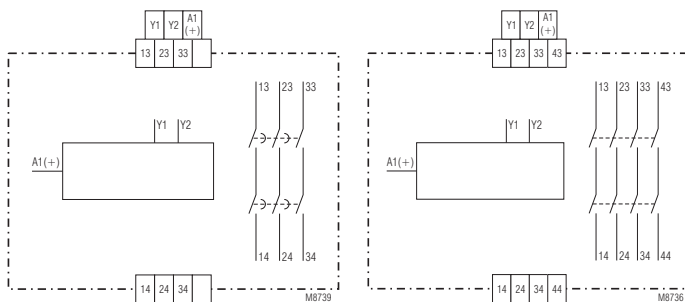




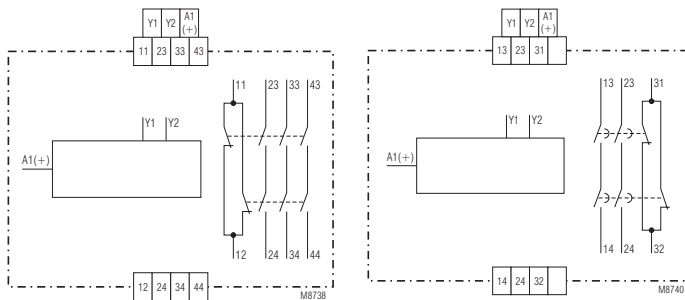
- According to
  - Performance Level (PL) e and category 4 to EN ISO 13849-1: 2008
  - SIL Claimed Level (SIL CL) 3 to IEC/EN 62061
  - Safety Integrity Level (SIL 3) to IEC/EN 61508
  - Category 4 to EN 954-1
- Safety outputs can be assigned to one or several function modules (control unit or input modules).
- Outputs:
  - 4 NO contacts
  - 3 NO contacts, 1 NC contact
  - 3 NO contacts 0-3 s delay-release time-delay relay
  - 2 NO contacts, 1 NC contact 0-3 s delay-release time-delay relay
- Permanently monitored feedback loop for external contact reinforcement
- LEDs for status indication
- Width 22.5 mm

### Circuit Diagrams



BG 5912.86

BG 5912.04



BG 5912.48

BG 5912.95

### Approvals and Marking



1) The approval to EN 954 will be replaced by a TÜV-approval according to EN ISO 13849-1:2008, IEC/EN 62061, e. g. 61508

### Applications

Realization of fail-safe control circuits for protection of people and machinery

### General Information SAFEMASTER M

The maximum configuration of the SAFEMASTER M multi-function safety system is as follows:

- the control unit BH 5911
- up to 3 input modules BG 5913, or BG/BH 5914, BG/BH 5915
- up to 3 output modules BG 5912
- 1 diagnostic module BG 5551 for CANopen, or
- 1 diagnostic module BG 5552 for Profibus-DP

The BH 5911 controls the whole system.

The input/output modules can be used to expand the control unit in a modular way into a multi-functional safety system.

To transmit status messages of the individual modules to a monitoring or control unit, one of the following diagnostic modules may be connected:

- BG 5551 for CANopen
- BH 5552 for Profibus-DP

### Indication

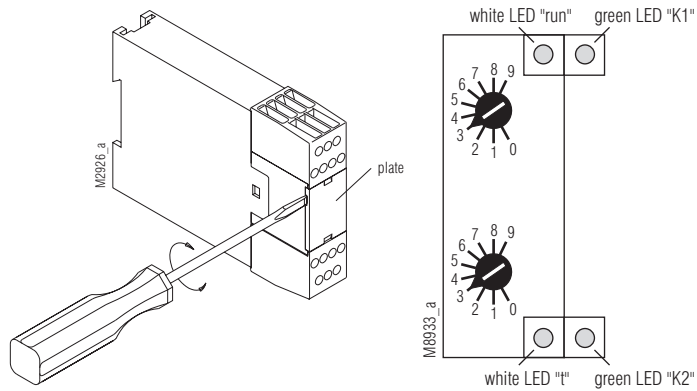
Green LEDs K1 and K2:	on, when the output contacts are activated
Yellow LED "Run":	on, when the unit operates without fault. Function errors are indicated by flashing codes.
Yellow LED "t":	on, while the delay time is elapsing. Only applicable for delayed outputs.

