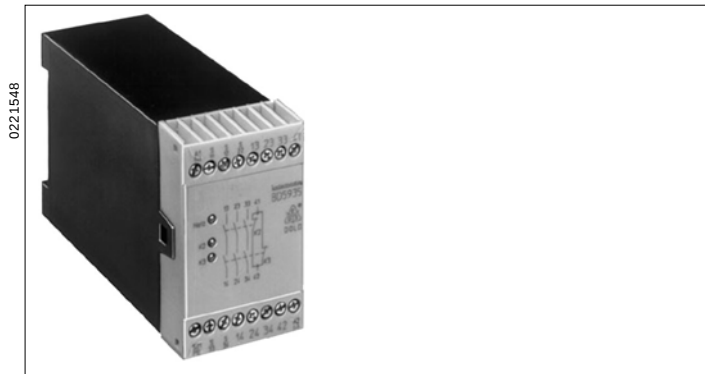
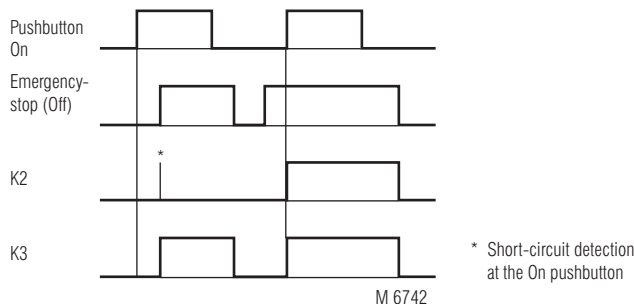




- According to EU Directive for machines 98/37/EG
- According to IEC/EN 60204-1
- Safety category 4 according to EN 954-1
- Output: optionally 1 NO / 1 NC or 3 NO / 1 NC contacts
- Gold plated contacts to switch low loads (signal to PLC)
- 1- or 2-channel connection
- Line fault detection on ON pushbutton
- Operating state display
- LED display for channels 1 and 2
- Removable terminal strips
- 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
- Optionally automatic ON function when the operating voltage is applied or activation via the ON pushbutton
- Optionally cross fault detection in emergency-stop
- With fast auto start as option
- Width 45 mm

Function diagram



Approvals and marking



* see variants

Applications

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

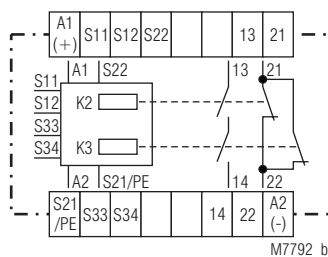
Indication

- upper LED: on when supply voltage connected
- lower LEDs: on when relay K2 and K3 active

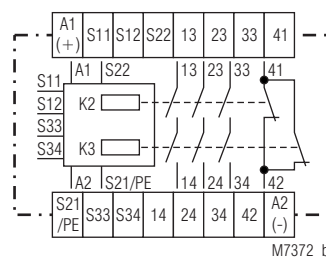
Notes

Line fault detection at the ON pushbutton:
If the ON pushbutton was already closed before the voltage was applied at S12, S22 (also in the case of line fault via the ON pushbutton), the output contacts cannot be switched on.
A line fault at the ON pushbutton which occurred after activation of the unit is recognized when switching on takes place again and switching-on of the output contacts is prevented. If a line fault occurs at the ON pushbutton after the voltage has already been applied at S12 and S22, unwanted activation occurs because this line fault can not be distinguished from the regular switching-on function. The PE testing terminal allows the units to be also operated in IT networks with insulation monitoring. It also serves as a reference point for checking the control voltage and as a connection contact in the event of an emergency-stop with cross fault detection.

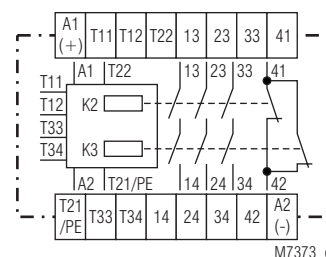
Circuit diagrams



BD 5935.16

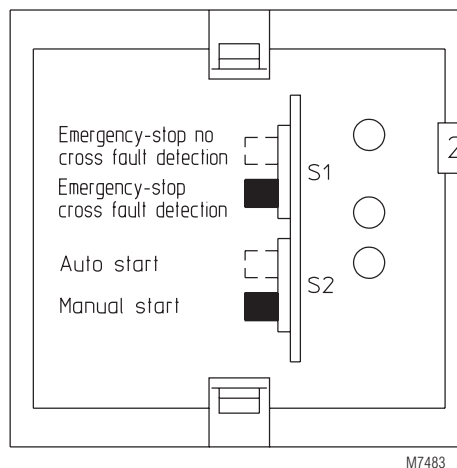
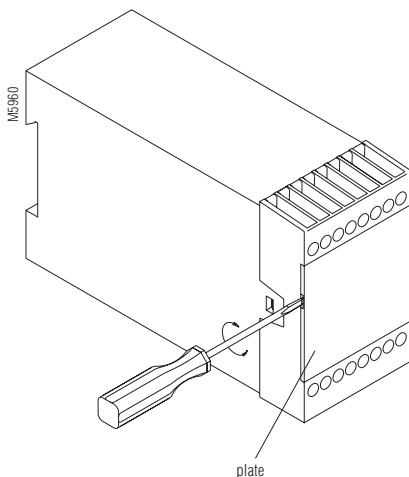


