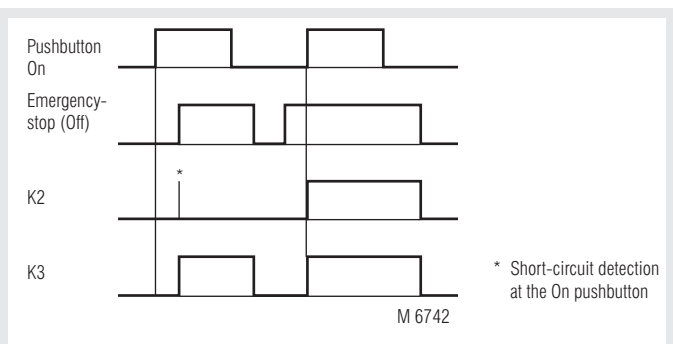
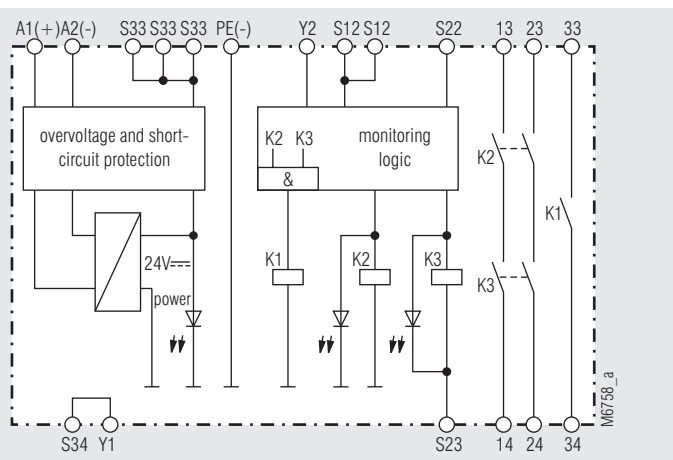


Function diagram



Block diagram



BD 5987.02:

- 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
 - Category 4 to EN 954-1
- Output: 2 NO contacts for AC 250 V
- Gold-plated contacts to switch small loads (input for PLC)
- 1-channel or 2-channel connection
- Line fault detection at On pushbutton
- 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: as BD 5987.02 but

- Optionally automatic On function or after activation by the On pushbutton
 - Optionally cross fault detection in emergency stop circuit
- BD 5987.--/301: as BD 5987.--/001 but
- shorter release time when opening the supply circuit
 - single-channel e-stop circuit

Approvals and marking



* see variants

Applications

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

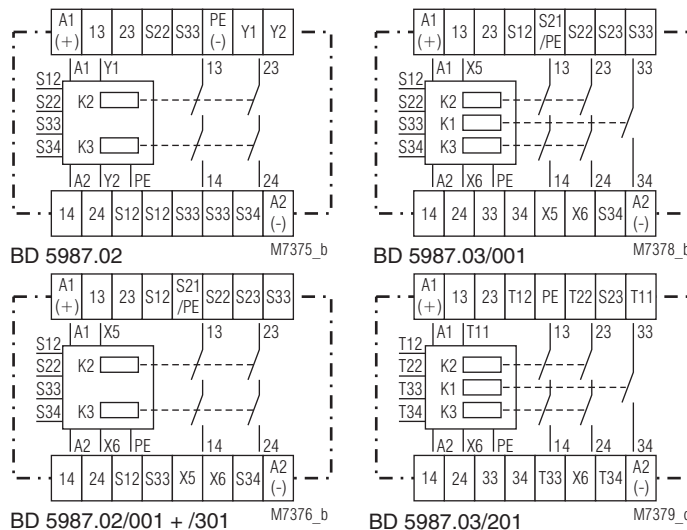
Indication

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

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.

Circuit diagrams



Notes

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
DC 24 V

Voltage range: AC 0.8 ... 1.1 U_N
at 10% residual ripple: DC 0.9 ... 1.2 U_N
at 48% residual ripple: DC 0.8 ... 1.1 U_N

Nominal consumption: approx. 5.5 VA

Nominal frequency: 50 / 60 Hz

Control voltage at S33: DC 24 V

Control current

BD 5987.02: typ. DC 55 mA

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

Minimum voltage at terminals S12, S22: DC 21 V with activated device

Recovery time: 0.5 s after release of the emergency stop pushbutton

Output

Contacts

BD 5987.02: 2 NO contacts
The NO contacts are safety contacts.
ATTENTION! The NO contact 33-34 can only be used for monitoring.

