

Safety Relay for Elevators SR3E

Operating Instructions

English translation

Errors and technical changes reserved

Correct Use



SR3E is an all-purpose emergency stop device with three safe relay contacts for safe monitoring of one or two channel sensors.

The SR3E is specially designed for the use as safety component in elevators according to EN 81-20 and EN 81-50, certified by TÜV Rheinland.

Further applications for the SR3E include single or dual-channel emergency stop circuits and guard monitoring on machines and plants according to EN ISO 13849-1, EN IEC 62061 and EN 61508.

- 3 non-delayed safety contacts
1 non-delayed auxiliary contact
- Connection of:
 - Emergency stop buttons
 - Mechanical Safety switches
 - Non-contact safety switches
 - Safety components with OSSD-Outputs
- Control: single or dual channel
- Feedback loop for external contactors or extension modules
- Cyclical monitoring of the output contacts
- LED indicator for power and status



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- Automatic or manual start
- Short-circuit monitoring and ground fault monitoring
- Up to PL e, SIL 3, category 4
(EN ISO 13849-1 / EN IEC 62061 / EN 61508)

Function

The safety relay SR3E is designed for isolation of safety circuits according to EN 60204-1, stop-category 0 and can be used in safety-related applications up to safety category 4, PL e (EN ISO 13849-1) SIL 3 (EN IEC 62061 / EN 61508) and as a safety component in elevators according to EN 81-20.

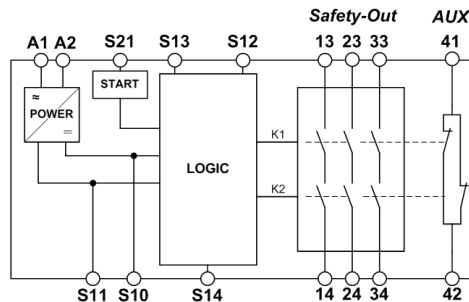


Fig. 1 Block diagram SR3E

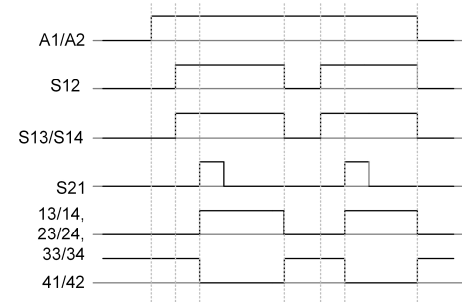


Fig. 2 State diagram for SR3E with manual start

Installation

As per EN 60204-1, the device is intended for installation in control cabinets with a minimum degree of protection of IP54. The following should be noted:

- Mounting on 35 mm rail according to EN 60715
- Ensure sufficient heat dissipation in the control cabinet
- Minimum distance to adjacent devices according to the total current limit curve

Note: Spacer from ZANDER AACHEN (Art. No. 472596) for defined distances - See section Accessories.

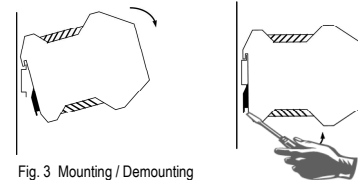


Fig. 3 Mounting / Demounting

Safety Precautions



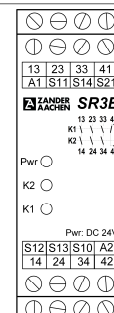
- Installation and commissioning of the device must be performed **only by authorized personnel** and who has read and understood this operating instructions.
- Observe the country-specific regulations when installing the device.
- The electrical connection of the device is only allowed to be made with the device isolated.
- The wiring of the device must comply with the instructions in this operating instructions, otherwise there is a risk that the safety function will be lost.
- It is not allowed to open the device, tamper with the device or bypass the safety devices.
- The contact protection and the insulation of the supply cables must be designed for the highest voltage

to the device.

- It is not allowed to open the device, tamper with the device or bypass the safety devices.
- All relevant safety regulations and standards are to be observed.
- The overall concept of the control system in which the device is incorporated must be validated by the user.
- Failure to observe the safety regulations can result in death, serious injury and serious damage.
- Note down the version of the product (see label "Ver.") and check it prior to every commissioning of a new device. If the version has changed, the overall concept of the control system in which the device is incorporated must be validated again by the user.

Electrical Connection

- A safety transformer according to EN 61558-2-6 or a power supply unit with electrical isolation from the mains must be connected
- Observe the instructions in the section "Tech. Data"
- If the device does not function after commissioning, it must be returned to the manufacturer unopened. Opening the device will void the warranty
- The auxiliary contact 41-42 may not be used as a safety contact
- Use adequate protective circuit for inductive loads (e.g. free-wheeling diode)



- A1: Power supply
- A2: Power supply
- S11: Control voltage
- S10: Control line
- S21: Start control line
- S13: Control line
- S14: Control line
- S12: Control line
- 13-14: Safety contact 1
- 23-24: Safety contact 2
- 33-34: Safety contact 3
- 41-42: Auxiliary contact

Fig. 4 Terminals

Applications

Depending on the application or the result of the risk assessment according to EN ISO 13849-1, the device must be wired as shown in Fig. 5 to Fig. 16.

