

Correct use

Safety switches series NZ.VZ-...VS are interlocking devices with guard locking solenoid for process protection (type 2) without guard locking monitoring. The actuator has a low coding level. In combination with a movable guard and the machine control, this safety component prevents dangerous machine functions from occurring while the guard is open. A stop command is triggered if the guard is opened during the dangerous machine function.

This means:

- ▶ Starting commands that cause a dangerous machine function must become active only when the guard is closed.
- ▶ Opening the guard triggers a stop command.
- ▶ Closing a 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 are suitable only for process protection.

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
- ▶ EN ISO 12100
- ▶ IEC 62061

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

- ▶ EN ISO 13849-1
- ▶ EN ISO 14119
- ▶ EN 60204-1

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 personnel 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.
- ▶ The switching operation must be triggered only by actuators designated for this purpose.
- ▶ Prevent bypassing by means of replacement actuators. For this purpose, restrict access to actuators and to keys for releases, for example.
- ▶ Mounting, electrical connection and setup only by authorized personnel possessing special knowledge about handling safety components.

⚠ CAUTION

Danger due to high housing temperature.

- ▶ Protect switch against touching by personnel or contact with flammable material.

Function

The safety switch permits the locking of movable guards for process protection.

The switch contains a rotating switching disk and a locking arm that block/release the guard locking pin.

The guard locking pin is moved on the insertion/removal of the actuator and on the activation/release of the guard locking. During this process the switching contacts are actuated.

If the guard locking pin is blocked (guard locking active), the actuator cannot be pulled out of the switch head. For design reasons, guard locking can be activated only when the guard is closed (prevention of inadvertent locking position (faulty closure protection)).

The safety switch is designed so that fault exclusions for internal faults in accordance with EN ISO 13849-2:2013, Table A4, can be assumed.

Version VSM

(guard locking actuated by spring force and released by power-ON)

- ▶ Activating guard locking: close guard; no voltage at the solenoid
- ▶ Releasing guard locking: apply voltage to the solenoid

The spring-operated guard locking functions in accordance with the closed-circuit current principle. If the voltage is interrupted at the solenoid, the guard locking remains active and the guard cannot be opened directly.

If the guard is open when the power supply is interrupted and is then closed, guard locking is activated. This can lead to persons being locked in unintentionally.

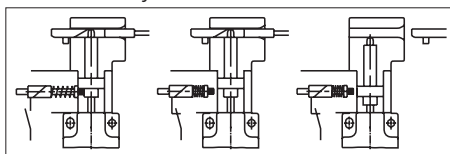


Fig. 1: Locking method VSM

Version VSH

(guard locking actuated by spring force and released by manual release)

Important!

- ▶ This type may be used only in special cases after strict assessment of the accident risk!
- ▶ The guard can be opened immediately on pressing the manual release!

The guard locking is held in position by spring force and released by pressing the manual release. The guard locking is independent of the power supply.

Version VSE

(guard locking actuated by power-ON and released by spring force)

- ▶ Activating guard locking: apply voltage to the solenoid
- ▶ Releasing guard locking: disconnect voltage from the solenoid

The magnetically actuated guard locking operates in accordance with the open-circuit current principle. If the voltage at the solenoid is interrupted, the guard locking is released and the guard can be opened directly!

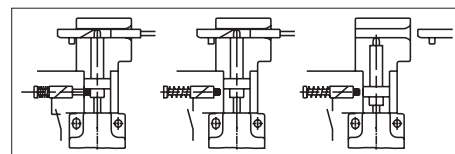


Fig. 2: Locking method VSE

Switching states

The detailed switching states for your switch can be found in Fig. 4. All available switching elements are described there.

Guard open

VSM, VSH and VSE:

The safety contacts ⊖ are open.

Guard closed and not locked

VSM, VSH and VSE:

The safety contacts ⊖ are closed.

Guard closed and locked

VSM, VSH and VSE:

The safety contacts ⊖ are closed.

Selection of the actuator

NOTICE

Damage to the device due to unsuitable actuator. Make sure to select the correct actuator.

Additionally pay attention to the door radius and the mounting options (see Fig. 10).

