value class B	EN 55 011
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Degree of protection

Housing:	IP 40	IEC/EN 60 529
Terminals:	IP 20	IEC/EN 60 529

Housing:

Thermoplastic with V0 behaviour

according to UI subject 94

Amplitude 0,35 mm IEC/EN 60 068-2-6

frequency 10 ... 55 Hz

Technical Data

Climate resistance:	15 / 055 / 04	IEC/EN 60 068-1
Terminal designation:	EN 50 005	
Wire connection:	1 x 4 mm ² solid or 1 x 2,5 mm ² stranded ferruled (isolated) or 2 x 1,5 mm ² stranded ferruled (isolated) DIN 46 228-1/-2/-3/-4 or 2 x 2,5 mm ² stranded ferruled DIN 46 228-1/-2/-3	
Wire fixing:	Plus-minus terminal screws M3.5 box terminal with wire protection	
Fixing torque:	0.8 Nm	
Mounting:	DIN rail	IEC/EN 60 715
Weight:	450 g	

Dimensions

Width x height x depth: 45 x 74 x 121 mm

Safety Related Data BD5987.02/001

Values according to EN ISO 13849-1:

Category:	4	
PL:	e	
MTTF _d :	353,1	a
DC / DC _{avg} :	98.9	%
d _{op} :	365	d/a (days/year)
h _{op} :	24	h/d (hours/day)
t _{cycle} :	3600	s/cycle
	± 1	/h (hour)

Values according to IEC/EN 62061 / IEC/EN 61508:

SIL CL:	3	IEC/EN 62061
SIL	3	IEC/EN 61508
HFT:	1	
DC / DC _{avg} :	98.9	%
SFF	99.7	%
PFH _D :	1.57E-10	h ⁻¹
T _i :	20	a (year)

¹⁾ HFT = Hardware-Failure Tolerance

Safety Related Data BD5987.02/301

Values according to EN ISO 13849-1:

Category:	3	
PL:	d	
MTTF _d :	353,1	a
DC / DC _{avg} :	98.9	%
d _{op} :	365	d/a (days/year)
h _{op} :	24	h/d (hours/day)
t _{cycle} :	3600	s/cycle
	± 1	/h (hour)

Values according to IEC/EN 62061 / IEC/EN 61508:

SIL CL:	2	IEC/EN 62061
SIL	3	IEC/EN 61508
HFT:	1	
DC / DC _{avg} :	98.9	%
SFF	99.7	%
PFH _D :	1.57E-10	h ⁻¹
T _i :	20	a (year)

¹⁾ HFT = Hardware-Failure Tolerance



The values stated above are valid for the standard type.

Safety data for other variants are available on request.

The safety relevant data of the complete system has to be determined by the manufacturer of the system.

Standard Type

BD 5987.02/001	DC 24 V
Article number:	0040954
• Output:	2 NO contacts
• Nominal voltage U _N :	DC 24 V
• Width:	45 mm

Variants

- BD 5987.02/61:** with UL approval (Canada/USA)
BD 5987.02/001: Optionally cross fault monitoring on the emergency stop loop (see application M6749)
 Optionally automatic On function when operating voltage is applied or after activation by the On pushbutton.

Jumper assignment for functions:

Activation via On pushbutton / or automatic On function:

On pushbutton S12-S34 or S33-S34	Jumper X5 - X6	Function
		The output contacts are switched only after operation of the On pushbutton. Line fault monitoring at the On pushbutton.
		Automatic On function for operating voltage Off/On or after emergency-stop release

BD 5987.03/001: with 2 NO contacts,
1 signalling contact AC/DC 0,1 ... 1 A / 10 ... 120 V

BD 5987.03/201: see BD 5987.03/001,
but with special terminal designation

Jumper assignment for functions:

Activation via On pushbutton / or automatic On function

On pushbutton T11-T34 or T12-T34	Jumper T33 - X6	Function
		The output contacts are switched only after operation of the On pushbutton. Line fault monitoring at the On pushbutton.
		Automatic On function for operating voltage Off/On or after emergency-stop release

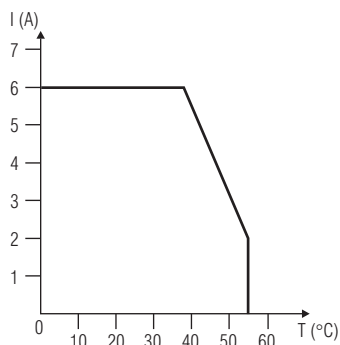
BD 5987.02/301: Starting behaviour as with BD 5987.02/001,
shorter release time when opening the supply circuit,
Suitable also for elevators according to EN 81-1/-2,
Complies to the requirements of the directive
95/16/EG for elevators.

