

Safety Switches

NZ/TZ



More than safety.



EUCHNER

More than safety.



Emil Euchner, the company's founder and inventor of the multiple limit switch, circa 1928.



Around the world – the Swabian specialists in motion sequence control for mechanical and systems engineering.

EUCHNER's history began in 1940 with the establishment of an engineering office by Emil Euchner. Since that time, EUCHNER has been involved in the design and development of switchgear for controlling a wide variety of motion sequences in mechanical and systems engineering. In 1953, Emil Euchner founded EUCHNER + Co., a milestone in the company's history. In 1952, he developed the first multiple limit switch – to this day a symbol of the enterprising spirit of this family-owned company.

Automation – Safety – ManMachine

Today, our products range from electromechanical and electronic components to complex system solutions. With this wide range of products we can provide the necessary technologies to offer the right solution for special requirements – regardless of whether these relate to reliable and precise positioning or to components and systems for safety engineering in the automation sector.

EUCHNER products are sold through a world-wide sales network of competent partners. With our closeness to the customer and the guarantee of reliable solutions throughout the globe, we enjoy the confidence of customers all over the world.

Quality, reliability, precision

Quality, reliability and precision are the hallmarks of our corporate philosophy. They represent concepts and values to which we feel totally committed.

At EUCHNER, quality means that all our employees take personal responsibility for the company as a whole and, in particular, for their own field of work. This individual commitment to perfection results in products which are ideally tailored to the customers' needs and the requirements of the market. After all: our customers and their needs are the focus of all our efforts. Through efficient and effective use of resources, the promotion of personal initiative and courage in finding unusual solutions to the benefit of our customers, we ensure a high level of customer satisfaction. We familiarize ourselves with their needs, requirements and products and we learn from the experiences of our customers' own customers.

EUCHNER – More than safety.



Quality – made by EUCHNER

Safety Switches NZ/TZ

General

About this catalog	4
How can I find the right switch?	4
Standards and approvals	5
Function and technology used in safety switches	5
Attaching safety switches	8
Overview of the switching elements	11

Safety Switches with Safety Function, Metal Housing

Single hole fixing limit switches N1A and NB01	13
Position switches NZ	21

Safety Switches with Separate Actuator, Metal Housing

Safety switches NZ.VZ without guard locking	41
Safety switches NZ.VZ.VS with guard locking	47
Safety switches TZ with guard locking and guard locking monitoring	55

Accessories for Safety Switches

Actuators	76
Plug connectors	78
Other accessories	82

Technical Data

87

Appendix

Safety and mounting instructions	103
Overview of the most important standards on machinery safety	104
Glossary	107

Item Index

Index by item designation	113
Index by order numbers	118

Product Catalog








125

About this catalog

The *Safety Switches NZ/TZ* catalog gives you an overview of our series NZ and TZ safety switches with metal housing. For numerous applications these switches are the right choice due to their robustness and long service life. You will find the technical data after the product overview. On the pages listing the products there is a reference to the page with the related technical data.

At the front of the catalog you will find useful information on the topic of safety switches. We have prepared an overview of the standards and a glossary on this topic in the appendix. You will also find important safety instructions in the appendix.

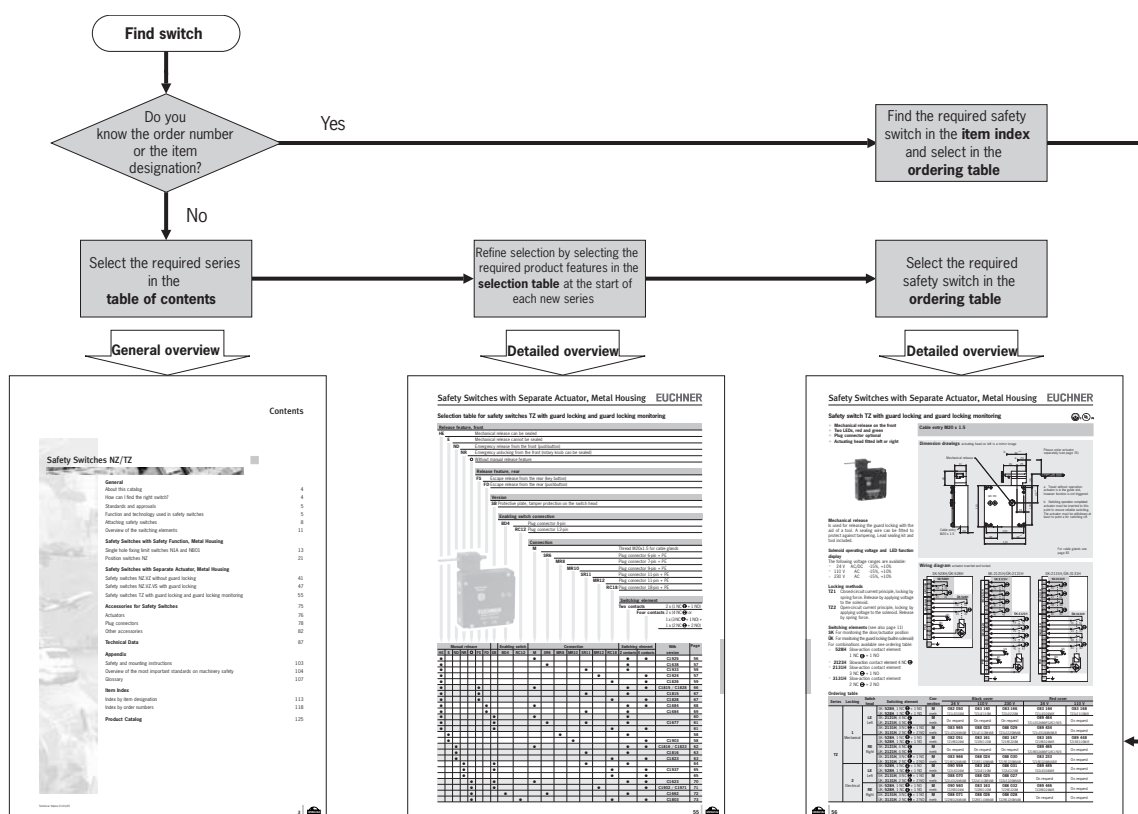
You will find the following series and accessories in this catalog:

Safety switches in metal housing						
With safety function		With separate actuator			Accessories	
Precision single limit switches	Position switches	Without guard locking	With guard locking	With guard locking and guard locking monitoring		
N1A  see page 13	NB01  see page 13	NZ  see page 21	NZ.VZ  see page 41	NZ.VZ.VS  see page 47	TZ  see page 55	 see page 75

How can I find the right switch?

There are two ways you can find the right switch:

- 1 If you know the order number or the product designation, look for the switch directly in the item index (see page 113 or page 118).
- 2 If you have specific requirements, refine the selection step-by-step with the aid of the table of contents and the selection tables.



Standards and approvals

Standards

Safety switches must meet the requirements for safety components as per the Machinery directive. The Machinery directive has been implemented in national law in the EU member states and, as a result, is binding for all manufacturers.

Detailed requirements for the switches are defined in EN 60947 Part 5-1 (Specification for low-voltage switchgear and controlgear. Part 5-1: Control circuit devices and switching elements. Electromechanical control circuit devices).

If the requirements of this standard are met, conformity with the applicable laws and therefore with the Machinery directive is assumed. EUCHNER safety switches comply with the relevant standards for safety switchgear and therefore help you to comply with safety requirements during the design of your machinery.



Approvals

To demonstrate conformity, the Machinery directive also includes the possibility of type examination. Although all relevant standards are taken into account during development, we have all our safety switches subjected to additional type examinations by a notified body.

Many of the safety switches listed in this catalog have been tested by an employers' liability insurance association and are given in the lists from the BG.

Furthermore, numerous switches are listed by Underwriters Laboratories (UL). These switches can be used in countries in which this listing is required. The approval symbols on the individual pages of the catalog indicate which body tested the switches.

With the aid of the approval symbols listed below you can quickly see which approvals are available for the related switches:

	<p>Switches with this symbol are approved by an employers' liability insurance association</p>
	<p>Switches with this symbol are approved by Underwriters Laboratories (UL, Canada and USA)</p>

Safety switches

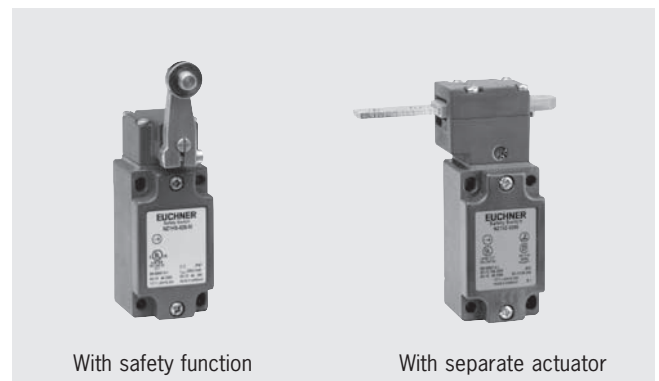
The task of safety switches

Safety switches have the task of preventing the operation of a machine in the case of a potential hazard. This task is defined in EN 1088 (Safety of machinery. Interlocking devices associated with guards. Principles for design and selection). For this purpose the safety circuit must be opened by the safety switch. Safety switches are therefore key elements of an interlocking device.

In this context an interlocking device is, for example, the interruption of machine operation if the safety door is open – the stop state of the machine is "interlocked" so to speak and unintentional starting is therefore prevented. In relation to movable safety guards this means that if safety doors or safety flaps are open, the machine or system cannot be operated if the machine or system can produce a hazard. For this reason the safety switch for a safety guard must be attached such that a malfunction is excluded. Safety switches must also not be tampered with or bypassed. The most important feature of a safety switch is at least one normally closed contact which is operated positively. The switching contacts are separated by a positively driven mechanism when the safety guard is opened.

Safety switch types

In general, a differentiation is made between safety switches with safety function and safety switches with separate actuator.



EUCHNER has safety switches with safety function and safety switches with separate actuator in its range.

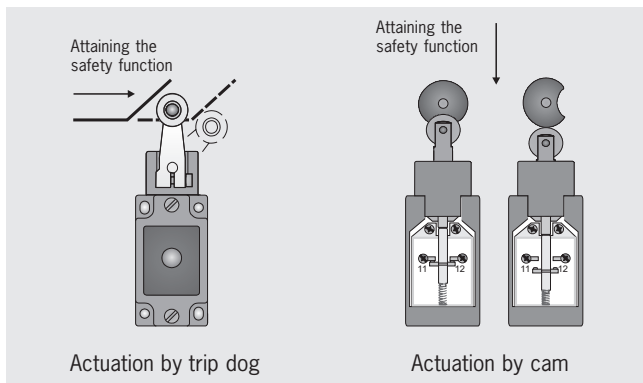
Safety switches with safety function

Safety switches with safety function are safety switches in which the actuating element and the switch are fitted in one housing. The actuating elements are available in various versions (e.g. in the form of a plunger or a lever arm). The switches N1A, NBO1 and NZ listed in this catalog are safety switches with safety function.

To actuate a switch with safety function, trip dogs or cams are often used.

The switch must be attached such that the switch is actuated if the safety guard is opened. The positively driven contact in the switching element is then opened and the machine is shut down. A built-in spring returns the switch to the free position when the safety guard is closed and the positively driven contact is closed. In this way the safety circuit is enabled again.

A trip dog with a defined slope should be used to approach the switch. EUCHNER has various trip dogs in its range.

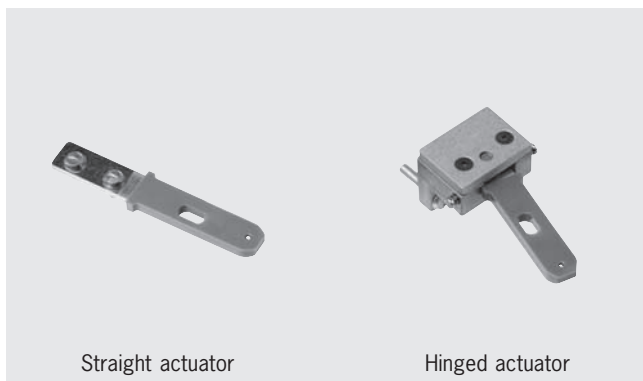


Safety switches with separate actuator

On safety switches with separate actuator, the actuating element is separate to the switch and is attached to the moving part of the safety guard to be monitored. The actuating elements are available in various versions to suit the safety guard that is to be monitored. This catalog contains series NZ.VZ, NZ.VZ.VS and TZ switches that are used in combination with separate actuating elements. The function of these switches is, apart from the actuating element, identical to the switches with safety function.

Actuating elements for switches with separate actuator

The safety switches NZ.VZ, NZ.VZ.VS and TZ can only be actuated using a special actuating element with multiple coding. The coding is a type of lock and key principle. This means that the safety switch can only be actuated using an actuating element of a specific shape. Unlike a conventional key, the actuating elements for switch series are always the same shape.



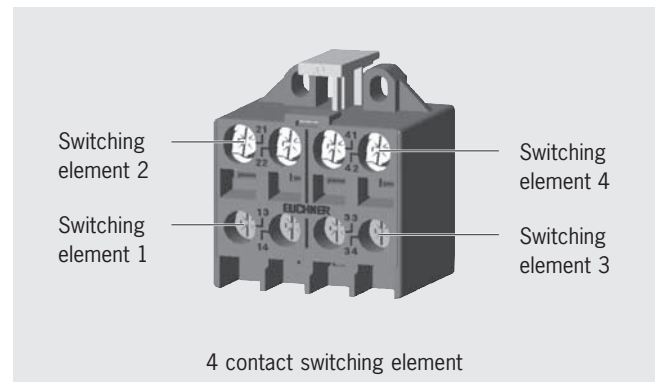
The switching element is closed by inserting the actuating element in the switch head. The positively driven contact is reliably opened by the positive application of force when the actuating element is removed – even if the contacts are welded together. In the open state the machinery or systems are then safely interlocked against starting. The actuators for the series NZ.VZ and TZ comprise a laminated spring steel core encapsulated in an abrasion-resistant plastic. As the spring steel core comprises three layers, complete fracture on overloading is unlikely. Straight actuators and hinged actuators are available for a wide range of applications in which hinged and sliding doors are used. Hinged actuators are spring-mounted actuators that adjust to the inner contours of the switch on insertion in the actuating head. They are suitable for small hinged doors with a radius from 165 mm. For sliding doors and hinged doors with an adequately large pivoting radius (> 1000 mm) a straight actuator can be used.

If increased play is required when the door is closed, an actuator with overtravel is available. With this actuator the door can move slightly in the actuating direction when closed. This is important, e.g., if safety doors have a rubber end stop. Using an actuator with overtravel, the continuous pressure from the compressed rubber can be reduced. In this way the load is reduced on the switch head and the door mechanism.

Switching elements

Different switching elements are available for the safety switches offered in the catalog:

- ▶ 1 contact switching elements
- ▶ 2 contact switching elements with two independent switching elements
- ▶ 4 contact switching elements with four independent switching elements

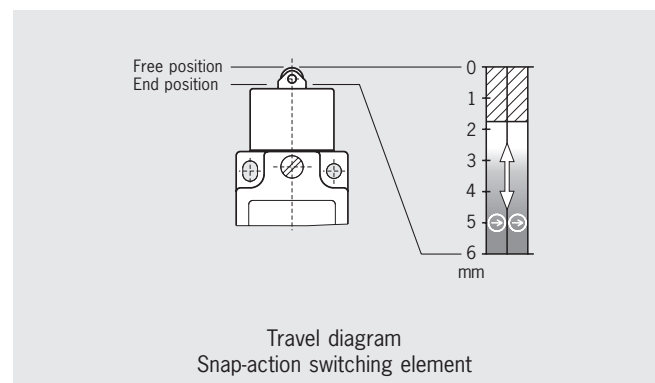


Only one switching element is fitted to series N1A, NB and NZ safety switches. Two switching elements are fitted to all series TZ safety switches. In this case one of the switching elements is used to monitor the door position (SK) and the other is used to monitor the position of the interlocking solenoids (ÜK). Switching elements are divided into two types as a function of their switching behavior:

- ▶ Slow-action switching elements and
- ▶ Snap-action switching elements

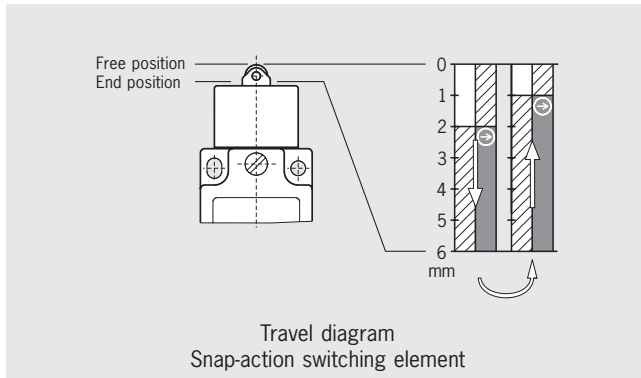
Slow-action switching element

Slow-action switching elements are mostly used in safety switches. The opening of the switching element is directly dependent on the position of the actuator. The further the actuator is moved, the further the switching element is opened. The actuator travel is therefore directly proportional to the travel covered by the switching contact in the switching element. From the travel diagrams it can be seen at which point the switching element changes from the closed state to the open state.



Snap-action switching element

On snap-action switching elements, the change from the completely closed state to the completely open state is made at a defined point. As a result the switching point is at a defined position unlike on slow-action contact elements. Snap-action switching elements typically have a switching hysteresis.



Positively driven contacts

Positively driven contacts are used in the switching elements. These are special switching elements that are designed to ensure that the switching contacts are always reliably separated. Even if contacts are welded together, the connection is opened by the actuating force.

It is a common feature of all switching elements that at least one switching element is designed as a positively driven contact. Often two positively driven contacts are employed to increase safety using the principle of duplicated design (redundancy). This dual-channel design ensures that on the failure of one channel or on a fault in the control circuit (e.g. in the machine wiring), the interlocking can still be provided with the aid of the second channel.

Door auxiliary contacts

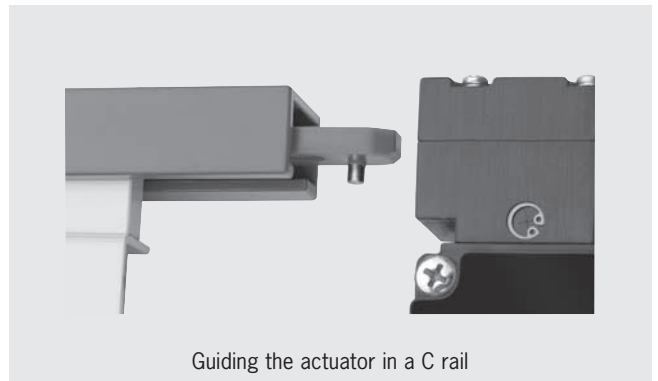
In addition, door auxiliary contacts are also required to indicate to the control system that the safety guard is open. As these switching elements do not have any safety function, either normally closed or normally open contacts can be used.

