



Basic device according to EN 60204-1:2007 and EN ISO 13849-1:2007 for single- or two-channel EMERGENCY STOP monitoring

Basic unit also for elevators EN 81-1/2 and heaters EN 50156-1

PL e / category 4 according to EN ISO 13849-1:2007

SIL<sub>CL</sub> 3 according to DIN EN 62061:2005

Manual and automatic start

Stop category 0 according to EN 60204-1

Single- and two-channel control

Crossover detection

3 enabling current paths, 1 signaling current path



## Technical data

### 1. Applications

Emergency stop monitoring, Safety door monitoring  
Safety mat monitoring according to EN 1760-1  
Elevator systems monitoring according to EN 81-1  
Combustion plant monitoring according to EN 50156-1

### 2. Functions

The device is a two-channel safety switching device for EMERGENCY STOP equipment according to EN 60204-1. It performs self-monitoring during each ON-OFF cycle and is equipped with positively driven relays. The device is suitable for connection in series with short-circuiting pressure sensitive mats, pressure sensitive bumpers or switching edges with 4-wire technology (without a monitoring resistor).

### 3. Mechanical design

Degree of protection according to EN 60529, IP40/IP20 - case/terminals  
Mounted on DIN rail TS 35 according to EN 60715  
Tightening torque: 0.5 to 0.6Nm  
Stripping length: max. 7mm  
AWG conductor size: 26-14 (only use Cu wires)  
Terminal capacity:  
1 x 0.14 to 2.5mm<sup>2</sup> rigid or flexible  
2 x 0.14 to 0.75mm<sup>2</sup> rigid or flexible  
1 x 0.25 to 2.5mm<sup>2</sup> flexible with wire end ferrule (DIN 46228)  
2 x 0.25 to 1.5mm<sup>2</sup> flexible with wire end ferrule (DIN 46228)

### 4. Indicators

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

### 5. Input circuit

Rated voltage U<sub>N</sub>: 24V DC  
terminals A1-A2  
Tolerance: -15% to +10%  
Rated frequency: 50 to 60Hz  
Rated consumption: 1,6W  
Availability time: max. 3,5s

### 6. Control circuit

Nominal output voltage: 22,5V DC  
Input voltage: 19,2 to 26,4V DC  
Input current (typ. / max.):  
S12 / S22: 25mA / 100mA  
S14 / S34: 3mA / 5mA  
Response time:  
t<sub>A1</sub> (manual start): 250ms  
t<sub>A2</sub> (automatic start): 250ms  
Minimum activation time t<sub>M</sub>:  
manual start (min. / max.): 125ms / 5s  
Recovery time t<sub>W</sub>: 120ms  
Release time t<sub>R</sub> (typ. / max.): 12 / 35ms  
Synchronous time monitoring t<sub>S</sub>: 1,5s  
Test pulse S11 (length / interval): 4ms / 200ms  
Test pulse S12, S22 (length / interval @ installation 3):  
< 0,8ms / > 5,5ms

Test pulse ratio S12, S22 (length / interval @ installation 3):  
< 7%

Test pulse length t<sub>TR</sub> of the incoming test pulse:  
< 16ms

Delay time t<sub>D</sub> (time between test pulse and incoming test pulse):  
< 48ms

Max. line resistance per channel <sup>2)</sup>:  
≤ 12Ω

### 7. Output circuit

Enabling current paths: terminals 13/14, 23/24, 33/34  
Contact: normally open, positively driven  
Contact material: AG alloy, gold plated  
Rated voltage U<sub>N</sub>: 230V AC  
max. thermal continuous current I<sub>TH</sub>: 6A  
max. total current I<sub>N</sub><sup>2</sup>:  
55°C: 25A<sup>2</sup> (UL 508: 9A<sup>2</sup>)  
65°C: 9A<sup>2</sup>  
Utilisation category according to EN 60947-5-1:  
AC-15: 230V AC / 5A  
DC-13: 24V DC / 5A  
Short circuit protection: 6A class gG fuse,  
fuse internal < 100A<sup>2</sup>s  
Signalling current paths: terminals 41 / 42  
Contact: normally closed, positively driven  
Contact material: AG alloy, gold plated  
Rated voltage U<sub>N</sub>: 230V AC  
max. thermal continuous current I<sub>TH</sub>: 2A  
max. total current I<sub>N</sub><sup>2</sup>:  
55°C: 25A<sup>2</sup> (UL 508: 9A<sup>2</sup>)  
65°C: 9A<sup>2</sup>  
Conditional short circuit current: 1000A  
Mechanical life: 10 x 10<sup>6</sup> operations