Ordering example for variants

BD 5987 .02 / _ _ _ AC 230 V 50/60 Hz

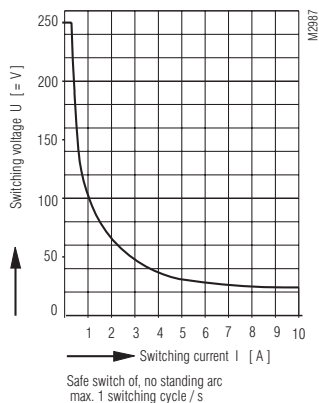
— Nominal frequency
 — Nominal voltage
 — Variant, if required
 — Contacts
 — Type

Characteristics



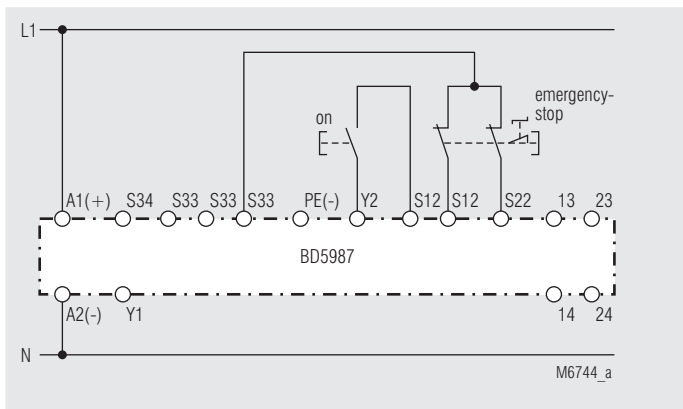
Continuous current limit curve
(Current via two contact rows) M6759

Continuous current limit curve

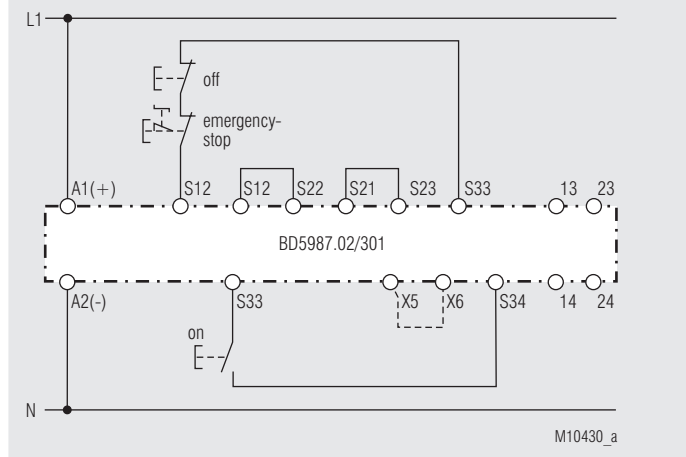
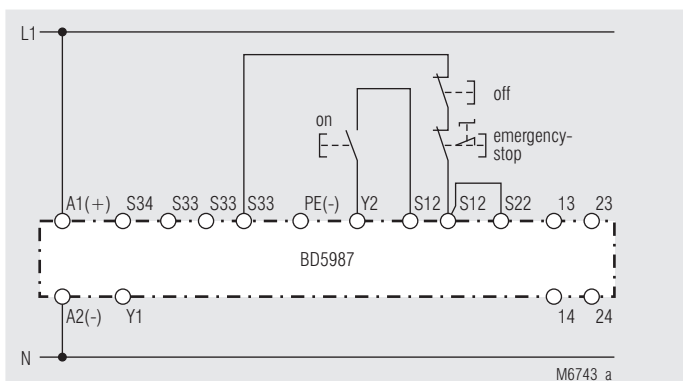


