

### Correct use

Safety switches series NZ are interlocking devices without guard locking (with safety function). The actuator is uncoded (e.g. dog). In combination with a movable safety guard and the machine control, this safety component prevents dangerous machine functions from occurring while the safety guard is open. A stop command is triggered if the safety guard is opened during the dangerous machine function.

This means:

- ▶ Starting commands that cause a dangerous machine function must become active only when the safety guard is closed.
- ▶ Opening the safety guard triggers a stop command.
- ▶ Closing a safety guard must not cause automatic starting of a dangerous machine function. A separate start command must be issued. For exceptions, refer to EN ISO 12100 or relevant C-standards.

Devices from this series can be used as safe position encoders.

Before the device is used, a risk assessment must be performed on the machine, e.g. in accordance with the following standards:

- ▶ EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- ▶ EN ISO 12100, Safety of machinery – General principles for design – Risk assessment and risk reduction
- ▶ IEC 62061, Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems

Correct use includes observing the relevant requirements for installation and operation, particularly based on the following standards:

- ▶ EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- ▶ EN ISO 14119, Safety of machinery – Interlocking devices associated with guards – Principles for design and selection
- ▶ EN 60204-1, Safety of machinery – Electrical equipment of machines.

### Important!

- ▶ The user is responsible for the proper integration of the device into a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-2.
- ▶ If the simplified method according to section 6.3 of EN ISO 13849-1:2015 is used for determining the Performance Level (PL), the PL might be reduced if several devices are connected in series.
- ▶ Logical series connection of safe contacts is possible up to PL d in certain circumstances. More information about this is available in ISO TR 24119.
- ▶ If a product data sheet is included with the product, the information on the data sheet applies in case of discrepancies with the operating instructions.

### Safety precautions

#### ⚠ WARNING

Danger to life due to improper installation or due to bypassing (tampering). Safety components perform a personal protection function.

- ▶ Safety components must not be bypassed, turned away, removed or otherwise rendered ineffective. On this topic pay attention in particular to the measures for reducing the possibility of bypassing according to EN ISO 14119:2013, section 7.

- ▶ Mounting, electrical connection and setup only by authorized personnel possessing special knowledge about handling safety components.

### Function

Precision single limit switches are used for positioning and control applications in mechanical and systems engineering.

The switching contacts are actuated when the actuating element is moved from the free position to the end position. The safety contacts (⊖) are positively opened in this process (see Figure 2).

### Switching states

The detailed switching states for your switch can be found in Figure 2. All available switching elements are described there.

### Actuating element in free position

The safety contacts (⊖) are closed.

### Actuating element in end position

The safety contacts (⊖) are open.

### Mounting

#### NOTICE

Device damage due to improper mounting and unsuitable ambient conditions.

- ▶ Safety switches and actuators must not be used as an end stop.
- ▶ Observe EN ISO 14119:2013, sections 5.2 and 5.3, for information about fastening the safety switch and the actuator.
- ▶ Observe EN ISO 14119:2013, section 7, for information about reducing the possibilities for bypassing an interlocking device.
- ▶ Protect the switch head against damage.

### Changing the actuating direction

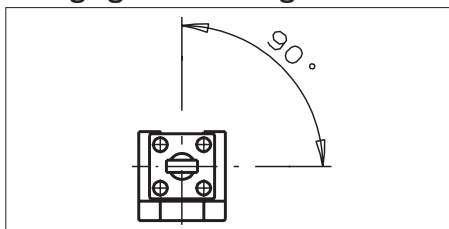


Figure 1: Changing the actuating direction

1. Remove the screws from the actuating head.
2. Set the required direction.
3. Tighten the screws with a torque of 1.2 Nm.

### Electrical connection

#### ⚠ WARNING

Loss of the safety function due to incorrect connection.

- ▶ Use only safe contacts (⊖) for safety functions.

### Use of the safety switch as an interlocking device for personnel protection

At least one contact (⊖) must be used. This signals the position of the safety guard (for terminal assignment, see Figure 2).

### The following information applies to devices with plug connector:

- ▶ Check that the plug connector is sealed.

### The following information applies to devices with cable entry:

1. Use a suitable tool to open the desired insertion opening.
2. Fit the cable gland with the appropriate degree of protection.
3. Connect and tighten the terminals with 0.5 Nm (1 Nm on ES511) (for terminal assignment, see Figure 3).