## Setting of Functions

The instantaneous output modules are controlled directly by the control unit; no settings are required. The feedback input Y1-Y2 must be linked when no feedback is required. With contact reinforcement by external contactors, their forcibly guided NC contacts must be connected in series between Y1 and Y2.

With the delayed output modules the output contacts are activated immediately.

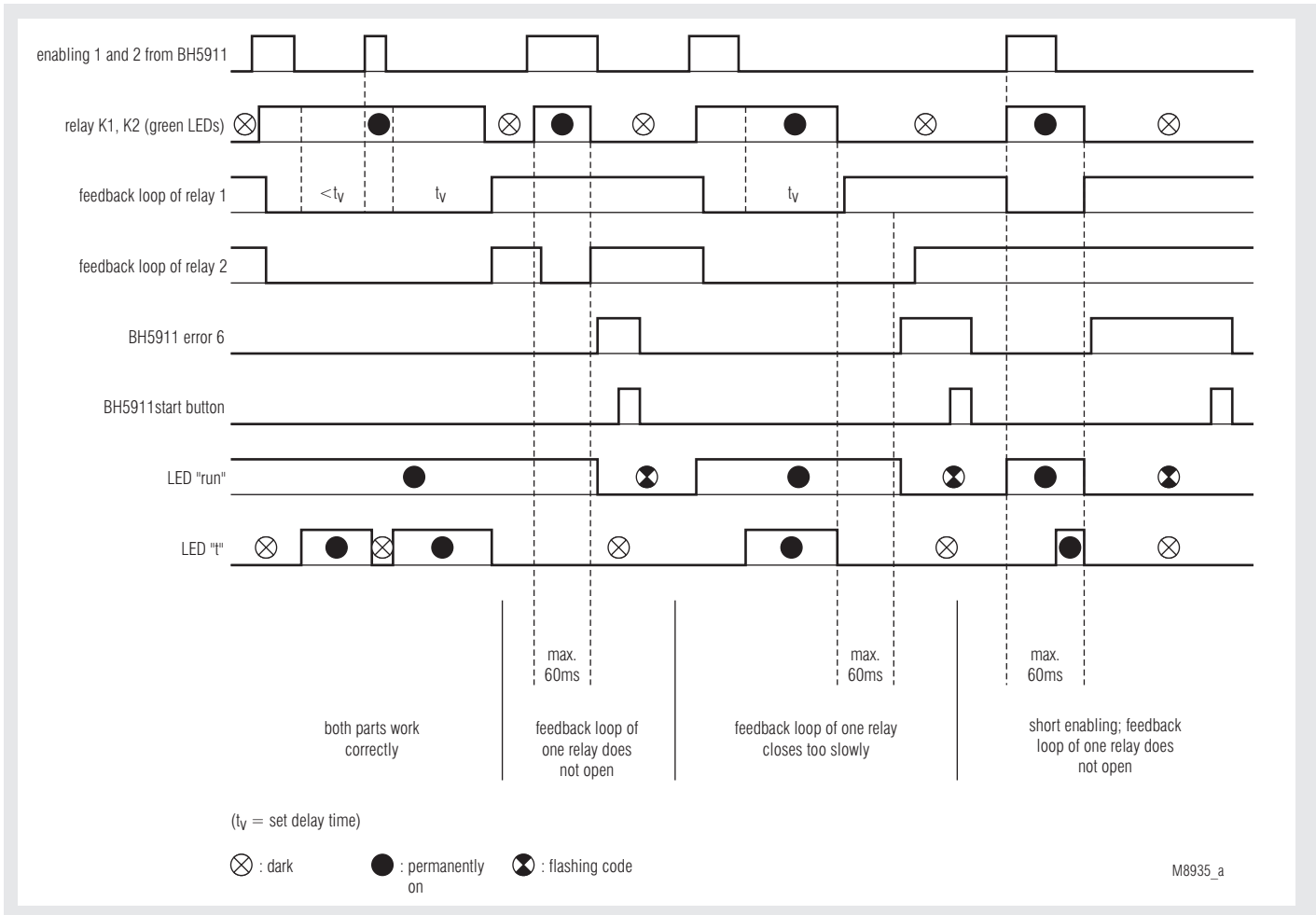
When the control signal is disconnected the outputs switch off after the adjusted time is elapsed (setting with 2 rotary switches).



