Safety technique

Emergency Stop Module BH 5928, BI 5928 with time delay safemaster

- According to EU directive for machines 98/37/EG
- According to IEC/EN 60 204, EN 954-1
- Safety category 4 according to EN 954-1
- Output: 3 NO or 2 NO, 1 NC instantaneous contacts and 3 NO release delayed contacts
- Single and 2-channel operation
- Line fault detection on On-button, when On-button is connected to S33-S34
- Manual restart with button on S33-S34 or automatic restart with bridge between S13-S14
- With or without cross fault monitoring in the E-stop loop
- LED indication for supply, channel 1/2 and release delayed contacts
- Removable terminal strips
- 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
- BI 5928.50 with 2 separate time adjustments for nominal voltage AC/DC 24 V
- Width
  - BH 5928: 45 mm
  - BI 5928: 67.5 mm

Function diagram

Protection of people and machines
- Emergency stop circuits on machines
- Monitoring of safety gates
- Stop category 1 can be realised

Applications
- Indication
  - upper LED: on, when supply connected
  - lower LEDs: on, when relay K1 and K2 resp. K1 t and K2 t energized

Notes

To select automatic restart terminals S13 - S14 must be bridged, S33 - S34 must be opened. Open terminals S13 - S14 select manual restart, the On-button must then be connected to S33 - S34.

Line fault detection on On-button:
- The line fault detection is only active when the time delayed relais K1, and K2 have released and then S12 (channel A) and S32 (channel B) are switched simultaneously. If the On-button is closed before S12, S31, S32 is connected to voltage (also when line fault across On-button), the output contacts will not close. The unit will not restart before the time delay is finished.
- A line fault across the On-button which occurred after activation of the relay will be detected with the next activation and the output contacts will not close. If a line fault occurs after the voltage has been connected to S12, S31, S32, the unit will be activated because this line fault is similar to the normal On-function.
- The unit can be operated with single channel and 2-channel operation with cross fault monitoring. For connection please refer to application examples.
Technical data

Input

Nominal voltage $U_{\text{N}}$:
- BH 5928, BI 5928.50: DC 24 V, AC/DC 24 V
- BI 5928:
  - AC 110 V, 230 V

Voltage range:
- AC 0,85 ... 1,1 $U_{\text{N}}$
- DC AC/DC at 10% residual ripple: 0,9 ... 1,1 $U_{\text{N}}$, 0,95 ... 1,1 $U_{\text{N}}$
- DC at 48% residual ripple: 0,8 ... 1,1 $U_{\text{N}}$, 0,8 ... 1,1 $U_{\text{N}}$

Nominal consumption:
- AC approx. 6,0 VA
- DC approx. 3,5 W

Nominal frequency:
- 50 / 60 Hz

Min. Off-time:
- 1 s

Control voltage on S11:
- DC 23 V at $U_{\text{N}}$

Control current over S12, S32:
- 40 mA at $U_{\text{N}}$ each

Min. voltage on S12, S32:
- DC 21 V when relay activated

Short-circuit protection:
- Internal PTC

Overvoltage protection:
- Internal VDR

Output

Contacts
- BH 5928.47, BI 5928.47: 3 NO, 1 NC contacts instantaneous and 1 NO contact release delayed
- BH 5928.91: 2 NO contacts instantaneous, and 2 NO contacts release delayed
- BH 5928.92, BI 5928.92: 2 NO, 1 NC contacts instantaneous and 3 NO contacts release delayed
- BH 5928.93, BI 5928.93: 3 NO contacts instantaneous and 3 NO contacts release delayed

Notes

The gold plated contacts of the BH 5928 mean that this module is also suitable for switching small loads of 1 mVA - 7 VA, 1 mW - 7 W in the range 0,1 - 60 V, 1 - 300 mA. The contacts also permit the maximum switching current. However since the gold plating will be burnt off at this current level, the device is no longer suitable for switching small loads after this.

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.

Y39 - Y40 must be closed to have timed outputs. By opening the bridge between Y39 and Y40 the time delay can be interrupted immediately. Without bridge the contacts switch without delay. The time setting has to be sealed by the user after test.
**Technical data**

BI 5928.50:
- 3 NO, 1 NO contacts instantaneous and 2 NO contacts release delayed with separate time adjustment.
- The not delayed NO contacts are safety contacts.
- **ATTENTION!** The NC contacts 31-32 or 41-42 can only be used for monitoring.

