Two-hand safety relay BG 5933, BH 5933
SAFEMASTER®

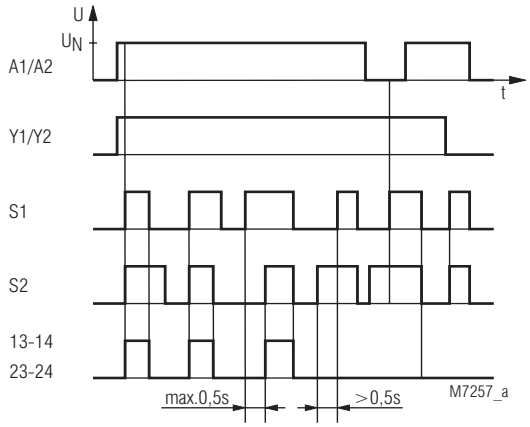
0230733

BG 5933

BH 5933

- According to
  - SIL Claimed Level (SIL CL) 3 to EN 62061
  - Performance Level (PL) e to DIN EN ISO 13849-1
  - Category 4 to EN 954-1
  - Safety Level Type III-C according to EN 574 (02-1997)
- Complies with the safety regulations for two-hand controls on power-operated presses in metalworking ZH 1-456
- Inputs for 2 push buttons with 1 NC and 1 NO contact
- Output: 2 NO contacts, 1 NC contact or 3 NO contacts, 1 NC contact
- Feedback circuit Y1 - Y2 to monitor external contactors used for reinforcement of contacts
- 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
- BG 5933: width 22.5 mm
  BH 5933: width 45 mm

Function diagram



1.) "S1, S2 activated" means, NC open and NO closed
2.) activated S1, switches "+"-potential
3.) activated S2, switches "-"-potential

Approvals and marking

cULus Canada / USA * | 1) TÜVRheinland Functional Safety Type Approved FS | CE

1) pending
* see variants

For the existing BG certificate DOLD has not demanded for an extension. There has not been made any changes on the product since then.

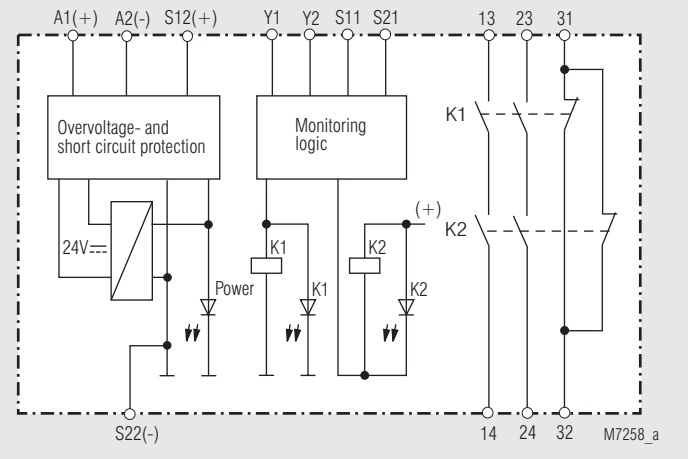
Applications

Designed for press controls in metalworking as well as in other working machines with dangerous closing movements.

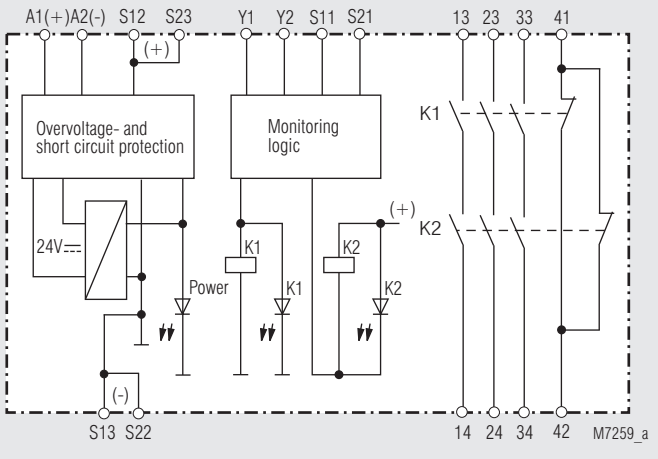
Indication

LED power-supply:	on, when operating voltage applied
LED K1:	on, when relay K1 active
LED K2:	on, when relay K2 active