### 8. General data

Air gap and creepage paths between the circuits according to EN 60664-1  
Output circuit 1: 13/14, 23/24  
Output circuit 2: 33/34, 41/42  
Power circuit: A1/A2  
Control circuit: S11, S12, S21, S22, S14 und S34  
Safety separation:  
Rated insulation voltage 300V / Over voltage category III (6kV)  
Output circuits 1 - Output circuits 2  
Output circuits 1 and 2 - Power circuit  
Output circuits 1 and 2 - Control circuits  
Basic insulation:  
Rated insulation voltage 300V / Over voltage category III (4kV)  
Output circuits 1, Output circuits 2  
Power circuit - Control circuits  
Ambient operating temperature: -25 to +65°C  
-25 to +55°C according to UL 508  
-25 to +75°C  
Storage temperature: -25 to +75°C  
Weight: 200g  
Standards: EN ISO 13849-1, EN 62061,  
EN 81-1, EN 50156-1  
Approvals: TÜV  
<sup>2)</sup> If only one of the channels on a 2-channel device is used, the value is halved.

## 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, the safety channels are connected to positive voltage (terminals S11 - S12, S21 - S22 or S11 - S22, S21 - S12). To disable Cross Monitoring both channels are connected to terminal S21 (terminals S12/S22 - S21).

### 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. 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  $\infty$  to disable this monitoring function.

### 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 S11-S34 provides an automatic start of the safety relay and the enabling current paths are closed. This function disables Starting and Restarting Lockout.

### Manual Start with Reset Monitoring

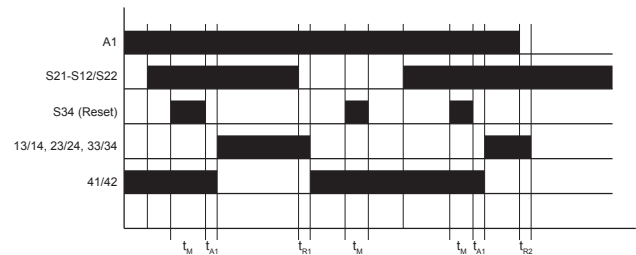
After closing the safety channels the output relays can be activated by pushing and releasing the reset button at terminals S21-S34. This ensures the correct operation of the connected reset button.

## Possible applications

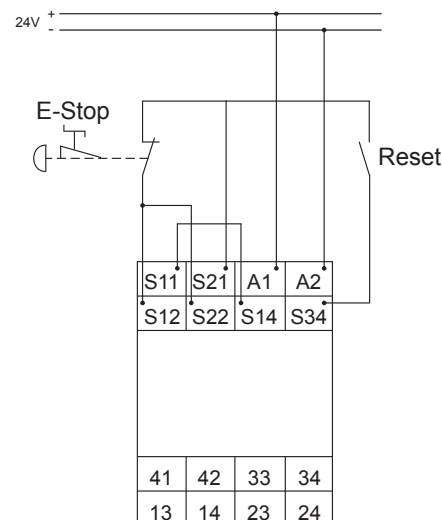
### Single channel E-stop with Manual Start and Reset Monitoring

When the supply voltage is applied to terminals A1 and A2 (LED U illuminated) and the E-stop switch is not actuated (terminals S21-S12/S22 closed), the Starting Lockout is effective. If the reset button at terminals S21-S34 is closed and opened again (Manual Start with Reset Monitoring) the output relays pick up within the response time  $t_{A1}$  (LED K1, K2 illuminated). If the E-stop switch is actuated, the output relays release within the release time  $t_{R1}$ . If the supply voltage fails, the 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.