**Operate delay typ. at U_n:**
- Manual start: 40 ms
- Automatic start: 500 ms

**Release delay typ. at U_n:**
- Disconnecting the supply: 40 ms
- Disconnecting S12, S22, S31 and S32: 15 ms

**Time delay tv (release delayed):**
- Auxiliary supply must be connected for time delay.
- Time ranges:
  - 0,1 ... 1 s
  - 0,3 ... 3 s
  - 0,5 ... 5 s
  - 1,0 ... 10 s
- Other ranges or values on request
- Fixed values: 1 s, 3 s, 5 s, 10 s, 300 s ± 1 % of setting value

**Repeat accuracy:**
- Contact type: positive guided

**Nominal output voltage:**
- AC 250 V
- DC: see limit curve for arc-free operation

**Max switching current:**
- DC: see limit curve for arc-free operation

**Switching of low loads:**
- (Contact 5 µ Au)
- >100 mV
- ≥1 mA

**Thermal current I_Th:**
- in 1 contact path: max. 5 A

**Switching capacity to AC 15:**
- NO contact: AC 3 A / 230 V IEC/EN 60 947-5-1
- NC contact: AC 2 A / 230 V IEC/EN 60 947-5-1

**Switching to DC 13:**
- NO contact: AC 2 A IEC/EN 60 947-5-1
- NC contact: AC 2 A IEC/EN 60 947-5-1

**NO contacts to DC 13:**
- DC 8 A / 24 V ON: 0,4 s, OFF: 9,6 s

**Electrical life to AC 15 at 2 A, AC 230 V:**
- 10^9 switching cycles IEC/EN 60 947-5-1

**Permissible operating frequency:**
- max. 1200 switching cycles / h with manual restart and short release delay time

**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 10^9 switching cycles

**General data**

**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
- HF irradiation: 10 V / m IEC/EN 61 000-4-3
- Fast transients: 2 kV IEC/EN 60 110-4-4
- Surge voltages between wires for power supply: 1 kV IEC/EN 60 110-4-5
- between wire and ground: 2 kV IEC/EN 60 110-4-5
- HF-line-conducted: 10 V IEC/EN 60 110-4-6

**Interference suppression:**
- Limit value class B EN 55 011
- Housing: IP 40 IEC/EN 60 529
- Terminals: IP 20 IEC/EN 60 529

**Degree of protection:**
- Thermo plastic with V0 behaviour according to UL subject 94

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

**Technical data**

**Climate resistance:**
- EN 50 005
- 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 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:**
- Box terminal with wire protection, removable terminal strips

**Mounting:**
- DIN rail IEC/EN 60 715

**Weight:**
- 400 g

**Dimensions**

**Width x height x depth:**
- BH 5928: 45 x 84 x 121 mm
- BI 5928: 67,5 x 84 x 121 mm

**Standard type**

BH 5928.93 DC 24 V 0,5 ... 5 s
- Article number: 0050369
- Output: 3 NO contacts instantaneous and 3 NO contacts release delayed
- Nominal voltage U_n: DC 24 V
- Time delay tv: 0,5 ... 5 s
- Width: 45 mm

**Variants**

BH 5928.47/61: with UL approval
BH 5928.92/61: with UL approval
BH 5928.93/61: with UL approval
BH 5928._ _/001: with fix time delay
- fixed times: 1 s, 3 s, 5 s, 10 s, 300 s
- other times on request
BH 5928.91/002: with absolute time scale
- time ranges: 0,3 ... 3 s, 3 ... 30 s
- contact fusing 6 A fast, 4 A slow for DC 24 V

**Ordering example for variants:**

B_ 5928. _ _ / _ _ _ AC/DC 24 V 50/60 Hz 1 ... 10 s

0,1 ... 1 s
0,3 ... 3 s
0,5 ... 5 s
1 ... 10 s
30 ... 300 s

for fixed time end of scale value, other ranges on request
only for AC/DC at BH 5928:
- DC 24 V
at BI 5928:
- AC 230 V
- /000 standard, not stated in type number (for setttable time ranges)
- /001 fixed time
  - .47 = 3 NO contacts
  - 1 NC contact instantaneous and 1 NO contact release delayed
  - .91 = 2 NO contacts instantaneous and 2 NO contacts release delayed (only at BH 5928)
  - .92 = 2 NO contacts
  - 1 NC contact instantaneous and 3 NO contacts release delayed
  - .93 = 3 NO contacts instantaneous and 3 NO contacts release delayed

H: width 45 mm
I: width 67,5 mm
Application examples

Single channel emergency stop circuit. This circuit does not have any redundancy in the emergency-stop control circuit

2-channel emergency stop circuit without cross fault monitoring autostart and interruption of time by S1

2-channel emergency stop circuit with cross fault detection

Characteristics

Arc limit curve for resistive load

Quadratic total current limit curve

Switching voltage U [V]

Switching current I [A]

safe breaking, no continuous arcing under the curve, max. 1 switching cycle/s

Arc limit curve for resistive load

Switching current I [A]

Switching voltage U [V]

safe breaking, no continuous arcing under the curve, max. 1 switching cycle/s

Quadratic total current limit curve

Max. current at 55°C over 3 contact paths $= 0,5 \times 6 - 1,5 \times I_1$

Contact reinforcement by external contactors, 2-channel controlled. The output contacts can be reinforced by external contactors with positive guided contacts for switching currents $> 5$ A.

Functioning of the external contactors is monitored by looping the NC contacts into the closing circuit (terminals S13-S14 or S33-S34)
Contact reinforcement by external contactors controlled by one contact path. S33 - S34 must be opened.

2-channel safety gate monitoring