

- ▶ Base device with settable delay time for Emergency Stop and Safety Gate applications
- ▶ Two-channel activation with Cross Monitoring and Synchronous Time Check
- ▶ Automatic or Manual Star
- ▶ 2 non-delayed enabling current paths (stop category 0)
- ▶ 1 delayed enabling current path (stop category 1)
- ▶ For applications up to safety category 3/4
- ▶ Width 22.5mm
- ▶ Industrial design



Technical data

1. Functions

Single- and two-channel safety switching device with self-monitoring on each ON-OFF cycle. Monitoring of safety actuators for generating a safety-oriented output signal (enable) via forced output relay contacts. 2 non-delayed and 1 off-delayed enabling current path for stop category 1 applications.

2. Indicators

Green LED U ON: indication of supply voltage
 Green LED K1 ON/OFF: safety channel 1,2 enabled
 Green LED K2 ON/OFF: safety channel 3,4 enabled

3. Mechanical design

Self-extinguishing plastic housing, IP rating IP40
 Mounted on DIN-Rail TS 35 according to EN 50022
 Mounting position: any
 Shockproof terminal connection according to VBG 4, IP rating IP20
 Tightening torque: 0.5 to 0.6Nm
 Terminal capacity:
 2 x 0.14 to 0.75mm² without multicore cable end
 1 x 0.14 to 2.5mm² without multicore cable end
 2 x 0.25 to 0.5mm² flexible with multicore cable ends
 1 x 0.25 to 2.5mm² flexible with multicore cable ends

4. Input circuit

Supply voltage: 24V DC terminals A1-A2
 Tolerance: 24V DC -15% to +10%
 Rated frequency: 50 to 60Hz
 Rated consumption: 24V DC 2.6W
 Duration of operation: 100%
 Residual ripple bei DC: 2.4Vss

5. Output circuit

2 forced non-delayed normally open contacts (enabling current paths),
 1 forced delayed normally closed contact (signaling current path)
 2 positively driven undelayed normally open contacts (enabling current path),
 1 positively driven delayed normally open contact (enabling current path)
 Rated voltage: 230V AC/DC
 Rated current of enabling paths: max. 6A
 Fusing: gG 6A (MCB 6 B or C)
 Total current of all paths: max. 12A
 Mechanical life: 10 x 10⁶ operations
 Switching capacity (according to IEC 947-5-1):
 max. 6/min (AC-15: 4A/230V AC)
 max. 60/min (AC-15: 3A/230V AC)
 max. 6/min (DC-13: 4A/24V DC)
 max. 60/min (DC-13: 2.5A/24V DC)
 Insulation voltage: 300V AC (according to IEC 664-1)
 Surge voltage: 4kV, overvoltage category III (according to IEC 664-1)

Reset time K1,K2 (t_{R1}): max. 25ms
 Reset time K3,K4 (t_{R2}): 0.15s to 3s (±16%) adjustable

6. Safety circuit

Function: Connection of safety switching-devices (e.g. E-stop)
 22V DC
 Rated current: 25mA
 Peak current: 100mA
 Short circuit protection: PTC-resistor
 Response time: 2s
 Reset time: 3s
 Short circuit current: 2200mA
 Safety channel 1 (CH1): terminals S11-S12
 Safety channel 2 (CH2): terminals S21-S22
 cross monitoring: terminals S21-S22 (bridge S33-S31)
 without cross monitoring: terminals S33-S31 (bridge S21-S22)
 Synchronous time (CH1 before CH2): 100ms to 500ms
 Synchronous time (CH2 before CH1): ∞
 Input debouncing: No
 Galvanic separation to power supply: No

7. Reset circuit

Function:
 manual monitored reset: potential free normally open contact, terminals S33-S34
 automatic start: bridge at terminals S33-S35
 Rated voltage: 22V DC
 Rated current: 40mA
 Peak current: 50mA
 Short circuit protection: PTC-resistor
 Response time (K1,K2)
 manual monitored start (t_{A1}): max. 30ms
 automatic start (t_{A2}): max. 700ms
 Pulse length t_M:
 manual monitored reset: min. 200ms
 max. 3s (terminals S33-S34)
 automatic start: min. 200ms (terminals S33-S35)
 Galvanic separation to power supply: No