Protection against tampering

A safety switch can only ensure that operation is free of hazards if it is not bypassed. To prevent tampering on switches with separate actuator, the actuator should be positively mounted on the safety guard. All actuating elements are supplied with safety screws that can be fastened using commonly available tools, but that can only be undone with extreme difficulty. It should be ensured that the screws cannot be undone with simple tools.

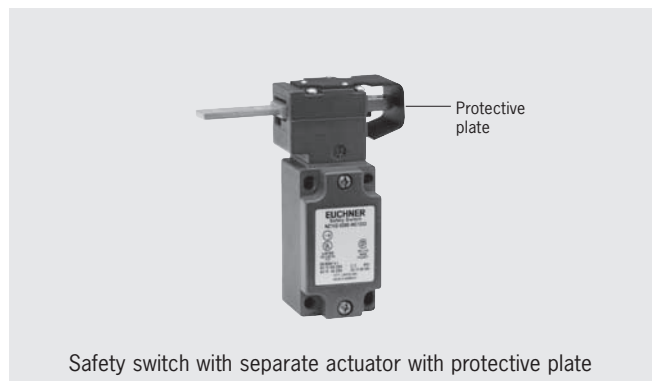
Increased protection against bypassing can be achieved by using a covered installation. In this way it can be made more difficult to insert replacement actuators, or this action can be prevented. Suitable for this purpose, for instance, are rear wall mounting or guiding the actuator in a C rail.

Switches with safety function can be installed covered so that the actuating element cannot be reached.



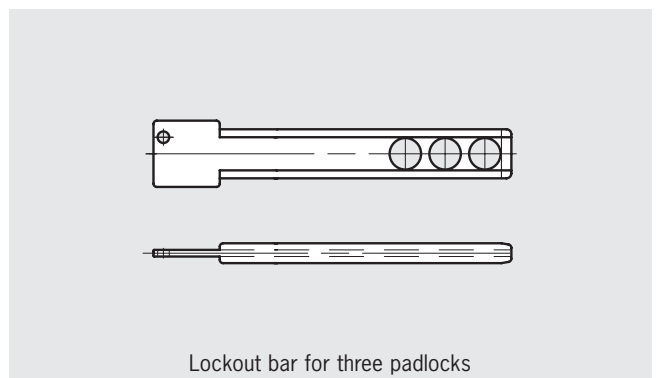
Protective plate

On switches with separate actuator, increased protection against bypassing can be achieved by using a protective plate over the switch head. The switch head's rearward opening is then rendered almost inaccessible.



Lockout bar

To prevent the unintentional closing of a safety guard, lockout bars are available for switches with separate actuator. The lockout bar is inserted in the safety switch instead of the actuator when the safety guard is open. The lockout bar can then be secured with commercially available padlocks (up to five locks) to protect against removal.



This feature guarantees protection for anyone (e.g. maintenance or service personnel, or cleaning staff) who needs to enter potentially hazardous areas. The switches cannot signal a safe (closed) state with a lockout bar fitted. As a result unintentional starting of the machine is not possible.

Guard locking

Safety switches with separate actuator are available both with and without guard locking. Guard locking is a feature that prevents the unintentional opening of a door as long as there is a hazard. The door is locked by preventing the removal of the actuator from the safety switch. The series NZ.VZ.VS and TZ listed in this catalog are safety switches with separate actuator with guard locking.



Protection of personnel

Guard locking is required if a hazard cannot be removed immediately by shutting down a machine (e.g. a movement with overtravel). In this case fail-safe control of the locking solenoid for the guard locking is required. This requirement can, for instance, be achieved by a standstill monitor or a safe delay. The safety switch must also provide a facility for monitoring the position of the solenoid. The series TZ has the guard locking monitoring necessary for this purpose and can therefore be used for the protection of personnel.

Process protection

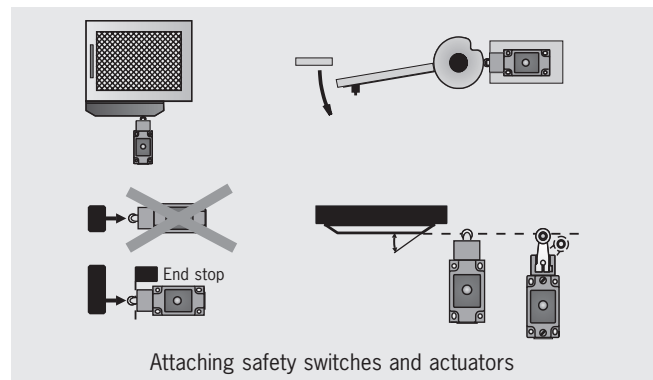
Often a safety guard is only to be locked to prevent interruption to the process due to unintentional opening of the safety guard. In this case the position of the interlocking solenoid does not need to be integrated in the safety circuit. In this situation the series NZ.VZ.VS and TZ safety switches are suitable.

Housing material

The series N1A, NB, NZ and TZ safety switches have a die-cast alloy housing with an anodized surface. Due to the durable housing material and the high degree of protection (up to IP 67), these switches can be used even under the harshest conditions.

Attaching safety switches with safety function, with separate actuator and the actuators

Certain requirements must be met on attaching the safety switches. Any installation position can be used, however, the switches must be attached such that their position cannot be changed in operation. On the other hand, if necessary it must be possible to replace the switches at any time without renewed adjustment. These requirements are achieved by using reliable fixings that can only be undone using tools. To prevent a change to the position, there must also be no movement in the joint (e.g. by using dowel pins).



The same applies to the trip dogs for switches with safety function. A joint without movement is also required here. Above all else, loosening must be prevented. In addition, it must be ensured that cams and trip dogs can only be mounted in the correct position. To prevent tampering, safety screws can also be used for the attachment of safety switches and trip dogs. Often the actuator approach direction does not match the standard alignment of the actuating head as delivered. For this reason, the actuating heads on the safety switches NZ and TZ can be very straightforwardly adjusted to the required direction. In addition, the actuating direction can be adjusted such that the actuator only switches in one direction.

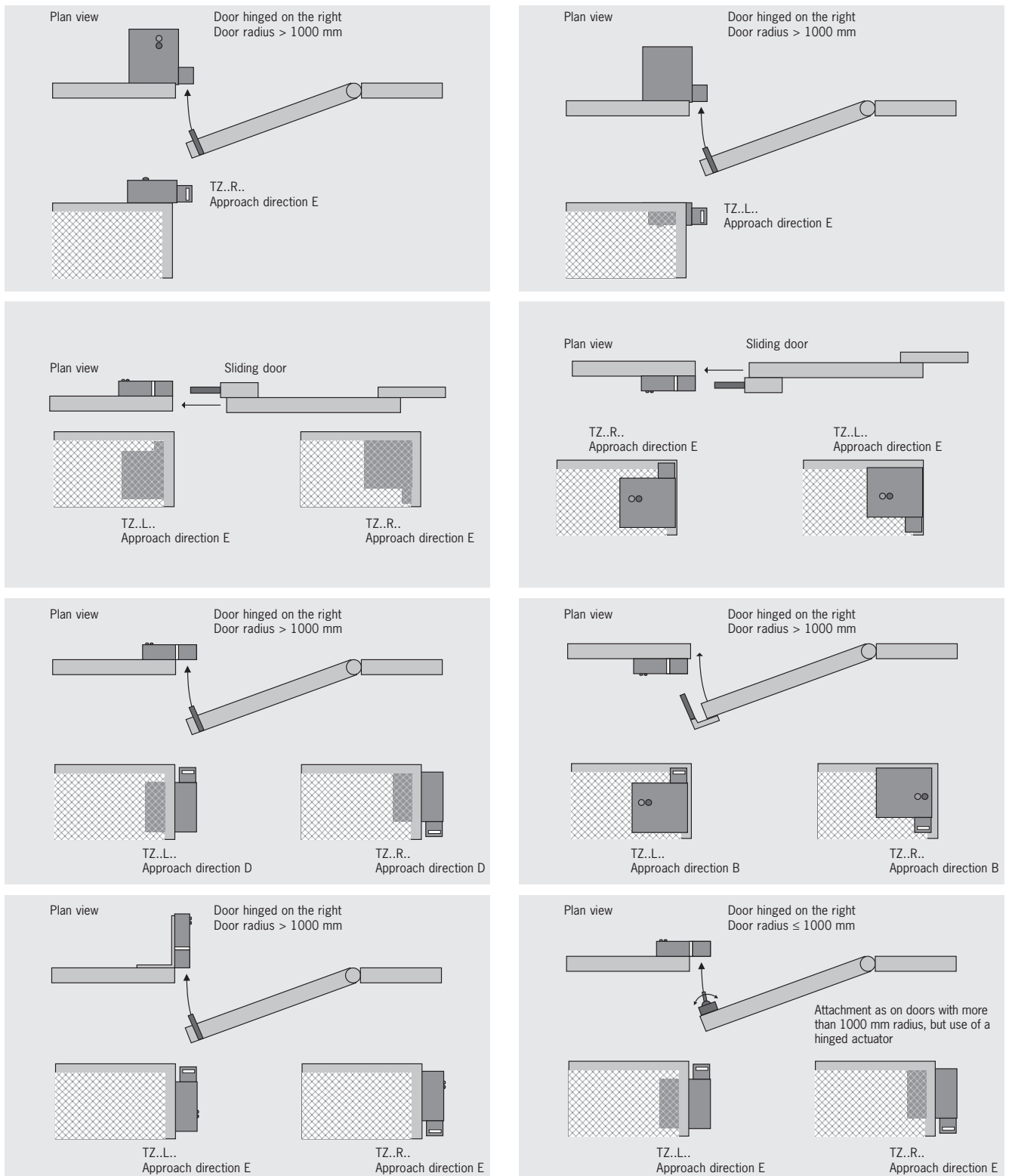
Position Use	Actuation	Left	Not activated	Right	
Active					
Both sides left + right					
State					
Pos.driven contacts					
NO contacts					
One side left					
State					
Pos.driven contacts					
NO contacts					
One side right					
State					
Pos.driven contacts					
NO contacts					

After undoing the four fastening screws, the actuating head can be rotated in 90° steps. If for reasons of protection against tampering, renewed removal of the actuating head is to be prevented, the actuating head can be fastened to the basic housing using safety screws. You will find appropriate fixings in the accessories section of this catalog. Mounting plates are available to ease the attachment of switches with separate actuator and also actuators. Bolts attached to the safety door are extremely helpful. Using bolts all requirements, e.g. the mechanical end stop for the door and the exact guidance of the actuator are optimally met.

Attaching the safety switch TZ

The safety switch TZ can be mounted in a large number of different installation positions. Often the switch is mounted horizontally on the roof of a machine or with a suspended actuating head. The method of attachment depends on whether the switch is to be attached in a protected installation position, for instance to make tampering more difficult, or whether the switch is to be mounted so that it is easily accessible as the escape release must be within reach from inside the system.

The drawings show that the attachment of the actuating head is very heavily dependent on how the switch is mounted. It is not possible to list all methods of attachment here, as the actuator head can be rotated in 90° steps. As a result there are a very large number of different methods of attachment. There is a suitable way of mounting the switch for every application.



Electrical connection

On switches with cable entry there is a large space envelope for making the electrical connection.

Modern wiring concepts increasingly utilize plug-in connections. A switch with plug connectors can be easily replaced during servicing work. This configuration results in short downtimes.

The safety switches NZ and TZ are available with various plug connectors. In addition to the appropriate mating connectors, these connectors are available with pre-assembled cables as accessories.

Switch layout

▶ Locking arm

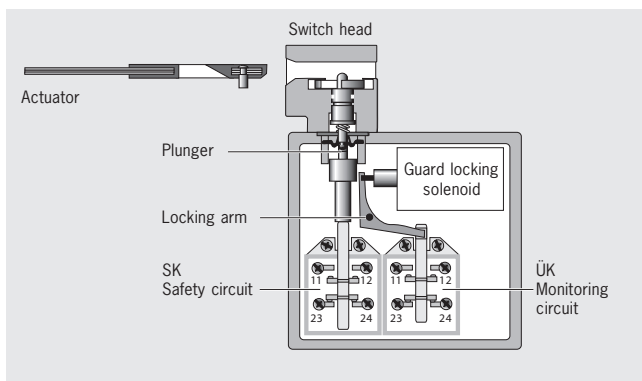
The locking arm ensures that the switch is guard locked by the solenoid. It acts directly on the switching element ÜK; the positively driven contact can only be closed in the locked state (see ◦ *protection against unintentional closing*).

▶ SK

The position of the SK switching element is dependent on the position of the actuator or the safety guard. This situation means that the positively driven contacts on the SK switching element are only closed if the actuator is in the switch head.

▶ ÜK

The position of the ÜK switching element is dependent on the position of the actuator or the safety guard and the position of the solenoid or the guard locking. I.e., both guard locking and positively driven contact on the ÜK switching element can only be closed if the actuator is in the switch head and the interlocking solenoid is controlled correspondingly.

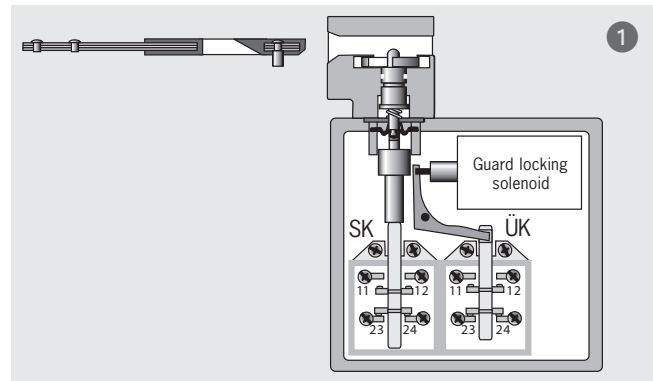


Operating principle

The sectional drawings show the safety switch TZ in its three switch states:

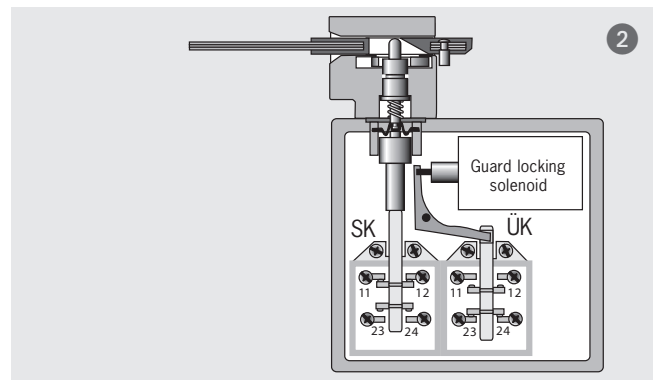
1 Door open and unlocked

In the initial state (actuator removed/safety guard open) all positively driven contacts (SK and ÜK) are open. The related normally open contacts 23-24 are closed and signal the state *open and unlocked*. Unintentional closing of the contacts on switching element ÜK is impossible due to the switch mechanism (see ◦ *protection against unintentional closing*).



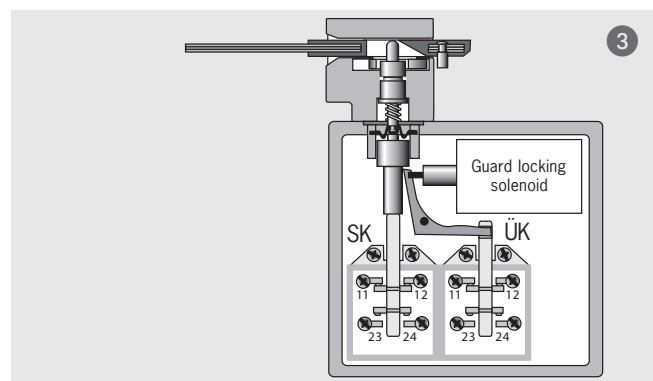
2 Door closed and unlocked

The plunger is released by inserting the actuator into the switch head. The contacts 11-12 on switching element SK are closed, the contacts 23-24 are opened. The contacts 11-12 on the switching element ÜK remain open as before, the door auxiliary contacts 23-24 for switching element ÜK remain closed.



3 Door closed and locked

After the actuator has been inserted, it is possible to activate the switch's guard locking. If the interlocking solenoid is activated, the locking arm locks the plunger and actuates the switching element ÜK. The contacts 11-12 are closed on this switching element. The contacts 11-12 on the switching element SK continue to remain closed. In this position the positively driven contacts 11-12 on the two switching elements SK and ÜK are safely locked, both door auxiliary contacts 23-24 are opened. The actuator and the safety guard are locked. This means that the machine connected to the safety circuit can be started.



Switching elements

The switching elements used in our safety switches have a dedicated numbering system. A selection of switching elements is available depending on the switch type. In the following overview you can see which switching element is covered by the related number.

Please note: safety switching elements are not available as replacement switching elements.

Explanation of symbols and notation

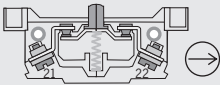

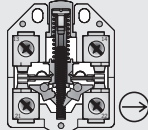
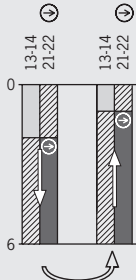
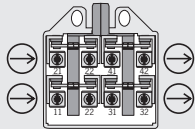
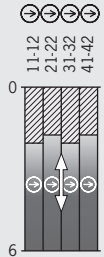
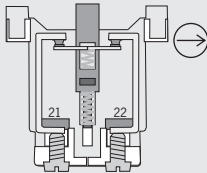
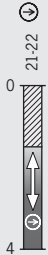
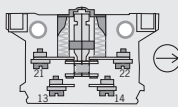
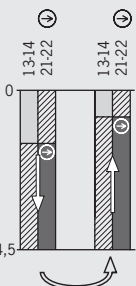
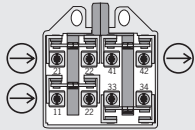
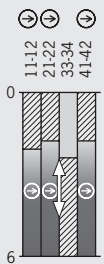
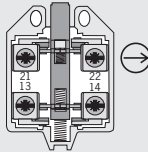

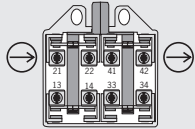
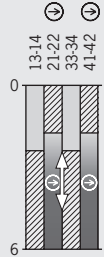
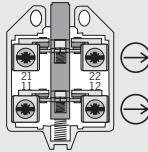

Symbols and specific notation related to the switches or the switching element are used time and again in the catalog. The following example is intended to explain these:

Notation

1 NC ⊕ + 1 NO

Explanation

Normally closed contacts are represented by NC, normally open contacts with NO. The number defines how many contacts are available. The symbol after the NC defines that normally closed contact is a positively driven contact. This switch therefore has one normally closed contact and one normally open contact; the normally closed contact is a positively driven contact.