Limit curve for arc-free operation with resistive load

Application Examples

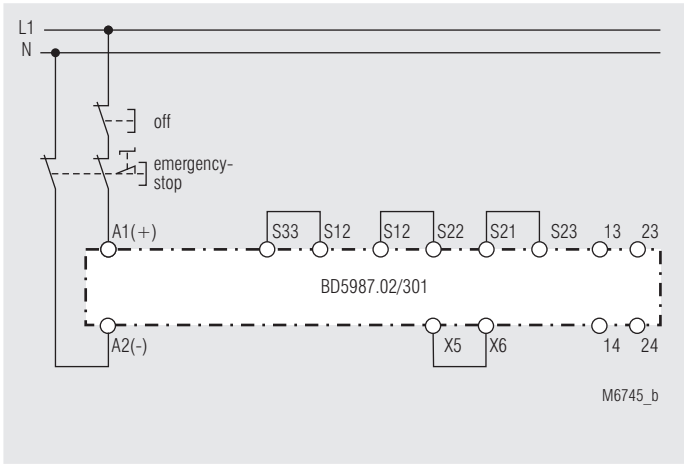


Two-channel emergency stop circuit.
Suited up to SIL3, Performance Level e, Cat. 4



Single-channel emergency stop circuit. This circuit does not have any redundancy in the emergency stop control circuit.
Suited up to SIL2, Performance Level d, Cat. 3

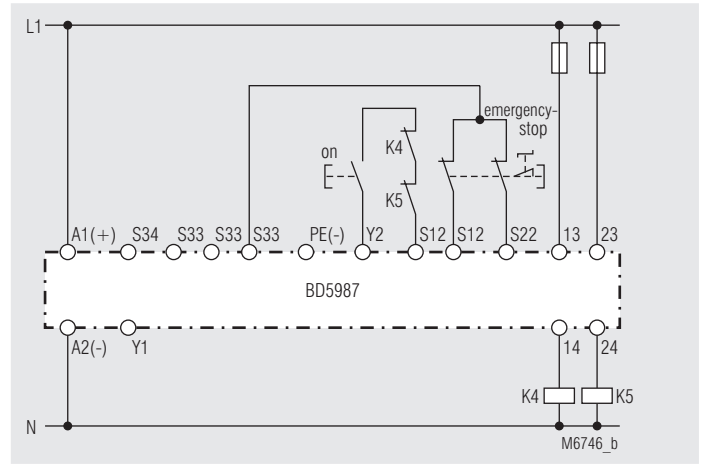
Anwendungsbeispiele



Two-pole emergency stop circuit with emergency stop control device in supply circuit with automatic ON-function.
Application for long emergency stop loops where the control voltage drops below the minimum voltage of 21 V.

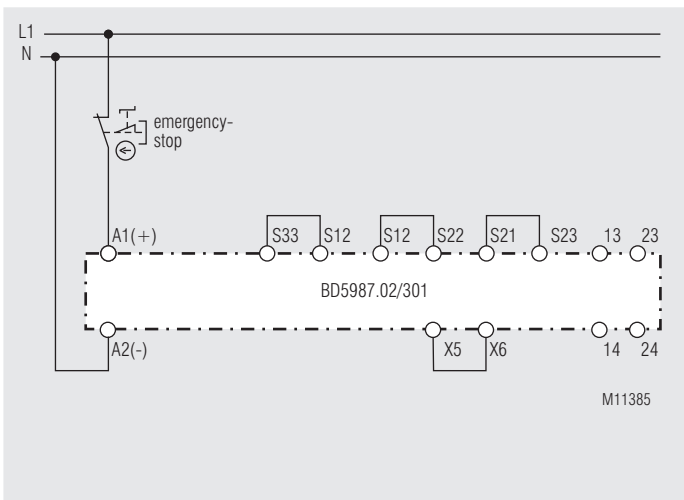
Attention:

Single faults (e.g. line faults at the emergency stop control device) are not detected with this external circuit configuration.
Suited up to SIL2, Performance Level d, Cat. 3