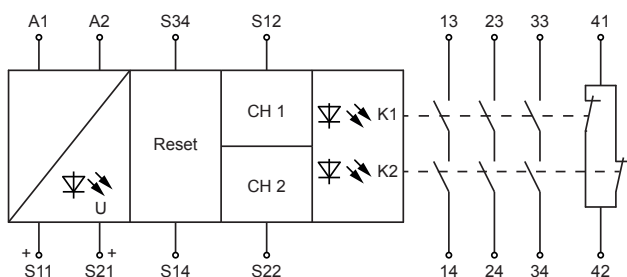
Function diagram:



Connections:

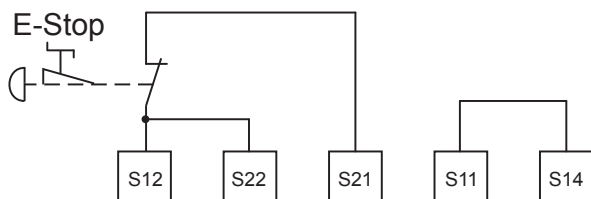


## Internal scheme logic

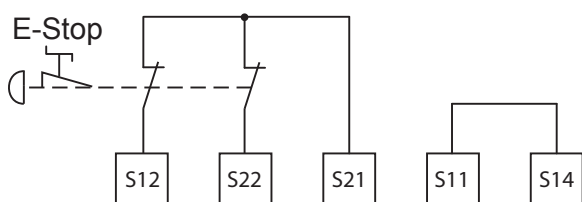


## Installation

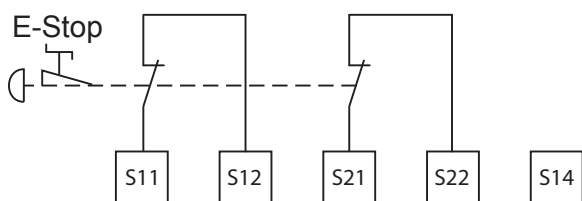
1 - Emergency Stop button, single-channel



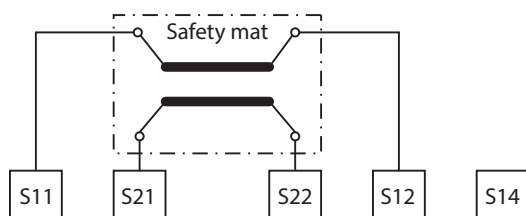
2 - Emergency Stop button, two-channel without crossover detection



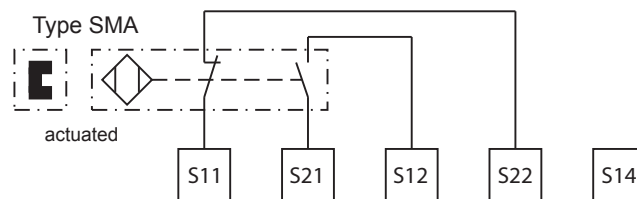
3 - Emergency Stop button, two-channel with crossover detection



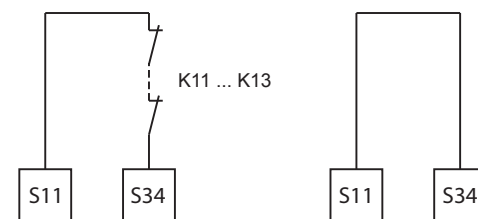
4 - Pressure sensitive mat, two-channel with crossover detection



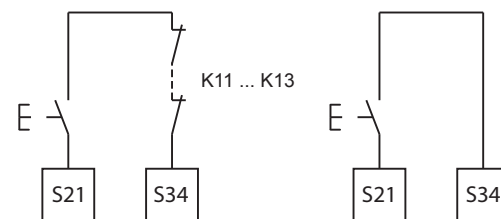
5 - Solenoid switch, two-channel, non-equivalent, with crossover detection