Emergency Stop Circuit

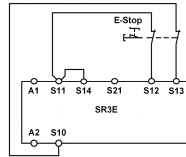


Fig. 5:
Dual channel emergency stop
with short circuit and ground fault
monitoring.
(category 4, up to PL e / SIL 3)

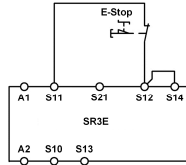


Fig. 7:
Single channel emergency stop
with ground fault monitoring.
(category 1, up to PL c / SIL 1)
Note:
Not suitable for applications in
elevators according to EN 81-20

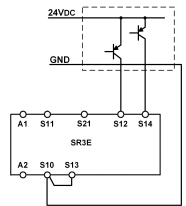


Fig. 9:
Two channel emergency stop with
pnp-outputs/OSSD-outputs with
its own short circuit monitoring.
(category 4, up to PL e / SIL 3)
Prerequisite:
Signal generator must meet re-
quirements for PL e / SIL 3, too.

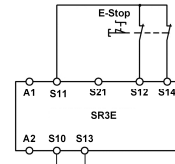


Fig. 6:
Dual channel emergency stop
with ground fault monitoring.
(category 3, up to PL d / SIL 2)

Note:
For applications according to EN
81-20 a fault exclusion for short
circuit between S12 and S14 is
required

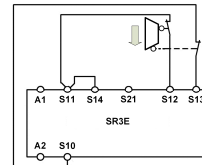


Fig. 8:
Dual channel safety guard
monitoring with short circuit and
ground fault monitoring.
(category 4, up to PL e / SIL 3)

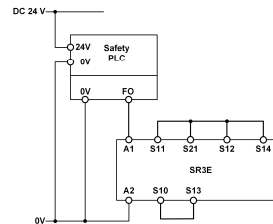


Fig. 10:
Connecting to a safety PLC
(category 4, up to PL e / SIL 3)
Prerequisite:
Safe PLC output meets the
required safety level and short
circuit between PLC output and
SR3E can be excluded
(e.g. wiring inside an electrical
installation space - see EN ISO
13849-2; Tab D4).



ATTENTION: Loss of functional safety!

For the applications according to Fig. 9 and Fig. 10 the following is to be noted:

- Make sure that the ground potential of the signal generator and the SR3E is the same
- It must be ensured that any switch-on pulses (light test) sent by the signal generator do not lead to a short activation of the safety relay and should therefore basically be deactivated.

Start Behaviour

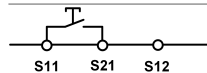


Fig. 11:
Monitored manual start.
It is monitored that the start button
has been opened before the
safety switch is closed.
Prerequisite:
Power supply may not be inter-
rupted

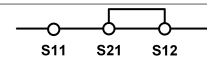


Fig. 12:
Automatic start.
Maximum allowable delay when
closing the safety switches at
S12 and S13/S14:
S12 before S13/S14: 200ms
S13/S14 before S12: no limit

Warning:
Safety contacts will be
activated immediately at
power-on.

Feedback Loop

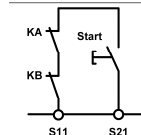


Fig. 13:
Feedback loop for monitored
manual start.
The feedback loop monitors
contactors or the expansion
modules.

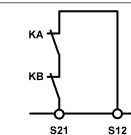


Fig. 14:
Feedback loop for automatic
start.
The feedback loop monitors
contactors or the expansion
modules.

Power supply and Safety contacts

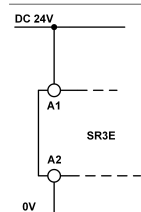


Fig. 15:
Power supply A1 and A2.

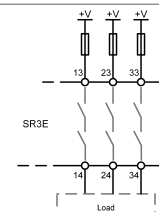


Fig. 16:
Connecting load to safety con-
tacts. Voltage „+V“ according to
techn. Data.

ATTENTION:
Inductive loads should have
adequate protection circuit such
as a free-wheeling diode.

Commissioning Procedure



Advice: Follow the guidelines in „Electrical Connection“ during the start-up.

1. Input circuit:

Depending on the risk evaluation choose one of the wiring diagrams in „Applications“ (Fig. 5 to Fig. 10).

2. Choose start mode:

Connect the start button with S11 and S21 for monitored manual start or connect S21 with S12 directly for automatic start (Fig. 11 or Fig. 12).