Manual release

Some situations require the guard locking to be released manually (e.g. malfunctions or an emergency). A function test should be performed after release.

More information on this topic can be found in the standard EN ISO 14119:2013, section 5.7.5.1. The device can feature the following release functions:

Manual release with automatic return

This permits opening of a locked guard from outside the danger zone without tools.

Important!

- ▶ It must be possible to operate the manual release manually from outside the protected area without tools.
- ▶ The manual release must possess a marking indicating that it may be used only in an emergency.
- ▶ The actuator must not be under tensile stress during manual release.

Actuating the manual release does not affect the switching contacts.

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 mounting 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, as well as penetrating foreign objects such as swarf, sand and blasting shot, etc.
 - ▶ The specified IP degree of protection is applicable only if the housing screws, cable entries and plug connectors are properly tightened. Observe the tightening torques.

Changing the actuating direction

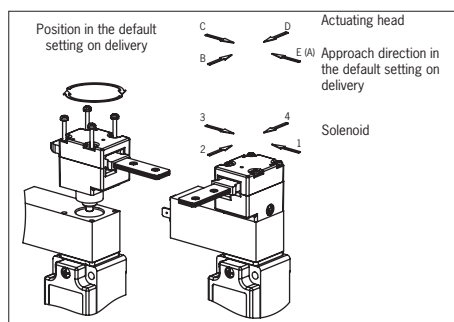


Fig. 3: Changing the actuating direction and the locking solenoid

1. Insert the actuator into the actuating head.
2. Remove the screws from the actuating head.
3. Set the required direction.
4. Tighten the screws with a torque of 1.2 Nm.
5. Cover the unused actuating slot with the enclosed slot cover.

VSM and VSE:

- ▶ Prior to making changes to the locking solenoid the actuator must be inserted.

VSH:

- ▶ The manual release must not be pressed during the change.

Electrical connection

⚠ WARNING

Loss of the safety function due to incorrect connection.

- ▶ Use only safe contacts ⊖ for safety functions.
- ▶ When choosing the insulation material and wires for the connections, pay attention to the required temperature resistance and the max. mechanical load!
- ▶ Strip the insulation from the ends of the individual wires over a length of 6^{+1} mm to ensure a safe contact.

Use of the safety switch as guard locking for process protection

At least one contact ⊖ must be used (see Fig. 4 for terminal assignment).

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 (for terminal assignment, see Fig. 4).
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 zone.
- ▶ 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 actuator must slide easily into the actuating head. Close the guard several times to check the function. The function of any manual releases (except for the auxiliary release) must also be tested.

Electrical function test

1. Switch on operating voltage.
2. Close all guards and activate guard locking.
 - ➔ The machine must not start automatically.
 - ➔ It must not be possible to open the guard.
3. Start the machine function.
 - ➔ It must not be possible to release guard locking as long as the dangerous machine function is active.
4. Stop the machine function and release guard locking.
 - ➔ The guard must remain locked until the process is no longer at risk.
 - ➔ It must not be possible to start the machine function as long as guard locking is released.

Repeat steps 2 - 4 for each 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 and actuator assembly 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.

Info: The year of manufacture can be seen in the bottom, right corner of the type label.

Exclusion of liability and warranty

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

Notes about US

The following information applies to devices with cable entry:

For use and application as per the requirements of a copper wire for the temperature range 60/75 °C must be used.

The following information applies to devices with plug connector:

This device is intended to be used and applied with a Class 2 power source in accordance with UL1310. Connecting 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 that 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 that possess an identical or higher dielectric strength compared to the other relevant parts of the system.

EU declaration of conformity

The declaration of conformity is part of the operating instructions, and it is included as a separate sheet with the device.

