Safety Emergency Stop Relay SR3D

User Information

English translation

Errors and technical changes reserved

Correct Use

EN ISO 13849-1

EN IEC 62061
IEC 61511
IEC 61508

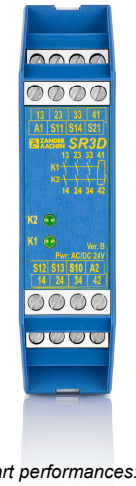
EN 746 - 2
EN 50156 - 1

GL
RINA

SR3D is an all-purpose emergency stop device which ensures the quick and safe deactivation of the moving parts of a machine in case of danger.

Applications for the SR3D include single or dual-channel emergency stop circuits and guard monitoring on machines and plants.

The SR3D has been specially designed for use in combustion systems in continuous operation in accordance with EN 50156-1 and EN 746-2 as well as for use on ships and has been certified by TÜV-Rheinland and Germanischer Lloyd.



Product Safety Functional Safety
TÜVRheinland CERTIFIED
www.tuv.com ID 0600000000

DNVGL.COM/AF

Germanischer Lloyd
Zertifikat TAE00003JF

- *3 safe redundant and diverse relay contacts 1 auxiliary contact*
- *Connection of:*
  - *Emergency stop buttons*
  - *Safety switches*
  - *Non-contact safety switches*
  - *OSSD-Outputs*
- *Control: single or dual channel*
- *Feedback loop for external contactors or extension modules*
- *Redundancy and cyclical monitoring*
- *LED indicator for status channel 1 and 2*
- *2 start performances:*
  - *monitored, manual start*
  - *automatic start*
- *Short-circuit monitoring and earth fault monitoring*
- *Up to PL e, SIL 3, category 4*

Function

The emergency stop safety switching device SR3D is designed for safe isolation of safety circuits according to EN 60204-1 and can be used up to safety category 4, PL e / SIL 3 according to EN ISO 13849-1 / IEC 61508.

The internal logical system closes the safety contacts when the start button is pressed.

If the safety switch is opened, the positively driven safety contacts are opened and safely switch the machine off. It is ensured that a single fault does not lead to a loss of the safety function and that every fault is detected by cyclical self-monitoring no later than when the system is switched off and switched on again.

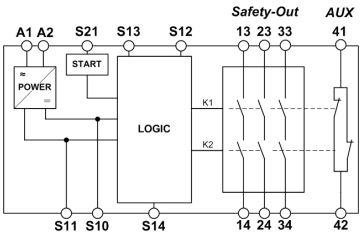


Fig. 1 Block diagram SR3D

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 TH35
- Ensure sufficient heat dissipation in the control cabinet
- With the AC 115 V / 230 V version, a minimum distance of 10 mm to adjacent devices must be maintained

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

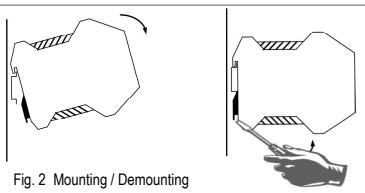


Fig. 2 Mounting / Demounting

Safety Precautions

- Installation and commissioning of the device must be performed **only by authorized personnel**.
- 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 user information, 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.
- 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. X”) 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.
- The year of manufacture can be found on the type label on the device. It is located at the end of the line of the voltage specification, below the ID number.

Electrical Connection

- Consider the information in the section "Techn. data"
- When the 24 V version is used, a safety transformer according to EN 61558-2-6 or a power supply unit with electrical isolation from the mains must be connected
- External fusing of the safety contacts must be provided.
- If the device does not function after commissioning, it must be returned to the manufacturer unopened. Opening the device will void the warranty
- Increasing service life if driving inductive loads by using appropriate protective circuitry (e.g. freewheeling diode)

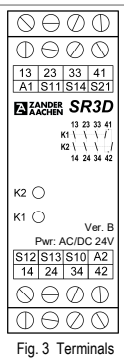


Fig. 3 Terminals

A1:	*Power supply*
A2 :	*Power supply*
S11:	*DC 24 V 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*

Note:
Fig. 3 shows the AC/DC 24 V variant.

