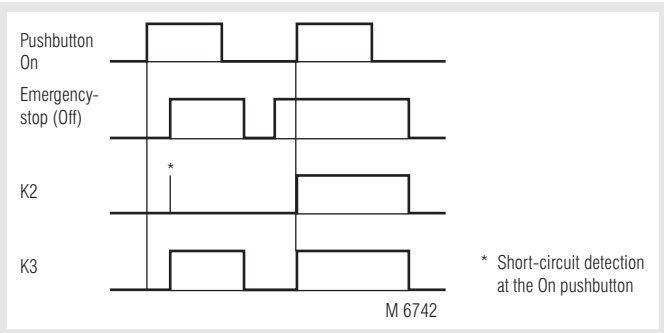


022 1548

- 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 mm<sup>2</sup> stranded ferruled (isolated), DIN 46 228-1/-2/-3/-4 or 2 x 2,5 mm<sup>2</sup> 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

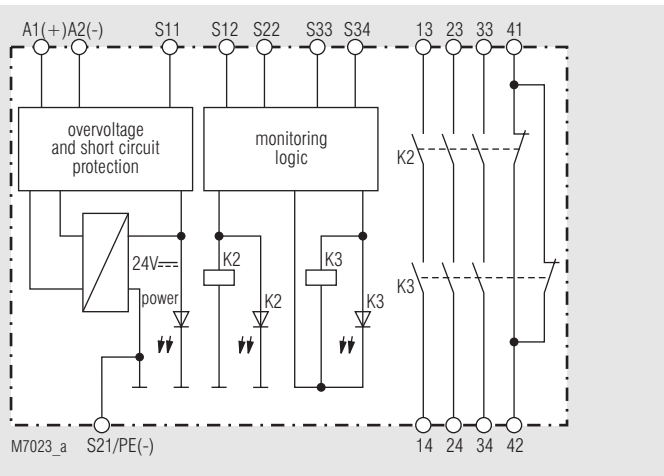
### Indication

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

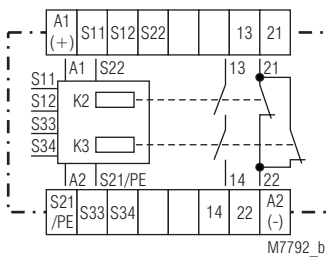
### Notes

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.

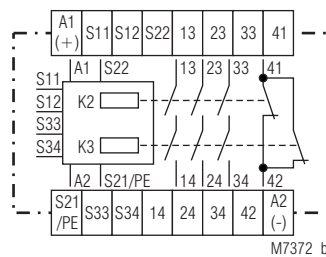
### Block diagram



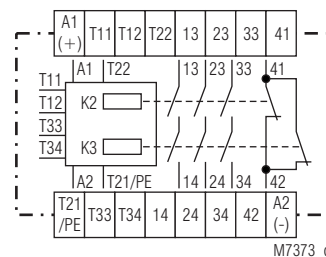
### Circuit diagrams



BD 5935.16

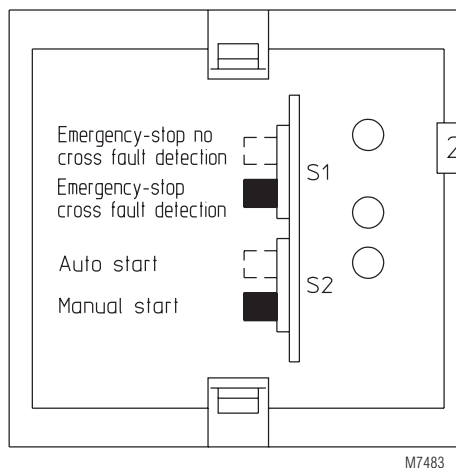
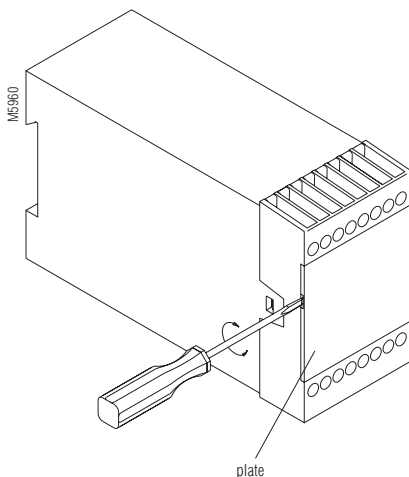