Switching elements with 1 contact element	Switching elements with 2 contact elements	Switching elements with 4 contact elements
<p>Switching element 508</p> <ul style="list-style-type: none"> ▶ Slow-action switching element ▶ 1 positively driven contact ▶ for series N1A  	<p>Switching element 511</p> <ul style="list-style-type: none"> ▶ Snap-action switching element ▶ 1 positively driven contact + 1 NO contact ▶ for series NZ  	<p>Switching element 2121H</p> <ul style="list-style-type: none"> ▶ Slow-action switching element ▶ 4 positively driven contacts ▶ for series NZ / TZ  
<p>Switching element 588</p> <ul style="list-style-type: none"> ▶ Slow-action contact element ▶ 1 positively driven contact ▶ for series NB01  	<p>Switching element 514</p> <ul style="list-style-type: none"> ▶ Snap-action switching element ▶ 1 positively driven contact + 1 NO contact ▶ for series N1A  	<p>Switching element 2131H</p> <ul style="list-style-type: none"> ▶ Slow-action switching element ▶ 3 positively driven contacts + 1 NO contact ▶ for series NZ / TZ  
<p>Switching element 528H</p> <ul style="list-style-type: none"> ▶ Slow-action switching element ▶ 1 pos.driven contact + 1 NO contact ▶ for series NZ / TZ  	<p>Switching element 3131H</p> <ul style="list-style-type: none"> ▶ Slow-action switching element ▶ 2 positively driven contacts + 2 NO contacts ▶ for series NZ / TZ  	
<p>Switching element 538H</p> <ul style="list-style-type: none"> ▶ Slow-action switching element ▶ 2 positively driven contacts ▶ for series NZ / TZ  		

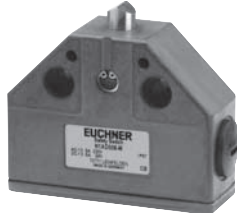
Selection table for single hole fixing limit switches N1A and NB01

Actuating element											
N1AD						Chisel plunger					Approach direction horizontal
	N1AR					Roller plunger with steel roller \varnothing 8 mm					Approach direction horizontal
		N1ARL				Roller plunger with steel roller \varnothing 18 mm					Approach direction horizontal
			N1AW			Domed plunger					Approach direction horizontal and vertical
				NB01D		Chisel plunger					Approach direction horizontal
					NB01R	Roller plunger with steel roller \varnothing 5 mm					Approach direction horizontal
Connection											
						M					Thread M16x1.5 or M12x1.5 for cable glands
							SVM5				M12 plug connector 5-pin
Exterior diaphragm											
								AM			Protection against heavy soiling (dust) and aggressive coolants.
Switching element											
										One contact	1 NC \ominus
										Two contacts	1 NC \ominus + 1 NO

Actuating element						Connection		Diaphragm	Switching element		With version	Page
N1AD	N1AR	N1ARL	N1AW	NB01D	NB01R	M	SVM5	AM	1 contact	2 contacts		
●						●			●	●	C1292 / C1293	14
●						●		●	●	●		15
●							●			●		15
	●					●			●	●	C1293	16
	●					●		●	●	●		17
	●						●			●		17
		●				●			●	●		18
			●			●	●		●	●		19
				●		●			●			20
					●	●			●			20

Single hole fixing limit switch N1AD with chisel plunger

- ▶ Housing according to DIN 43693
- ▶ LED optional
- ▶ Plug connector optional
- ▶ Exterior diaphragm optional



Approach direction



Horizontal
Can be adjusted in 90°-steps.

Exterior diaphragm (optional)

Protection against heavy soiling (dust) and aggressive coolants.

LED function display (optional)

A function display is available for the following voltage ranges:

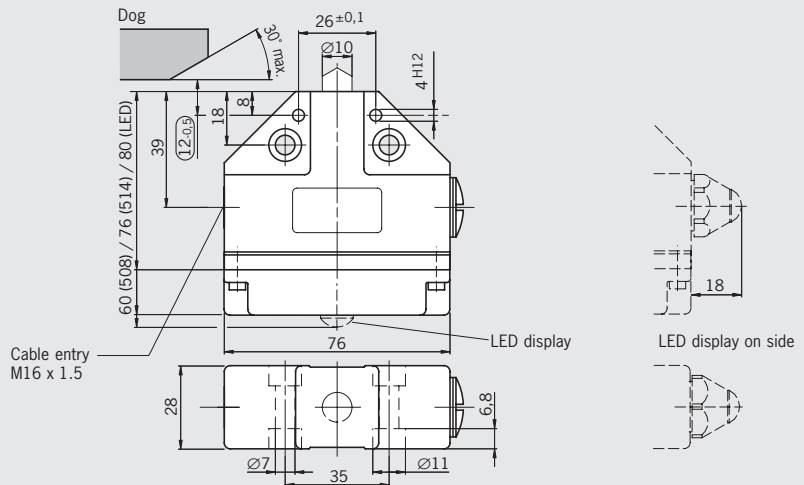
- ▶ AC/DC 12-60 V red
- ▶ DC 24 V on side red or yellow
- ▶ AC 110 V ±15% red
- ▶ AC 230 V ±15% red

Switching elements (see also page 11)

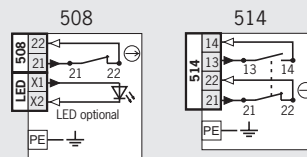
- ▶ **514** Snap-action contact element
1 NC ⊖ + 1 NO
- ▶ **508** Slow-action contact element
1 NC ⊖

Cable entry M16 x 1.5

Dimension drawings



Wiring diagrams



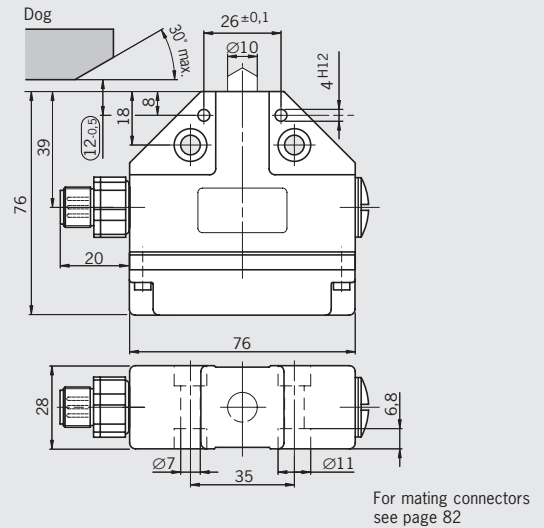
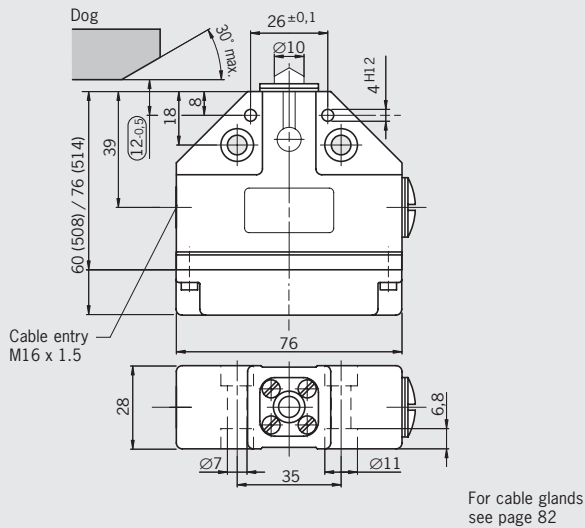
Ordering table

Series	Actuator	Switching element	Connection	Function display					
				Without LED	12-60 V LED red	110 V LED red	230 V LED red	24 V side red	24 V side yellow
N1A	D Chisel plunger	508 1 NC ⊖	Cable entry M16 x 1,5	083 886 N1AD508-M	087 218 N1AD508LE060-M	087 221 N1AD508LE110-M	087 224 N1AD508LE220-M	087 197 N1AD508-MC1293	087 193 N1AD508-MC1292
		514 1 NC ⊖ + 1 NO	Cable entry M16 x 1,5	083 849 N1AD514-M	-	-	-	On request	On request

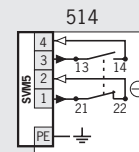
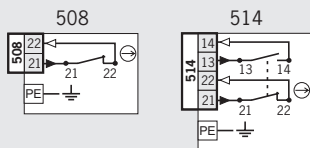
Cable entry M16 x 1.5 Exterior diaphragm

Plug connector SVM5 M12 plug, 5-pin

Dimension drawings



Wiring diagrams

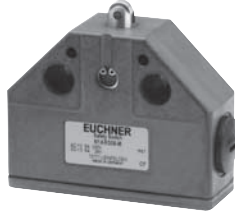


Ordering table

Series	Actuator	Switching element	Connection	Version	Function display without LED
N1A	D Chisel plunger	508 1 NC ⊖	Cable entry M16 x 1,5	Exterior diaphragm	090 546 N1AD508AM-M
		514 1 NC ⊖ + 1 S	Cable entry M16 x 1,5	Exterior diaphragm	091 261 N1AD514AM-M
N1A	D Chisel plunger	514 1 NC ⊖ + 1 S	Plug connector SVM5 (M12 plug)		087 603 N1AD514SVM5-M

Single hole fixing limit switch N1AR with roller plunger

- ▶ Housing according to DIN 43693
- ▶ Steel roller \varnothing 8 mm
- ▶ LED optional
- ▶ Plug connector optional
- ▶ Exterior diaphragm optional
- ▶ Bearing optional



Approach direction



Horizontal
Can be adjusted in 90°-steps.

Exterior diaphragm (optional)

Protection against heavy soiling (dust) and aggressive coolants.

LED function display (optional)

A function display is available for the following voltage ranges:

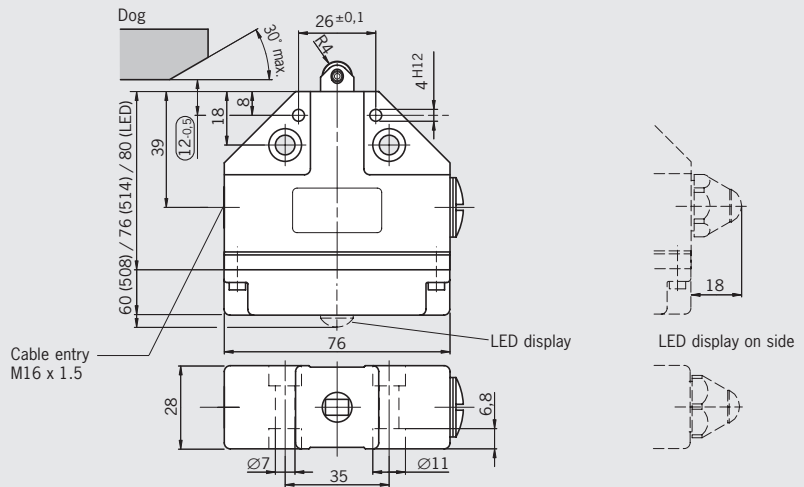
- ▶ AC/DC 12-60 V red
- ▶ DC 24 V on side red
- ▶ AC 110 V $\pm 15\%$ red
- ▶ AC 230 V $\pm 15\%$ red

Switching elements (see also page 11)

- ▶ **514** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **508** Slow-action contact element
1 NC \ominus

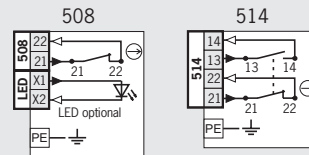
Cable entry M16 x 1.5

Dimension drawings



For cable glands see page 82

Wiring diagrams



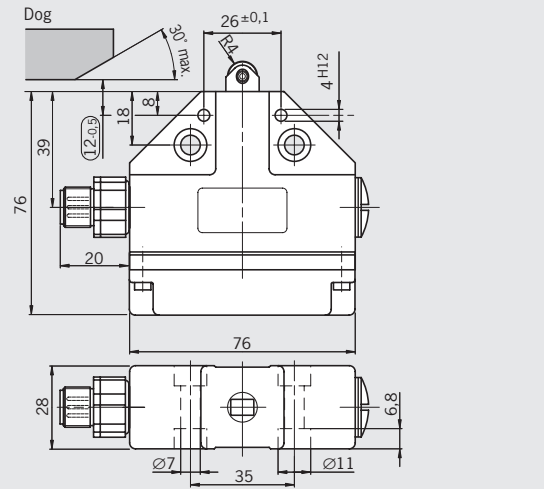
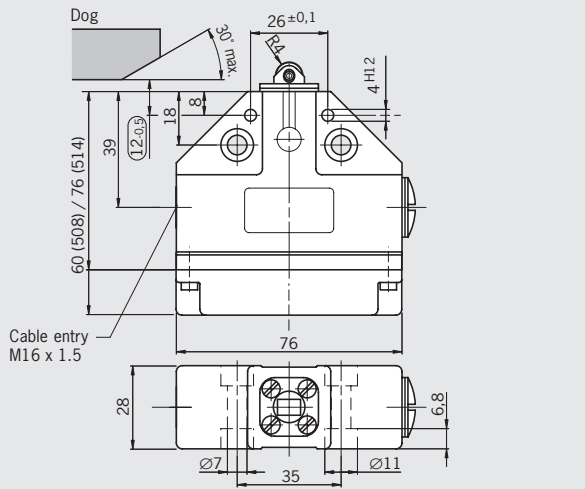
Ordering table

Series	Actuator	Switching element	Connection	Version	Function display				
					Without LED	12-60 V LED red	110 V LED red	230 V LED red	24 V side red
N1A	R Roller plunger \varnothing 8 mm	508 1 NC \ominus	Cable entry M16 x 1,5		083 887 N1AR508-M	087 219 N1AR508LE060-M	087 222 N1AR508LE110-M	087 225 N1AR508LE220-M	087 198 N1AR508-MC1293
				Bearing	087 245 N1AB508-M	-	-	-	On request
	514 1 NC \ominus + 1 NO	Cable entry M16 x 1,5		078 487 N1AR514-M	On request	On request	On request	On request	
			Bearing	087 247 N1AB514-M	-	-	-	On request	

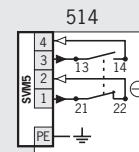
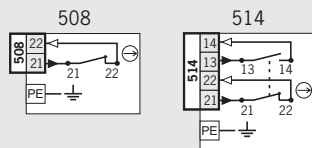
Cable entry M16 x 1.5 Exterior diaphragm

Plug connector SVM5 M12 plug, 5-pin

Dimension drawings



Wiring diagrams

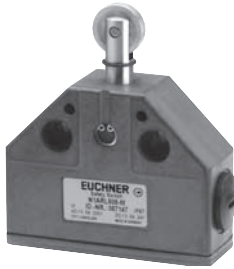


Ordering table

Series	Actuator	Switching element	Connection	Version	Function display without LED
N1A	R Roller plunger ∅ 8 mm	508 1 NC ⊖	Cable entry M16 x 1,5	Exterior diaphragm	090 547 N1AR508AM-M
		514 1 NC ⊖ + 1 NO	Cable entry M16 x 1,5	Exterior diaphragm	087 158 N1AR514AM-M
N1A	R Roller plunger ∅ 8 mm	514 1 NC ⊖ + 1 NO	Plug connector SVM5 (M12 plug)		087 604 N1AR514SVM5-M

Single hole fixing limit switch N1ARL with extended roller plunger

- ▶ Housing according to DIN 43693
- ▶ Steel roller \varnothing 18 mm



Approach direction



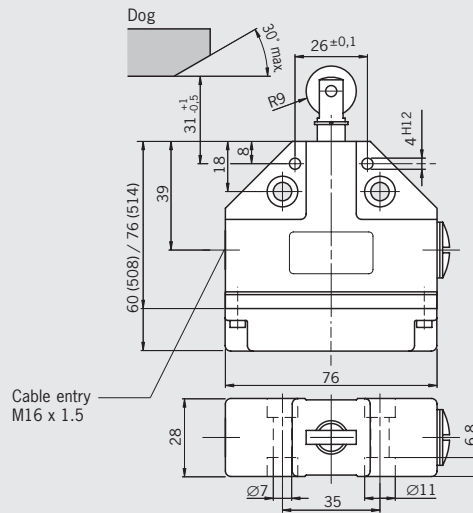
Horizontal
Can be adjusted in 90°-steps.

Switching elements (see also page 11)

- ▶ **514** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **508** Slow-action contact element
1 NC \ominus

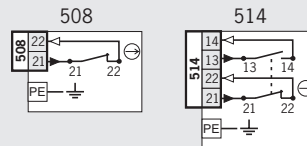
Cable entry M16 x 1.5

Dimension drawings



For cable glands
see page 82

Wiring diagrams

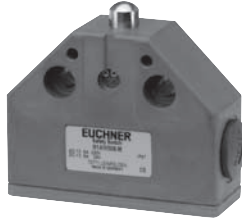


Ordering table

Series	Actuator	Switching element	Connection	Function display
				Without LED
N1A	RL Roller plunger \varnothing 18 mm	508 1 NC \ominus	Cable entry M16 x 1,5	087 147 N1ARL508-M
		514 1 NC \ominus + 1 NO	Cable entry M16 x 1,5	087 204 N1ARL514-M

Single hole fixing limit switch N1AW with domed plunger

- ▶ Housing according to DIN 43693
- ▶ LED optional
- ▶ Plug connector optional



Approach direction



Horizontal and vertical

LED function display (optional)

A function display is available for the following voltage ranges:

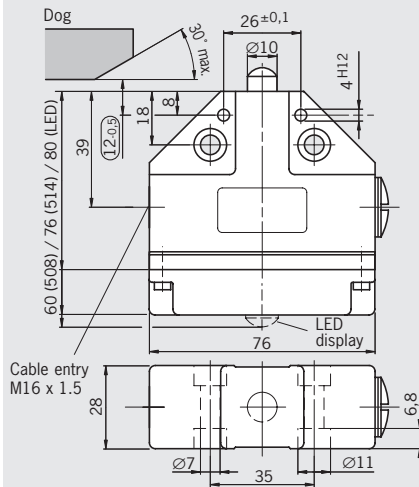
- ▶ AC/DC 12-60 V red
- ▶ AC 110 V ±15% red
- ▶ AC 230 V ±15% red

Switching elements (see also page 11)

- ▶ **514** Snap-action contact element
1 NC ⊖ + 1 NO
- ▶ **508** Slow-action contact element
1 NC ⊖

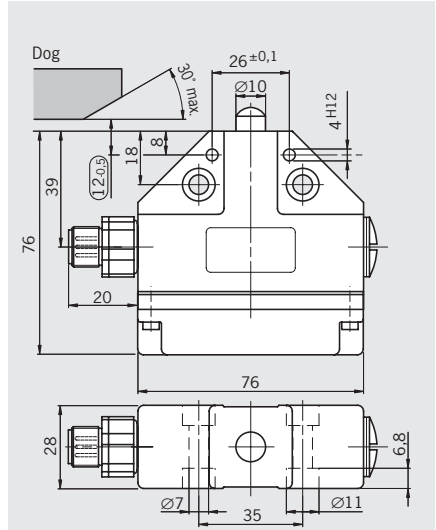
Cable entry M16 x 1.5

Dimension drawings



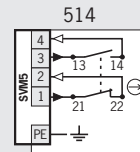
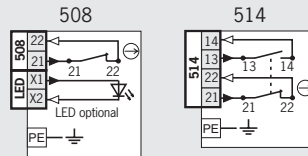
For cable glands see page 82

Plug connector SVM5 M12 plug, 5-pin



For mating connectors see page 82

Wiring diagrams



Ordering table

Series	Actuator	Switching element	Connection	Function display			
				Without LED	12-60 V LED red	110 V LED red	230 V LED red
N1A	W Domed plunger	508 1 NC ⊖	Cable entry M16 x 1,5	087 205 N1AW508-M	087 220 N1AW508LE060-M	087 223 N1AW508LE110-M	087 226 N1AW508LE220-M
		514 1 NC ⊖ + 1 NO	Cable entry M16 x 1,5	083 850 N1AW514-M	-	-	-
N1A	W Domed plunger	514 1 NC ⊖ + 1 NO	Plug connector SVM5 (M12 plug)	090 743 N1AW514SVM5-M	-	-	-

Single hole fixing limit switch NB01

- ▶ With chisel plunger
- ▶ With roller plunger, steel roller \varnothing 5 mm



Approach direction



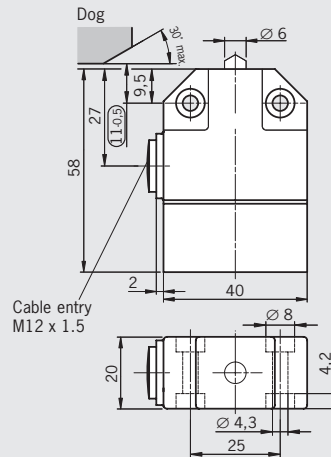
Horizontal
Can be adjusted in 90°-steps.