BD 5935.48



BD 5935.48/200

Unit programming



Notes

Because of the gold-plated contacts the BD 5935 can be used to switch small loads 1 mVA ... 7 VA, 1 mW ... 7 W in the range of 0,1 ... 60 V, 1 ... 300 mA. The gold-plated contacts allow also to switch the maximum current but the gold plating will be burnt off. After that the contacts cannot be used any more to switch the small loads.

One or more extension modules BN 3081 or external contactors with positively driven contacts can be used to multiply the number of contacts of the emergency-stop module BD 5935.

The switches S1 and S2 are provided for the following selection possibilities: Automatic-start, manual-start and emergency-stop with or without cross fault detection. These switches are located behind the front cover panel (see unit programming diagrams).

Switch S2 is for selecting automatic or manual Start. In addition, terminals S33 and S34 must be jumpered for "automatic start function".

Selection of the operating mode with or without cross fault detection at the emergency-stop pushbutton is performed via the switch S1. The unit must be connected as shown in the application example.

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

Operate time

activation via ON pushbutton: 50 ms - 25 % + 50 %
automatic ON function: 1 s - 25 % + 50 %, as option also with shorter on-delay (see variants)

Release time

opening in secondary circuit (S12-S22): 25 ms - 25 % + 50 %

opening in supply circuit: 50 ms - 25 % + 50 %

Contact type: relay, positively-driven

Rated output voltage: AC 250 V

DC: see arc limit curve
see quadratic total current limit curve
(max. 10 A in one contact path)

Thermal current I_{th} :

Switching capacity

to AC 15

for NO contact: AC 5 A / 250 V IEC/EN 60 947-5-1

for NC contact: AC 2 A / 250 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

Permissible operating frequency:

600 switching cycles / h

Short circuit strength

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

max. line circuit breaker: C 10 A

Mechanical life: 10×10^6 switching cycles

General data

Operating mode: Continuous operation

Temperature range: - 15 ... + 55 °C

at max. 90% humidity

Clearance and creepage distances

overvoltage category /
contamination level: 4 kV / 2 IEC 60 664-1

EMC

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

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

Degree of protection: Housing: IP 40* IEC/EN 60 529

Terminals: IP 20 IEC/EN 60 529

* when front plate is removed to set switches, protection class IP 40 is not valid

Housing: Thermoplastic with V0 behaviour according to UL 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

Technical data

Input

Nominal voltage U_N : AC 24, 48, 110, 127, 230, 240 V
DC 24 V

Voltage range: AC 0,85 ... 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: AC approx. 4 VA, DC approx. 2 W

Nominal frequency: 50 / 60 Hz

Recovery time: 0,5 s after activating the emergency-stop button.

If the line fault detection of the ON-button is be active, the device must stay off for approx. 5 sec.

Control voltage at S11: DC 24 V

Control current via S12, S22: approx. 35 mA $\pm$ 25 % at U_N

Minimum voltage at terminal S12, S22: DC 21 V when unit is activated

Output

Contacts

BD 5935.16: 1 NO / 1 NC contacts

BD 5935.48: 3 NO / 1 NC contacts

The NO contacts are safety contacts.

ATTENTION! The NC contacts 21-22 or 41-42 can only be used for monitoring.

Technical data

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
Mounting:	DIN rail
Weight:	450 g

Dimensions

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

Standard type

BD 5935.48 DC 24 V	
Article number:	0045456
• Output:	3 NO / 1 NC contacts
• Nominal voltage U_N :	DC 24 V
• Width:	45 mm

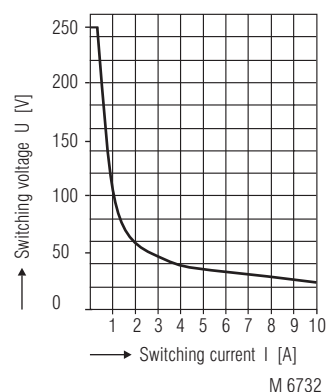
Variants

BD 5935.48/61:	with UL-approval
BD 5935.48/200:	special terminal arrangement see diagram
BD 5935.48/324:	with fast auto start: typ. 500 ms, without line fault detection on ON-button
BD 5935.48/824:	with fast auto start: typ. 110 ms, without line fault detection on ON-button