8. Ambient conditions

Ambient temperature: -25 to +55°C (according to IEC 68-1)
 Storage temperature: -25 to +75°C
 Transport temperature: -25 to +75°C
 Relative Humidity: max. 83% (bei 23°C), max. 93% (bei 40°C) nach DIN 50016
 Pollution degree: 3 outside, 2 inside (according to IEC 664-1)

Functions

Base functions:

Single-channel activation

Both safety channels are activated by only one contact of the safety actuator. (e.g. single-channel E-Stop switch)

Two-channel activation

Each safety channel of the safety relay is activated by an own contact of the safety actuator. (e.g. two-channel E-Stop switch)

Cross Monitoring:

The Cross Monitoring function detects short circuits between the two safety channels. To activate Cross Monitoring, safety channel 1 is connected to positive voltage (terminals S11-S12) and channel 2 is wired to mass (terminals S21-S22). To disable Cross Monitoring both channels are connected to positive voltage (terminals S11-S12/S31).

Synchronous Time Check

Synchronous Time Check is only possible in Automatic Start mode. If the contact at safety channel 1 is closed, contact at safety channel 2 has to be activated within the synchronous time t_s to activate the enabling current paths (LEDS K1 and K2 illuminated). If channel 2 is activated after the synchronous time has elapsed, the enabling current paths are not closed. In this case both channels have to be deactivated first before a new activation cycle can be started. If safety channel 2 is closed before safety channel 1 synchronous time is set to ∞ to disable this monitoring function.

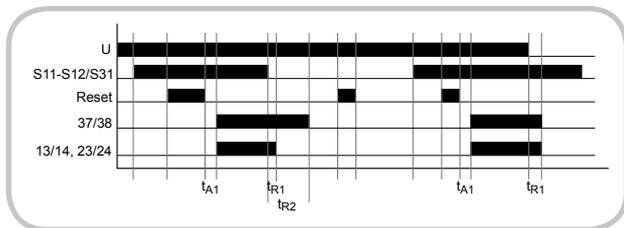
Single channel E-stop with Manual Start and Reset Monitoring

When the supply voltage is applied to terminals A1 and A2 (LED U illuminated) and the E-stop switch is not actuated (terminals S11-S12/S31 closed), the Starting Lockout is effective. If the reset button at terminals S33-S34 is closed and opened again (Manual Start with Reset Monitoring) the output relays pick up within the response time t_{A1} (LEDs K1, K2 and K3, K4 illuminated) The enabling current paths (terminals 13-14, 23-24, 37-38) are closed.

If the E-stop switch is actuated, the output relays K1 and K2 release within the release time t_{R1} , the relays K3 and K4 release within the adjusted release time t_{R2} .

If the supply voltage fails, all output relays release within the release time t_{R2} .

A reset of the safety relay can only be provided, if the e-stop switch has been unlocked again.



Connections

Starting Lockout

If the supply voltage is connected to terminals A1 and A2 and the safety contacts are closed, the output relays do not pick up until the reset button is actuated.

Restarting Lockout

If the safety contacts are opened and closed again, the output relays do not pick up until the reset button is actuated.