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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. 4 to Fig. 17.

Emergency Stop Circuit

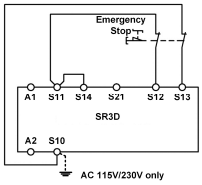


Fig. 4:
Dual channel emergency stop with short circuit and earth fault detection.
(category 4, up to PL e / SIL 3)

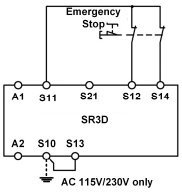


Fig. 5:
Dual channel emergency stop with earth fault detection.
(category 3, up to PL d / SIL 2)

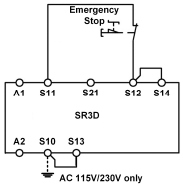


Fig. 6:
Single channel emergency stop with earth fault detection.
(category 1, up to PL c / SIL 1)

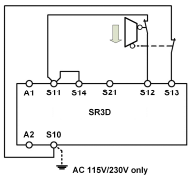


Fig. 7:
Dual channel safety guard monitoring with short circuit and earth fault detection.
(category 4, up to PL e / SIL 3)

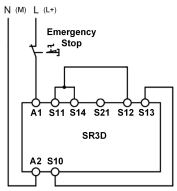


Fig. 8:
Single channel emergency stop without fault-detection of the safety switch and the wires.
(category 1, up to PL c / SIL 1)

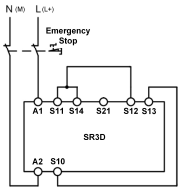


Fig. 9:
Dual channel emergency stop without fault-detection of the safety switch and the wires.
(category 3, up to PL d / SIL 2)

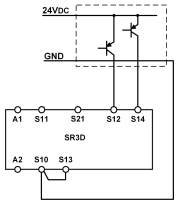


Fig. 10:
Two channel emergency stop with pnp-outputs/OSSD-outputs
***with its own** short circuit monitoring.*
(category 4, up to PL e / SIL 3)

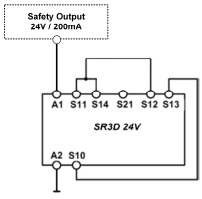


Fig. 11:
Single channel emergency stop with a safety output. Wired inside a control cabinet (minimum degree of protection IP54)
(category 4, bis PL e / SIL 3; Condition: Safety output meets PL e, SIL 3)

ATTENTION:

- *In order to activate earth fault monitoring, S10 must be connected to PE (protective earth) on the AC 115 V / 230 V devices*
- *With AC/DC 24 V, connect PE only to the power supply unit according to EN 60204-1*
- *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*
- *For applications according to Fig. 10 and Fig. 11 make sure that the reference potential of the signal generator and the SR3D is the same*

Start Behavior

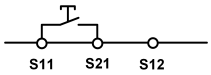
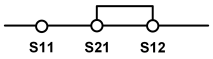


Fig. 12:
Monitored manual start.
It is monitored that the start button has been opened before the safety switch is closed.
(Condition:
power supply may not be interrupted)



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

Fig. 13:
Automatic start.
Maximum allowable delay when closing the safety switches at S12 and S13:
S12 before S13: 300ms
S13 before S12: no limit

Feedback Loop

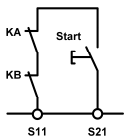


Fig. 14:
Feedback loop for monitored manual start:
The feedback loop monitors contactors or the expansion modules .

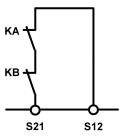


Fig. 15:
Feedback loop for automatic start:
The feedback loop monitors contactors or the expansion modules .

Power supply and Safety contacts

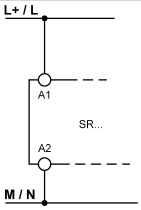


Fig. 16:
Power supply A1 and A2.
(Power supply according to techn. Data)

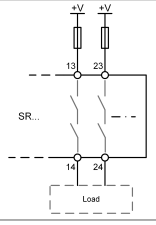


Fig. 17:
Connecting load to safety contacts.
(Figure shows example.
Voltage „+V“ according to techn. Data)

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. 4 - 11).