6 - Reset, automatic, with and without feedback circuit

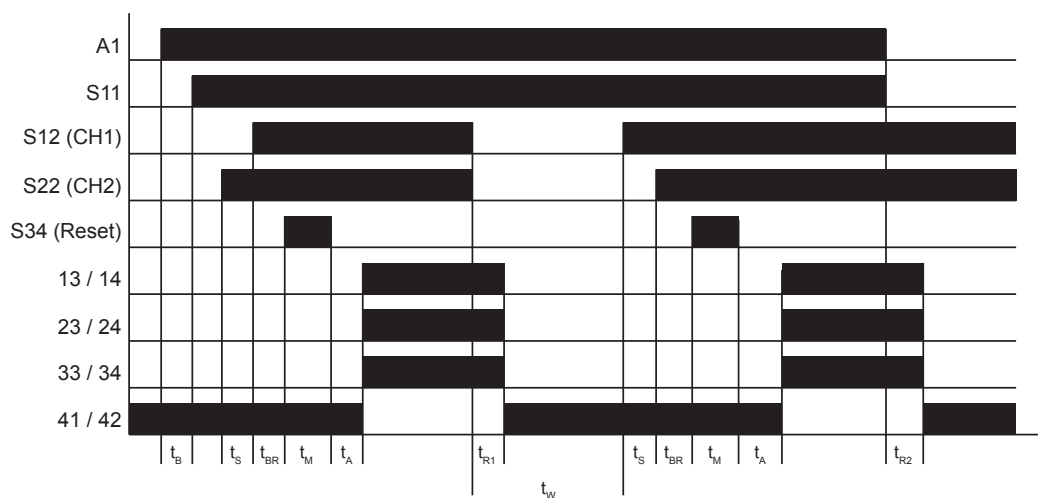


7 - Reset, manual, monitored, with and without feedback circuit

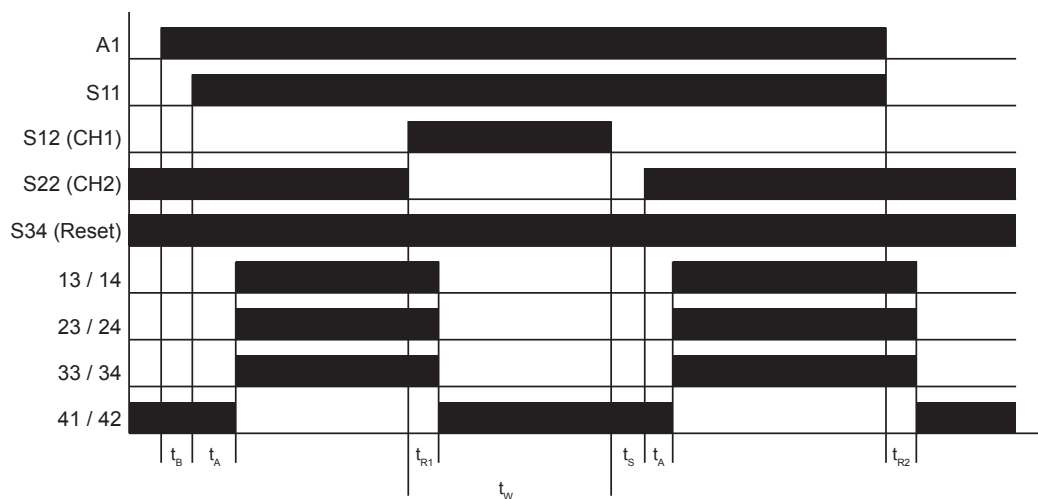


## Function diagrams

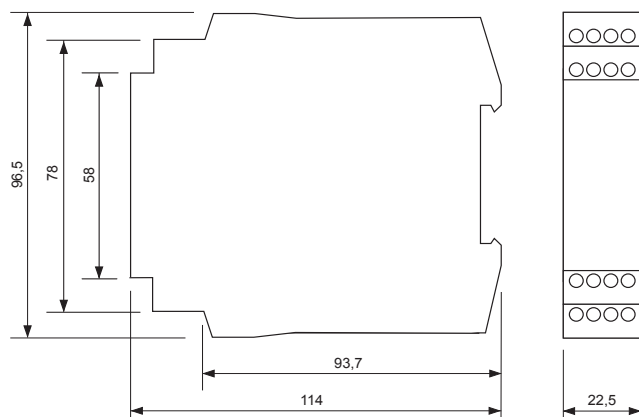
Equivalent actuation with manual start (installation 1, 2, 3, 4, 7)



Non-equivalent actuation with automatic start (installation 5, 6)



## Dimensions



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Subject to alterations and errors