Automatic Start

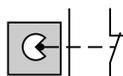
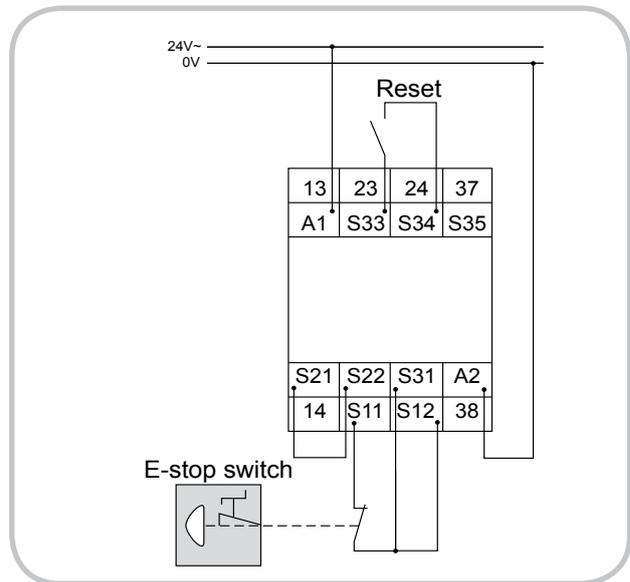
If safety channels are closed correctly, the bridge at terminals S33-S35 provides an automatic start of the safety relay and the enabling current paths are closed. This function disables Starting and Restarting Lockout.

Manual Start without Reset Monitoring

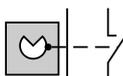
After closing the safety channels the output relays can be activated by closing the reset button at terminals S33-S35. Broken reset buttons are not monitored. This might cause an uncontrolled automatic start, if reset button fails

Manual Start with Reset Monitoring

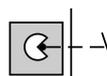
After closing the safety channels the output relays can be activated by pushing and releasing the reset button at terminals S33-S34. This ensures the correct operation of the connected reset button.



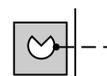
not actuated normally closed contact



actuated normally closed contact



not actuated normally open contact



actuated normally open contact

Functions

Two-channel E-stop with Cross Monitoring and Manual Start with Reset Monitoring.

With the supply voltage connected to terminals A1-A2 (green LED U illuminated) and not actuated E-stop switch (terminals S21-S22 and S11/S12 closed) the output relays pick up within the response time t_{A1} (green LED K1,K2 and K3,K4 illuminated), as soon as the reset button at terminals S33-S34 is closed and opened again (Manual Start with Reset Monitoring).

If the E-stop switch is actuated (terminals S11-S12 and S21-S22 opened), the output relays K1 and K2 release within the release time t_{R1} (enabling current paths 13-14 and 23-24 open), the output relays K3 and K4 release within the adjusted release time t_{R2} (enabling current paths 37-38 open).

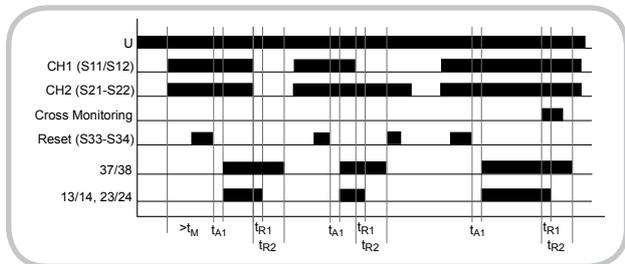
If the supply voltage fails, all output relays release within the release time t_{R1} .

A restart of the safety relay can only be provided, after the E-stop switch has been unlocked again.