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. 12 or 13).

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. 14 or Fig. 15.

4. Power supply:

Connect the power supply to A1 and A2 (Depending on Application Fig. 8, 9, 11 or 16).

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Caution: Power must not yet be activated.

5. Starting the device:

Switch on the operating voltage.

Warning:

If the “Automatic start” starting behavior is set, the safety contacts will close immediately.

If the “Monitored manual start” starting behavior is set, close the start button to close the safety contacts. LEDs ***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:

Switch the device on again as described under 5.

Check and Maintenance

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
- Ceck 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

Regardless of this, the safe functioning of the safety device should be checked at suitable intervals, e.g. as part of the maintenance schedule of the plant. No maintenance is required for the device itself

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 used 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 again 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.

Caution: Opening the device is impermissible and will void the warranty.

Techn. Data

In compliance with	EN 60204-1; EN ISO 13849-1; EN IEC 62061; EN 50156-1; EN 746-2; IEC 61508 Parts 1-2 and 4-7; IEC 61511-1
Operating voltage	AC 230 V, AC 115 V, AC/DC 24 V
Rated supply frequency	50-60 Hz
Allowable tolerance	+ / - 10 %
Power consumption	**DC 24 V** approx. 2 W **AC 230 V** approx. 6.9 VA
Control voltage at S11	DC 24 V
Control current at S11...S14	max. 100 mA
Safety contacts	3 NO
Auxiliary contacts	1 NC
Switching voltage max.	AC 250 V
Contact rating of safety contacts (13-14, 23-24, 33-34) *) 6 switching cycles/ min	AC: 250 V, 2000 VA, 8 A for resistive load 250 V, 3 A for AC-15 DC: 30 V, 240 W, 8 A for resistive load 24 V, 3 A for DC-13 UL: B300 / R300 Cumulative current Max. 15 A (13-14, 23-24, 33-34)
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 voltage/current	5 V, 10 mA
External fuses for safety contacts	10 A gG 6 A gG for applications acc. to EN 50156-1 (See Chapter 10.5.5.3.4)
Wire width	0.14 - 2.5 mm^2
Tightening moment (Min. / Max.)	0.5 Nm / 0.6 Nm
Typ. switch-on delay / switch-off delay	< 30 ms / < 20 ms
Length of control lines	Max. 1000 m at 0.75 mm^2
Contact material	$AgSnO_2$
Service Life	mech. approx. 1 x 10^7
Rated impulse withstand voltage	2.5 kV (control voltage / contacts)
Dielectric strength	4 kV (EN 60664-1)
Rated insulation voltage	250 V
Protection	IP20
Temperature range	DC 24 V: -15 °C bis +55 °C AC 115 V / 230 V: -15 °C bis +55 °C (see load curve)
Max. altitude	≤ 2000 m (above sea level)
Degree of pollution / Overvoltage category	2 / 3 (EN 60664-1)
Weight	approx. 230 g
Mounting	DIN rail according to EN 60715 TH35

*) If several SR3D-24V are mounted closely together the maximum cumulative current is 9A at an ambient temperature of 20°C or 3 A at 30 °C or 1 A at 40 °C. If the current exceeds these limits, keep a minimum space of 5 mm between the devices.

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Disclaimer and warranty

If the above mentioned conditions for appropriate use are not complied with or if the safety instructions are not followed or if any maintenance operations are not carried out as required, this shall lead to an exclusion of liability and loss of warranty.

ATTENTION!

We would like to point out that it is the full responsibility of the operator to ensure a plant availability.
Using the SR3D, a safety emergency stop relay according to

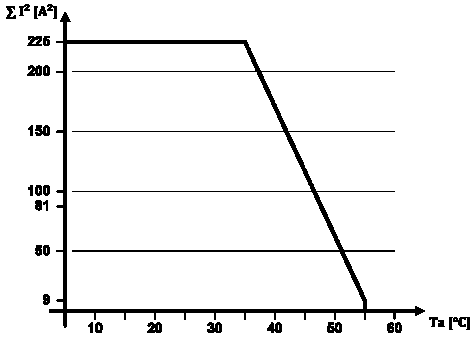
- EN ISO 13849-1
- EN IEC 62061
- IEC 61508
- EN 50156-1
- EN 746-2
- IEC 61511-1

is used, which will be brought into the safe state when the safety function is requested.

