Safety technique

Emergency stop module BL 5931
safemaster

Function diagrams

Pushbutton on
Mains or emergency-stop (Off)
K1
K2
Output contacts connected in series

In the case of a line fault across the On-button the relays K1 and K2 will not be energised in the model BL 5931.64/002.

BL 5931.64/003

• According to EU directive for machines 98/37/EG
• According to IEC/EN 60204-1
• Safety category 4 for E-stop circuit according to EN 954-1
• Output: max. 7 NO, 1 NC contacts for AC 250 V
• 1- or 2-channel connection
• Line fault detection at the On pushbutton
• Optionally automatic on feature when operating voltage applied or activation via the On pushbutton
• Optionally cross fault detection in the emergency stop circuit
• Feedback circuit Y1, Y2 for monitoring external contactors
• Integrated short circuit and overvoltage protection
• LED indicators
• Optionally with phase failure bridging BL 5931.64/003
• Removable terminal blocks
• Width 90 mm

Approvals and marking

* 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

Protection of persons and machines
• Emergency stop circuits of machines
• Monitoring safety gates

Indication

LED power supply: on when operating voltage present
LED K1: on when current flows through relay K1
LED K2: on when current flows through relay K2

In addition to BL 5931.64/003
LED Input 1: on when current flows through channel 1
LED Input 2: on when current flows through channel 2
LED K3: on when current flows through relay K3

All technical data in this list relate to the state at the moment of edition. We reserve the right for technical improvements and changes at any time.

BL 5931/12.12.05 e
Notes

Line fault detection at the ON pushbutton:
If the ON pushbutton was already closed before the voltage was applied at S12, Y3 (also in the case of line fault via the ON pushbutton), the output contact 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 Y3, unwanted activation occurs because this line fault cannot be distinguished from the regular switching-on function.

BL 5931.60 and BL 5931.63:
On these models the line fault detection across the ON-button is activated by switch S1. The switch is located under the removable front plate. The default setting of S1 is “AUS” (Off).

The setting of switch S1 and the corresponding start function is described in the table below. See also picture 1 to 7.
The line fault detection on the ON-button is only active if both channels of a 2 channel e-stop loop are operated at the same time and a min ON-time of 5 sec is provided.

BL 5931.64/003:
On these models the line fault detection across the ON-button is activated by linking terminals S37-Y2. The default setting is with link on S37-Y2.
The setting of link S37-Y2 and the corresponding start function is described in the table below. See also picture 7 to 9.

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.

General:
The connection terminal PE is used for operating the unit even in IT systems with insulation monitoring, and also as a reference point for testing the control voltage. With DC units, connecting the protective conductor to connection terminal PE jumps out internal short-circuit protection.
The terminal blocks are provided with markings as identification aids for placing. Not for BL 5931.64/003.

Technical data

Input
Nominal voltage $U_{N1}$: DC 24 V
Voltage range:
- at 10% residual ripple: AC 0.85 ... 1.1 $U_{N}$
- at 48% residual ripple: DC 0.90 ... 1.2 $U_{N}$
Nominal frequency: 50 / 60 Hz
Phase failure bridging BL 5931.64/003: approx. 150 ms
Control voltage at S11:
- at S11: typ. DC 24 V
- at S21: 0 V
Minimum voltage at terminals S12, Y3: DC 21 V when unit activated
Current in S12, Y3: typ. 55 mA
Recovery time: 1 s

Output
Contacts
BL 5931.60:
- 5 NO, 1 NC contacts (on request)
BL 5931.63:
- 7 NO, 1 NC contacts
BL 5931.64:
- 6 NO, 4 NC contacts not redundant (redundancy can be achieved by external wiring).
The NO contacts are safety contacts.
ATTENTION! The NC contacts 61-62 up to 01-02 can only be used for monitoring.
Contact type: Relay, positively driven
Output voltage: AC: 250 V
DC: see limit curve for arc-free operation see Continous current limit curve (max. 5 A in one contact path)

Thermal current $I_{th}$:
- to AC 15:
  - NO contact: 5 A / AC 230 V
  - NC contact: 2 A / AC 230 V
Electrical life to AC 15 at 2 A, AC 230 V: 600 switching cycles
Permissible switching frequency:
- Short circuit strength:
  - max. fuse rating: 6 A gL
  - max. line circuit breaker: C 10 A
- Mechanical life:
  - 30 x 10^6 switching cycles

Operating mode:
Continuous operation
Temperature range:
- -15 ... +55°C at max. 90% air humidity

Clearance and creepage distances
- overvoltage category / contamination level:
  - EMC
    - Fast transients: 4 kV / 2
    - Surge voltages between wires: 8 kV (air)
    - Interference suppression:
      - between wire and ground: 2 kV
      - Limit value class B
Degree of protection:
- Housing: IP 40
- Terminals: IP 20
- Housing:
  - Thermoplastic with V0 behaviour according to UL subject 94
Vibration resistance:
- Amplitude 0.35 mm
Climate resistance:
- Temperature designation: 15 / 055 / 04
  - IEC/EN 60 608-1 EN 50 005
- Frequency 10 ... 55 Hz
**Application example**

Picture 1: Single-channel emergency stop circuit, activated with On-button.

For automatic restart at the BL 5931.64/003 terminals S12-S34 and at the BL 5931.60 and BL 5931.63 terminals S33-S34 have to be linked, the push button is left away.
Picture 2: Two-channel emergency stop circuit without cross fault detection, activated with On-button. For automatic restart at the BL 5931.64/003 terminals S12-S34 and at the BL 5931.60 and BL 5931.63 terminals S33-S34 have to be linked, the push button is left away.

Picture 3: Two-channel emergency stop circuit with cross fault detection. For automatic restart at the BL5931.64/003 terminals S12-S34 and at the BL 5931.60 and BL 5931.63 terminals S33-S34 have to be linked. No On-button.

Picture 4: Contact reinforcement with external contactors, 2-channel connection, without cross fault detection. For current > 5 A the output contacts can be reinforced by external contactors with positive guided contacts. The function of the contactors is monitored by connecting the NC-contacts to the feedback circuit (terminals Y1-Y2).

Picture 5: Contact reinforcement with external contactors with reduced redundancy. BL 5931._ _ / _ _ _ for all variants.
**Application examples**

**Picture 6:** Two-channel monitoring of a safety gate. With manual restart S1 and S2 can be switched without observing a certain sequence. Activated with On-button. For automatic restart at the BL 5931.64/003 the terminals S12-S34 and at the BL 5931.60 and BL 5931.63 terminals S33-S34 have to be linked, the push button is left away.

**Picture 7:** Two-channel emergency stop circuit with cross fault detection and automatic restart

**Picture 8:** Two-channel emergency stop circuit with cross fault detection, activated with On-button without line fault detection on On-button. With link on S37-Y2 line fault detection is activated.

**Picture 9:** Monitoring of a safety gate by limit switches with 1 NO and 1NC contact and automatic restart

BL 5931._ _ /_ _ _ for all variants

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