4. Check that the cable entry is sealed.
5. Close the switch cover and screw in place (tightening torque 1.2 Nm).

### Function test

#### ⚠ WARNING

Fatal injury due to faults during the function test.

- ▶ Before carrying out the function test, make sure that there are no persons in the danger area.
- ▶ Observe the valid accident prevention regulations.

Check the device for correct function after installation and after every fault.

Proceed as follows:

### Mechanical function test

The actuating element must move easily. Close the safety guard several times to check the function.

### Electrical function test

1. Switch on operating voltage.
2. Close all safety guards.
  - ➔ The machine must not start automatically.
3. Start the machine function.
4. Open the safety guard.
  - ➔ The machine must switch off and it must not be possible to start it as long as the safety guard is open.

Repeat steps 2 - 4 for each safety guard.

### Inspection and service

#### ⚠ WARNING

Danger of severe injuries due to the loss of the safety function.

- ▶ If damage or wear is found, the complete switch must be replaced. Replacement of individual parts or assemblies is not permitted.
- ▶ Check the device for proper function at regular intervals and after every fault. For information about possible time intervals, refer to EN ISO 14119:2013, section 8.2.

Inspection of the following is necessary to ensure trouble-free long-term operation:

- ▶ correct switching function
- ▶ secure mounting of all components
- ▶ damage, heavy contamination, dirt and wear
- ▶ sealing of cable entry
- ▶ loose cable connections or plug connectors.

**Information:** The year of manufacture can be seen in the bottom, right corner of the rating plate.

### Exclusion of liability and warranty

In case of failure to comply with the conditions for correct use stated above, or if the safety instructions are not followed, or if any servicing is not performed as required, liability will be excluded and the warranty void.

### Notes about cULus

#### The following information applies to devices with cable entry:

For use and applications as per the requirements of cULus, a copper wire for the temperature range 60/75 °C is to be used.

#### The following information applies to devices with plug connector:

For use and applications as per the requirements of cULus, a class 2 power supply according to UL1310 must be used. Connection cables for safety switches installed at the place of use must be separated from all moving and permanently installed cables and un-insulated active elements of other parts of the system which operate at a voltage of over 150 V. A constant clearance of 50.8 mm must be maintained. This does not apply if the moving cables

are equipped with suitable insulation materials which possess an identical or higher dielectric strength compared to the other relevant parts of the system.

**EC declaration of conformity**

The manufacturer named below herewith declares that the product fulfills the provisions of the directive(s) listed below and that the related standards have been applied.

EUCHNER GmbH + Co. KG  
 Kohlhammerstr. 16  
 D-70771 Leinfelden-Echterdingen

Directives applied:  
 ► Machinery directive 2006/42/EC

Standards applied:  
 ► EN 60947-5-1:2004 + Cor.:2005 + A1:2009  
 ► EN 14119:2013

The original EC declaration of conformity can also be found at: [www.euchner.de](http://www.euchner.de)

**Service**

If service support is required, please contact:

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 +49 711 7597-500

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 +49 711 753316

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**Internet:**  
[www.euchner.de](http://www.euchner.de)

**Technical data**

Parameter	Value
Housing material	Anodized die-cast alloy
Degree of protection	
NZ1... cable entry	IP 67
NZ2... plug connector M12/SVM5	IP 67
NZ2... plug connector SR6/SR11	IP 65
Mech. life	30 x 10 <sup>6</sup> operating cycles
Ambient temperature	-25 ... +80 °C
Degree of contamination (external, acc. to EN 60947-1)	3 (industrial)
Installation position	Any
Max. approach speed	
Actuator DO/WO	10 m/min
RG/RS/RL	20 m/min
RK	50 m/min
Min. approach speed	0.1 m/min
Actuating force at 20 °C	30 N
Actuation frequency	7,000/h
Contact material	Silver alloy, gold flashed