Warning:

If „Automatic start“ is set, bear in mind that the safety contacts will switch immediately after the power supply is connected. If „Monitored manual start“ is set, the start button must be opened after wiring.

3. Feedback loop:

If external contactors or extension modules are used, connect them according to Fig. 13 or Fig. 14.

4. Power supply:

Connect the power supply to A1 and A2 (Fig. 13).

Caution: Power must not yet be activated.

5. Starting the device:

Switch on the operating voltage.

Warning:

If the „Automatic start“ starting behaviour is set, the safety contacts will close immediately.

If the „Monitored manual start“ starting behaviour is set, close the start button to close the safety contacts.

LEDs **Pwr**, **K1** and **K2** are lit.

6. Triggering safety function:

Open the emergency stop circuit by actuating the connected safety switch. The safety contacts open immediately.

7. Reactivation:

Close the emergency stop circuit. If „Automatic start“ is selected, the safety contacts will close immediately.

If the „Monitored manual start“ starting behaviour is set, close the start button to close the safety contacts.

Operating Instructions

Check and Maintenance

No maintenance is required for the device itself.
But the following checks are regularly required to ensure proper and continuous functioning:

- Check the switch function
- Check for signs of manipulation and safety function bypassing

- Check if the device is mounted and connected securely
 - Check for soiling
- Check if the safety device is working properly, in particular:
- Every time after initial commissioning
 - Every time after replacing a component
 - After every fault in the safety circuit

According to CNB / M / 11.050, a request for the safety function is recommended at the following intervals:

- Once a month for applications up to PL e with Cat. 3 or Cat. 4 and SIL 3 with HFT = 1
- Once a year for applications up to PL d with Cat. 3 and SIL 2 with HFT = 1

What to do in Case of a Fault?

Device does not switch on:

- Check the wiring by comparing it to the wiring diagrams.
- Check the safety switch for correct function and adjustment.
- Check whether the emergency stop circuit is closed.
- Check whether the start button (manual start) is closed.
- Check the operating voltage at A1 and A2.
- Is the feedback loop closed?

Device cannot be switched on after an emergency stop:

- Emergency stop circuit was closed again.
- Was the start button opened before closing of the emergency stop circuit (manual start)?
- Is the feedback loop closed?

If the fault still exists, perform the steps listed under "Commissioning Procedure". If these steps do not remedy the fault either, return the device to the manufacturer.

Safety Characteristics according to EN ISO 13849-1

Load per contact	<= 1 A	<= 2 A	<= 3 A
Use duration T_{10d} [years]	20	20	20
Category	4	4	4
PL	e	e	e
PFHd [1/h]	1.2E-08	1.2E-08	1.2E-08
nop [Cycles per year]			
AC-15 / DC-13	$\leq 55,000 / \leq 350,000$	$\leq 42,500 / \leq 100,000$	$\leq 42,500 / \leq 15,000$

Load per contact	<= 1 A	<= 2 A	<= 3 A
Use duration T_{10d} [years]	20	20	20
Proof-Test-Intervall [years]	20	20	20
PFH [1/h]	1.2E-10	1.2E-10	1.2E-10
SIL	3	3	3
nop [Cycles per year]			
AC-15 / DC-13	$\leq 55,000 / \leq 350,000$	$\leq 42,500 / \leq 100,000$	$\leq 42,500 / \leq 15,000$

Safety Characteristics according to EN IEC 62061 / EN 61508 - High Demand

Technical Data

In compliance with	EN 60204-1; EN ISO 13849-1; EN IEC 62061; IEC 61508 Parts 1-2 and 4-7; EN 81-20; EN 81-50
Operating voltage	DC 24 V +/- 10 %
Power consumption	2.6 W
Inrush current	5 A (approx. 250 μ s)
Pulse suppression (A1 / S12 / S14)	
Switch-Off pulse / dark test	max. 3 ms (Pulse width) / 500 ms (Pulse rate)
Switch-On pulse / light test	max. 1 ms (Pulse width) / 500 ms (Pulse rate)
	Note: It must be ensured that any switch-on pulses (light test) sent by the signal generator do not lead to a short activation of the safety relay and should therefore basically be deactivated.
Contact configuration	3 NO (Safety contacts) / 1 NC (Auxiliary contact)
Max. switching voltage	AC 250 V
Contact rating of safety contacts (13-14, 23-24, 33-34)	AC: 250 V, 2000 VA, 8 A for resistive load 250 V, 3 A for AC-15
6 switching cycles/ min	DC: 30 V, 240 W, 8 A for resistive load 24 V, 3 A for DC-13
Thermal current I_{th}	Max. 5 A per contact (see total current limit curve)
Contact rating of auxiliary contact (41-42)	AC: 250 V, 500 VA, 2 A for resistive load DC: 30 V, 60 W, 2 A for resistive load
Minimum contact load	5 V, 10 mA
External fuses	10 A gG (NO); 6 A gG (NC)
Max. switch-on delay	< 50 ms
Max. switch-off delay	Via A1: < 40 ms; Via S12 or S13/S14 < 20 ms
Recovery time	< 500 ms
Wire width	0.14 - 2.5 mm ²
Tightening moment (Min. / Max.)	0.5 Nm / 0.6 Nm
Contact material	AgSnO ₂
Service Life	mech. approx. 1×10^7
Rated impulse withstand voltage	2.5 kV (control voltage / contacts)
Dielectric strength	4 kV (EN 60664-1)
Rated insulation voltage	250 V
Degree of pollution / Overvoltage category	2 / 3 (EN 60664-1)
Protection	IP20
Temperature range Ambient	-15 °C to +55 °C
Temperature range Storage	-15 °C to +85 °C
Max. altitude	≤ 2000 m (above sea level)
Weight	approx. 150g
Mounting	DIN rail according to EN 60715 TH35