BD 5935.48



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

#### Input

<b>Nominal voltage <math>U_N</math>:</b>	AC 24, 48, 110, 127, 230, 240 V DC 24 V
<b>Voltage range:</b>	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 $U_N$
<b>Nominal consumption:</b>	AC approx. 4 VA, DC approx. 2 W
<b>Nominal frequency:</b>	50 / 60 Hz
<b>Recovery time:</b>	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.
<b>Control voltage at S11:</b>	DC 24 V
<b>Control current via S12, S22:</b>	approx. 35 mA $\pm$ 25 % at $U_N$
<b>Minimum voltage at terminal S12, S22:</b>	DC 21 V when unit is activated

#### Output

<b>Contacts</b>	
BD 5935.16:	1 NO / 1 NC contacts
BD 5935.48:	3 NO / 1 NC contacts
	The NO contacts are safety contacts.
	<b>ATTENTION! The NC contacts 21-22 or 41-42 can only be used for monitoring.</b>

### Technical data

<b>Operate time</b>	
activation via ON pushbutton:	50 ms - 25 % + 50 %
automatic ON function:	1 s - 25 % + 50 %, as option also with shorter on-delay (see variants)
<b>Release time</b>	
opening in secondary circuit (S12-S22):	25 ms - 25 % + 50 %
opening in supply circuit:	50 ms - 25 % + 50 %
<b>Contact type:</b>	relay, positively-driven
<b>Rated output voltage:</b>	AC 250 V
<b>Thermal current <math>I_{th}</math>:</b>	DC: see arc limit curve (max. 10 A in one contact path)
<b>Switching capacity</b>	
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
<b>Electrical life</b>	
to AC 15 at 2 A, AC 230 V:	10 <sup>5</sup> switching cycles IEC/EN 60 947-5-1
<b>Permissible operating frequency:</b>	600 switching cycles / h
<b>Short circuit strength</b>	
max. fuse rating:	6 A gL IEC/EN 60 947-5-1
max. line circuit breaker:	C 10 A
<b>Mechanical life:</b>	10 x 10 <sup>6</sup> switching cycles

### General data

<b>Operating mode:</b>	Continuous operation
<b>Temperature range:</b>	- 15 ... + 55 °C at max. 90% humidity
<b>Clearance and creepage distances</b>	
overvoltage category / contamination level:	4 kV / 2 IEC 60 664-1
<b>EMC</b>	
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
<b>Degree of protection:</b>	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
<b>Housing:</b>	Thermoplastic with V0 behaviour according to UL subject 94
<b>Vibration resistance:</b>	Amplitude 0,35 mm IEC/EN 60 068-2-6 frequency 10 ... 55 Hz
<b>Climate resistance:</b>	15 / 055 / 04 IEC/EN 60 068-1
<b>Terminal designation:</b>	EN 50 005

## Technical data

<b>Wire connection:</b>	1 x 4 mm <sup>2</sup> solid or 1 x 2,5 mm <sup>2</sup> stranded ferruled (isolated) or 2 x 1,5 mm <sup>2</sup> stranded ferruled (isolated) DIN 46 228-1/-2/-3/-4 or 2 x 2,5 mm <sup>2</sup> stranded ferruled DIN 46 228-1/-2/-3
<b>Wire fixing:</b>	Plus-minus terminal screws M3.5, box terminal with wire protection
<b>Mounting:</b>	DIN rail IEC/EN 60 715
<b>Weight:</b>	450 g