Switching elements (see also page 11)

- ▶ **588** Slow-action contact element 1 NC \ominus

Cable entry M12 x 1.5 Chisel plunger

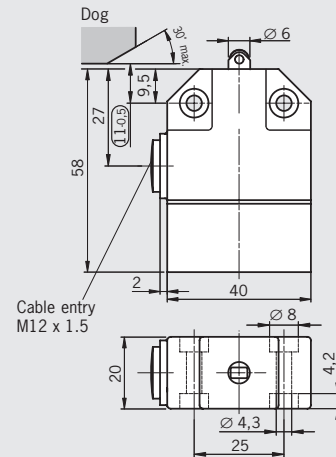
Dimension drawings



For cable glands
see page 82

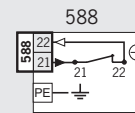
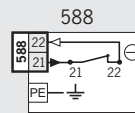
Cable entry M12 x 1.5 Roller plunger

Dimension drawings



For cable glands
see page 82

Dimension drawings



Ordering table

Series	Actuator	Switching element	Connection	Function display
				Without LED
NB01	D Chisel plunger	588 1 NC \ominus	Cable entry M12 x 1,5	088 584 NB01D588-M
NB01	R Roller plunger \varnothing 5 mm	588 1 NC \ominus	Cable entry M12 x 1,5	088 583 NB01R588-M

Position switch NZ.WO with domed plunger



- ▶ Version B according to EN 50041 (hardened)
- ▶ LED optional
- ▶ Plug connector optional



Approach direction



Horizontal and vertical

LED function display (optional)

A function display is available for the following voltage ranges:

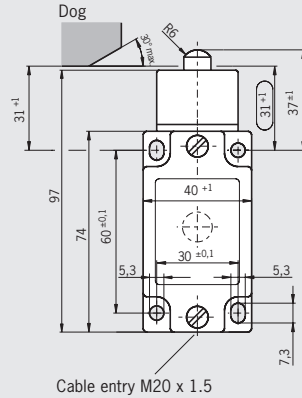
- ▶ AC/DC 12-60 V red or yellow
- ▶ AC 110 V ±15% red
- ▶ AC 230 V ±15% red

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC ⊖ + 1 NO
- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **538H** Slow-action contact element
2 NC ⊖
- ▶ **2121H** Slow-action contact element
4 NC ⊖
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

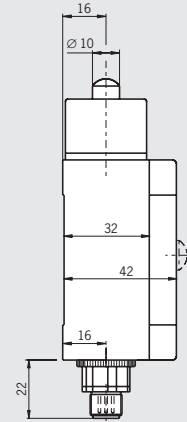
Dimension drawings



For cable glands see page 82

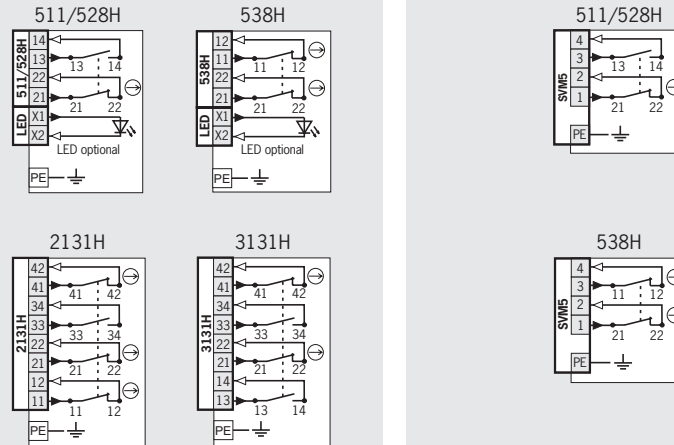
Plug connector SVM5

M12 plug, 5-pin



For mating connectors see page 82

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display					
				Without LED	12-60 V LED red	110 V LED red	230 V LED red	12-60 V LED yellow	
NZ	1	Cable entry M20 x 1,5	WO Domed plunger	511 ¹⁾ 1 NC ⊖ + 1 NO	088 611 ¹⁾ NZ1WO-511-M	089 057 ¹⁾ NZ1WO-511L060-M	089 059 ¹⁾ NZ1WO-511L110-M	089 060 ¹⁾ NZ1WO-511L220-M	089 058 ¹⁾ NZ1WO-511L060GE-M
				528H 1 NC ⊖ + 1 NO	089 624 NZ1WO-528-M	089 078 NZ1WO-528L060-M	On request	On request	On request
				538H 2 NC ⊖	090 878 NZ1WO-538-M	089 076 NZ1WO-538L060-M	On request	On request	On request
				2131H 3 NC ⊖ + 1 NO	089 629 NZ1WO-2131-M	-	-	-	-
				3131H 2 NC ⊖ + 2 NO	089 626 NZ1WO-3131-M	-	-	-	-
NZ	2	Plug connector SVM5 (M12-Plug)	WO Domed plunger	511 1 NC ⊖ + 1 NO	089 014 NZ2WO-511SVM5	On request	-	-	On request
				528H 1 NC ⊖ + 1 NO	090 923 NZ2WO-528SVM5	On request	-	-	On request
				538H 2 NC ⊖	090 924 NZ2WO-538SVM5	On request	-	-	On request

1) No BG approval for switching element 511

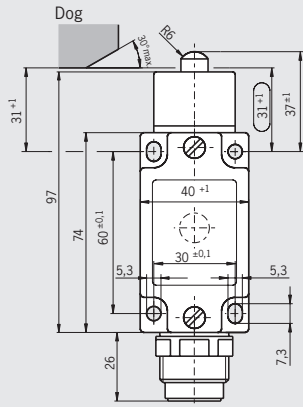


Plug connector SR6 6-pin + PE

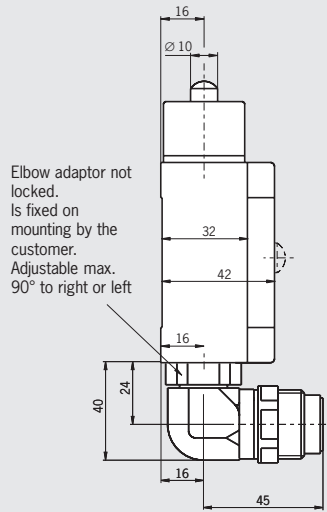
Plug connector SR6 angled 6-pin + PE

Plug connector SR11 11-pin + PE

Dimension drawings

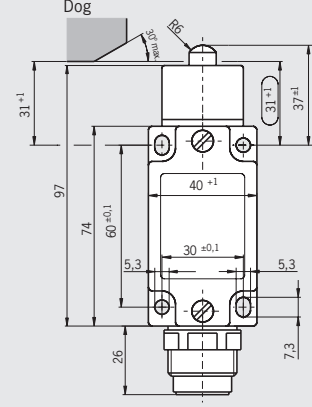


For mating connectors see page 79



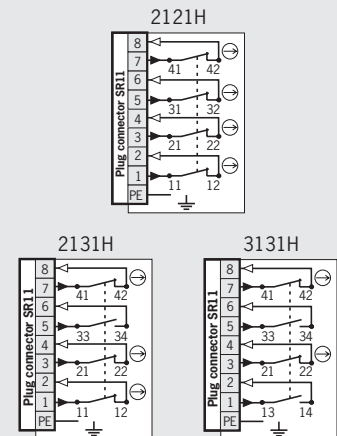
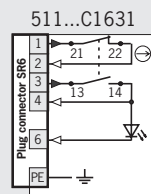
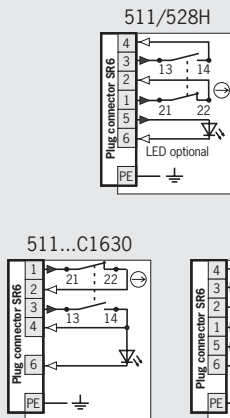
Elbow adaptor not locked. Is fixed on mounting by the customer. Adjustable max. 90° to right or left

For mating connectors see page 79



For mating connectors see page 79

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display		
					Without LED	12-60 V LED red	12-60 V LED yellow
NZ	2 Plug connector SR6	WO Domed plunger	511 ¹⁾ 1 NC ⊖ + 1 NO	C1630 Alternative wiring	090 909 ¹⁾ NZ2WO-511	091 280 ¹⁾ NZ2WO-511L060	On request
			511 ¹⁾ 1 NC ⊖ + 1 NO		On request	On request	059 481 ¹⁾ NZ2WO-511L060C1630
			528H 1 NC ⊖ + 1 NO		090 910 NZ2WO-528	091 279 NZ2WO-528L060	On request
			538H 2 NC ⊖		090 911 NZ2WO-538	087 558 NZ2WO-538L060	On request
NZ	2 Plug connector SR6 angled	WO Domed plunger	511 ¹⁾ 1 NC ⊖ + 1 NO	C1631 Alternative wiring	On request	On request	059 482 ¹⁾ NZ2WO-511L060C1631
NZ	2 Plug connector SR11	WO Domed plunger	2121H 4 NC ⊖	C1631 Alternative wiring	090 976 NZ2WO-2121	-	-
			2131H 3 NC ⊖ + 1 NO		090 912 NZ2WO-2131	-	-
			3131H 2 NC ⊖ + 2 NO		090 913 NZ2WO-3131	-	-

1) No BG approval for switching element 511

Position switch NZ.RK with roller plunger



- ▶ Steel roller \varnothing 8 mm
- ▶ LED optional
- ▶ Plug connector optional
- ▶ Bearing optional



Approach direction



Horizontal
Can be adjusted in 90°-steps.

LED function display (optional)

A function display is available for the following voltage ranges:

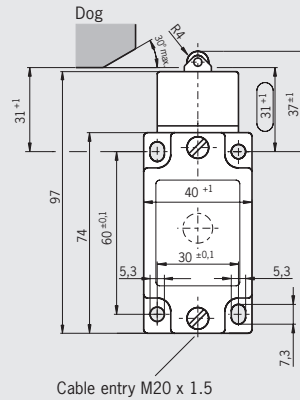
- ▶ AC/DC 12-60 V red or yellow
- ▶ AC 110 V $\pm 15\%$ red
- ▶ AC 230 V $\pm 15\%$ red

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **538H** Slow-action contact element
2 NC \ominus
- ▶ **2131H** Slow-action contact element
3 NC \ominus + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC \ominus + 2 NO

Cable entry M20 x 1.5

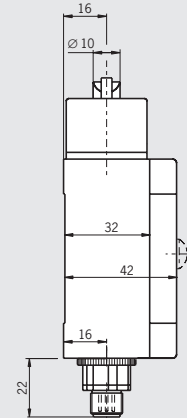
Dimension drawings



For cable glands see page 82

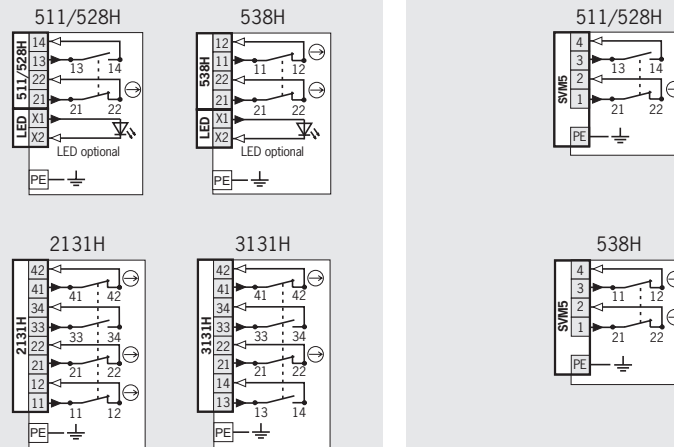
Plug connector SVM5

M12 plug, 5-pin



For mating connectors see page 82

Wiring diagrams switch not activated



Ordering table

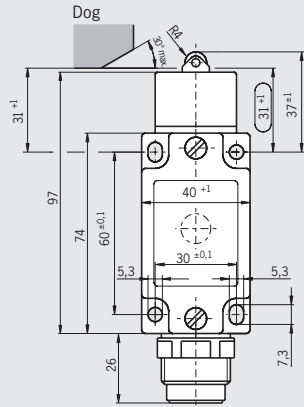
Series	Connection	Actuator	Switching element	Version	Function display				
					Without LED	12-60 V LED red	110 V LED red	12-60 V LED yellow	
NZ	1	Cable entry M20 x 1,5	RK Roller plunger	511 ¹⁾ 1 NC \ominus + 1 NO	088 608 ¹⁾ NZ1RK-511-M	090 354 ¹⁾ NZ1RK-511L060-M	090 355 ¹⁾ NZ1RK-511L220-M	On request	
				528H 1 NC \ominus + 1 NO	090 905 NZ1RK-528-M	090 358 NZ1RK-528L060-M	On request	On request	
				528H 1 NC \ominus + 1 NO	C1912 With bearing	090 572 NZ1RK-528-MC1912	On request	On request	086 408 NZ1RK-528L060GE-MC1912
				538H 2 NC \ominus		090 906 NZ1RK-538-M	On request	On request	On request
				2131H 3 NC \ominus + 1 NO		090 907 NZ1RK-2131-M	-	-	-
				3131H 2 NC \ominus + 2 NO		090 908 NZ1RK-3131-M	-	-	-
				NZ	2	Plug connector SVM5 (M12-Plug)	RK Roller plunger	511 1 NC \ominus + 1 NO	089 007 NZ2RK-511SVM5
528H 1 NC \ominus + 1 NO	090 930 NZ2RK-528SVM5	On request	-					On request	
538H 2 NC \ominus	089 018 NZ2RK-538SVM5	On request	-					On request	

1) No BG approval for switching element 511



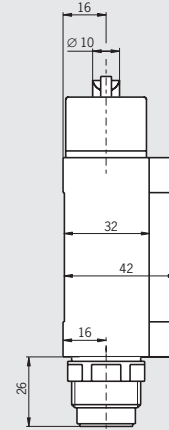
Plug connector SR6 6-pin + PE

Dimension drawings



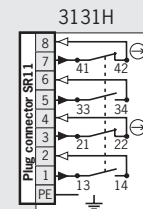
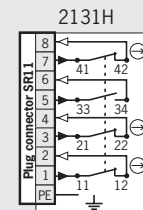
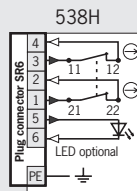
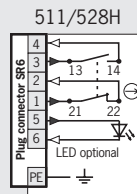
For mating connectors see page 79

Plug connector SR11 11-pin + PE



For mating connectors see page 79

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display		
				Without LED	12-60 V LED red	110 V LED red
NZ	2 Plug connector SR6	RK Roller plunger	511 ¹⁾ 1 NC ⊖ + 1 NO	090 016 ¹⁾ NZ2RK-511	On request	088 180 ¹⁾ NZ2RK-511L110
			528H 1 NC ⊖ + 1 NO	090 919 NZ2RK-528	091 292 NZ2RK-528L060	On request
			538H 2 NC ⊖	090 920 NZ2RK-538	On request	On request
NZ	2 Plug connector SR11	RK Roller plunger	2131H 3 NC ⊖ + 1 NO	090 921 NZ2RK-2131	-	-
			3131H 2 NC ⊖ + 2 NO	090 922 NZ2RK-3131	-	-

1) No BG approval for switching element 511

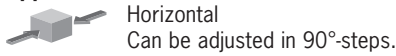
Position switch NZ.RS with roller plunger



- ▶ Version C according to EN 50041 (steel roller \varnothing 12 mm)
- ▶ LED optional
- ▶ Plug connector optional
- ▶ ATEX approval optional



Approach direction



LED function display (optional)
function display is available for the following voltage ranges:

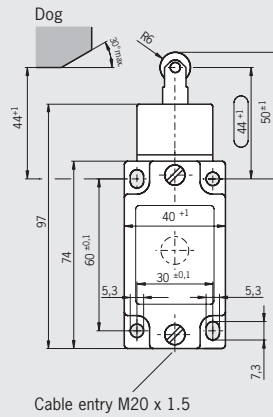
- ▶ AC/DC 12-60 V red or yellow
- ▶ AC 110 V \pm 15% red
- ▶ AC 230 V \pm 15% red

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **538H** Slow-action contact element
2 NC \ominus
- ▶ **2121H** Slow-action contact element
4 NC \ominus
- ▶ **2131H** Slow-action contact element
3 NC \ominus + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC \ominus + 2 NO