The original EU declaration of conformity can also be found at: www.euchner.com

Service

If servicing is required, please contact: EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen

Service telephone:

+49 711 7597-500

E-mail:

support@euchner.de

Internet:

www.euchner.com

Technical data

Parameter	Value
Housing material	Anodized die-cast alloy
Weight	Approx. 0.75 kg
Degree of protection	IP65
Mechanical life	2 x 10 ⁶ operating cycles
Ambient temperature	-25 ... +80 °C
Degree of contamination (external, acc. to EN 60947-1)	3 (industrial)
Installation orientation	Any
Approach speed, max.	20 m/min
Approach speed, min.	0.02 m/min (NZ.VZ-511...)
Extraction force (not locked)	40 N
Retention force	35 N
Actuating force at 20 °C (not locked)	45 N
Actuation frequency	7000/h
Switching principle of switching elements	
511	Snap-action switching contact
528, 538, 2121, 2131, 3131	Slow-action switching contact
Contact material	Silver alloy, gold flashed
Connection	
NZ1VZ...	Cable entry M20 x 1.5
NZ2VZ...	Plug connector
Conductor cross-section (flexible/rigid)	
NZ1VZ...	0.34 ... 1.5 mm ²
Z1VZ...L (with indicator LED)	max. 0.75 mm ²
Conductor cross-section of mating connector	
SR6 (NZ2VZ-5...)	0.5 ... 1.5 mm ²
SR11 (NZ2VZ-2.../NZ2VZ-3...)	0.5 mm ²

Indicator LED (only with switching element 511, 528, 538)	
L060	AC/DC 12...60 V
L110	AC 110 V (±15 %)
L220	AC 230 V (±15 %)
Rated insulation voltage	
NZ1VZ-.../NZ2VZ-5-...	$U_i = 250$ V
NZ2VZ-2-.../NZ2VZ-3-...	$U_i = 50$ V
Rated impulse withstand voltage	
NZ1VZ-.../NZ2VZ-5-...	$U_{imp} = 2.5$ kV
NZ2VZ-2-.../NZ2VZ-3-...	$U_{imp} = 1.5$ kV
Conditional short-circuit current	100 A
Switching voltage, min., at 10 mA	12 V
Utilization category acc. to EN 60947-5-1	
NZ.VZ-511...	AC-15 6 A 230 V / DC-13 6 A 24 V
NZ1VZ-.../NZ2VZ-5-...	AC-15 4 A 230 V / DC-13 4 A 24 V
NZ2VZ-2-.../NZ2VZ-3-...	AC-15 4 A 50 V / DC-13 4 A 24 V
Switching current, min., at 24 V	
NZ.VZ-511...	10 mA
NZ.VZ-...	1 mA
Short circuit protection (control circuit fuse) acc. to IEC 60269-1	
Convent. thermal current I_{th}	4 A
Solenoid operating voltage/solenoid power consumption	
VSE03/VSM03	DC 19V/AC 24V (+10%/-15%) 8 W
VSE04/VSM04	DC 24V (+10%/-15%) 8 W
VSE05/VSM05	DC 41V/AC 48V (+10%/-15%) 8 W
VSE06/VSM06	DC 48V (+10%/-15%) 8 W
VSE07/VSM07	DC 97V/AC 110V (+10%/-15%) 8 W
VSE09/VSM09	DC 196V/AC 230V (+10%/-15%) 10 W
Duty cycle	100 %
Plug connector for solenoid locking	
DC	Order no. 028345
AC	Order no. 028338
Locking force F_{max} (in locked position)	
	$F_s = 2000$ N
Locking force F_{Zh} acc. to EN ISO 14119	
	$(F_{Zh} = \frac{F_{max}}{1.3}) = 1500$ N
Limitations at ambient temperature above +70 ... +80 °C	
Utilization category	
NZ2VZ-5-...	AC-15 2 A 230 V / DC-13 2 A 24 V
NZ2VZ-2-.../NZ2VZ-3-...	AC-15 2 A 50 V / DC-13 2 A 24 V
Short circuit protection (control circuit fuse) acc. to IEC 60269-1	
Convent. thermal current I_{th}	2 A
Reliability values acc. to EN ISO 13849-1 depending on the switching current at 24 V DC	
	At DC-13 100 mA/24 V ≤ 0.1 A
	ES511 -
B_{10D}	ES528H/ES538H 4.5×10^6
	SK2121H/SK2131H/SK3131H 4.5×10^6