This means that the connected load is switched off as soon as a request from connected sensor elements or diagnostic measures detects a dangerous state, e.g. caused by a component fault.

Since process-related applications in particular have high demands on availability, limited availability can also have significant consquences. It is therefore recommended to stock a second unit to avoid long downtimes in such a case. These are recommendations of the manufacturer, the evaluation of the importance of the plant availability is the sole responsibility of the operator.

Load curve

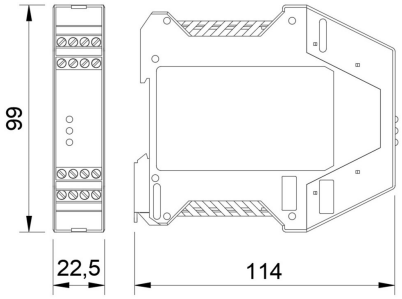


Max. cumulative current depending on the ambient temperature for AC 115 V / 230 V variants with 10 mm space between the devices.

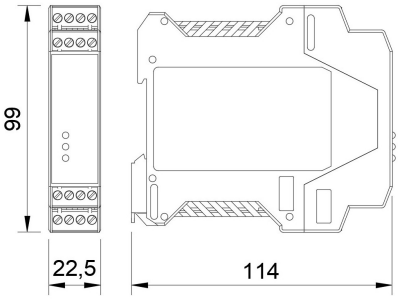
Cumulative current: $\sum I^2 = (I_1 + I_2 + I_3)^2$

Dimension Drawing

Fixed Terminals



Plug-In Terminals



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

Variants

Order No. 472270	SR3D, AC 230 V (50-60 Hz),	fixed screw terminals
Order No. 472271	SR3D, AC 115 V (50-60 Hz),	fixed screw terminals
Order No. 472272	SR3D, AC/DC 24 V (AC: 50-60 Hz),	fixed screw terminals
Order No. 474270	SR3D, AC 230 V (50-60 Hz),	incl. plug-in screw terminals
Order No. 474271	SR3D, AC 115 V (50-60 Hz),	incl. plug-in screw terminals
Order No. 474272	SR3D, AC/DC 24 V (AC: 50-60 Hz),	incl. plug-in screw terminals
Order No. 475270	SR3D, AC 230 V (50-60 Hz),	incl. push-in twin spring connector
Order No. 475271	SR3D, AC 115 V (50-60 Hz),	incl. push-in twin spring connector
Order No. 475272	SR3D, AC/DC 24 V (AC: 50-60 Hz),	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

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Safety Charcteristics

Safety characteristics according to EN ISO 13849-1

Load - AC-15 / DC-13	**≤ 1 A / ≤ 1 A**	**≤ 2A / ≤ 2A**	**≤ 3A / ≤ 3A**
Max. duration of use [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 / year] - AC-15 / DC-13	≤ 50,000 / ≤ 350,000	≤ 35,000 / ≤ 100,000	≤ 8,760 / ≤ 8,760

Safety characteristics according to IEC 61508 - High Demand

Conditions: Days of operation/year: 365; Hours/Day: 24; Switching-Cycle/Hour: 1; Maximum load AC-15 / DC-13	
Max. duration of use [Years]	20
Proof-Test-Intervall [Years]	20
PFH [1/h]	9.69E-11
SIL	3

Safety characteristics for alternate 1oo1 structure for process industry - High Demand

Conditions: Days of operation/year: 365; Hours/Day: 24; Switching-Cycle/Hour: 1; Maximum load AC-15 / DC-13	
Device type	A
HFT	0
SIL	3
SFF [%]	99.93
λ_{SD} [FIT]	0
λ_{SU} [FIT]	121.09
λ_{DD} [FIT]	9.66
λ_{DU} [FIT]	0.10
PFH [1/h]	9.69E-11