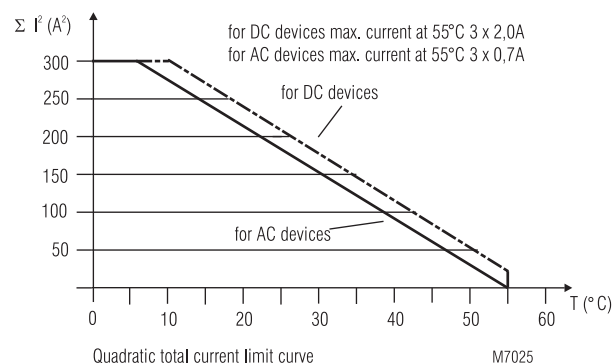
Ordering example of Variants

BD 5935	.48	/	AC 230 V	50/60 Hz
				Nominal frequency
				Nominal voltage
				Variant, if required
				Contacts
				Type

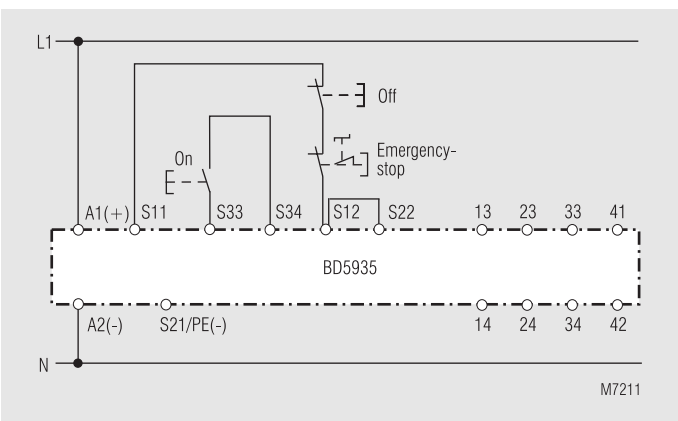
Characteristics



Arc limit curve under resistive load



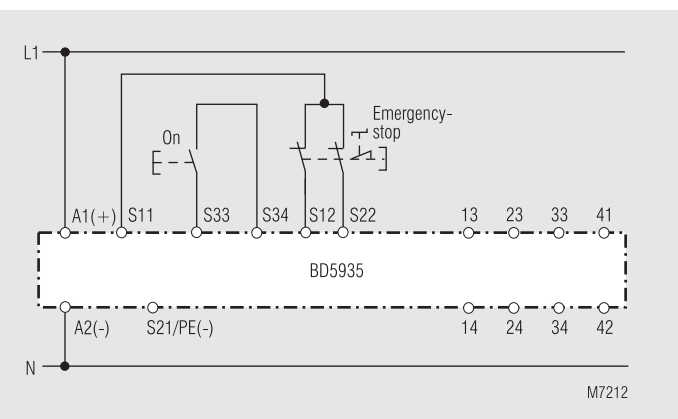
Application examples



Single-channel emergency-stop circuit. This circuit has no redundancy in the emergency-stop control circuit.

Please note "Unit programming" !

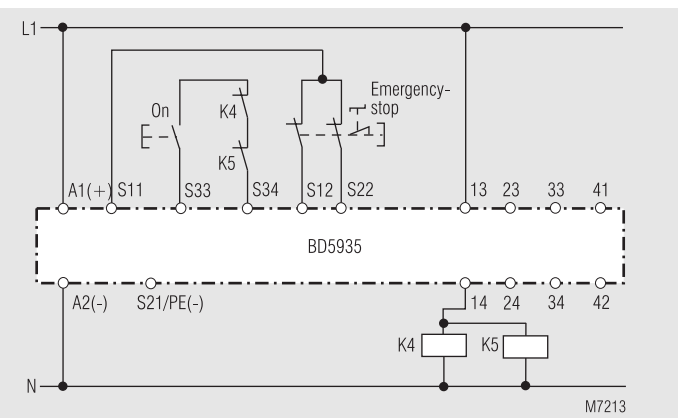
Switches in pos.: S1 no cross fault detection
S2 manual start



Two-channel emergency-stop circuit without cross fault detection.

Please note "Unit programming" !