Total current limit curve

The max. permissible total current is shown in Fig. 17.

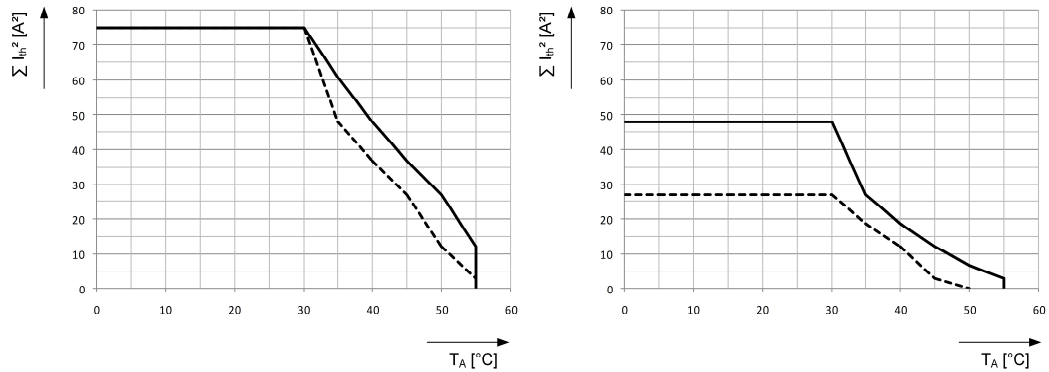


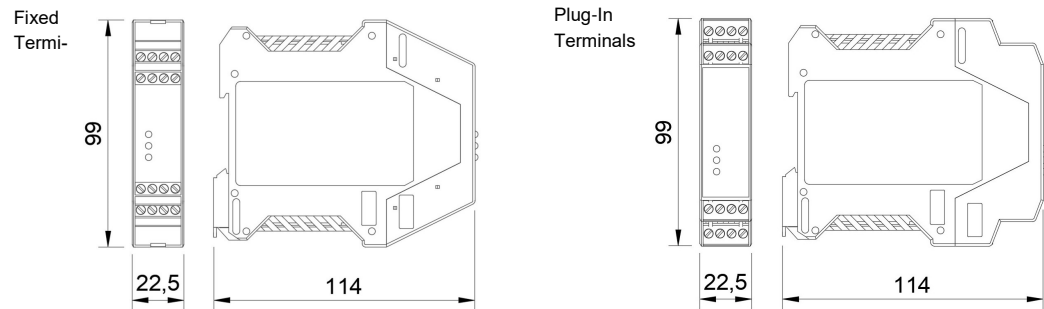
Fig. 17: Total current limit depending on the ambient temperature

Left: SR3E with 5 mm clearance to adjacent devices, heated with same load
Right: SR3E with no clearance to adjacent devices, heated with same load

— Nominal voltage DC 24 V
- - - Overvoltage up to DC 26,4 V

Total current: $\Sigma I_{th}^2 = I_1^2 + I_2^2 + I_3^2$ (I_1, I_2, I_3 : Current in contact paths 13-14, 23-24, 33-34)

Dimension Drawing



Note: Actual number of front LEDs may differ from the number shown in the drawing, depending on the variant.

Variants	Order No. 472292	SR3E, DC 24 V	fixed screw terminals
	Order No. 474292	SR3E, DC 24 V	incl. plug-in screw terminals
	Order No. 475292	SR3E, DC 24 V	incl. push-in twin spring connector
Accessories	Order No. 472592	EKLS4,	set of plug-in screw terminals
	Order No. 472595	EKLZ4,	set of push-in twin spring connector
	Order No. 472596	Spacer Electric Cabinet	rail spacer 5mm, PU = 12 pcs