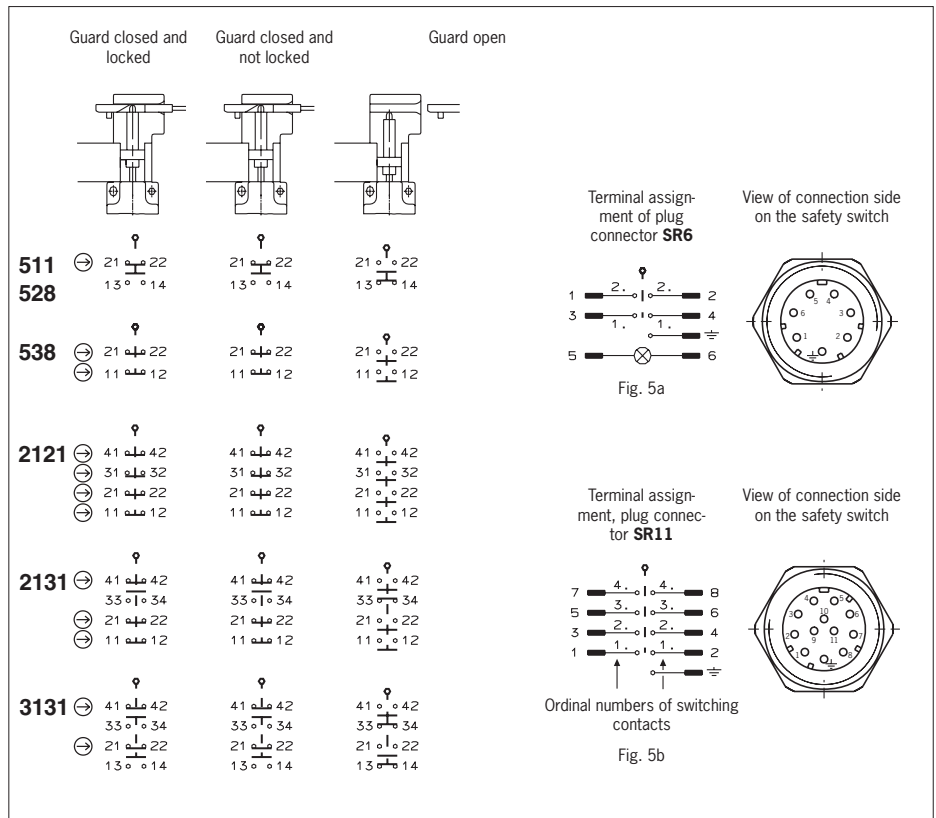


Fig. 4: Switching elements with switching functions and connector assignment

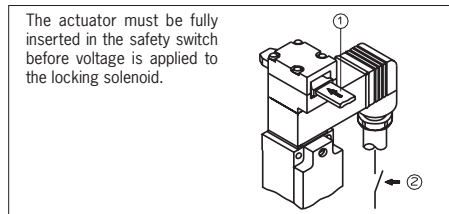


Fig. 5: Safety switch series NZ.VZ-...VS.