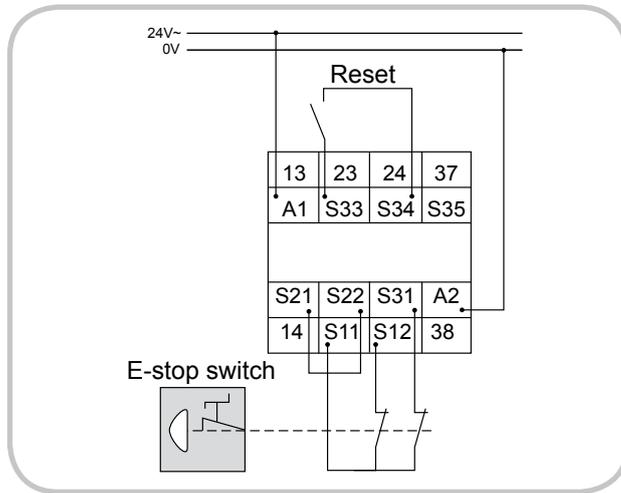
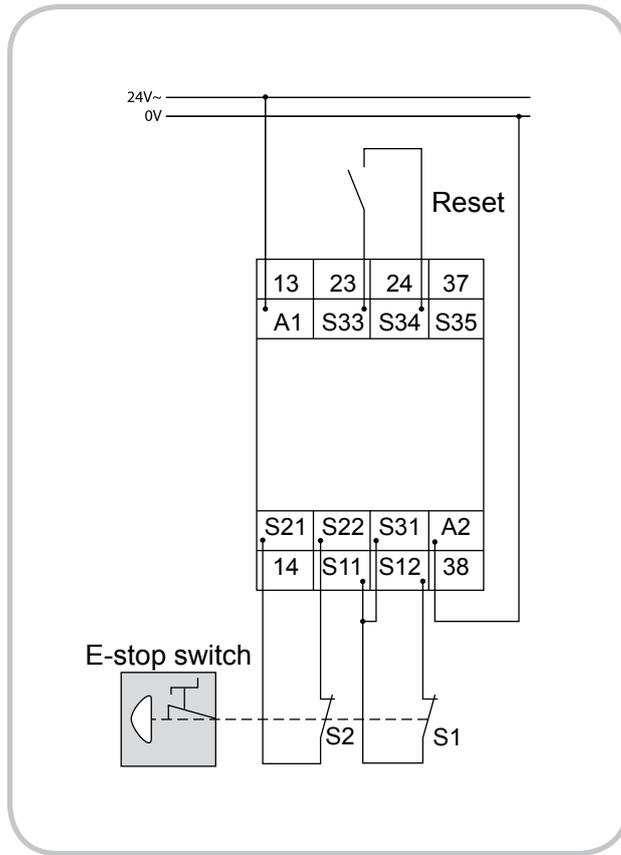
If in case of a fault only one of the two safety channels is opened, the output relays release within the release times and get locked until both safety channels have been opened and closed again.

If a short circuit to ground or an interwire short circuit occurs, the cross monitoring function deactivates the output relays within the release time.

A restart of the safety relay can only be provided, if the short circuit has been removed.



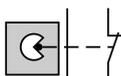
Connections



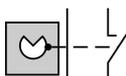
Two-channel E-stop without Cross Monitoring with manual monitored start

The function is equal to two-channel E-stop with cross monitoring, but interwire short circuits between the safety channels are not monitored.