## Dimensions

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

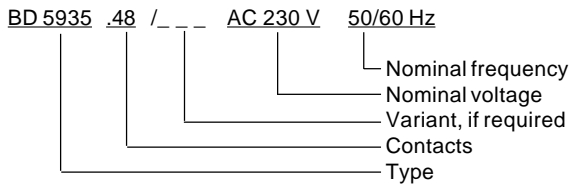
## Standard type

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

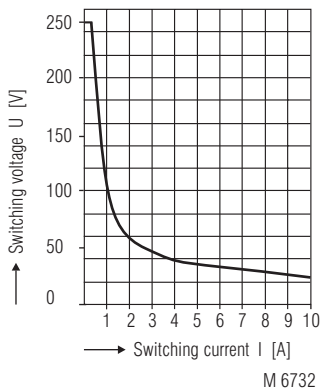
## Variants

BD 5935.../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

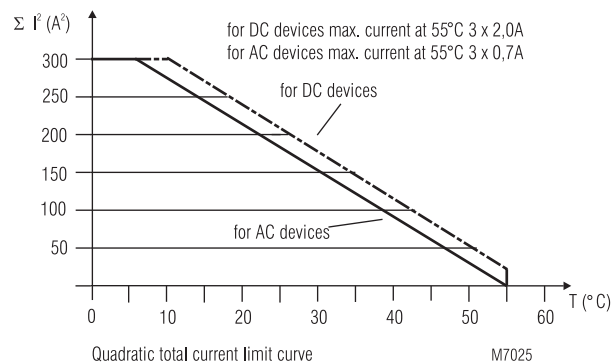
## Ordering example of Variants



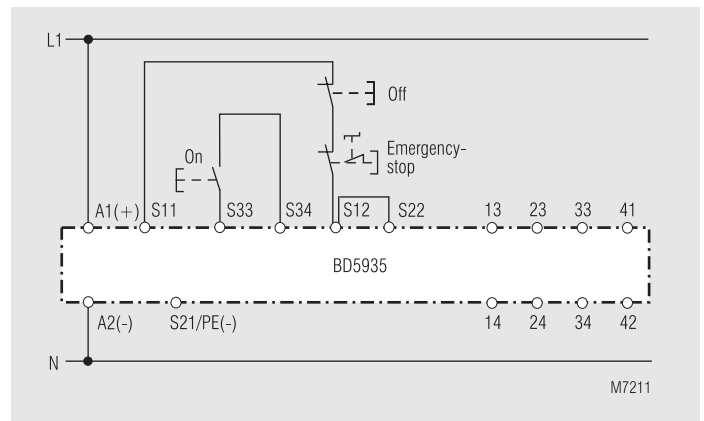
## Characteristics



## Arc limit curve under resistive load



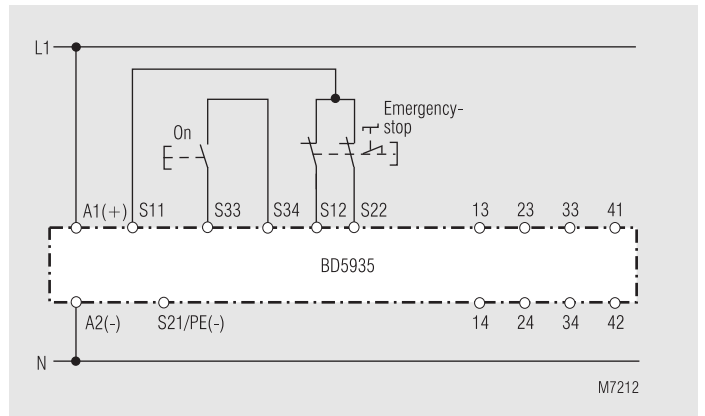
## Application examples



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

**Please note "Unit programming" !**

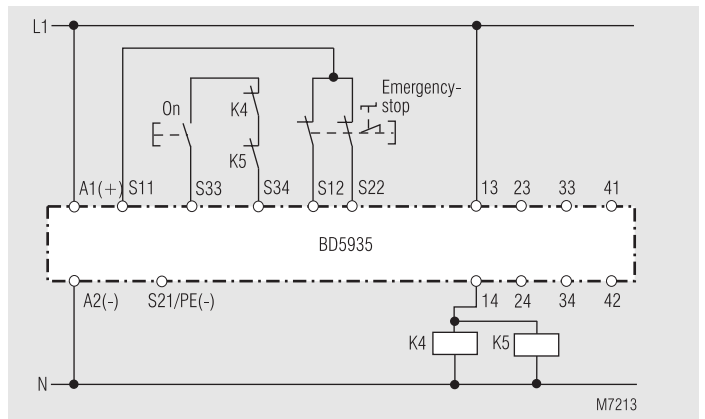
Switches in pos.: S1 no cross fault detection  
S2 manual start