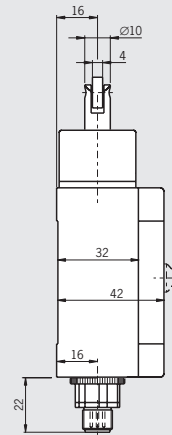
Cable entry M20 x 1.5

Dimension drawings



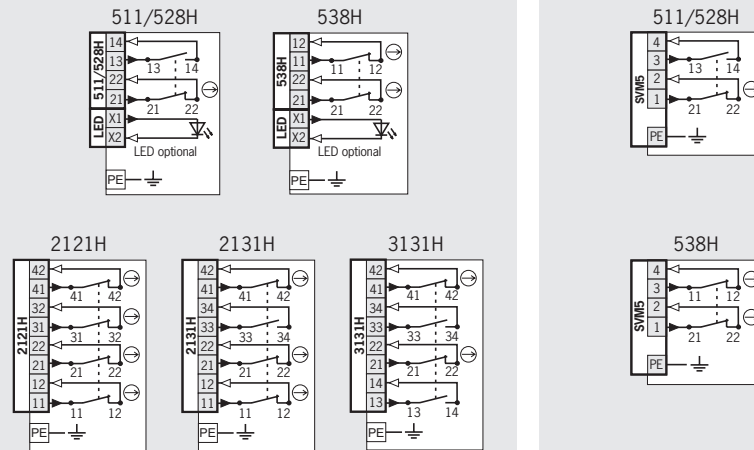
For mating connectors see page 82

Plug connector SVM5 M12 plug, 5-pin



For mating connectors see page 82

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display			
					Without LED	12-60 V LED red	110 V LED red	12-60 V LED yellow
NZ	1	Cable entry M20 x 1,5	RS Roller plunger	511 ¹⁾ 1 NC \ominus + 1 NO	079 960 ¹⁾ NZ1RS-511-M	089 053 ¹⁾ NZ1RS-511L060-M	089 055 ¹⁾ NZ1RS-511L220-M	086 528 ¹⁾ NZ1RS-511L060GE-M
				528H 1 NC \ominus + 1 NO	089 627 NZ1RS-528-M	086 413 NZ1RS-528L060-M	091 291 NZ1RS-528L220-M	On request
				538H 2 NC \ominus	090 936 NZ1RS-538-M	090 555 NZ1RS-538L060-M	On request	090 424 NZ1RS-538L060GE-M
				2121H 4 NC \ominus	087 595 NZ1RS-2121-M	-	-	-
				2131H 3 NC \ominus + 1 NO	089 633 NZ1RS-2131-M	-	-	-
				3131H 2 NC \ominus + 2 NO	089 631 NZ1RS-3131-M	-	-	-
				3131H 2 NC \ominus + 2 NO	ATEX incl. cable gland 094 169 ²⁾ NZ1RS-3131-MEX	-	-	-
NZ	2	Plug connector SVM5 (M12-Plug)	RS Roller plunger	511 1 NC \ominus + 1 NO	090 027 NZ2RS-511SVM5	On request	-	On request
				528H 1 NC \ominus + 1 NO	090 963 NZ2RS-528SVM5	On request	-	On request
				538H 2 NC \ominus	090 964 NZ2RS-538SVM5	On request	-	On request

1) No BG approval for switching element 511
2) EX II 3G EEx n C II T6



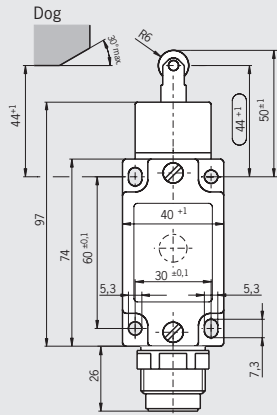
Plug connector SR6
6-pin + PE

Plug connector SR6 angled
6-pin + PE

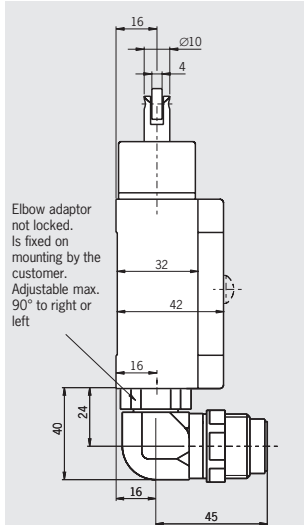
Plug connector MR9
8-pin + PE

Plug connector SR11
11-pin + PE

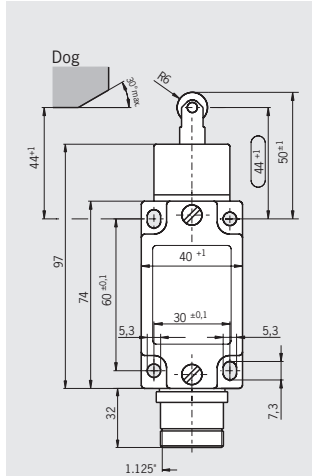
Dimension drawings



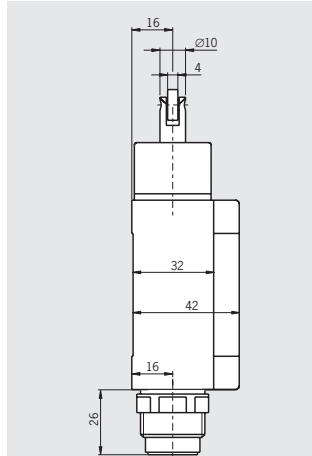
For mating connectors see page 79



For mating connectors see page 79

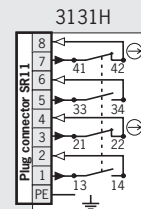
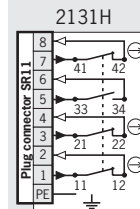
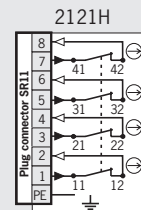
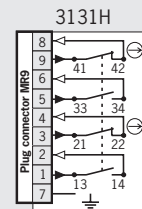
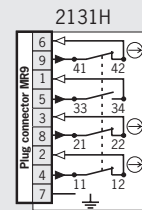
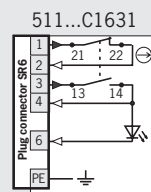
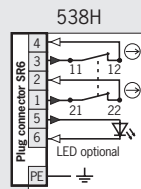
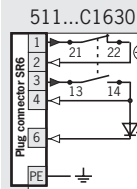
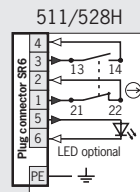


For mating connectors see page 86



For mating connectors see page 79

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display			
					Without LED	12-60 V LED red	110 V LED red	12-60 V LED yellow
NZ	2	Plug connector SR6	RS Roller plunger	511 ¹⁾ 1 NC ⊖ + 1 NO	090 024 ¹⁾ NZ2RS-511	090 147 ¹⁾ NZ2RS-511L060	091 302 ¹⁾ NZ2RS-511L110	089 622 ¹⁾ NZ2RS-511L060GE
				511 ¹⁾ 1 NC ⊖ + 1 NO	On request	On request	On request	082 400 ¹⁾ NZ2RS-511L060C1630
				528H 1 NC ⊖ + 1 NO	090 950 NZ2RS-528	088 197 NZ2RS-528L060	On request	On request
				538H 2 NC ⊖	090 951 NZ2RS-538	090 952 NZ2RS-538L060	On request	On request
NZ	2	Plug connector SR6 angled	RS Roller plunger	511 ¹⁾ 1 NC ⊖ + 1 NO	On request	On request	On request	079 350 ¹⁾ NZ2RS-511L060C1631
NZ	1...9C	Plug connector MR9	RS Roller plunger	2131H 3 NC ⊖ + 1 NO	077 362 ³⁾ NZ1RS-2131-9C-GMMF	-	-	-
				3131H 2 NC ⊖ + 2 NO	087 074 NZ1RS-3131-9C-GMMF	-	-	-
NZ	2	Plug connector SR11	RS Roller plunger	2121H 4 NC ⊖	090 974 NZ2RS-2121	-	-	-
				2131H 3 NC ⊖ + 1 NO	090 149 NZ2RS-2131	-	-	-
				3131H 2 NC ⊖ + 2 NO	090 954 NZ2RS-3131	-	-	-

1) No BG approval for switching element 511
3) No UL approval for safety switch 077 362

For safety instructions see page 103
For technical data see page 87



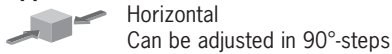
Position switch NZ.RG with roller plunger



- ▶ **Version C** according to EN 50041 (plastic roller \varnothing 12 mm)
- ▶ **LED optional**
- ▶ **Plug connector optional**



Approach direction



LED function display (optional)

A function display is available for the following voltage ranges:

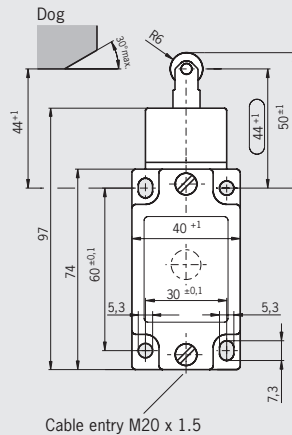
- ▶ AC/DC 12-60 V red or yellow
- ▶ AC 230 V \pm 15% red

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **538H** Slow-action contact element
2 NC \ominus
- ▶ **2131H** Slow-action contact element
3 NC \ominus + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC \ominus + 2 NO

Cable entry M20 x 1.5

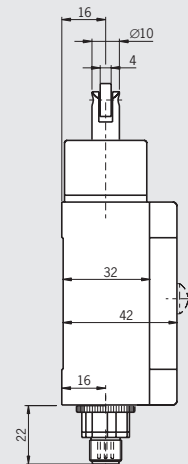
Dimension drawings



For cable glands see page 82

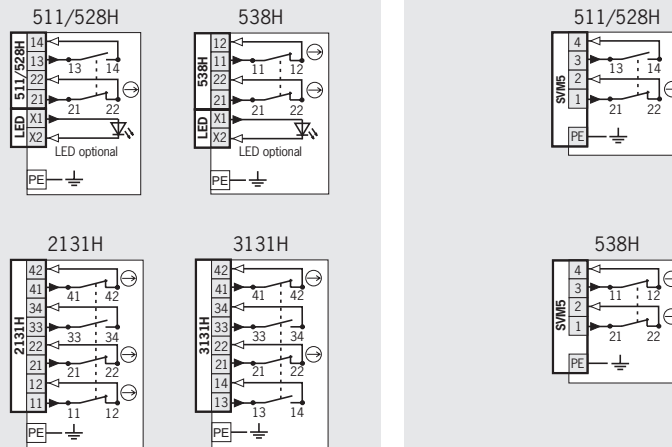
Plug connector SVM5

M12 plug, 5-pin



For mating connectors see page 82

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display			
				Without LED	12-60 V LED red	230 V LED red	
NZ	1	Cable entry M20 x 1,5	RG Roller plunger	511 ¹⁾ 1 NC \ominus + 1 NO	088 605 ¹⁾ NZ1RG-511-M	089 052 ¹⁾ NZ1RG-511L060-M	089 054 ¹⁾ NZ1RG-511L220-M
				528H 1 NC \ominus + 1 NO	090 932 NZ1RG-528-M	090 008 NZ1RG-528L060-M	On request
				538H 2 NC \ominus	090 933 NZ1RG-538-M	090 009 NZ1RG-538L060-M	On request
				2131H 3 NC \ominus + 1 NO	090 934 NZ1RG-2131-M	-	-
				3131H 2 NC \ominus + 2 NO	090 935 NZ1RG-3131-M	-	-
				511 1 NC \ominus + 1 NO	090 026 NZ2RG-511SVM5	On request	-
NZ	2	Plug connector SVM5 (M12-Plug)	RG Roller plunger	528H 1 NC \ominus + 1 NO	090 961 NZ2RG-528SVM5	On request	-
				538H 2 NC \ominus	090 962 NZ2RG-538SVM5	On request	-

1) No BG approval for switching element 511

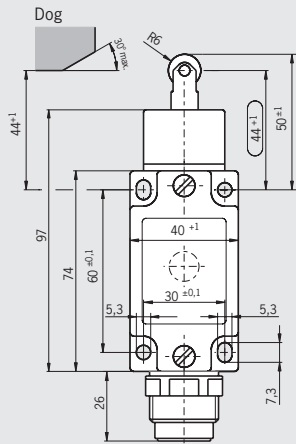


Plug connector SR6 6-pin + PE

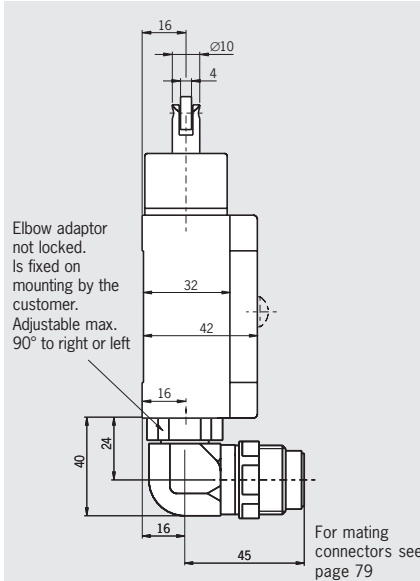
Plug connector SR6 angled 6-pin + PE

Plug connector SR11 11-pin + PE

Dimension drawings

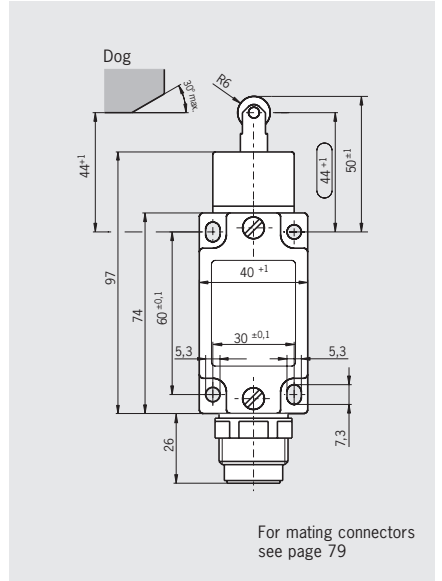


For mating connectors see page 79



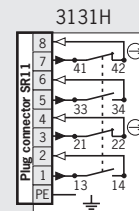
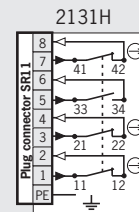
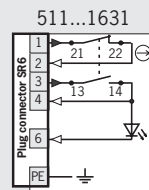
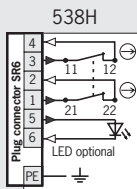
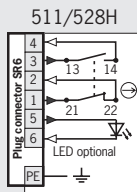
Elbow adaptor not locked. Is fixed on mounting by the customer. Adjustable max. 90° to right or left

For mating connectors see page 79



For mating connectors see page 79

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display		
					Without LED	12-60 V LED red	12-60 V LED yellow
NZ	2 Plug connector SR6	RG Roller plunger	511 ¹⁾ 1 NC ⊖ + 1 NO	C1631 Alternative wiring	090 032 ¹⁾ NZ2RG-511	091 284 ¹⁾ NZ2RG-511L060	On request
			528H 1 NC ⊖ + 1 NO		090 943 NZ2RG-528	090 944 NZ2RG-528L060	On request
			538H 2 NC ⊖		090 945 NZ2RG-538	090 946 NZ2RG-538L060	On request
NZ	2 Steckverbinder SR6 angled	RG Roller plunger	511 ¹⁾ 1 NC ⊖ + 1 NO		On request	On request	074 562 ¹⁾ NZ2RG-511L060C1631
NZ	2 Plug connector SR11	RG Roller plunger	2131H 3 NC ⊖ + 1 NO		090 947 NZ2RG-2131		
			3131H 2 NC ⊖ + 2 NO		090 948 NZ2RG-3131		

1) No BG approval for switching element 511

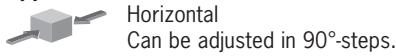
Position switch NZ.RL with roller plunger



- ▶ Steel roller \varnothing 18 mm
- ▶ LED optional
- ▶ Plug connector optional



Approach direction



LED function display (optional)

A function display is available for the following voltage ranges:

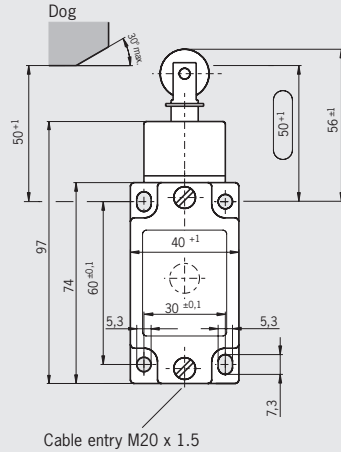
- ▶ AC/DC 12-60 V red
- ▶ AC 110 V $\pm 15\%$ red
- ▶ AC 230 V $\pm 15\%$ red

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **538H** Slow-action contact element
2 NC \ominus
- ▶ **2121H** Slow-action contact element
4 NC \ominus
- ▶ **2131H** Slow-action contact element
3 NC \ominus + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC \ominus + 2 NO

Cable entry M20 x 1.5

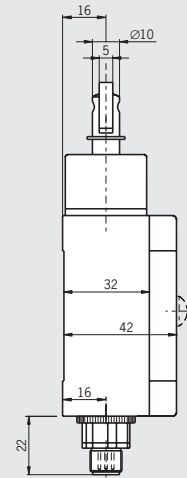
Dimension drawings



For cable glands see page 82

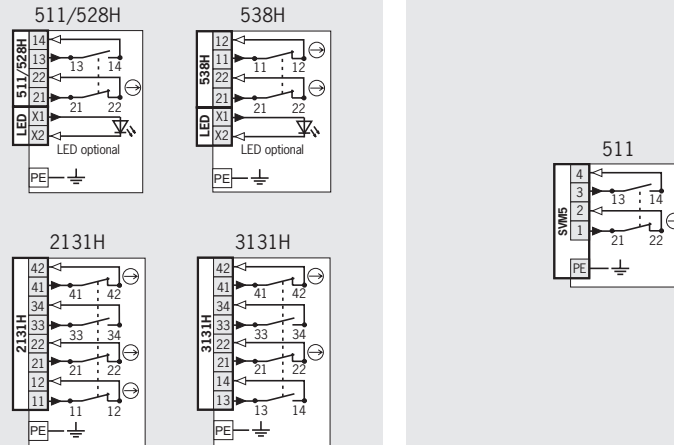
Plug connector SVM5

M12 plug, 5-pin



For mating connectors see page 82

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display				
				Without LED	12-60 V LED red	110 V LED red	230 V LED red	
NZ	1	Cable entry M20 x 1,5	RL Roller plunger	511 ¹⁾ 1 NC \ominus + 1 NO	088 614 ¹⁾ NZ1RL-511-M	088 996 ¹⁾ NZ1RL-511L060-M	089 080 ¹⁾ NZ1RL-511L110-M	089 079 ¹⁾ NZ1RL-511L220-M
				528H 1 NC \ominus + 1 NO	090 937 NZ1RL-528-M	090 938 NZ1RL-528L060-M	On request	089 084 NZ1RL-528L220-M
				538H 2 NC \ominus	090 939 NZ1RL-538-M	090 940 NZ1RL-538L060-M	On request	On request
				2131H 3 NC \ominus + 1 NO	090 941 NZ1RL-2131-M	-	-	-
				3131H 2 NC \ominus + 2 NO	090 942 NZ1RL-3131-M	-	-	-
				511 1 NC \ominus + 1 NO	090 028 NZ2RL-511SVM5	On request	-	-
NZ	2	Plug connector SVM5 (M12-Plug)	RL Roller plunger	511 1 NC \ominus + 1 NO	090 028 NZ2RL-511SVM5	On request	-	-

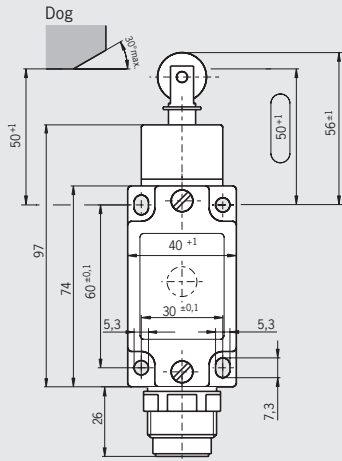
1) No BG approval for switching element 511