Safety characteristics according to IEC 61508 - Low Demand

Conditions: Maximum load AC-15 / DC-13	
Max. duration of use [Years]	20
Proof-Test-Intervall [Years]	9
$\mathbf{PFD_{AVG}}$	9.87E-05
SIL	3

Safety characteristics for alternate 1oo1 structure for process industry - Low Demand

Conditions: Maximum load AC-15 / DC-13	
Device type	A
HFT	0
SIL	3
SFF [%]	97.49
λ_{SD} [FIT]	0
λ_{SU} [FIT]	121.09
λ_{DD} [FIT]	0
λ_{DU} [FIT]	3.12
$\mathbf{PFD_{avg}}$ (e.g. for T = 1 year)	1.37E-05

Proof-Test

In order to check the proper function of the device, the following steps have to be carried out

- Demand the safety function by opening the safety circuit. Check that the relay contact (13-14; 23-24; 33-34) opened by activation of the safety function.
- Close the safety circuit and start the device again. Check that the safety contacts (13-14; 23-24; 33-34) closed again.

If the device doesn‘t switch on again, the proof-test failed.

ATTENTION:

If the proof-test fails, the device must be replaced. Otherwise there is a risk of loss of functional safety.

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Declaration

CE Konformitätserklärung
EC Declaration of Conformity
Déclaration de conformité

Hersteller: H. ZANDER GmbH & Co. KG
Producer: Am Gut Wolf 15 • 52070 Aachen • Deutschland
Fabricant:

Produktgruppe: Sicherheits-Not-Halt-Schaltgeräte
Product Group: Safety emergency stop switching devices
Groupe de produits: Relais de sécurité d'arrêt d'urgence

Produkt Name Product Name Nom du produit	**Anbringung der CE-Kennzeichnung** Affixing of CE marking: Application du marque CE	**Zertifikats-Nr.** No of Certificate N° du certificat
SRLC	2023	01/205/5463.03/23
SR2C	2023	01/205/5463.03/23
SR3C	2023	01/205/5463.03/23
SR3D	2023	01/205/5463.03/23
SR3A	2023	01/205/5463.03/23
SR3AD	2023	01/205/5463.03/23
SK3D	2023	01/205/5463.03/23

Die Produkte stimmen mit den Vorschriften folgender Europäischer Richtlinien überein:
The products conform with the essential protection requirements of the following European directives:
Les produits sont conformes aux dispositions des directives européennes suivantes:

2006/42/EG : Maschinenrichtlinie
2006/42/EG : Machinery directive
2006/42/EG : Directive Machines

2011/65/EU: RoHS Richtlinie
2011/65/EU: RoHS directive
2011/65/EU: Directive RoHS

2014/30/EU : EMV Richtlinie
2014/30/EU : EMC directive
2014/30/EU : Directive CEM

Die Übereinstimmung der bezeichneten Produkte mit den Vorschriften der o.a. Richtlinie wird, falls anwendbar, nachgewiesen durch die vollständige Einhaltung folgender Normen:
If applicable, the conformity of the designated products is proved by full compliance with the following standards:
Le strict respect des norms suivantes confirme, s´il y a lieu, que les produits désignés sont conformes aux dispositions de la directive susmentionnée:

EN 61326-3-1:2018 **EN IEC 61000-6-2:2019** **IEC 63000:2018**

Gemäß Zertifikat der benannten Stelle:
According to the certificate of the below mentioned organisation:
Selon de organisme notifé:

EN ISO 13849-1:2015 **EN ISO 13849-1:2023** **IEC 61508 Parts 1-7:2010**

Benannte Stelle / Organisme notifé: Nr. NB 0035
TÜV Rheinland Industrie Service GmbH
51105 Köln
Zertifizierungsstelle für Maschinen

Dokumentationsbeauftragte/-r: Christiane Nittschalk
Documentation manager
Autorisé à constituer le dossier technique

Aachen, den 24.10.2023

Dr.-Ing. Marco Zander
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Responsable évaluation de conformité CE

F7.307/03

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