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

Release time

Opening in secondary circuit (S12-S22): 50 ms \pm 25 %

Opening in supply circuit BD 5987.02: 350 ms \pm 50 %

BD 5987.02/001: 120 ms \pm 50 %

BD 5987.02/301: 40 ms \pm 50 %

Contact type: relay, forcibly guided

Nominal output voltage: AC 250 V
DC: see limit curve for arc-free operation

Thermal current I_{th} : see continuous current limit curve (max. 10 A in one contact path)

Switching capacity

to AC 15: 5 A / AC 230 V IEC/EN 60 947-5-1
for NO contact
2 A / AC 230 V IEC/EN 60 947-5-1
for NC contact

Electrical life: to AC 15 at 2 A, AC 230 V: 10⁵ switching cycles IEC/EN 60 947-5-1

Permissible operating frequency: 600 switching cycles / h

Short circuit strength max. fuse rating: 6 A gL IEC/EN 60 947-5-1

Mechanical life: 10 x 10⁶ switching cycles

Technical Data

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

Electrostatic discharge: 8 kV (air) IEC/EN 61 000-4-2

HF irradiation: 10 V / m IEC/EN 61 000-4-3

Fast transients: 2 kV IEC/EN 61 000-4-4

Surge voltages

between wires for power supply: 1 kV IEC/EN 61 000-4-5

between wire and ground: 2 kV IEC/EN 61 000-4-5

Interference suppression: Limit value class B EN 55 011

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

Vibration resistance: Amplitude 0,35 mm IEC/EN 60 068-2-6
frequency 10 ... 55 Hz

Climate resistance: 15 / 055 / 04 IEC/EN 60 068-1

Terminal designation: EN 50 005

Wire connection: 1 x 4 mm² solid or

1 x 2,5 mm² stranded ferruled (isolated) or

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

Plus-minus terminal screws

M3.5 box terminal with wire protection

DIN rail IEC/EN 60 715

Weight: 450 g

Dimensions

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

Safety related data

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

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 stock item

• Output: 2 NO contacts

• Optionally automatic On function when operating voltage is applied or after activation by the On pushbutton

• Nominal voltage U_N : DC 24 V





• Width: 45 mm

Variants

- BD 5987.02/60:** with CSA approval
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)

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

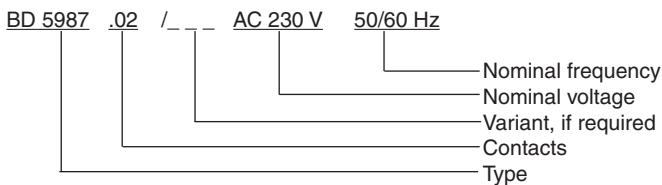
Jumper assignment for functions:

Activation via On pushbutton / or automatic On function

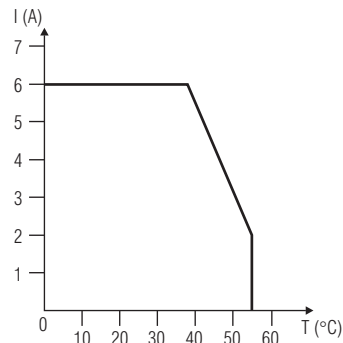
On pushbutton T11-T34 or T12-T34	Jumper T33-X6	Function
		The output contacts are switched only after operation of the On pushbutton. Line fault monitoring at the On pushbutton.
		Automatic On function for operating voltage Off/On or after emergency-stop release

- BD 5987.03/301:** Starting behaviour as with BD 5987.02/001,
shorter release time when opening the supply circuit