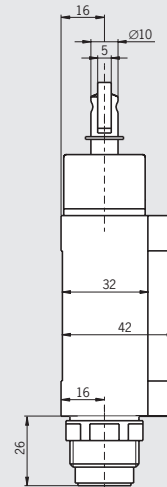
Plug connector SR6 6-pin + PE

Plug connector SR11 11-pin + PE

Dimension drawings

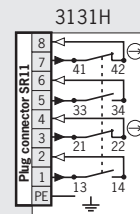
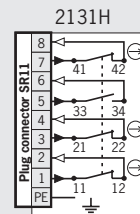
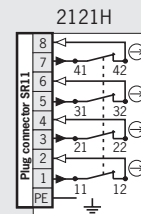
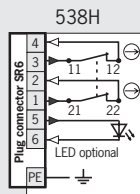
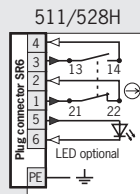


For mating connectors see page 79



For mating connectors see page 79

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display	
				Without LED	12-60 V LED red
NZ	2 Plug connector SR6	RL Roller plunger	511 ¹⁾ 1 NC ⊖ + 1 NO	090 025 ¹⁾ NZ2RL-511	090 955 ¹⁾ NZ2RL-511L060
			528H 1 NC ⊖ + 1 NO	090 956 NZ2RL-528	091 282 NZ2RL-528L060
			538H 2 NC ⊖	090 957 NZ2RL-538	091 278 NZ2RL-538L060
NZ	2 Plug connector SR11	RL Roller plunger	2121H 4 NC ⊖	090 975 NZ2RL-2121	-
			2131H 3 NC ⊖ + 1 NO	090 958 NZ2RL-2131	-
			3131H 2 NC ⊖ + 2 NO	090 959 NZ2RL-3131	-

1) No BG approval for switching element 511



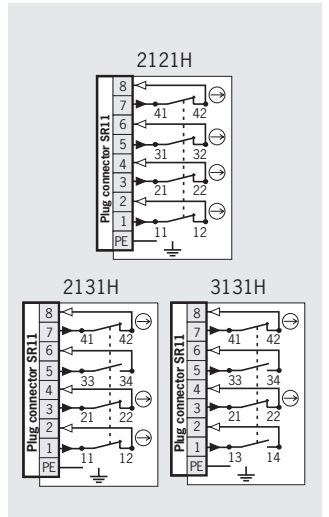
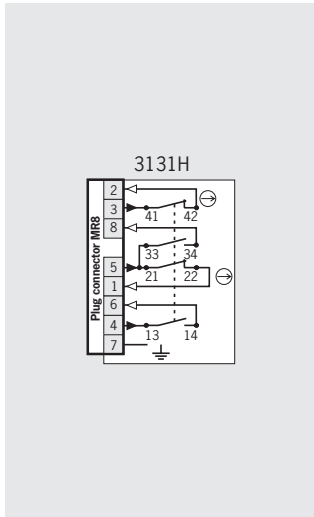
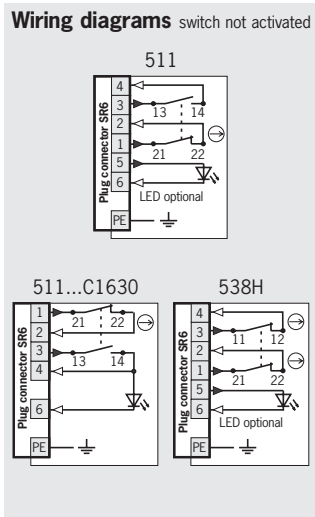
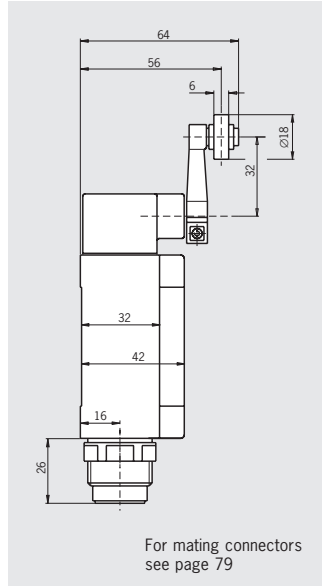
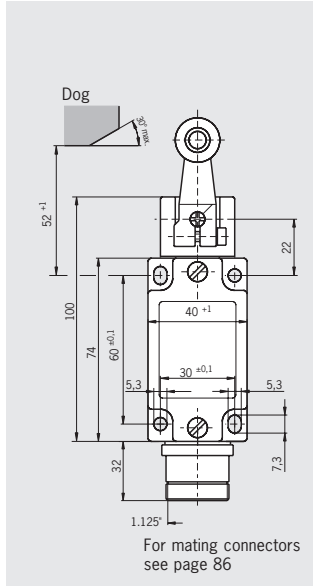
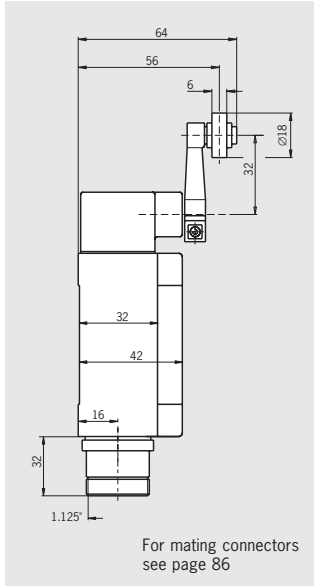
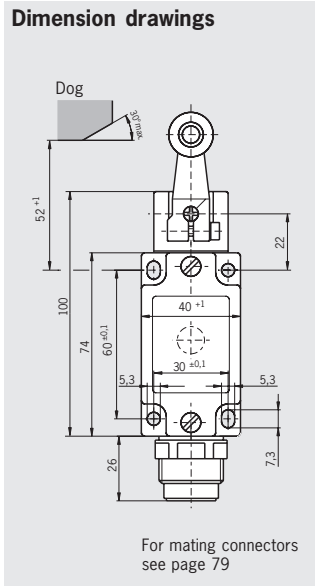


Plug connector SR6 6-pin + PE

Plug connector MR8 7-pin + PE

Plug connector MR9 8-pin + PE

Plug connector SR11 11-pin + PE



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display		
					Without LED	12-60 V LED red	12-60 V LED yellow
NZ	2	Plug connector SR6	HS Lever arm	511 ¹⁾ 1 NC ⊖ + 1 NO	089 093 ¹⁾ NZ2HS-511	089 094 ¹⁾ NZ2HS-511L060	090 697 ¹⁾ NZ2HS-511L060GE
				511 ¹⁾ 1 NC ⊖ + 1 NO	On request	On request	078 473 ¹⁾ NZ2HS-511L060C1630
				528H 1 NC ⊖ + 1 NO	090 852 NZ2HS-528	088 196 NZ2HS-528L060	On request
				538H 2 NC ⊖	090 853 NZ2HS-538	090 854 NZ2HS-538L060	On request
NZ	1...8C	Plug connector MR8	HS Lever arm	3131H 2 NC ⊖ + 2 NO	086 574 NZ1HS-3131-8C-Ford / PT60577-101K01	-	-
NZ	1...9C	Plug connector MR9	HS Lever arm	2131H 3 NC ⊖ + 1 NO	077 391 ³⁾ NZ1HS-2131-9C-GMMF	-	-
				3131H 2 NC ⊖ + 2 NO	073 508 NZ1HS-3131-9C-GMMF	-	-
NZ	2	Plug connector SR11	HS Lever arm	2121H 4 NC ⊖	091 264 NZ2HS-2121	-	-
				2131H 3 NC ⊖ + 1 NO	090 146 NZ2HS-2131	-	-
				3131H 2 NC ⊖ + 2 NO	090 856 NZ2HS-3131	-	-

1) No BG approval for switching element 511
3) No UL approval for safety switch 077 391



Position switch NZ.HB with roller lever arm



- ▶ Version A according to EN 50041 (plastic roller $\varnothing 18$)
- ▶ LED optional
- ▶ Plug connector optional



Approach direction



Horizontal

Switch head and lever arm can be adjusted in 90° steps.

Switching direction

Right, left or both sides (see page 8).

LED function display (optional)

A function display is available for the following voltage ranges:

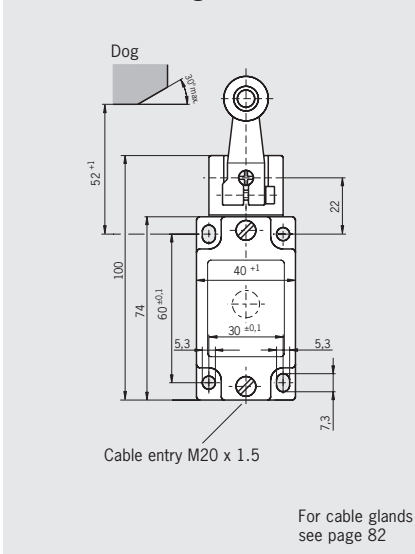
- ▶ AC/DC 12-60 V red or yellow
- ▶ AC 230 V $\pm 15\%$ red

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **538H** Slow-action contact element
2 NC \ominus
- ▶ **2131H** Slow-action contact element
3 NC \ominus + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC \ominus + 2 NO

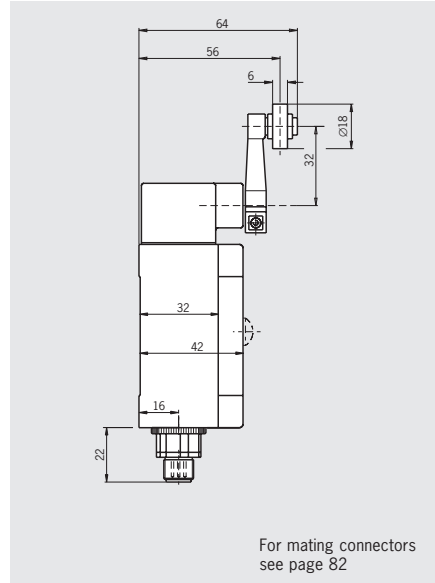
Cable entry M20 x 1.5

Dimension drawings

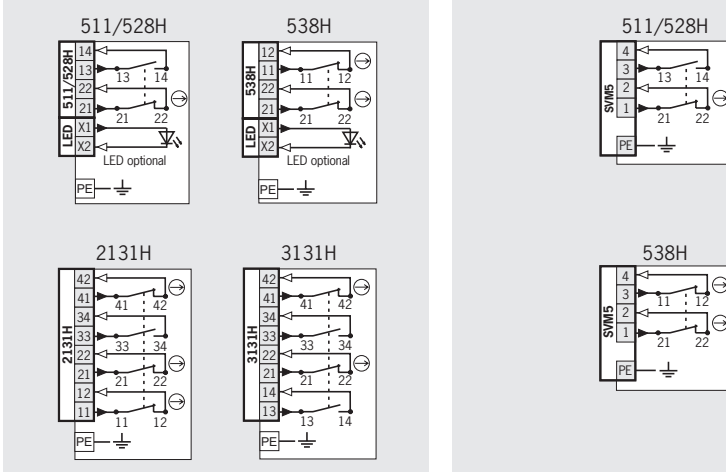


Plug connector SVM5

M12 plug, 5-pin



Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display				
				Without LED	12-60 V LED red	230 V LED red	12-60 V LED yellow	
NZ	1	Cable entry M20 x 1,5	HB Lever arm	511 ¹⁾ 1 NC \ominus + 1 NO	079 952 ¹⁾ NZ1HB-511-M	090 039 ¹⁾ NZ1HB-511L060-M	090 040 ¹⁾ NZ1HB-511L220-M	086 525 ¹⁾ NZ1HB-511L060GE-M
				528H 1 NC \ominus + 1 NO	088 199 NZ1HB-528-M	090 965 NZ1HB-528L060-M	090 051 NZ1HB-528L220-M	086 527 NZ1HB-528L060GE-M
				538H 2 NC \ominus	090 966 NZ1HB-538-M	090 967 NZ1HB-538L060-M	On request	On request
				2131H 3 NC \ominus + 1 NO	090 968 NZ1HB-2131-M	-	-	-
				3131H 2 NC \ominus + 2 NO	090 969 NZ1HB-3131-M	-	-	-
				511 1 NC \ominus + 1 NO	090 861 NZ2HB-511SVM5	On request	-	On request
NZ	2	Plug connector SVM5 (M12-Plug)	HB Lever arm	528H 1 NC \ominus + 1 NO	090 864 NZ2HB-528SVM5	On request	-	On request
				538H 2 NC \ominus	090 862 NZ2HB-538SVM5	On request	-	On request

1) No BG approval for switching element 511

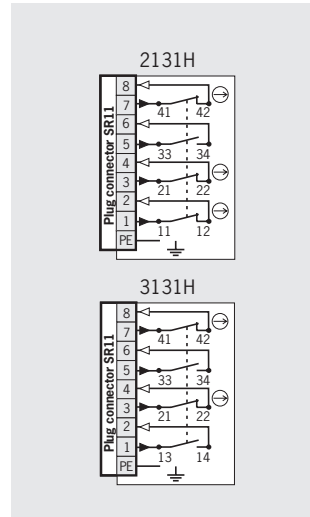
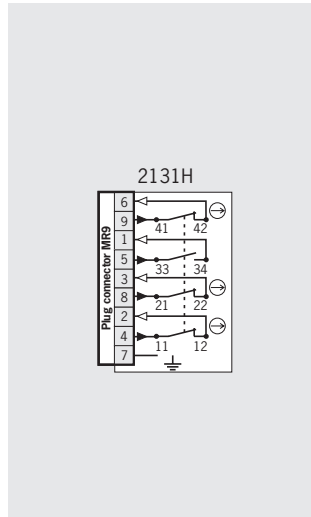
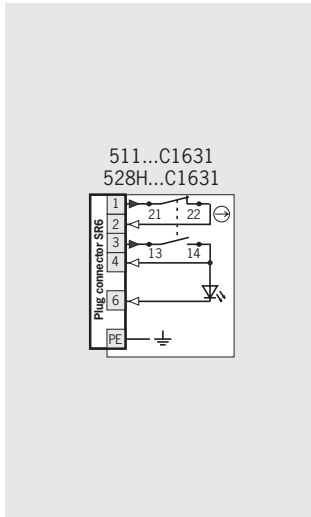
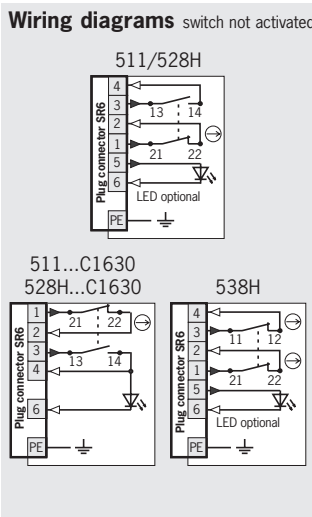
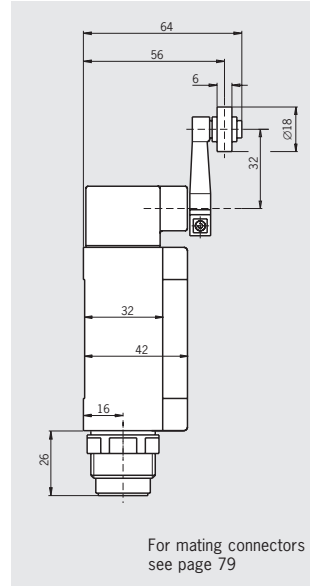
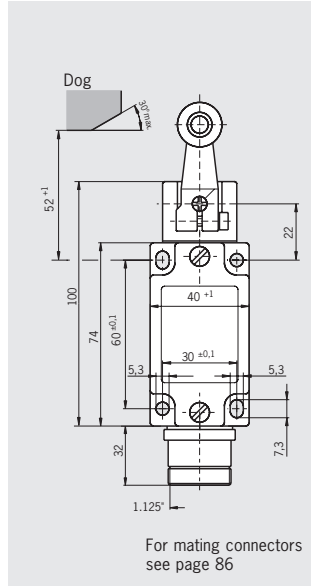
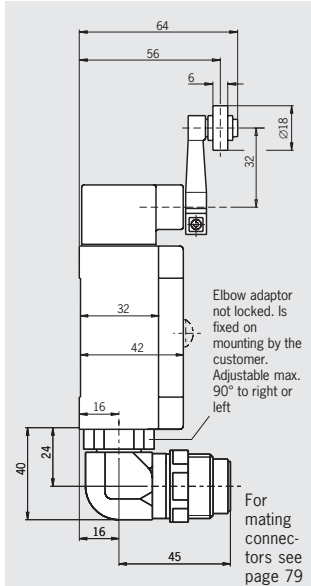
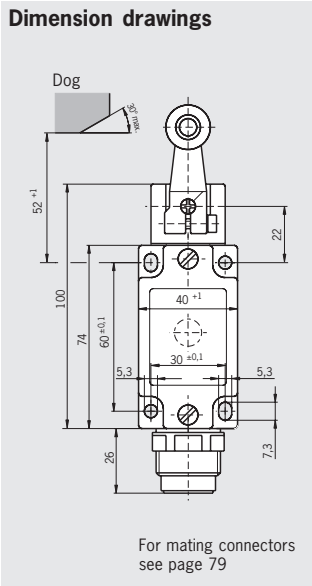


Plug connector SR6 6-pin + PE

Plug connector SR6 angled 6-pin + PE

Plug connector MR9 8-pin + PE

Plug connector SR11 11-pin + PE



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display				
					Without LED	12-60 V LED red	230 V LED red	12-60 V LED yellow	
NZ	2	Plug connector SR6	HB Lever arm	511 ¹⁾ 1 NC + 1 NO	089 091 ¹⁾ NZ2HB-511	089 092 ¹⁾ NZ2HB-511L060	On request	090 719 ¹⁾ NZ2HB-511L060GE	
				511 ¹⁾ 1 NC + 1 NO	C1630	On request	On request	On request	054 121 ¹⁾ NZ2HB-511L060C1630
				528H 1 NC + 1 NO	090 845 NZ2HB-528	090 846 NZ2HB-528L060	091 281 NZ2HB-528L220	091 301 NZ2HB-528L060GE	
				528H 1 NC + 1 NO	C1630	On request	On request	On request	091 346 NZ2HB-528L060C1630
NZ	2	Plug connector SR6 angled	HB Lever arm	511 ¹⁾ 1 NC + 1 NO	090 847 NZ2HB-538	090 848 NZ2HB-538L060	On request	On request	
				528H 1 NC + 1 NO	C1631	On request	On request	On request	054 122 ¹⁾ NZ2HB-511L060C1631
NZ	1...9C	Plug-connector MR9	HB Lever arm	2131H 3 NC + 1 NO	077 390 NZ1HB-2131-9C-GMMF	-	-	-	
NZ	2	Plug-connector SR11	HB Lever arm	2131H 3 NC + 1 NO	090 136 NZ2HB-2131	-	-	-	
				3131H 2 NC + 2 NO	090 137 NZ2HB-3131	-	-	-	

1) No BG approval for switching element 511



Position switch NZ.PS with adjustable lever arm



- ▶ Steel roller $\varnothing 18$
- ▶ LED optional
- ▶ Plug connector optional



Approach direction



Switch head and lever arm can be adjusted in 90° steps.