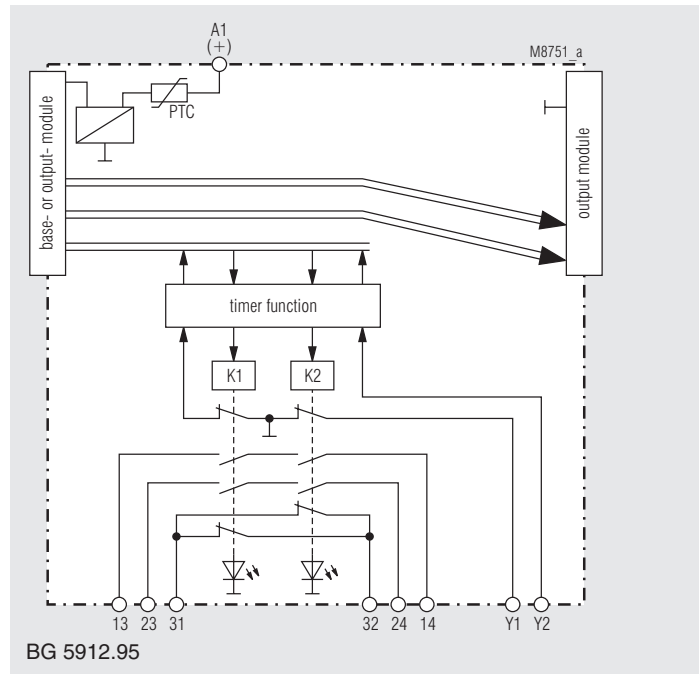
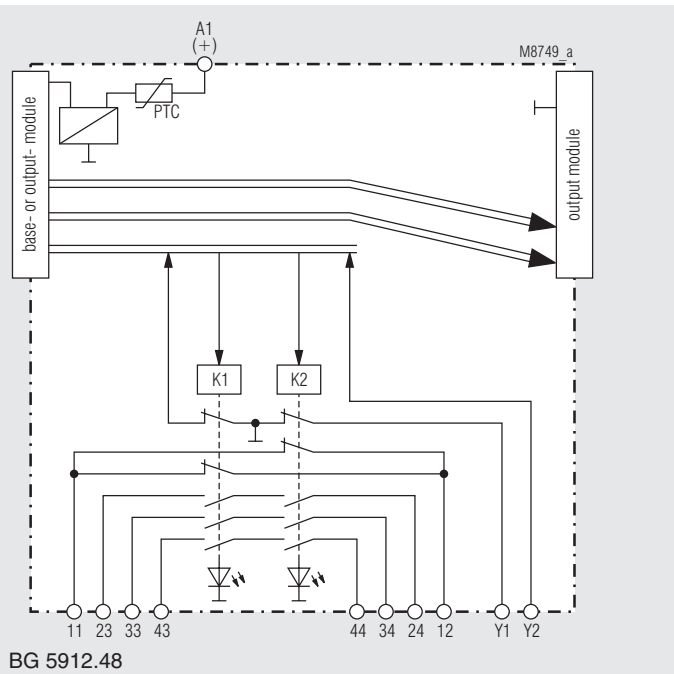
