Safety technique

Two-hand safety relay BG 5933, BH 5933

Safety level Type III-C according to EN 574 (02-1997)
Safety category 4 according to EN 954-1
According to the EU directive for machines 98/37/EG
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

Approvals and marking

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

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

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

BG 5933

BH 5933
**Input**

- **Nominal voltage** $U_N$:
  - BG 5933: AC 24 V, DC 24 V
  - BH 5933: AC 24, 48, 110, 120, 127, 230, 240 V

- **Voltage range**: AC $0.85 \ldots 1.1 U_N$ at 10% residual ripple; DC $0.9 \ldots 1.1 U_N$

- **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

- **Operate time**: typ. 40 ms

- **Release time**: typ. 15 ms

- **Contact type**: relay, positively driven

- **Nominal output voltage**: AC 250 V

- **Switching of low loads**:
  - (contacts with 5 $\mu$Au)
    - AC: $\geq 100 \text{ mV}$
    - DC: $\geq 1 \text{ mA}$

- **Thermal current** $I_{th}$: see continuous current limit curve

- **Switching capacity**
  - to AC 15:
    - AC 3 A / 230 V IEC/EN 60 947-5-1
  - to DC 13:
    - DC 2 A / 24 V IEC/EN 60 947-5-1

- **NO contacts**
  - 2 contacts in series: 8 A / 24 V   > 105
  - ON: 0.4 s, OFF: 9.6 s

- **Electrical contact life**
  - to AC 15 at 2 A, AC 230 V: 105 switching cycles IEC/EN 60 947-5-1
  - to DC 13 at 2 A, DC 24 V: > 1,5 $\times 10^5$ switching cycles

- **Permissible switching capacity**
  - to AC 15: 3 A / 230 V IEC/EN 60 947-5-1
  - for NO contacts
  - 2 A / 230 V IEC/EN 60 947-5-1
  - for NC contacts

- **Switching capacity to DC 13**: 2 A / 24 V IEC/EN 60 947-5-1

- **Short circuit strength**
  - max. fuse rating: 6 A gL IEC/EN 60 947-5-1
  - Line circuit breaker: C 8 A

- **Interference suppression Limit class**: B EN 55 011

**Technical data**

- **Nominal operating mode**: continuous operation

**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 $\leq$ 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:

$$ s = v \times t + C $$

a) moving speed of person $v = 1 \text{ 600 mm/s}$

b) stopping time of the machine $t$ (s)

c) Additional safety distance $C = 250 \text{ mm}$

If the risk 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.

**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.

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**Circuit diagrams**

BG 5933.22

BH 5933.48

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**Technical data**

- **Nominal voltage** $U_N$:
  - BG 5933: AC 24 V, DC 24 V
  - BH 5933: AC 24, 48, 110, 120, 127, 230, 240 V
- **Voltage range**: AC $0.85 \ldots 1.1 U_N$ at 10% residual ripple; DC $0.9 \ldots 1.1 U_N$
- **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

- **Operate time**: typ. 40 ms
- **Release time**: typ. 15 ms
- **Contact type**: relay, positively driven
- **Nominal output voltage**: AC 250 V
- **Switching of low loads**:
  - (contacts with 5 $\mu$Au)
    - AC: $\geq 100 \text{ mV}$
    - DC: $\geq 1 \text{ mA}$
- **Thermal current** $I_{th}$: see continuous current limit curve
- **Switching capacity**
  - to AC 15:
    - AC 3 A / 230 V IEC/EN 60 947-5-1
    - for NO contacts
    - AC 2 A / 230 V IEC/EN 60 947-5-1
    - for NC contacts
  - to DC 13:
    - DC 2 A / 24 V IEC/EN 60 947-5-1
    - for NC contacts
- **NO contacts**
  - 2 contacts in series: 8 A / 24 V $> 10^5$
  - ON: 0.4 s, OFF: 9.6 s
  - 10$^6$ switching cycles IEC/EN 60 947-5-1
- **Electrical contact life**
  - to AC 15 at 2 A, AC 230 V: 105 switching cycles IEC/EN 60 947-5-1
  - > 1.5 $\times 10^5$ switching cycles
  - max. 1 800 switching cycles / h
- **Permissible switching capacity**
  - Short circuit strength
    - max. fuse rating: 6 A gL IEC/EN 60 947-5-1
    - C 8 A
  - Line circuit breaker: C 8 A
  - Mechanical life: 10 $\times 10^6$ switching cycles

**General data**

- **Nominal operating mode**: continuous operation
- **Temperature range**: - 15 ... + 55°C
- **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
  - 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
Technical data

Housing: Thermoplas with V0 behaviour according to UL subject 94

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

Climate resistance: EN 50 005

Terminal designation: IEC/EN 60 068-1

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

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

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
Nominal voltage
Contacts
Type

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

Application examples

Two-hand control

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