Switching direction

Right, left or both sides (see page 8).

Lever arm adjustment

Lever arm length can be adjusted from 28 mm to 78 mm in steps of 12.5 mm.

LED function display (optional)

A function display is available for the following voltage ranges:

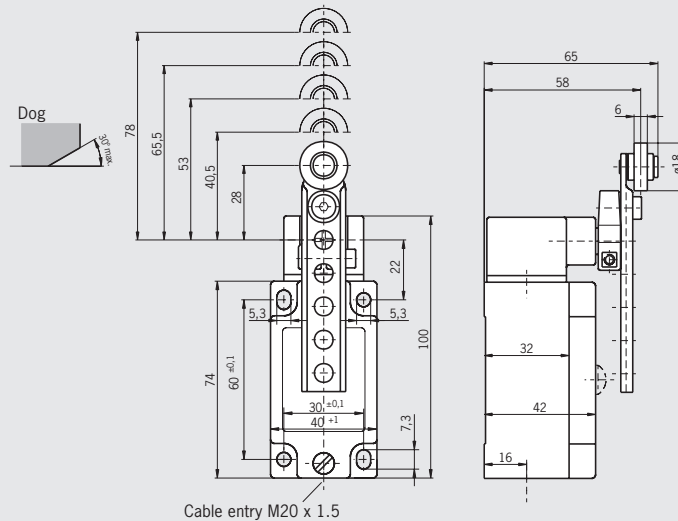
- ▶ AC/DC 12-60 V red or yellow
- ▶ AC 230 V $\pm 15\%$ red

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **538H** Slow-action contact element 2 NC \ominus
- ▶ **2121H** Slow-action contact element 4 NC \ominus
- ▶ **2131H** Slow-action contact element
3 NC \ominus + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC \ominus + 2 NO

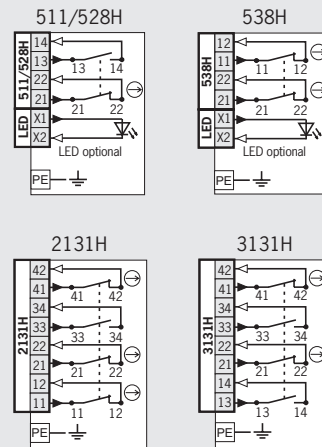
Cable entry M20 x 1.5

Dimension drawings



For cable glands see page 82

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display				
				Without LED	12-60 V LED red	230 V LED red	230 V LED yellow	
NZ	1	PS	Adjustable lever arm	511 ¹⁾ 1 NC \ominus + 1 NO	088 613 ¹⁾ NZ1PS-511-M	On request	On request	On request
				528H 1 NC \ominus + 1 NO	090 874 NZ1PS-528-M	090 430 NZ1PS-528L060-M	093 521 NZ1PS-528L220-M	093 523 NZ1PS-528L220GE-M
				538H 2 NC \ominus	090 875 NZ1PS-538-M	On request	On request	On request
				2131H 3 NC \ominus + 1 NO	090 876 NZ1PS-2131-M	-	-	-
				3131H 2 NC \ominus + 2 NO	090 877 NZ1PS-3131-M	-	-	-
				M20 x 1,5				

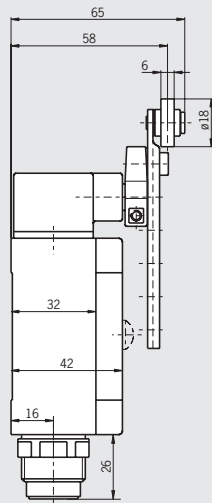
1) No BG approval for switching element 511



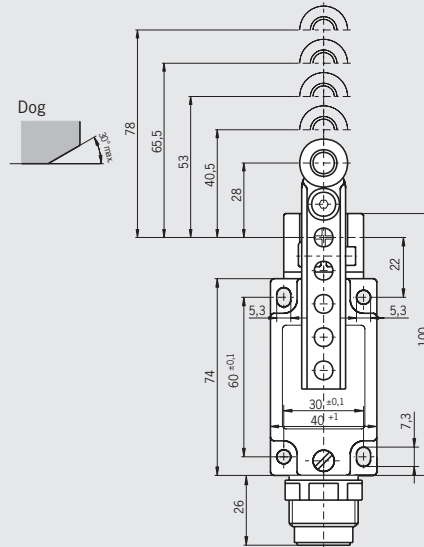
Plug connector SR6 6-pin + PE

Plug connector SR11 11-pin + PE

Dimension drawings

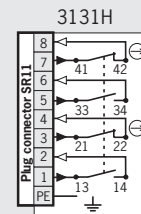
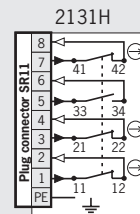
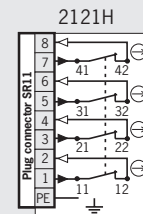
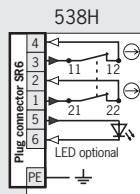
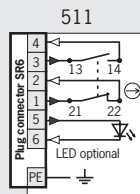


For mating connectors see page 79



For mating connectors see page 79

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display	
				Without LED	12-60 V LED red
NZ	2 Plug connector SR6	PS Adjustable lever arm steel roller	511 ¹⁾ 1 NC ⊖ + 1 NO	093 112 ¹⁾ NZ2PS-511	090 152 ¹⁾ NZ2PS-511L060
			538H 2 NC ⊖	On request	091 632 NZ2PS-538L060
NZ	2 Plug connector SR11	PS Adjustable lever arm steel roller	2121H 4 NC ⊖	091 268 NZ2PS-2121	-
			2131H 3 NC ⊖ + 1 NO	090 151 NZ2PS-2131	-
			3131H 2 NC ⊖ + 2 NO	090 150 NZ2PS-3131	-

1) No BG approval for switching element 511

Position switch NZ.PB with adjustable lever arm



- ▶ Plastic roller $\varnothing 18$



Approach direction



Horizontal

Switch head and lever arm can be adjusted in 90° steps.

Switching direction

Right, left or both sides (see page 8).

Lever arm adjustment

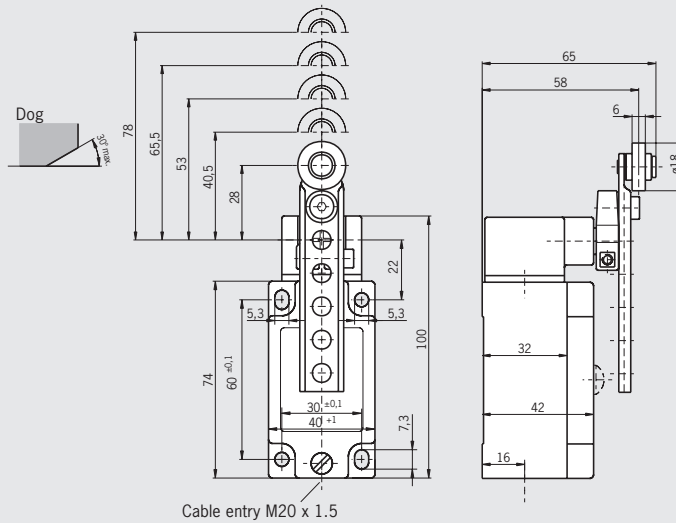
Lever arm length can be adjusted from 28 mm to 78 mm in steps of 12.5 mm.

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **538H** Slow-action contact element
2 NC \ominus
- ▶ **2131H** Slow-action contact element
3 NC \ominus + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC \ominus + 2 NO

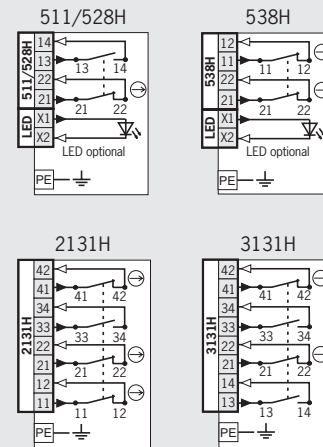
Cable entry M20 x 1.5

Dimension drawings



For cable glands see page 82

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Function display	
				Without LED	
NZ	1	PB	Adjustable lever arm	511 ¹⁾ 1 NC \ominus + 1 NO	088 618 ¹⁾ NZ1PB-511-M
				528H 1 NC \ominus + 1 NO	090 870 NZ1PB-528-M
				538H 2 NC \ominus	090 871 NZ1PB-538-M
				2131H 3 NC \ominus + 1 NO	090 872 NZ1PB-2131-M
				3131H 2 NC \ominus + 2 NO	090 873 NZ1PB-3131-M

1) No BG approval for switching element 511

Position switch NZ.RS.C1588 with roller plunger



- ▶ **Version C** according to EN 50041 (steel roller \varnothing 12 mm)
- ▶ **Exterior bellows** (CR-based material)



Approach direction



Horizontal

Switch head and lever arm can be adjusted in 90° steps.

Exterior bellows

Protection against heavy soiling (dust) and aggressive coolants.

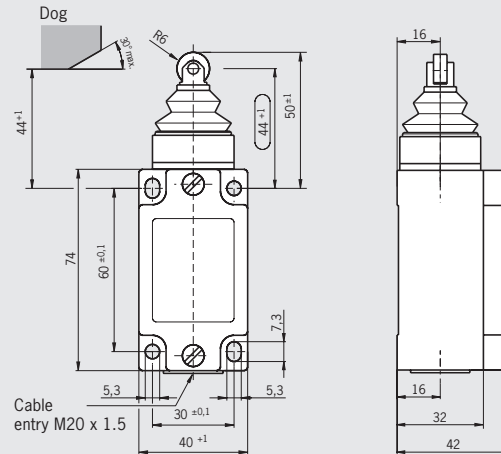
Switching elements

(see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO

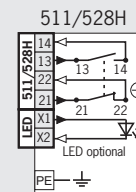
Cable entry M20 x 1.5

Dimension drawings



For cable glands see page 82

Wiring diagrams switch not activated



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display
					Without LED
NZ	1 Cable entry M20 x 1,5	RS Roller plunger	511 ¹⁾ 1 NC \ominus + 1 NO	C1588 Exterior bellows, red cover	091 352 ¹⁾ NZ1RS-511-MC1588
			528H 1 NC \ominus + 1 NO	C1588 Exterior bellows, red cover	091 339 NZ1RS-528-MC1588

1) No BG approval for switching element 511

Position switch NZ.HB.C569 with roller lever arm



- ▶ Large plastic roller \varnothing 30 mm
- ▶ LED optional



Approach direction



Switch head and lever arm can be adjusted in 90° steps.

Switching direction

Right, left or both sides (see page 8).

LED function display (optional)

A function display is available for the following voltage ranges:

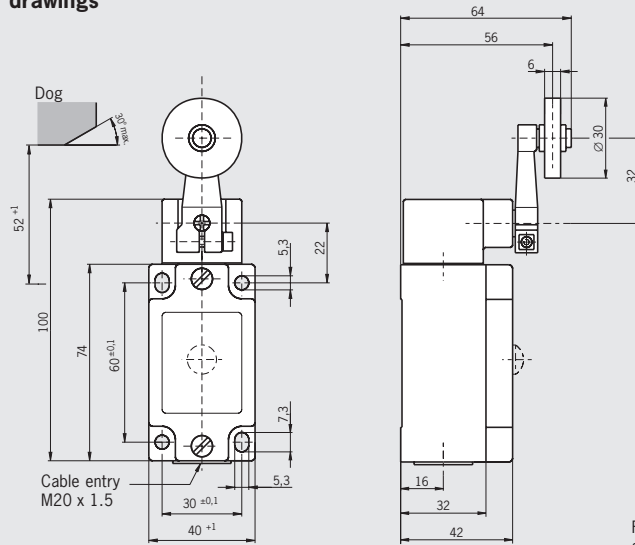
- ▶ AC/DC 12-60 V red

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC \ominus + 1 NO
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **538H** Slow-action contact element
2 NC \ominus

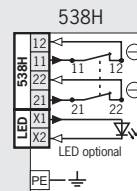
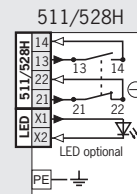
Cable entry M20 x 1.5

Dimension drawings



For cable glands see page 82

Wiring diagrams switch not activated




Ordering table

Series	Connection	Actuator	Switching element	Version	Function display	
					Without LED	12-60 V LED red
NZ	1 Cable entry M20 x 1,5	HB Lever arm	511 ¹⁾ 1 NC \ominus + 1 NO	C569 Large plastic roller \varnothing 30 mm	079 965 ¹⁾ NZ1HB-511-MC569	091 091 ¹⁾ NZ1HB-511L060-MC569
			528H 1 NC \ominus + 1 NO	C569 Large plastic roller \varnothing 30 mm	079 946 NZ1HB-528-MC569	091 330 NZ1HB-528L060-MC569
			538H 2 NC \ominus	C569 Large plastic roller \varnothing 30 mm	079 999 NZ1HB-538-MC569	On request

1) No BG approval for switching element 511

Selection table for safety switches NZ.VZ

Version											
SB	Protective plate, tamper protection on the switch head										
	Connection										
	M	SVM5	C16-1	SR6	MR8	MR9	SR11	Thread M20x1.5 for cable glands			
								M12 plug connector 5-pin			
								Plug connector 6-pin + PE			
								Plug connector 6-pin + PE			
								Plug connector 7-pin + PE			
								Plug connector 8-pin + PE			
								Plug connector 11-pin + PE			
								Switching element			
								Two contacts		1 NC ⊖ + 1 NO or 2 NC ⊖	
								Four contacts		2 NC ⊖ + 2 NO, 3 NC ⊖ + 1 NO or 4 NC ⊖	



SB	M	SVM5	Connection					Switching element		With version	Page
			C16-1	SR6	MR8	MR9	SR11	2 contacts	4 contacts		
	●	●						●	●	ATEX	42
				●				●			43
					●	●	●		●		43
●	●							●		C1233	44
●			●	●				●		C1420/C1701/C1233	45
●							●		●	C1233	45

Safety switch NZ.VZ

- ▶ Housing according to EN 50041
- ▶ Various cable entries
- ▶ Plug connector optional
- ▶ LED optional



Approach direction

- ▶ Horizontal
- ▶ Can be adjusted in 90°-steps.

LED function display (optional)

A function display is available for the following voltage ranges:

- ▶ AC/DC 12-60 V red
- ▶ AC 110 V ±15% red
- ▶ AC 230 V ±15% red

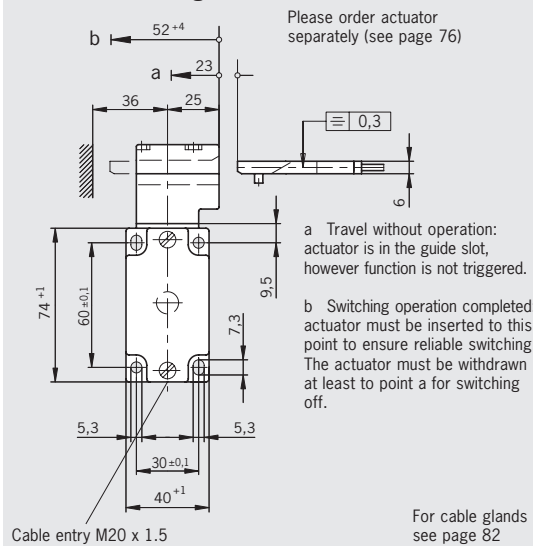
Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC ⊖ + 1 NO
- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **538H** Slow-action contact element
2 NC ⊖
- ▶ **2121H** Slow-action contact element
4 NC ⊖
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

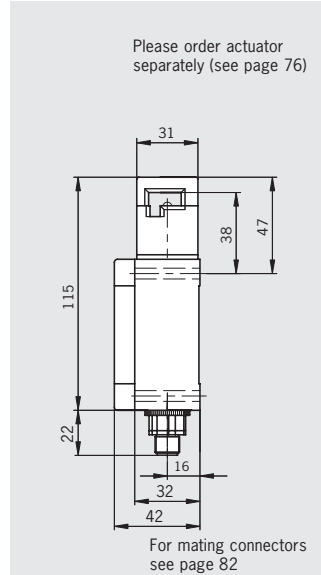


Cable entry M20 x 1.5

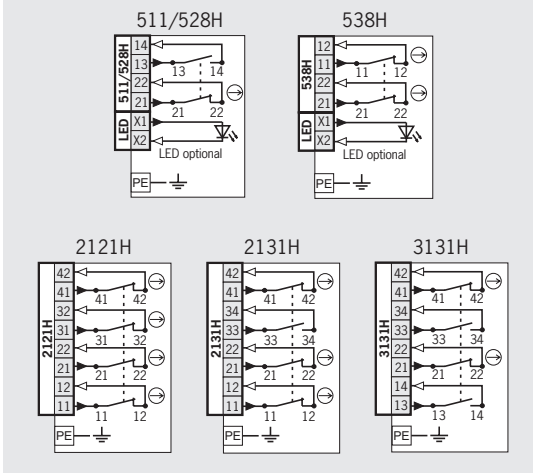
Dimension drawings



Plug connector SVM5 M12 plug, 5-pin



Wiring diagrams actuator inserted



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display			
					Without LED	12-60 V LED red	110 V LED red	230 V LED red
NZ	1 Cable entry M20 x 1,5	VZ Separate actuator	511 ¹⁾ 1 NC ⊖ + 1 NO		089 479 ¹⁾ NZ1VZ-511E-M	On request	On request	On request
			528 1 NC ⊖ + 1 NO		090 671 NZ1VZ-528E-M	090 566 NZ1VZ-528EL060-M	089 480 NZ1VZ-528EL110-M	082 121 NZ1VZ-528EL220-M
			538H 2 NC ⊖		085 676 NZ1VZ-538E-M	082 119 NZ1VZ-538EL060-M	089 481 NZ1VZ-538EL110-M	089 482 NZ1VZ-538EL220-M
			2121H 4 NC ⊖		089 486 NZ1VZ-2121E-M	-	-	-
			2131H 3 NC ⊖ + 1 NO		082 123 NZ1VZ-2131E-M	-	-	-
			2131H 3 NC ⊖ + 1 NO	ATEX incl. cable gland	093 660 ²⁾ NZ1VZ-2131E-MEX	-	-	-
			3131H 2 NC ⊖ + 2 NO		082 122 NZ1VZ-3131E-M	-	-	-
NZ	2 Plug connector SVM5	VZ Separate actuator	538H 2 NC ⊖		084 905 NZ2VZ-538ESVM5	On request	-	-