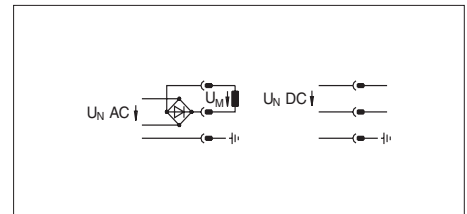


Fig. 6: Plug connector for solenoid locking

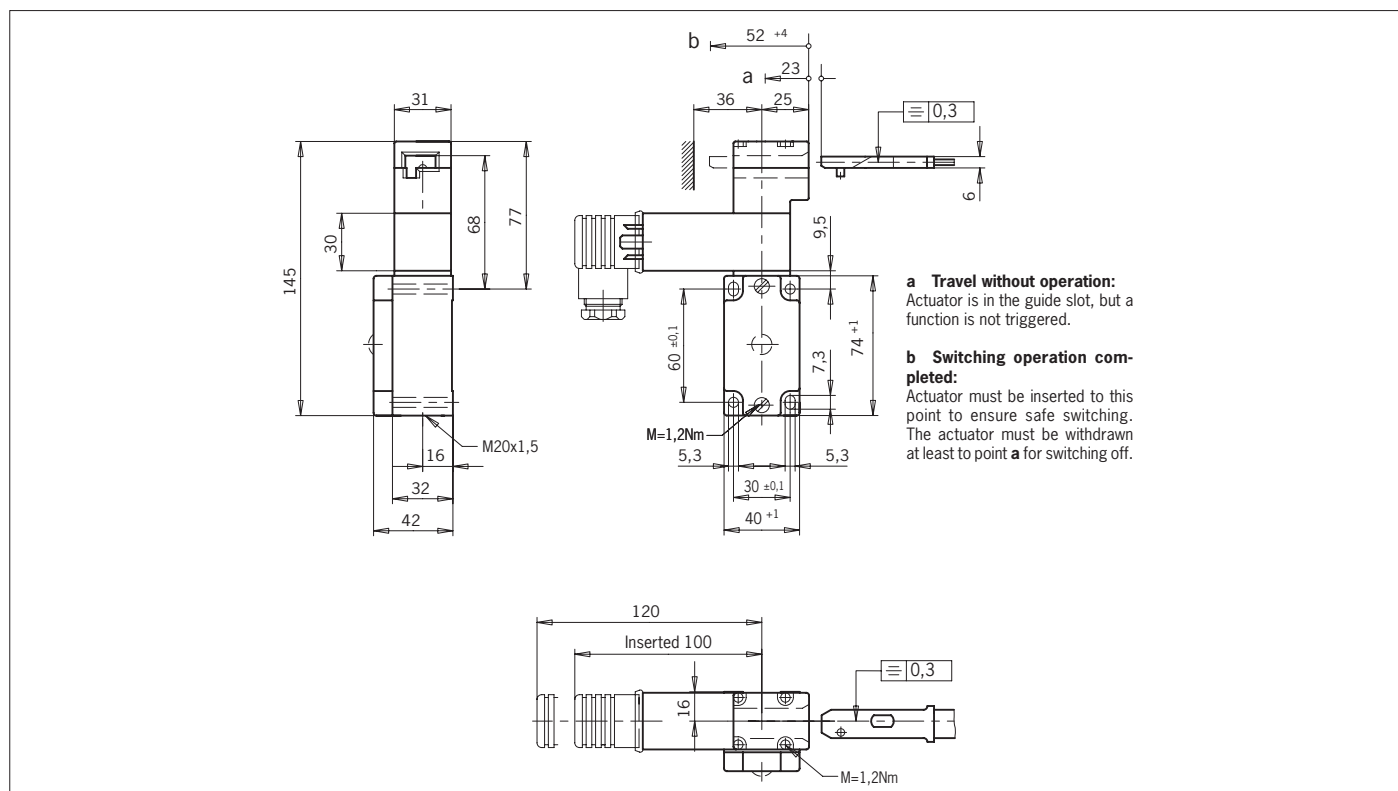


Fig. 7: Dimension drawing