	NZ1...	NZ2...	
Connection	Cable entry M20 x 1.5	Plug connector	
Conductor cross-section (flexible/rigid)	0.34 ... 1.5 mm <sup>2</sup> 0.34 ... 0.75 mm <sup>2</sup> with LED indicator	SR6: 0.5 ... 1.5 mm <sup>2</sup> SR11: 0.5 mm <sup>2</sup>	
	<b>NZ1...M/NZ2...SR6</b>	<b>NZ2...SR11</b>	<b>NZ2...SVM5</b>
Rated insulation voltage	U <sub>i</sub> = 250 V	U <sub>i</sub> = 50 V	U <sub>i</sub> = 50 V
Rated impulse withstand voltage	U <sub>imp</sub> = 2.5 kV	U <sub>imp</sub> = 1.5 kV	U <sub>imp</sub> = 1.5 kV
Conditional short-circuit current	100 A		
Operating voltage for optional LED indicator (only for switching elements ES511, ES528H, ES538H)	L060 12 - 60 V AC/DC L110 110 V AC ±15% L220 230 V AC ±15%		

Rated data for the switching elements	ES511	ES528H/ES538H	SK2121H/SK2131H/SK3131H	
Switching principle	Snap-action contact element	Slow-action contact element	Slow-action contact element	
Utilization category acc. to EN 60947-5-1 with cable entry	AC-12 I <sub>e</sub> 10 A U <sub>e</sub> 230 V AC-15 I <sub>e</sub> 6 A U <sub>e</sub> 230 V DC-13 I <sub>e</sub> 6 A U <sub>e</sub> 24 V	- I <sub>e</sub> 4 A U <sub>e</sub> 230 V I <sub>e</sub> 4 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V I <sub>e</sub> 4 A U <sub>e</sub> 24 V	- I <sub>e</sub> 4 A U <sub>e</sub> 230 V I <sub>e</sub> 4 A U <sub>e</sub> 24 V
with plug connector SR6 <sup>1)</sup>	AC-15 I <sub>e</sub> 6 A U <sub>e</sub> 230 V DC-13 I <sub>e</sub> 6 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V I <sub>e</sub> 4 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 230 V I <sub>e</sub> 4 A U <sub>e</sub> 24 V	-
with plug connector SR11 <sup>1)</sup>	AC-15 DC-13	- -	I <sub>e</sub> 4 A U <sub>e</sub> 50 V I <sub>e</sub> 4 A U <sub>e</sub> 24 V	-
with plug connector SVM5	AC-15 DC-13	I <sub>e</sub> 4 A U <sub>e</sub> 30 V I <sub>e</sub> 4 A U <sub>e</sub> 24 V	I <sub>e</sub> 4 A U <sub>e</sub> 30 V I <sub>e</sub> 4 A U <sub>e</sub> 24 V	- -
Short circuit protection (control circuit fuse) acc. to IEC 60269-1 <sup>1)</sup>	see utilization category	4 A gG	4 A gG	
Conventional thermal current I <sub>th</sub> <sup>1)</sup>		4 A	4 A	
Min. switching current at switching voltage	10 mA DC 24 V	1 mA DC 24 V	10 mA DC 12 V	1 mA DC 24 V    10 mA DC 12 V

1) Limitation for NZ2... at ambient temperature > 70 ... 80 °C

	NZ2...SR6	NZ2...SR11
Utilization category acc. to EN 60947-5-1	AC-15 I <sub>e</sub> 2 A U <sub>e</sub> 230 V DC-13 I <sub>e</sub> 2 A U <sub>e</sub> 24 V	I <sub>e</sub> 2 A U <sub>e</sub> 50 V I <sub>e</sub> 2 A U <sub>e</sub> 24 V
Short circuit protection (control circuit fuse) acc. to IEC 60269-1	2 A gG	2 A gG
Conventional thermal current I <sub>th</sub>	2A	2 A