Block diagram

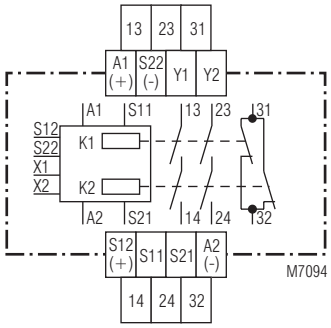


BG 5933

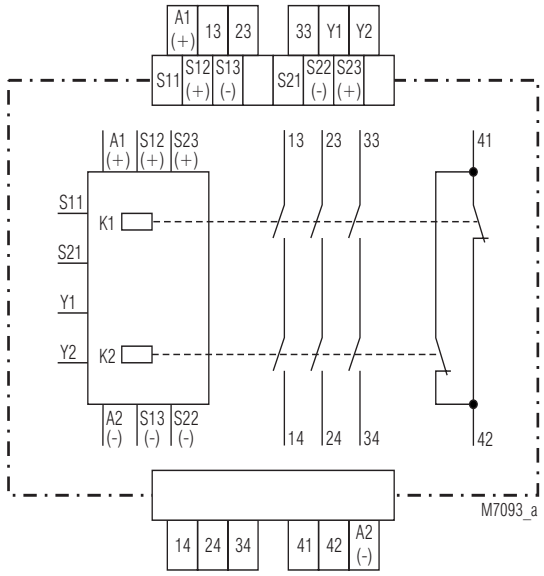


BH 5933

Circuit diagrams



BG 5933.22



BH 5933.48

Notes

If both buttons are pressed while switching on the operating voltage (e.g. after voltage failure) the output contacts do not energize.
The terminal S22 also serves as reference point for checking the control voltage.
On BG 5933 there is only one terminal S12 and S22.

Set-up instructions

The device has to be connected as shown in the application examples. When connecting the push-buttons in parallel or in series the safe function of the relay is disabled. Connected contactors (relays) must have positive guided contacts and have to be monitored in the feedback circuit.
To start a dangerous movement, 2 push buttons are used, each equipped with 1 NO and 1 NC contact. The output contacts will be switched if both push buttons are operated within ≤ 0.5 s. The buttons must be designed and installed in a way, that it is not possible to manipulate or to operate them without intention.
The distance between push buttons and dangerous area must be chosen in a way that it is not possible to reach the dangerous area after release of one button before the dangerous movement comes to standstill.

The safety distance "s" is calculated with the following formula:
s = v x t + C

a) moving speed of person v = 1 600 mm/s
b) stopping time of the machine t (s)
c) Additional safety distance C = 250 mm

If the risc of accessing the dangerous area is prohibited while the push buttons are pressed e.g. by covering the buttons, C can be 0. The minimum distance has to be in this case 100 mm. See also EN 574.

Technical data

Input

Nominal voltage U_N:	
BG 5933:	AC 24 V, DC 24 V
BH 5933:	AC 24, 48, 110, 120, 127, 230, 240 V DC 24 V
Voltage range:	AC 0.85 ... 1.1 U_N
at 10 % residual ripple:	DC 0.9 ... 1.1 U_N
Nominal consumption:	AC approx. 4 VA DC approx. 2.3 W
Nominal frequency:	50 / 60 Hz
Delay time for simultaneity demand:	max. 0.5 s
Recovery time:	1 s
Control contacts:	2 x (1 NO, 1 NC contacts)
Current via control contacts with DC 24 V:	
NO contact:	typ. 50 mA
NC contact:	typ. 20 mA
Fuse protection:	internal with PTC
Overvoltage protection:	by MOV