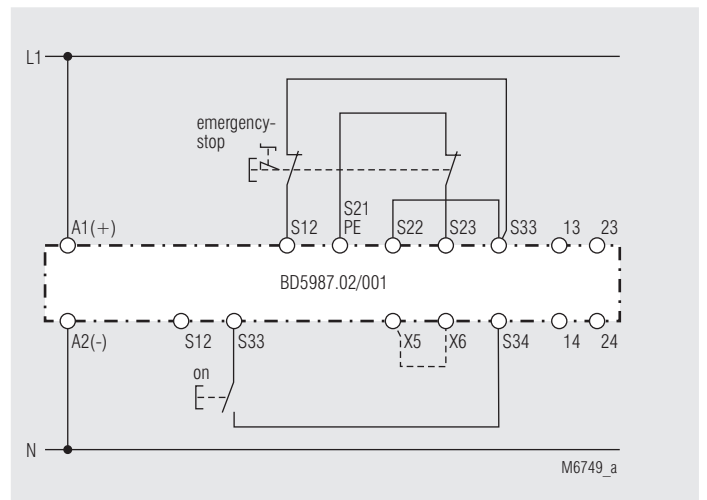


Contact reinforcement by external contactors, 2-channel.
The output contacts can be reinforced by external contactors with forcibly guided contacts for switching currents > 10 A. Functioning of the external contactors is monitored by looping the NC contacts into the closing circuit (terminals Y2 - S12).

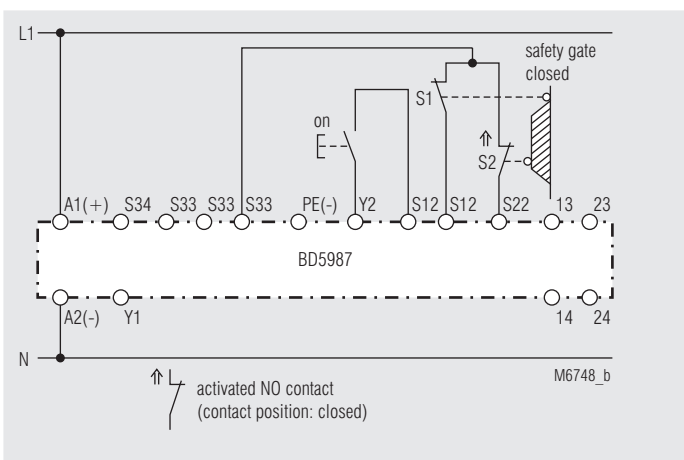
Suited up to SIL3, Performance Level e, Cat. 4



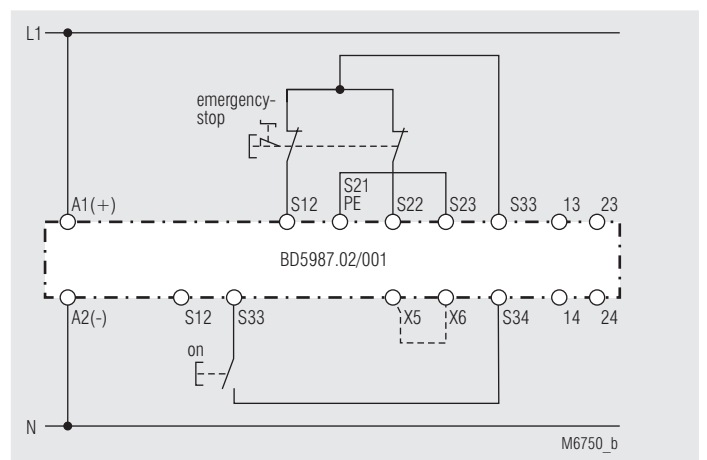
Single-channel emergency stop circuit. This circuit does not have any redundancy in the emergency stop control circuit
Suited up to SIL2, Performance Level d, Cat. 3



Two-channel emergency stop circuit with cross fault detection.
Activation via On pushbutton. ---- Jumper X5 - X6:
Jumper X5 - X6 must be fitted for the automatic On function.
The On pushbutton is not required.
Suited up to SIL3, Performance Level e, Cat. 4



Two-channel monitoring of a safety gate.
Suited up to SIL3, Performance Level e, Cat. 4



Two-channel emergency-stop circuit without cross fault detection.
Activation via On pushbutton. ---- Jumper X5 - X6:
Jumper X5 - X6 must be fitted for the automatic On function.
The On pushbutton is not required.
Suited up to SIL3, Performance Level e, Cat. 4