Reliability values acc. to EN ISO 13849-1	
B <sub>10d</sub>	2 x 10 <sup>7</sup>

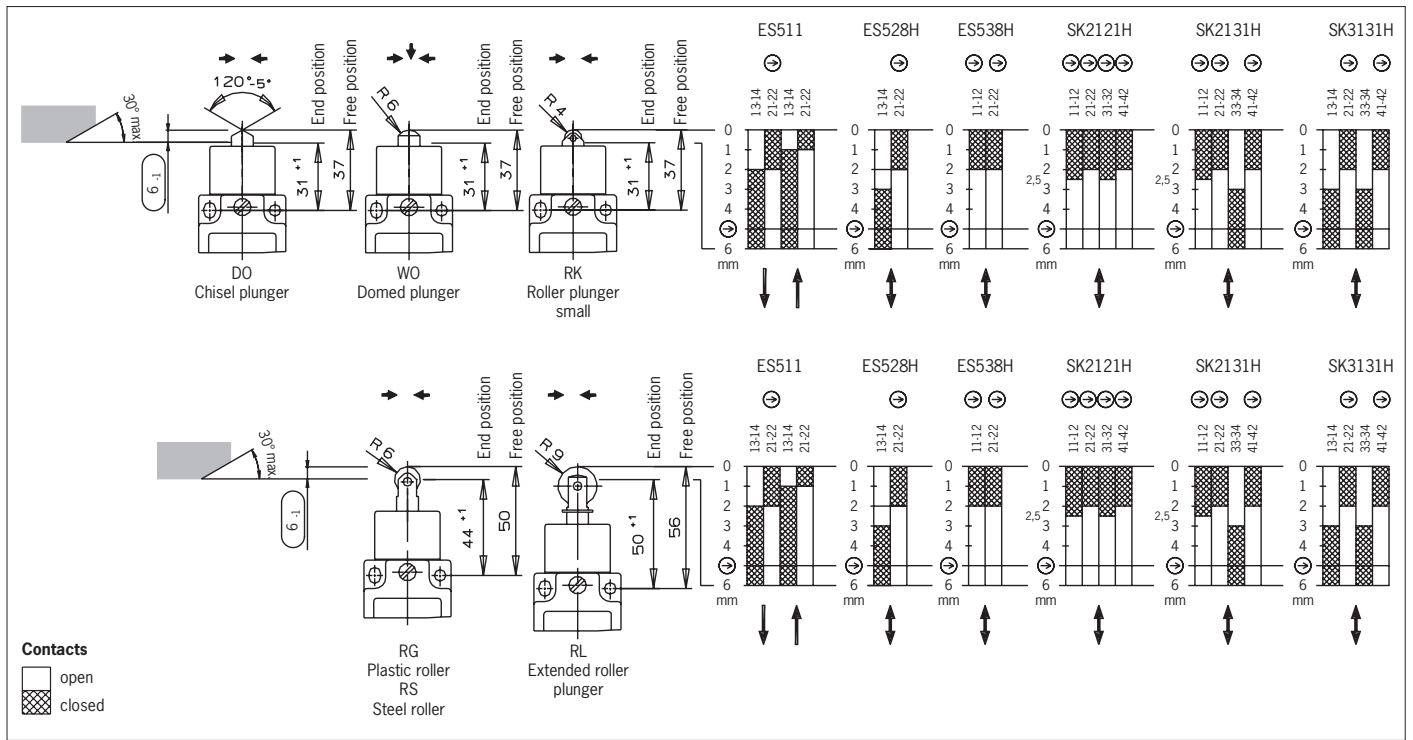


Figure 2: Travel diagrams, actuator and approach directions