Output

Contacts:		
BG 5933.22:	2 NO, 1 NC contacts	
BH 5933.48:	3 NO, 1 NC contacts The NO contacts are safety contacts. **ATTENTION! The NC contacts 31-32 or 41-42 can only be used for monitoring.**	
Operate time:	typ. 40 ms	
Release time:	typ. 15 ms	
Contact type:	relay, positively driven	
Nominal output voltage:	AC 250 V DC: see continuous current limit curve	
Switching of low loads:	≥ 100 mV	
(contacts with 5 µ Au)	≥ 1 mA	
Thermal current I_{th}:	max. 5 A (see continuous current limit curve)	
Switching capacity		
to AC 15:	AC 3 A / 230 V for NO contacts	IEC/EN 60 947-5-1
	AC 2 A / 230 V for NC contacts	IEC/EN 60 947-5-1
to DC 13:	DC 2 A / 24 V for NC contacts	IEC/EN 60 947-5-1
NO contacts 2 contacts in series:	8 A / 24 V $> 10^5$ ON: 0.4 s, OFF: 9.6 s	
Electrical contact life		
to AC 15 at 2 A, AC 230 V:	10^5 switching cycles	IEC/EN 60 947-5-1
to DC 13 at 2 A, DC 24 V:	> 1.5 x 10^5 switching cycles	
Permissible switching capacity:	max. 1 800 switching cycles / h	
Short circuit strength		
max. fuse rating:	6 A gL	IEC/EN 60 947-5-1
Line circuit breaker:	C 8 A	
Mechanical life:	10 x 10^6 switching cycles	

General Data

Nominal operating mode:	continuous operation	
Temperature range:	- 15 ... + 55°C	
Clearance and creepage distances		
rated impuls voltage / pollution degree:	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
HF-wire guided:	10 V	IEC/EN 61 000-4-6
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:	Thermoplast with V0 behaviour according to UL subject 94	

Technical Data

Vibration resistance:	Amplitude 0.35 mm, frequency 10 ... 55 Hz IEC/EN 60 068-2-6
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
Wire fixing:	Terminal screws M3.5 Box terminals with self-lifting wire protection
Mounting:	DIN rail IEC/EN 60 715
Weight	
BG 5933:	200 g
BH 5933:	400 g

Dimensions

Width x height x depth	
BG 5933:	22.5 x 84 x 121 mm
BH 5933:	45.0 x 84 x 121 mm

Safety related data

Probability of dangerous Failure per Hour (PFHD):	4.44 x 10-8 1/h (BG 5933) 9.89 x 10-8 1/h (BH 5933) (bei 415 switching cycles / h)
Safe Failure Fraction (SFF):	99.7 %
Proof Test Intervall (T1):	5 Years (at 415 switching cycles / h)

Info The values stated above are valid for the standard type.
Safety data for other variants are available on request

Standard type

BG 5933.22 DC 24 V

Article number:	0049544
• Output:	2 NO contacts, 1 NC contact
• Nominal voltage U_N:	DC 24 V
• Width:	22.5 mm

BH 5933.48 AC 230 V

Article number:	0050071
• Output:	3 NO contacts, 1 NC contact
• Nominal voltage U_N:	AC 230 V
• Width:	45 mm

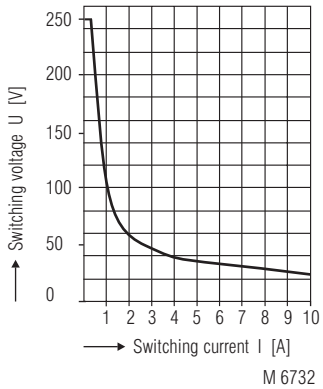
Ordering example

BG 5933 .22 DC 24 V
- DC 24 V — Nominal voltage
- .22 — Contacts
- BG 5933 — Type