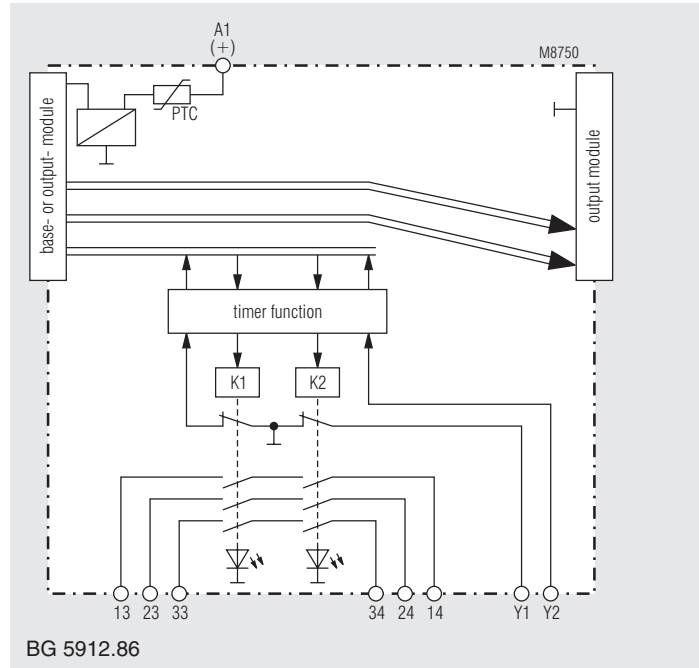
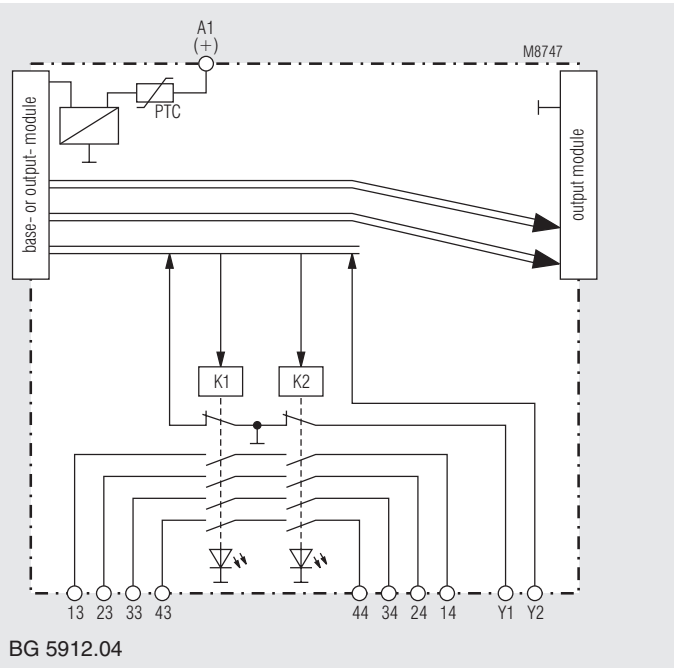
## Notes