for NZ1VZ...VSM/VSE with cable entry

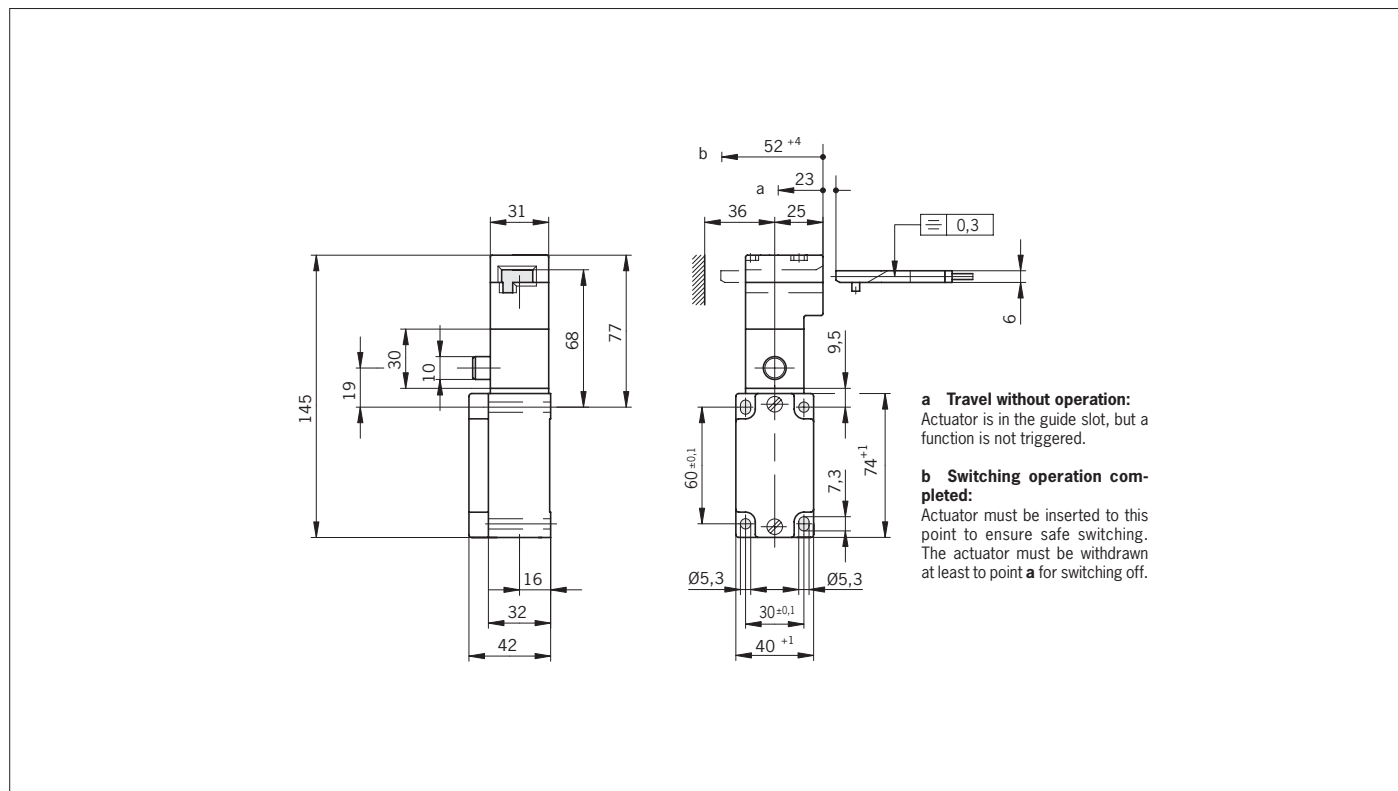


Fig. 8: Dimension drawing for NZ1VZ...VSH with cable entry