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

**Please note "Unit programming" !**

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

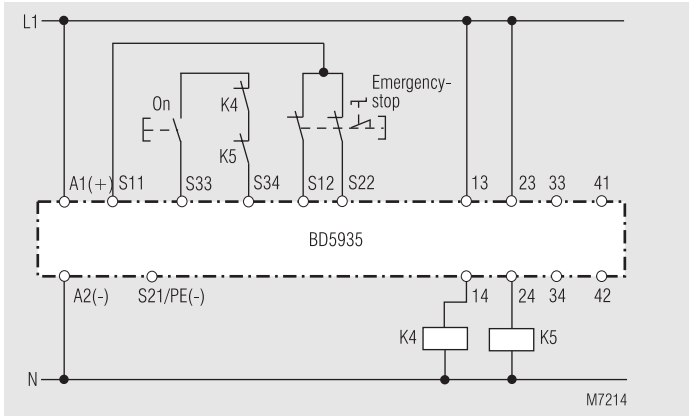


Contact reinforcement with external contactors, controlled with one contact path.

**Please note "Unit programming" !**

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

## Application examples

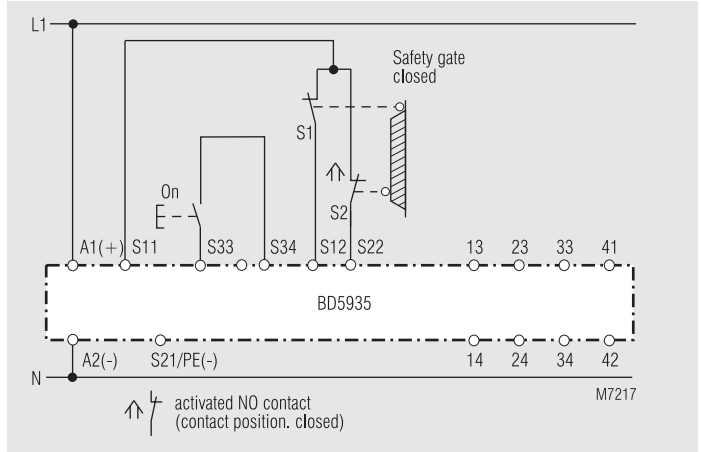


Contact reinforcement by external contactors, controlled with 2 contact paths. With switching current > 10 A, the output contacts can be reinforced by external contactors with positively-driven contacts. The function of the external contactors is monitored by looping the NC contacts into the making circuit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

**Please note "Unit programming" !**

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

## Application example

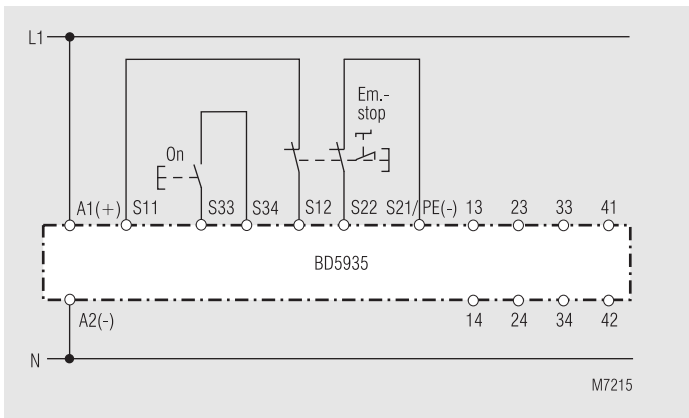


Two-channel monitoring of a safety gate.

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

**Please note "Unit programming" !**

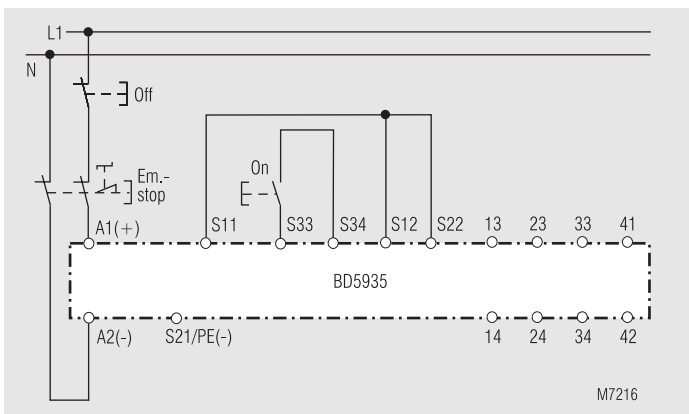
Switches in pos.: S1 no cross fault detection  
S2 manual start



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