Switches in pos.: S1 no cross fault detection
S2 manual start

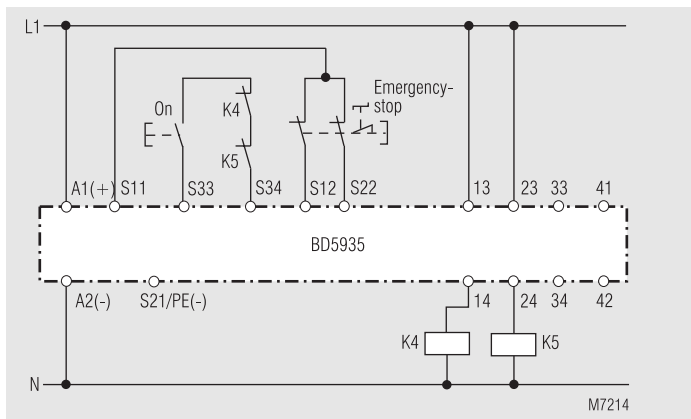


Contact reinforcement with external contactors, controlled with one contact path.

Please note "Unit programming" !

Switches in pos.: S1 no cross fault detection
S2 manual start

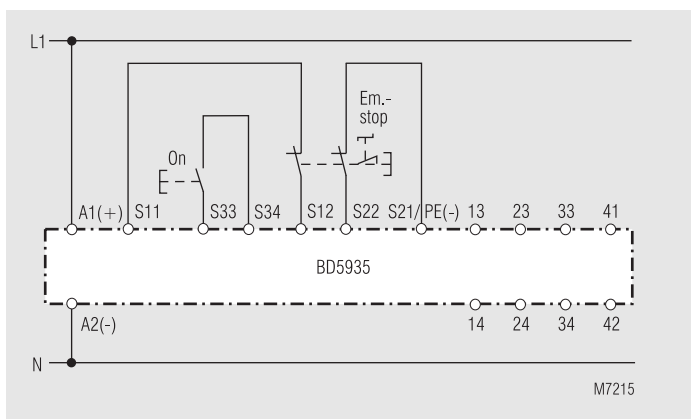
Application examples



Contact reinforcement by external contactors, controlled with 2 contact paths. With switching current > 10 A, the output contacts can be reinforced by external contactors with positively-driven contacts. The function of the external contactors is monitored by looping the NC contacts into the making circuit (terminals S33-S34).

Please note "Unit programming" !

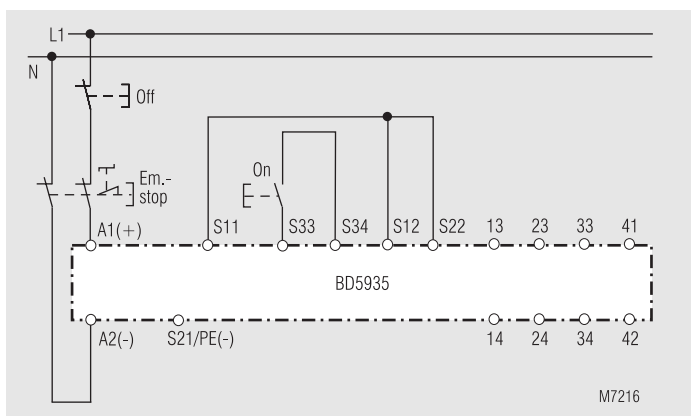
Switches in pos.: S1 no cross fault detection
S2 manual start



Two-channel emergency-stop circuit with cross fault detection.

Please note "Unit programming" !

Switches in pos.: S1 cross fault detection
S2 manual start



Two-pole emergency-stop with emergency-stop control device in the supply circuit.

Application for long emergency-stop loops in which the control voltage dropped below the minimum voltage of 21 V.

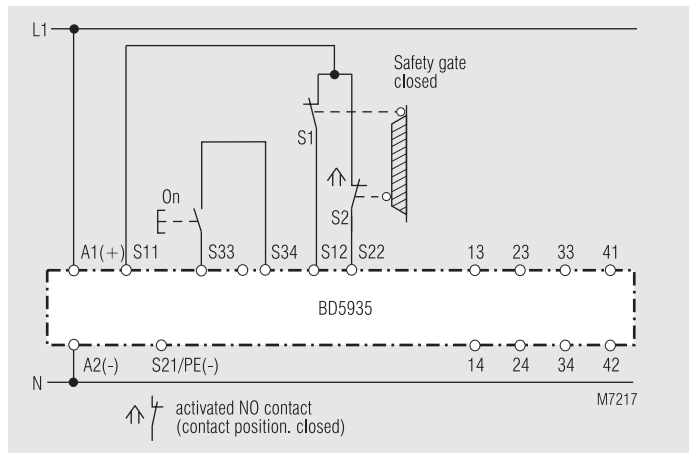
Important:

Single faults (line shorts over the emergency-stop control device) are not identified with this external circuit.

Please note "Unit programming" !

Switches in pos.: S1 no cross fault detection
S2 manual start

Application example



Two-channel monitoring of a safety gate.

The switch of S12 must close simultaneously with S22 or later.

Please note "Unit programming" !

Switches in pos.: S1 no cross fault detection
S2 manual start