- Settings to the unit must be performed by skilled personnel while the unit is disconnected.
- Before the front cover is removed, antistatic precautions must be observed.

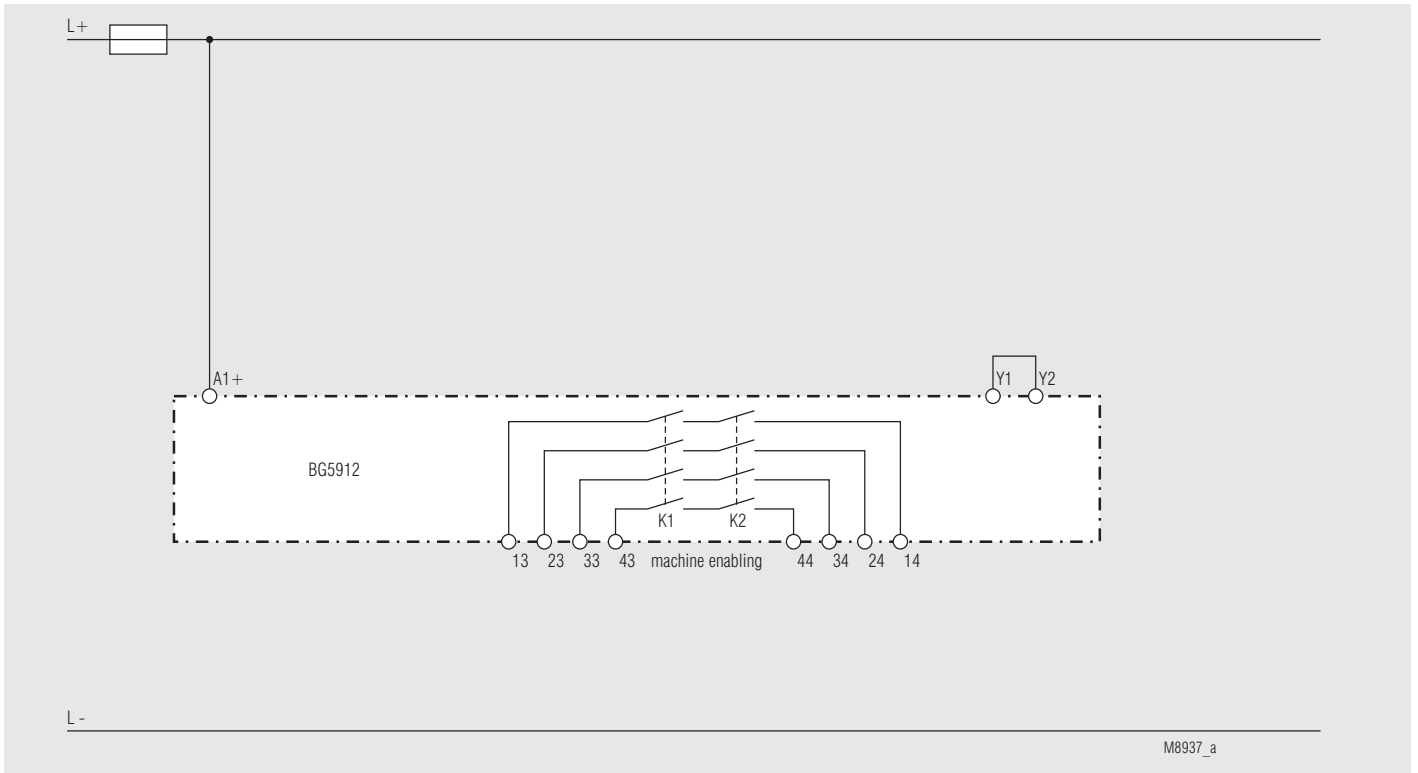
## Function Diagram for Delayed Outputs



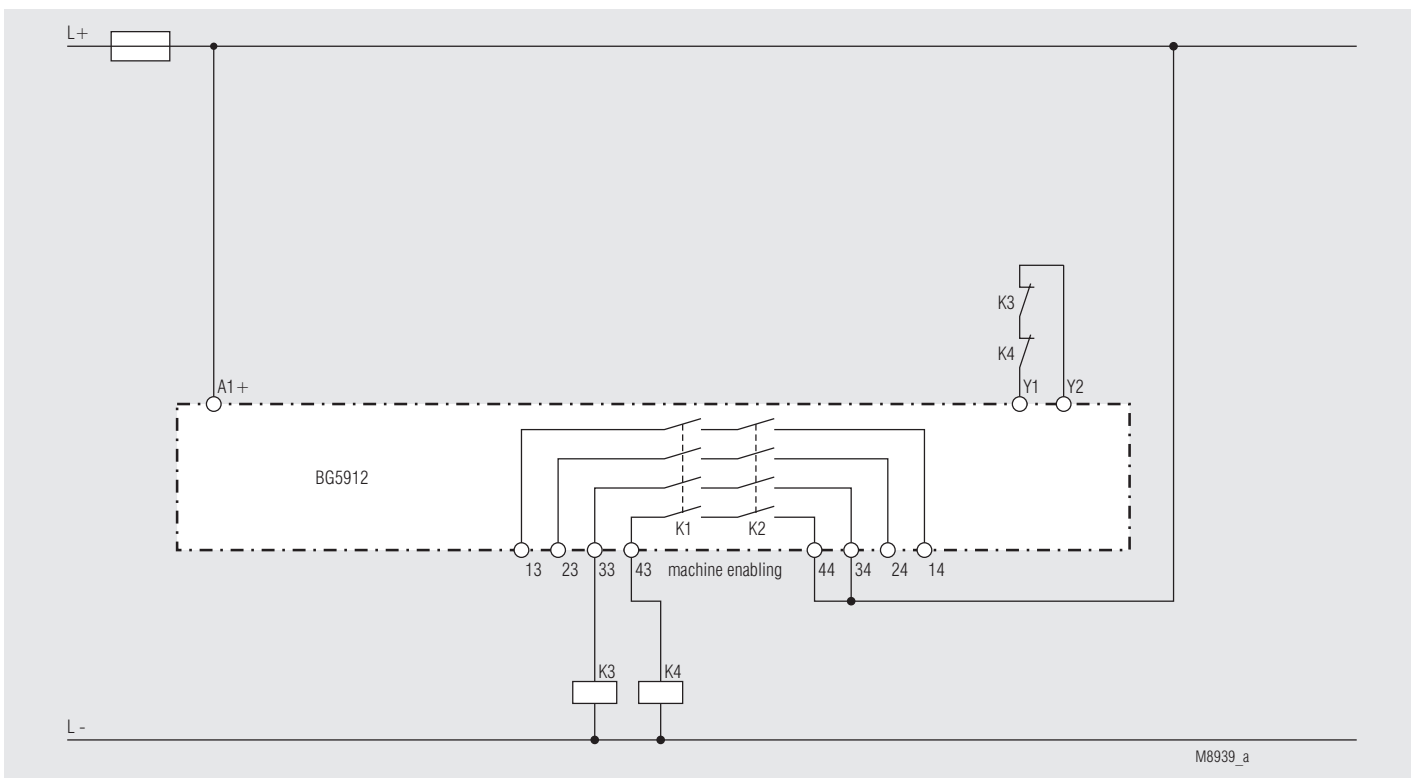
# Block Diagrams



## Application Examples



Without contact reinforcement



With contact reinforcement

Technical Data	
<b>Nominal voltage <math>U_N</math>:</b>	DC 24 V
<b>Voltage range:</b>	
with max. 5% residual ripple:	0.85 ... 1.15 $U_N$
<b>Nominal consumption:</b>	max. 120 mA
<b>Output</b>	
<b>Number of contacts provided</b>	
BG 5912.04/00000 DC24V	4 NO contacts
BG 5912.48/00000 DC24V	3 NO contacts, 1 NC contact
BG 5912.86/00000 DC24V	3 NO contacts 0-3 s off delay
BG 5912.95/00000 DC24V	2 NO contacts, 1 NC contact 0-3 s off delay
	(The NC contacts must not be used as safety outputs)
<b>Type of contact:</b>	Relay, forcibly guided
<b>Fault clearing in the feed back loop:</b>	
<b>Output nominal voltage:</b>	max. 600 ms AC 250 V DC: see limit curve for arc-free operation $\geq 100$ mV
<b>Switching of small loads:</b>	
<b>Thermal current <math>I_{th}</math>:</b>	max. 5 A (see quadratic total current limit curve)
<b>Switching capacity</b>	
acc. to AC 15	
NO contact:	3 A / AC 230 V IEC/EN 60 947-5-1
NC contact:	2 A / AC 230 V IEC/EN 60 947-5-1
acc. to DC 13 at 0.1 Hz:	DC 8 A / DC 24 V
<b>Contact life</b>	
acc. to AC 15 with 2 A, AC 230V: $10^5$ switching cycles IEC/EN 60 947-5-1	
<b>Permissible operating frequency:</b>	
max. 1 200 switching cycles / h	
<b>Short circuit strength</b>	
max. fuse rating	6 A gL IEC/EN 60 947-5-1
Line circuit NCer	C 8 A
<b>Mechanical life</b>	
$10 \times 10^6$ switching cycles	