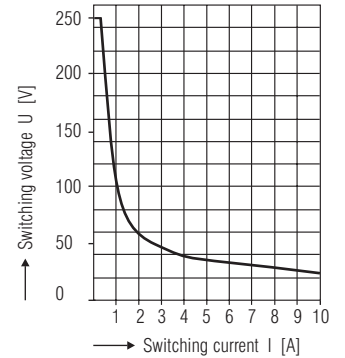
Ordering example for Variants



Characteristics

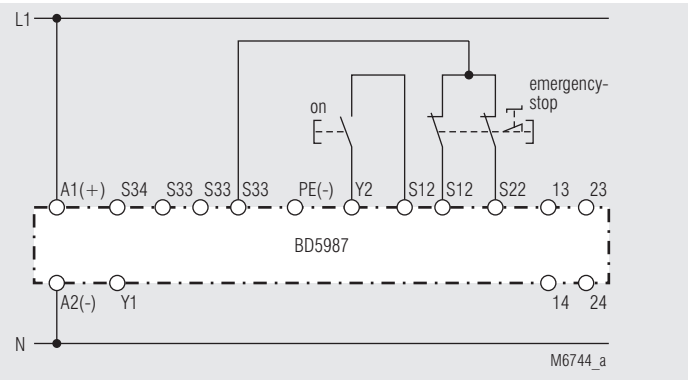


Continuous current limit curve
(Current via two contact rows) M6759

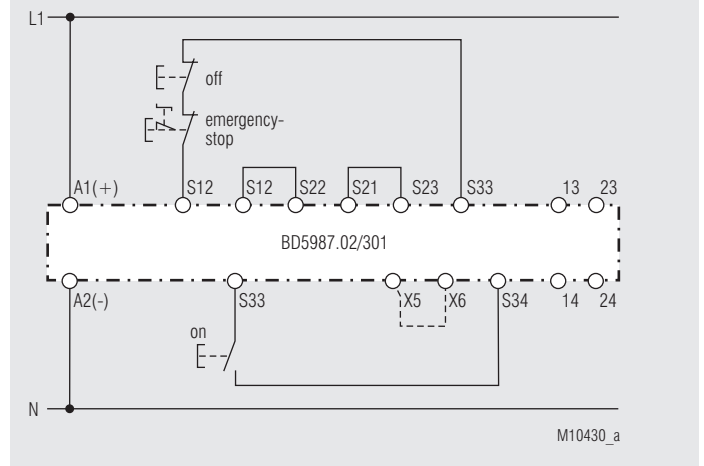
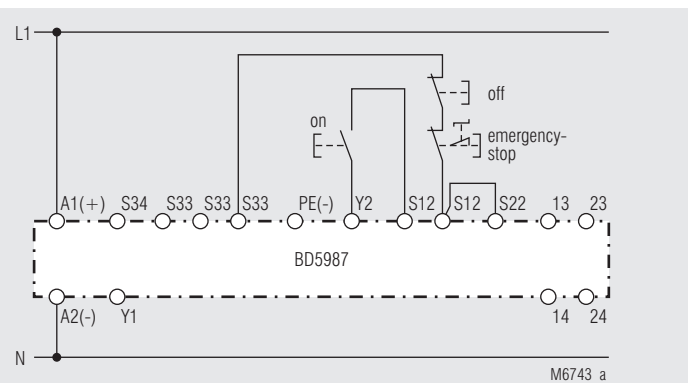


Limit curve for arc-free
operation with resistive load

Application examples

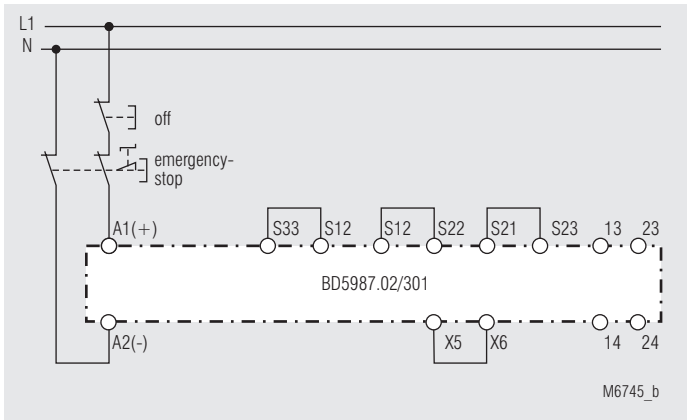


Two-channel emergency stop circuit



One-channel emergency stop circuit. This circuit does not have any redundancy in the emergency stop control circuit

Application examples

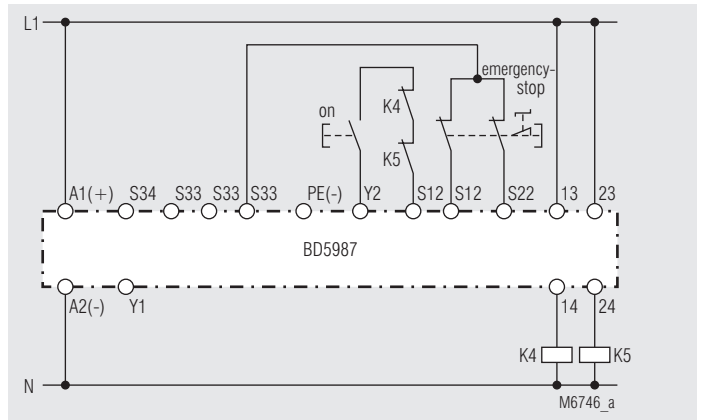


Two-pole emergency stop circuit with emergency stop control device in supply circuit with automatic ON-function.

Application for long emergency stop loops where the control voltage drops below the minimum voltage of 21 V.