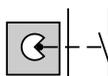
Subject to alterations and errors



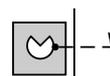
not actuated normally closed contact



actuated normally closed contact



not actuated normally open contact



actuated normally open contact

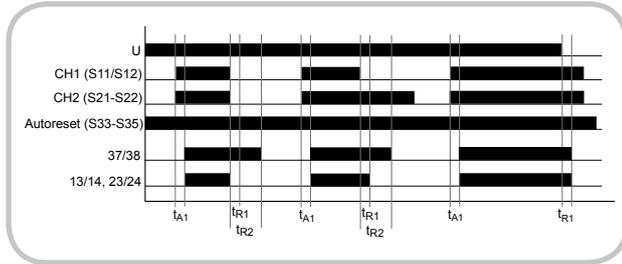
Functions

Two-channel Safety Gate Monitoring with Cross Monitoring and Automatic Start

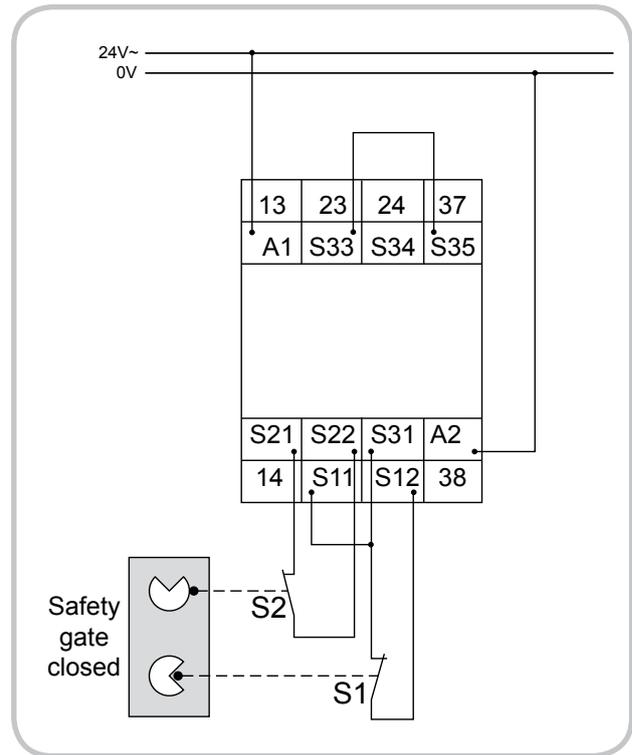
If the supply voltage applies at terminals A1-A2 (LED U illuminated), the bridge at terminals S33-S35 provides an automatic start of the safety relay as soon as contacts S1 (terminals S11-S12) and S2 (terminals S21-S22) are closed.

If the contacts are positioned in a way, that S1 gets closed before S2, synchronism of the activation is monitored. In this case the output relays (K1 to K4) only pick up, if contacts S1 and S2 get activated within the synchronous time. If S2 is closed before S1 synchronism is not monitored.

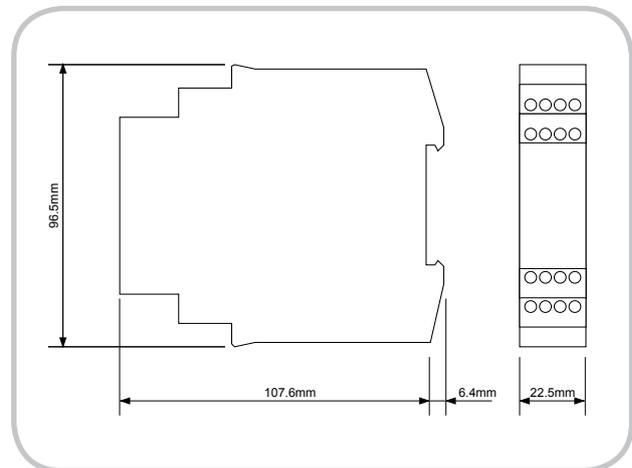
If a short circuit to ground or an interwire short circuit is monitored, the Cross Monitoring function deenergizes the output relays and the enabling current paths are opened within the release time t_{R1} . A reset of the safety relay can only be executed, if the short circuit has been removed.



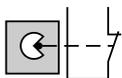
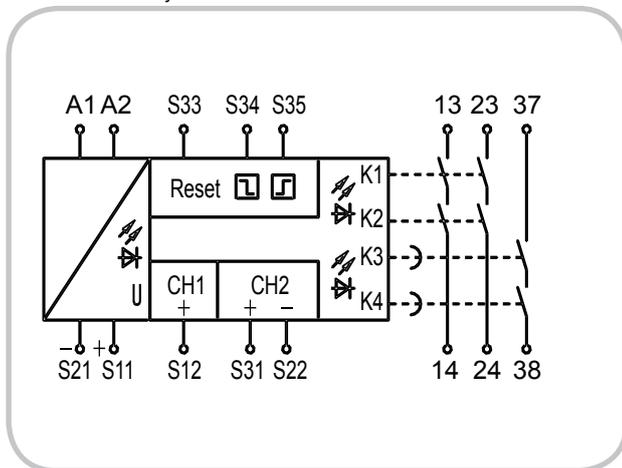
Connections



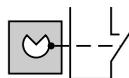
Dimensions



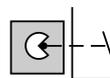
Internal circuitry



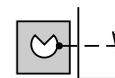
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actuated normally open contact

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