#### General Data

<b>Operating mode:</b>	Continous operation
<b>Temperature range:</b>	$\pm 0 \dots + 50$ °C At an operating temperature of 50 °C the modules must be mounted with a distance of 3 - 5 mm.
<b>Clearance and creepage distances</b>	
rated impuls voltage / pollution degree:	
EMC	4 kV / 2 (basis insulation) IEC 60 664-1
HF irradiation:	10 V / m IEC/EN 61 000-4-3
Fast transients:	
on supply line A1-A2	2 kV IEC/EN 61 000-4-4
on signal and control lines:	2 kV IEC/EN 61 000-4-4
Surge	
between supply lines:	1 kV IEC/EN 61 000-4-5
between wire and ground:	2 kV IEC/EN 61 000-4-5
HF-wire guided:	10 V IEC/EN 61 000-4-6
Radio interference suppression	Limit value class B EN 55011
<b>Degree of protection</b>	
Housing:	IP 20 IEC/EN 60 529
Terminals:	IP 20 IEC/EN 60 529
<b>Housing:</b>	
Thermoplast with V0 behavior according to UL Subject 94	
<b>Vibration resistance:</b>	
Amplitude 0.35 mm frequency 10 ... 55 Hz, IEC/EN 60 068-2-6	
<b>Shock resistance:</b>	
Acceleration:	10 g
Pulse duration:	16 ms
Number of shocks:	1000 per axis on three axes
<b>Climate resistance:</b>	0 / 050 / 04 IEC/EN 60 068-1
<b>Terminal designation:</b>	EN 50 005
<b>Wire connection:</b>	
1 x 2.5 mm <sup>2</sup> stranded wire with sleeve, or 1 x 4 mm <sup>2</sup> solid, or 2 x 1.5 mm <sup>2</sup> stranded wire with sleeve	
DIN 46 228-1/-2/-3/-4	
<b>Wire fixing:</b>	
Box terminal with wire protection, removable terminal strips	

Technical Data	
<b>Surge suppression:</b>	When connecting inductive loads to the relay outputs (contactor coils, valves, electric brakes) surge suppressor elements like diodes, capacitors, RC combinations, etc. have to be connected directly to the connection terminals of the controlled devices, keeping the connection wires as short as possible.
<b>Mounting:</b>	DIN rail IEC/EN 60 715
<b>Dimensions</b>	
<b>Width x height x depth:</b>	22.5 x 84 x 121 mm
<b>Safety Related Data for E-STOP (BG 5912.04, BG 5912.48)</b>	
<b>Values according to EN ISO 13849-1:</b>	
Category:	4
PL:	e
MTTF <sub>d</sub> :	178.3 a
DC <sub>avg</sub> :	99.0 %
d <sub>op</sub> :	365 d/a (days/year)
h <sub>op</sub> :	24 h/d (hours/day)
t <sub>Zyklus</sub> :	3600 s/Zyklus
	$\geq 1$ /h (hour)
<b>Values according to IEC EN 62061 / IEC EN 61508:</b>	
SIL CL:	3 IEC EN 62061
SIL	3 IEC EN 61508
HFT <sup>*)</sup> :	1
DC <sub>avg</sub> :	99.0 %
SFF	99.7 %
PFH <sub>D</sub> :	2.63E-10 h <sup>-1</sup>
<b>Safety Related Data for light curtains ,safety gates or two-hand (BG 5912.04, BG 5912.48)</b>	
<b>Values according to EN ISO 13849-1:</b>	
Category:	4
PL:	e
MTTF <sub>d</sub> :	31.5 a
DC <sub>avg</sub> :	99.0 %
d <sub>op</sub> :	220 d/a (days/year)
h <sub>op</sub> :	12 h/d (hours/day)
t <sub>Zyklus</sub> :	189 s/Zyklus
<b>Values according to IEC/EN 62061 / IEC/EN 61508:</b>	
SIL CL:	3 IEC/EN 62061
SIL	3 IEC/EN 61508
HFT <sup>*)</sup> :	1
DC <sub>avg</sub> :	99.0 %
SFF	99.7 %
PFH <sub>D</sub> :	7.26E-09 h <sup>-1</sup>