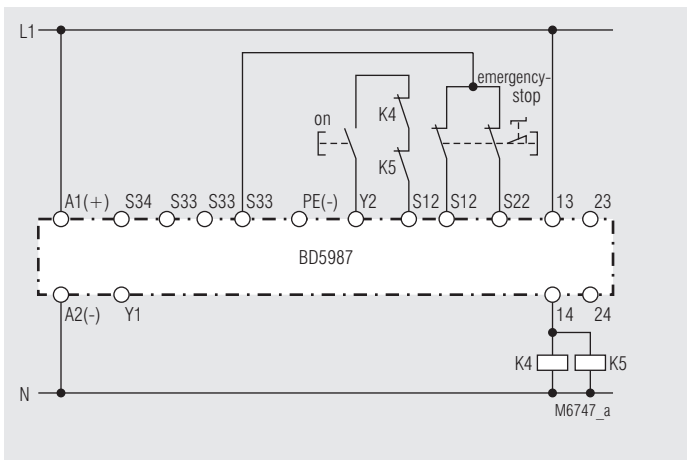
Attention:

Single faults (e.g. line faults at the emergency stop control device) are not detected with this external circuit configuration

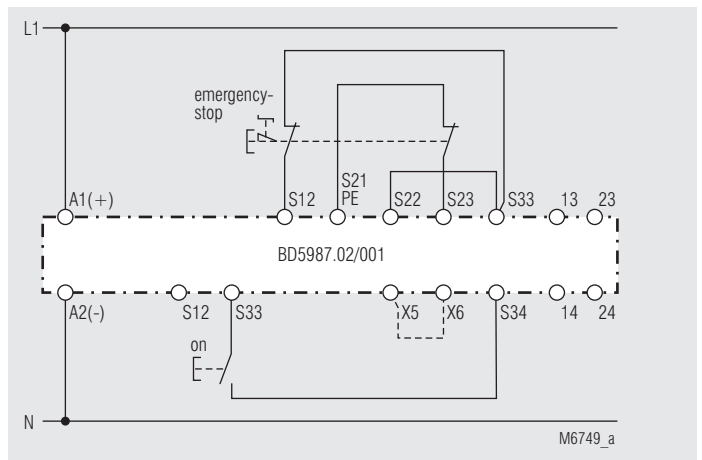


Contact reinforcement by external contactors, 2-channel.

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).



Contact reinforcement by external contactors with reduced safety level

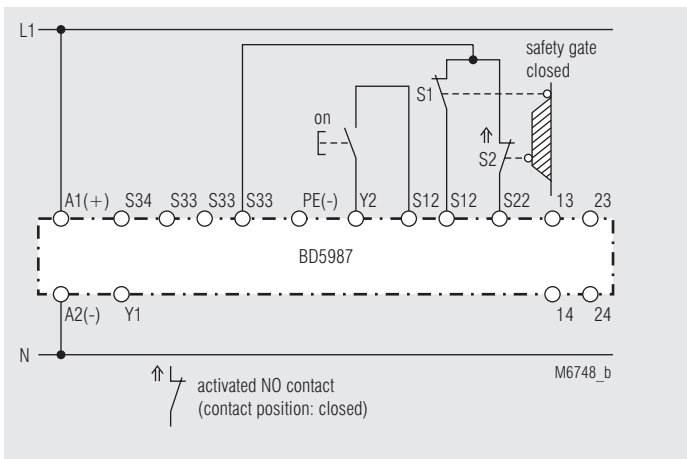


Two-channel emergency stop circuit with cross fault detection.

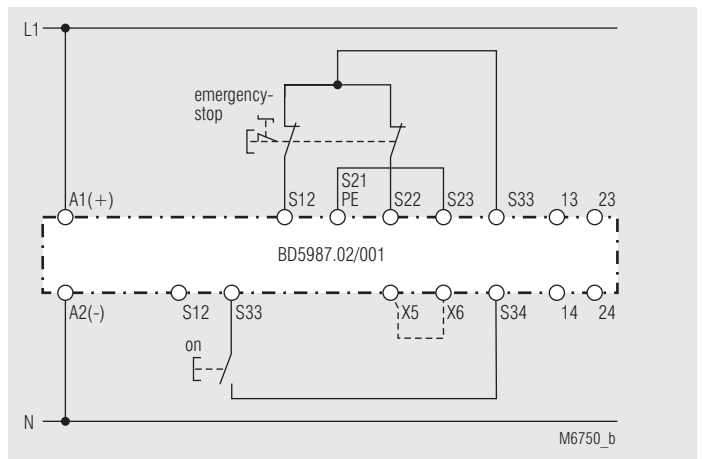
Activation via On pushbutton. ---- Jumper X5 - X6:

Jumper X5 - X6 must be fitted for the automatic On function.

The On pushbutton is not required



Two-channel monitoring of a safety gate



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