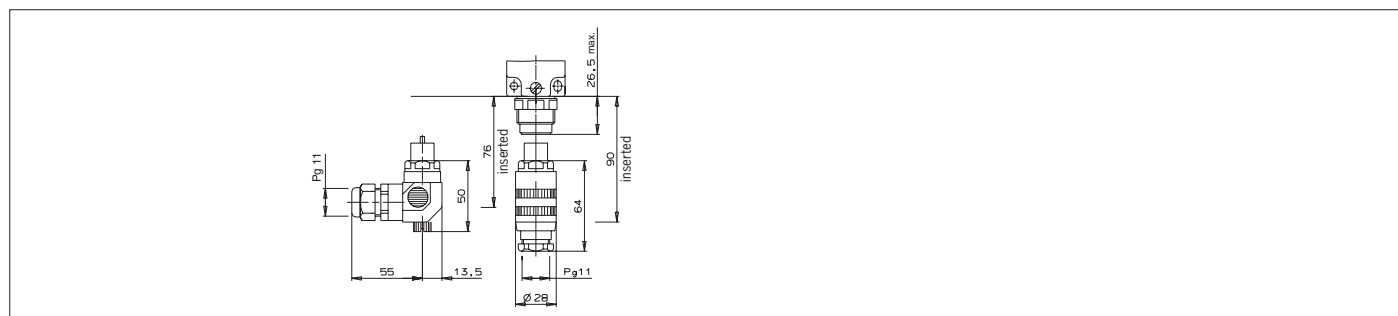


Fig. 9: Dimension drawing for NZ2VZ-5... with plug connector SR6

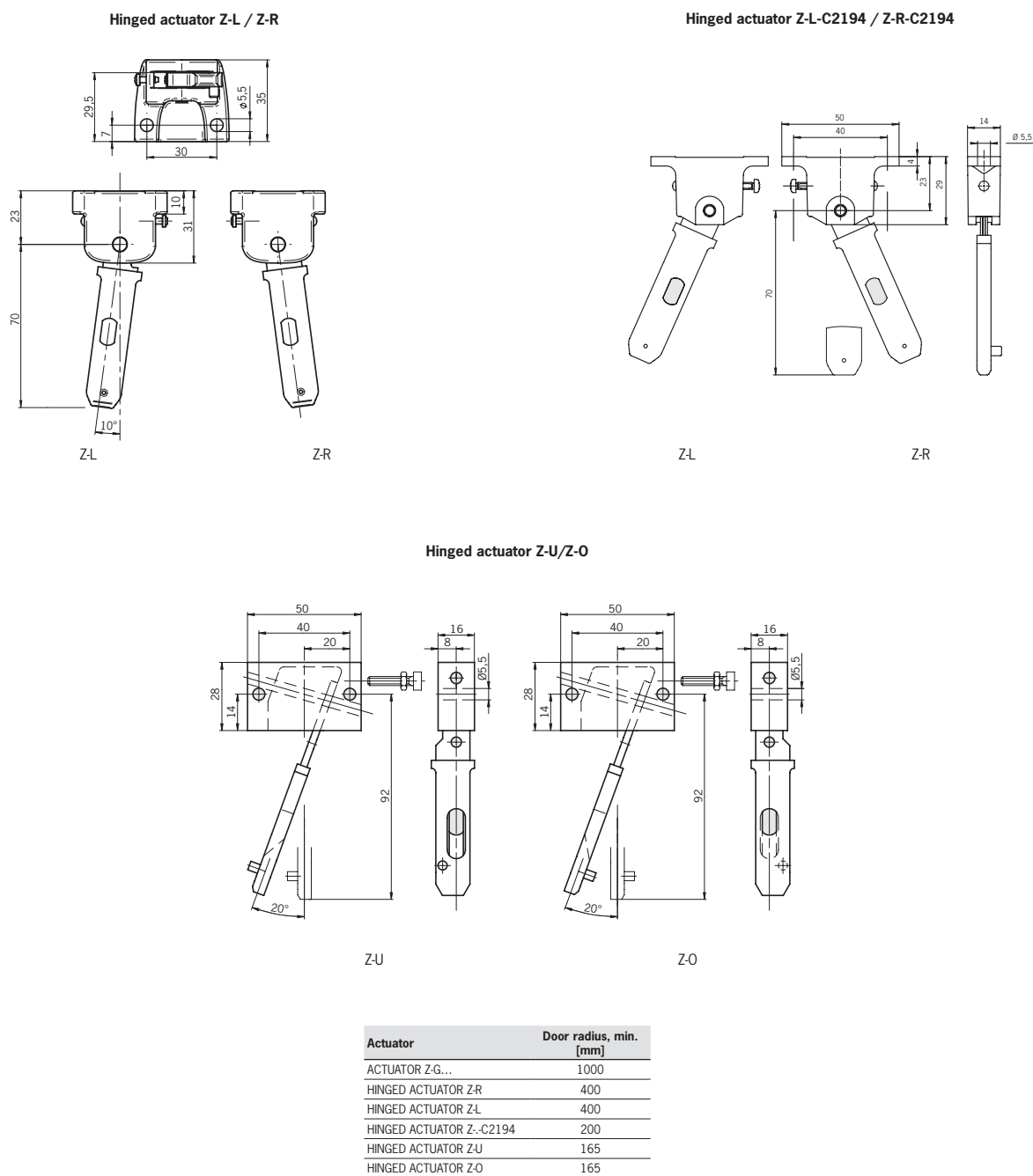


Fig. 10: Minimum door radii