\*) 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.

## Technical Data

### Safety Related Data for E-STOP (BG 5912.86, BG 5912.95)

#### Values according to EN ISO 13849-1:

Category:	4	
PL:	e	
MTTF <sub>d</sub> :	200.3	a
DC <sub>avg</sub> :	98.2	%
d <sub>op</sub> :	365	d/a (days/year)
h <sub>op</sub> :	24	h/d (hours/day)
t <sub>Zyklus</sub> :	3600	s/Zyklus
	± 1	/h (hour)

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

SIL CL:	3	IEC EN 62061
SIL	3	IEC EN 61508
HFT <sup>*)</sup> :	1	
DC <sub>avg</sub> :	98.2	%
SFF	99.4	%
PFH <sub>D</sub> :	4.18E-10	h <sup>-1</sup>

### Safety Related Data for light curtains ,safety gates or two-hand (BG 5912.86, BG 5912.95)

#### Values according to EN ISO 13849-1:

Category:	4	
PL:	e	
MTTF <sub>d</sub> :	30.5	a
DC <sub>avg</sub> :	99.0	%
d <sub>op</sub> :	220	d/a (days/year)
h <sub>op</sub> :	12	h/d (hours/day)
t <sub>Zyklus</sub> :	138	s/Zyklus

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

SIL CL:	3	IEC/EN 62061
SIL	3	IEC/EN 61508
HFT <sup>*)</sup> :	1	
DC <sub>avg</sub> :	99.0	%
SFF	99.6	%
PFH <sub>D</sub> :	7.94E-09	h <sup>-1</sup>

\*) 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.

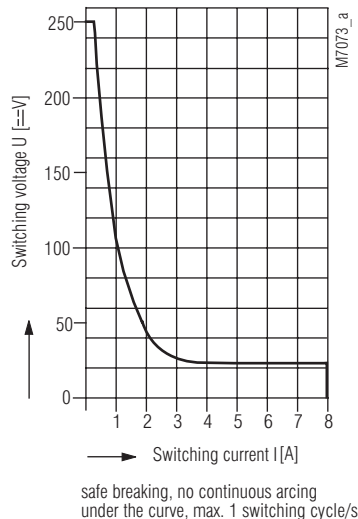
## Ordering Designation

BG 5912.04/00000 DC24V	4 NO contacts
BG 5912.48/00000 DC24V	3 NC contacts, 1 NC contact
BG 5912.86/00000 DC24V	3 NO contacts 0-3 s off delay
BG 5912.95/00000 DC24V	2 NO contacts, 1 NC contact 0-3 s off delay

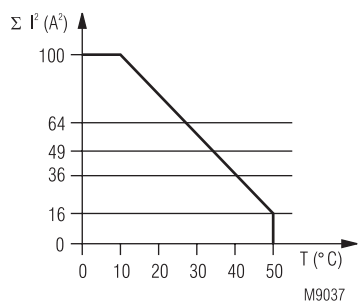


Note: The NC contacts must not be used as safety outputs!

## Characteristics



Limit curve for arc-free operation



Quadratic total current limit curve