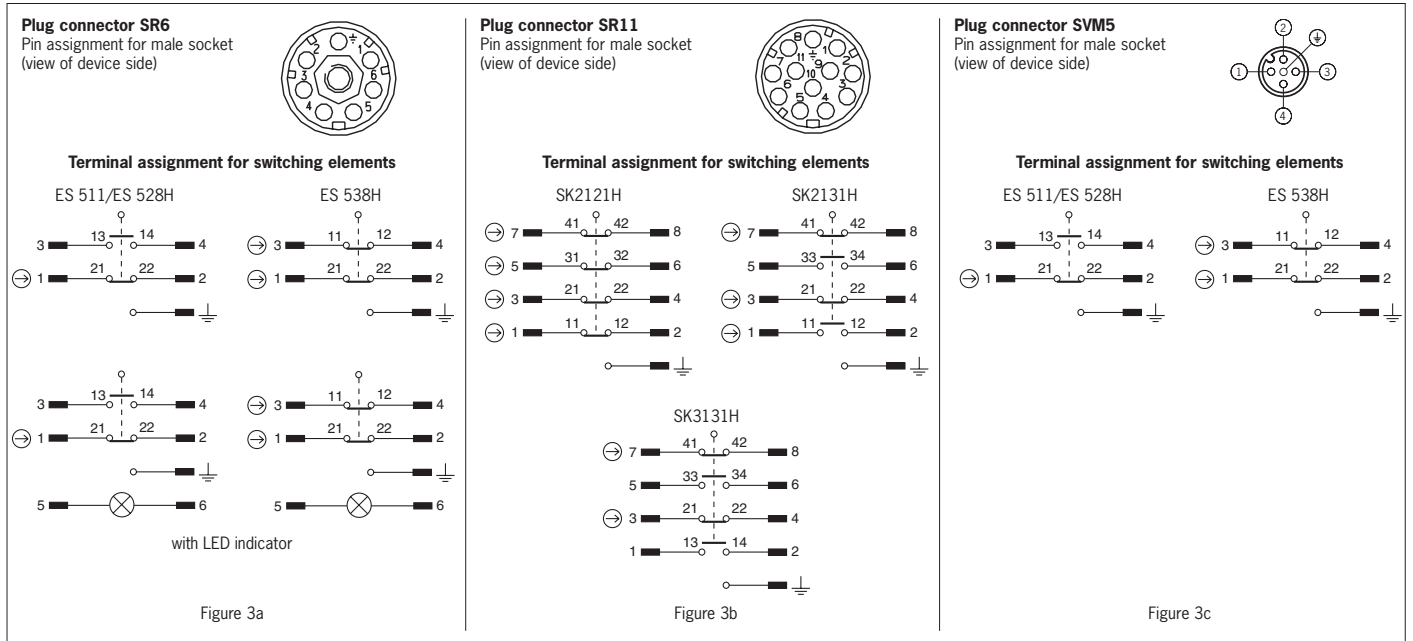


Figure 3: Switching elements and connector assignment

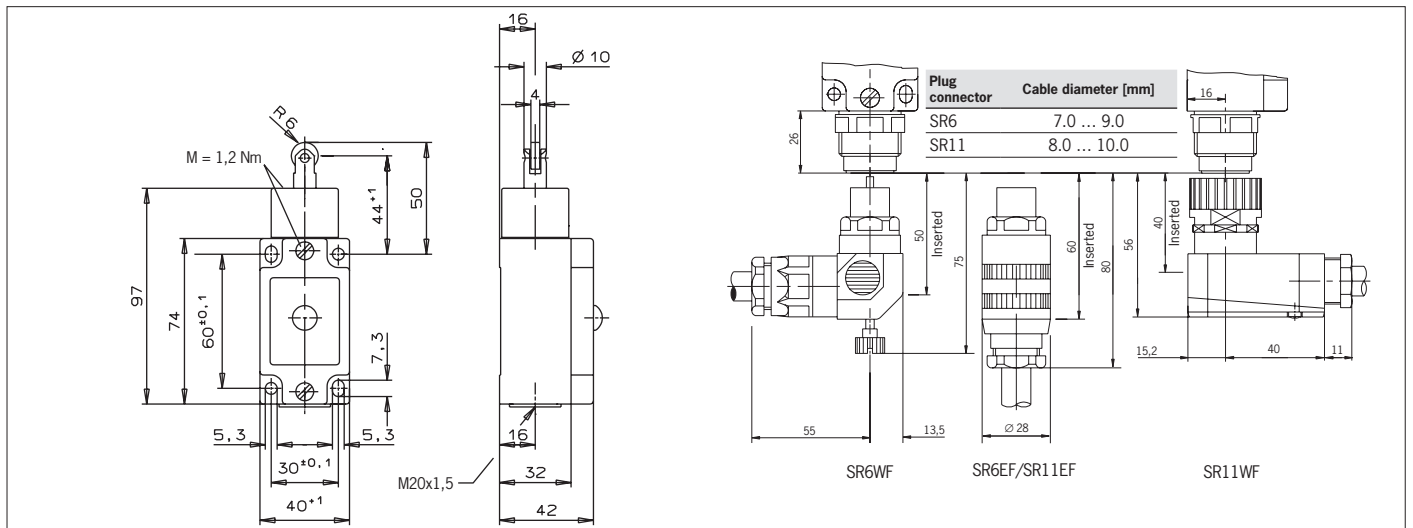


Figure 4: Dimension drawing of NZ1... with cable entry and NZ2... with plug connector