Variants

BG 5933/61, BH 5933/61: with UL-approval

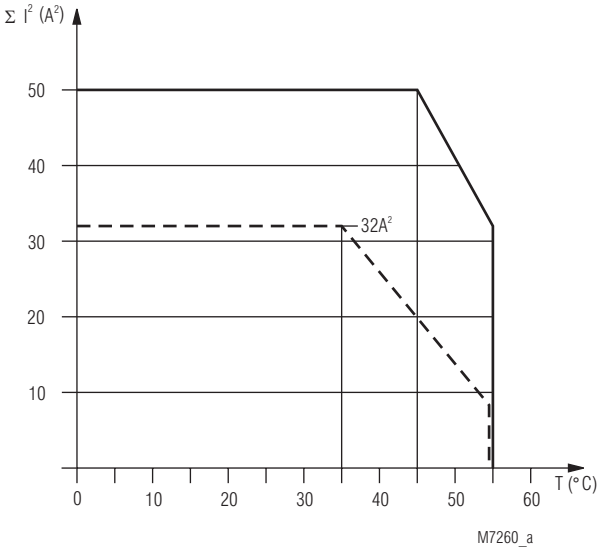
Characteristics



M 6732

Limit curve for arc-free operation with resistive load

Characteristics



M7260_a

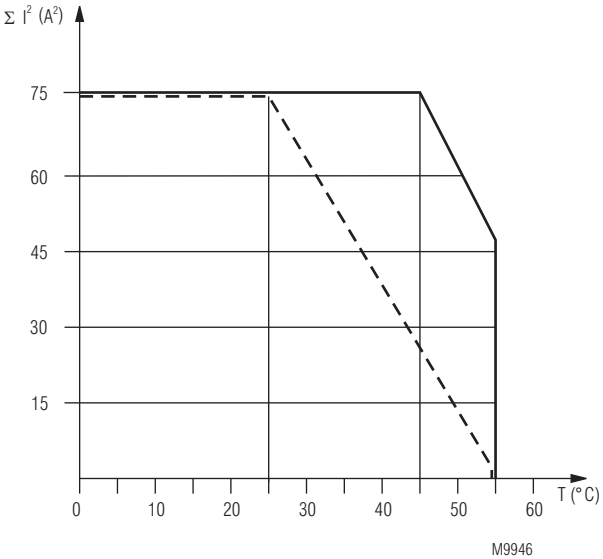
——— device mounted on distance with air circulation.
max. current at 55°C over
2 contactrows = 4A ≙ 2x4²A²=32A²

– – – device mounted without distance heated by devices with same load,
max current at 55°C over
2 contactrows = 2A ≙ 2x2²A²=8A²

$\Sigma I^2 = I_1^2 + I_2^2$

I_1, I_2 - current in contactrows

Continuous current limit curve BG 5933



M9946

——— device mounted on distance with air circulation.
max. current at 55°C over
3 contactrows = 4A ≙ 3x4²A²=48A²

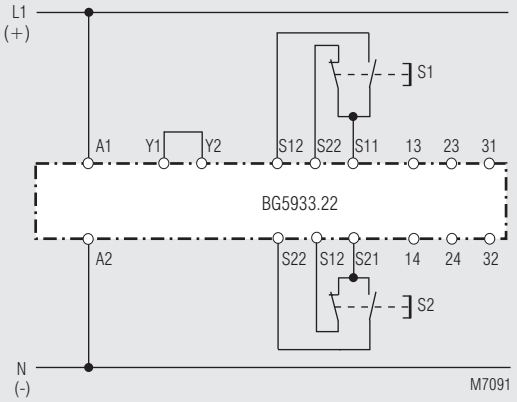
– – – device mounted without distance heated by devices with same load,
max current at 55°C over
3 contactrows = 1A ≙ 3x1²A²=3A²

$\Sigma I^2 = I_1^2 + I_2^2 + I_3^2$

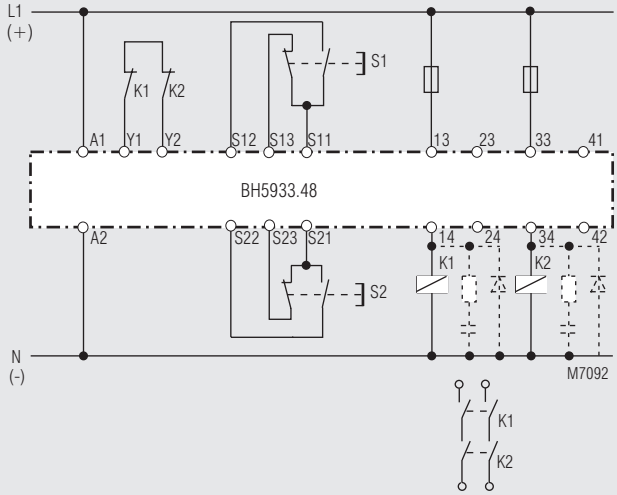
I_1, I_2, I_3 - current in contactrows

Continuous current limit curve BH 5933

Application examples



Two-hand control



Two-hand control with contact reinforcement via external positively-driven contactors. When switching inductive loads spark absorbers are recommended.