1) No BG approval for switching element 511

2) EX II 3G EEx n C II T6

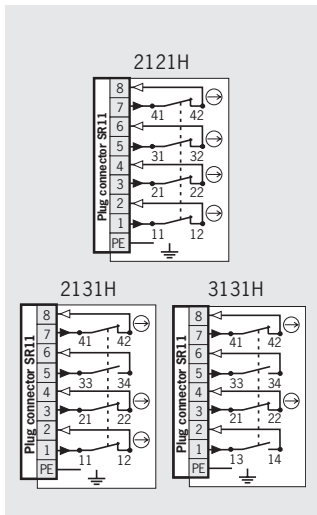
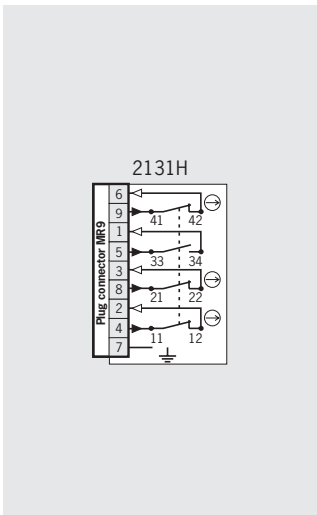
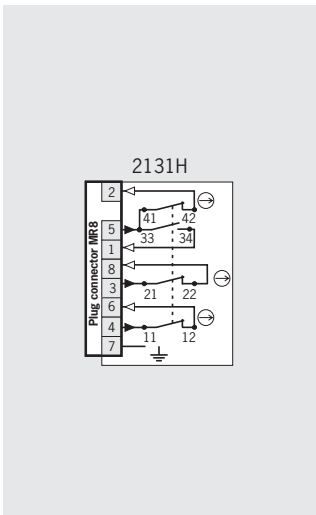
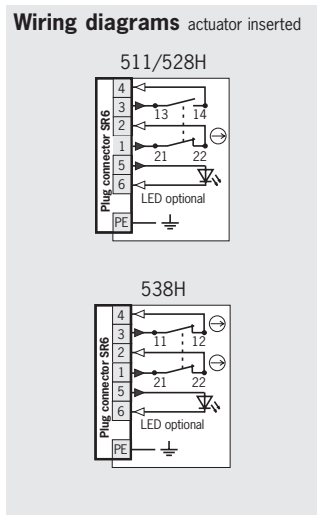
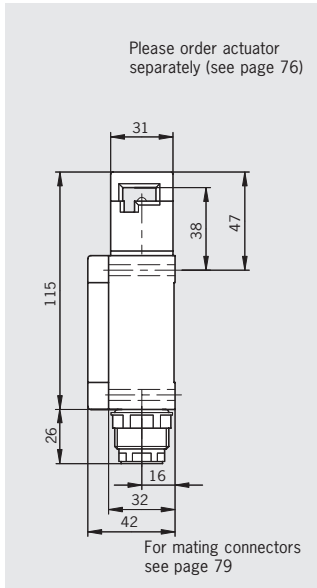
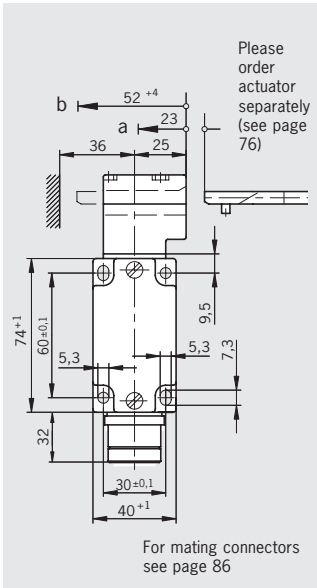
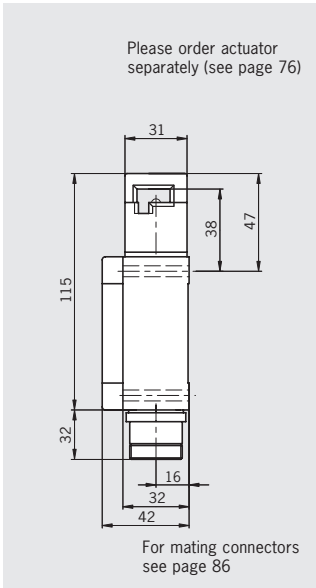
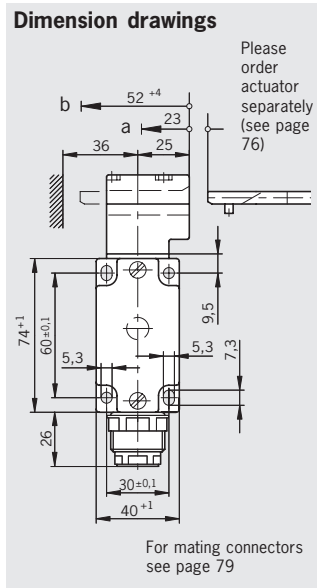


Plug connector SR6 6-pin + PE

Plug connector MR8 7-pin + PE

Plug connector MR9 8-pin + PE

Plug connector SR11 11-pin + PE



Ordering table

Series	Connection	Actuator	Switching element	Function display			
				Without LED	12-60 V LED red	110 V LED red	230 V LED red
NZ	2 Plug connector SR6	VZ Separate actuator	511 1 NC \ominus + 1 NO	On request	045 551 NZZVZ-511EL060	On request	On request
			528H 1 NC \ominus + 1 NO	084 885 NZZVZ-528E	045 801 NZZVZ-528EL060	059 467 NZZVZ-528EL110	038 129 NZZVZ-528EL220
			538H 2 NC \ominus	090 143 NZZVZ-538E	052 108 NZZVZ-538EL060	072 234 NZZVZ-538EL110	059 004 NZZVZ-538EL220
NZ	1 Plug connector MR8	VZ Separate actuator	2131H 3 NC \ominus + 1 NO	092 355 NZ1VZ-2131E-8C-GMMF	-	-	-
NZ	1 Plug connector MR9	VZ Separate actuator	2131H 3 NC \ominus + 1 NO	077 363 NZ1VZ-2131E-9C-GMMF	-	-	-
NZ	2 Plug connector SR11	VZ Separate actuator	2121H 4 NC \ominus	088 852 NZZVZ-2121E	-	-	-
			2131H 3 NC \ominus + 1 NO	090 144 NZZVZ-2131E	-	-	-
			3131H 2 NC \ominus + 2 NO	090 145 NZZVZ-3131E	-	-	-

3) Approval pending

For safety instructions see page 103
For technical data see page 87





Safety switch NZ.VZ

- ▶ Housing according to EN 50041
- ▶ Protective plate for switch head
- ▶ Plug connector optional
- ▶ LED optional



Approach direction

- ▶ Horizontal
- ▶ Can be adjusted in 90°-steps.

Protective plate for switch head

Makes it more difficult to tamper with the switch.

LED function display (optional)

A function display is available for the following voltage ranges:

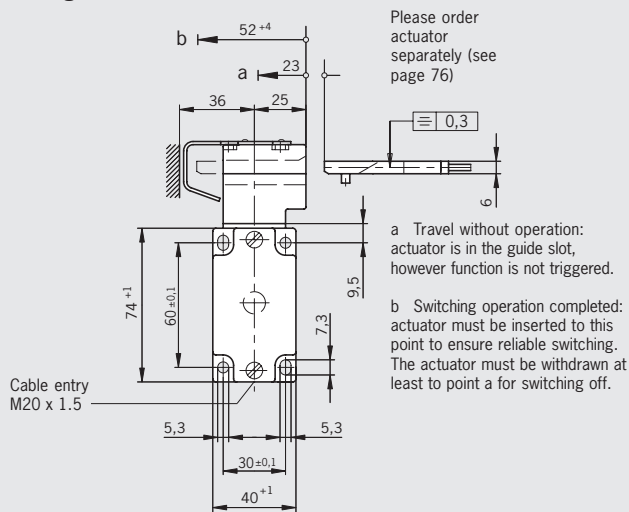
- ▶ AC/DC 12-60 V red
- ▶ AC 230 V ±15% red

Switching elements (see also page 11)

- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **538H** Slow-action contact element
2 NC ⊖
- ▶ **2121H** Slow-action contact element
4 NC ⊖
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO

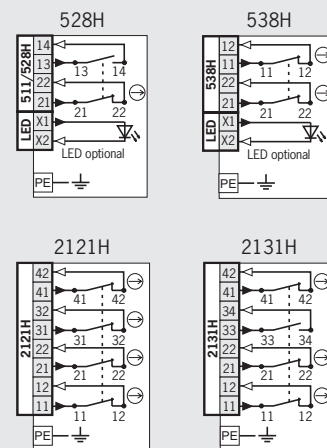
Cable entry M20 x 1.5

Dimension drawings



For cable glands see page 82

Wiring diagrams actuator inserted



Ordering table

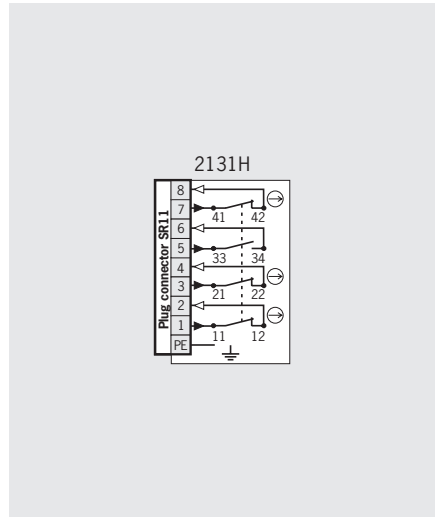
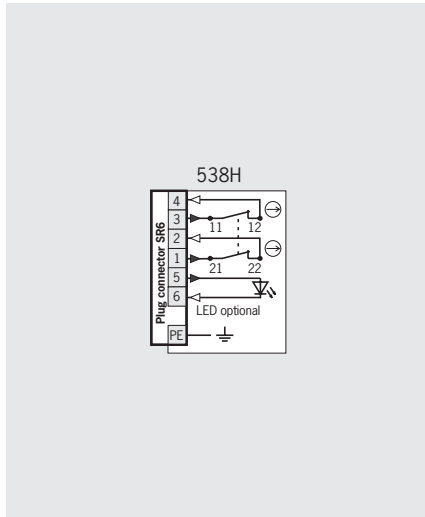
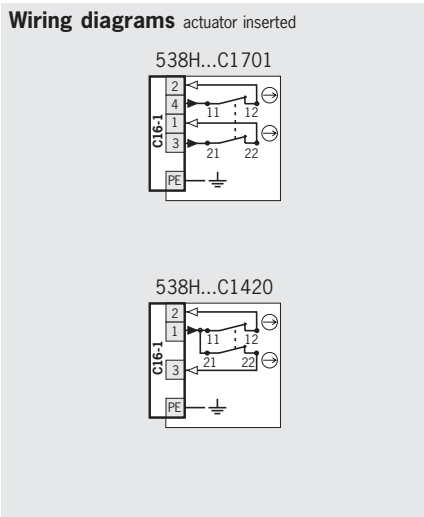
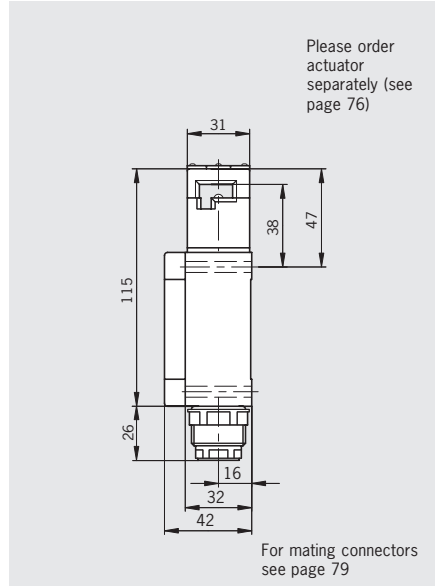
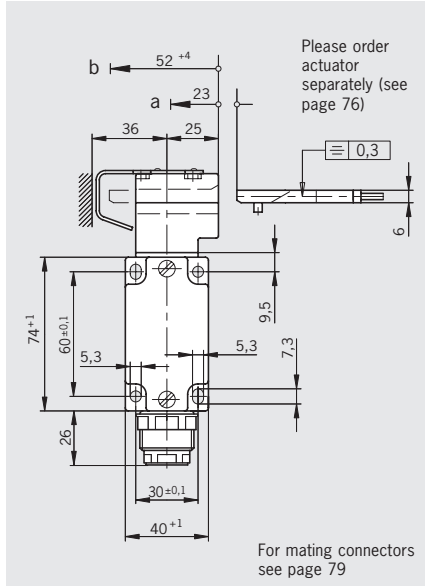
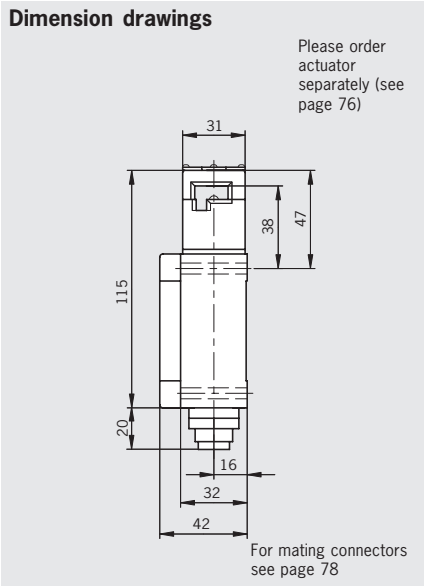
Series	Connection	Actuator	Switching element	Version	Function display		
					Without LED	12-60 V LED red	230 V LED red
NZ	1 Cable entry M20 x 1,5	VZ Separate actuator	528H 1 NC ⊖ + 1 NO	With protective plate	082 137 NZ1VZ-528E-MC1233	089 497 NZ1VZ-528EL060-MC1233	On request
			538H 2 NC ⊖	With protective plate	093 858 NZ1VZ-538E-MC1233	On request	089 496 NZ1VZ-538EL220-MC1233
			2121H 4 NC ⊖	With protective plate	089 914 NZ1VZ-2121E-MC1233	-	-
			2131H 3 NC ⊖ + 1 NO	With protective plate	093 859 NZ1VZ-2131E-MC1233	-	-



Plug connector C16-1 6-pin + PE

Plug connector SR6 6-pin + PE

Plug connector SR11 11-pin + PE



Ordering table

Series	Connection	Actuator	Switching element	Version	Function display
					Without LED
NZ	2 Plug connector C16-1 ⁴⁾	VZ Separate actuator	538H 2 NC \ominus	C1701 With protective plate	071 200 NZ2VZ-538EC1701
				C1420 With protective plate alternative wiring	043 296 NZ2VZ-538EC1420
NZ	2 Plug connector SR6	VZ Separate actuator	538H 2 NC \ominus	With protective plate	077 229 NZ2VZ-538EC1233
NZ	2 Plug connector SR11	VZ Separate actuator	2131H 3 NC \ominus + 1 NO	With protective plate	093 857 NZ2VZ-2131EC1233

3) Approval pending

4) Switch can be replaced by an enabling switch with C16-1 plug connector



Safety switch NZ.VZ.VSM with guard locking

- ▶ Housing according to EN 50041
- ▶ Plug connector optional
- ▶ LED optional



Approach direction

- Horizontal
- Can be adjusted in 90°-steps.

Solenoid operating voltage and optional LED function display

A function display is available for the following voltage ranges:

- | | |
|-----------------|---------------------------------|
| Solenoid | LED |
| ▶ DC 24 V ±10% | AC/DC 12-60 V red |
| ▶ AC 110 V ±15% | AC 110 V ±15% red ¹⁾ |
| ▶ AC 230 V ±15% | AC 230 V ±15% red ¹⁾ |

Locking method

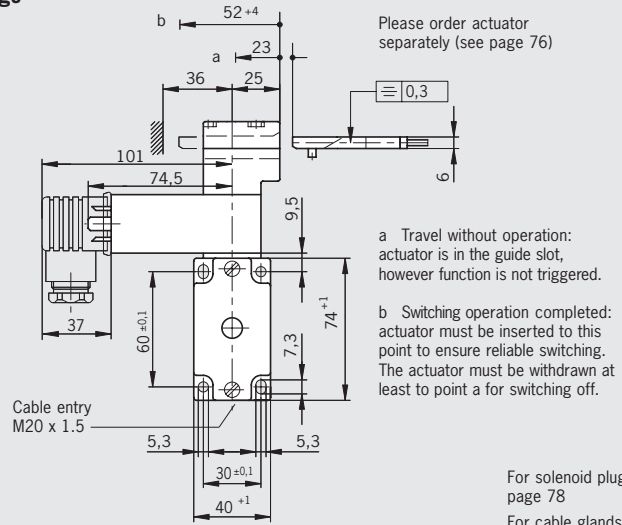
VSM Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.

Switching elements (see also page 11)

- ▶ **511** Snap-action contact element
1 NC ⊖ + 1 NO
- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **538H** Slow-action contact element 2 NC ⊖
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

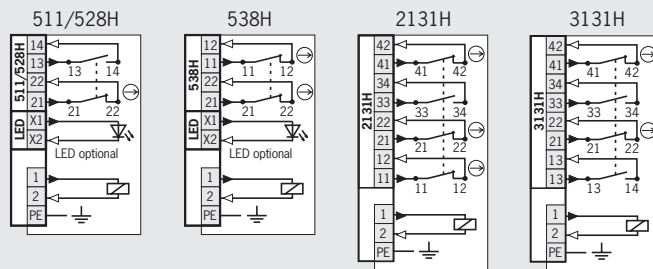
Cable entry M20 x 1.5

Dimension drawings



For solenoid plugs see page 78
For cable glands see page 82

Wiring diagrams



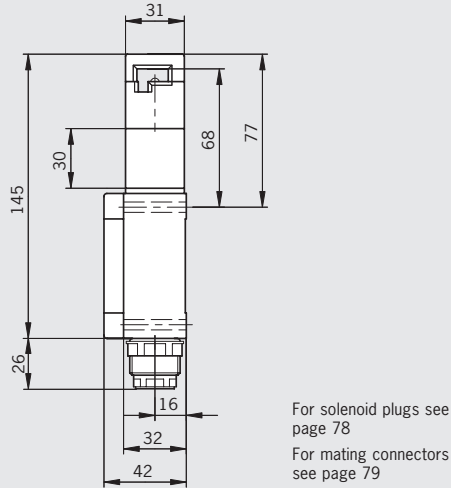
Ordering table

Series	Connection	Actuator	Approach direction	Locking	Solenoid-voltage	Switching element	Function display			
							Without LED	12-60V LED rot	110 V LED rot	230 V LED rot
NZ	1 Cable entry M20 x 1,5	VZ Separate actuator	E3	VSM Mech. guard locking closed-circuit current principle	04 24 V DC	1 NC ⊖ + 1 NO	090 339 NZ1VZ-511E3VSM04-M	090 344 NZ1VZ-511E3VSM04L060-M	On request	On request
						528H	082 125 NZ1VZ-528E3VSM04-M	082 126 NZ1VZ-528E3VSM04L060-M	On request	089 488 NZ1VZ-528E3VSM04L220-M
						1 NC ⊖ + 1 NO	082 131 NZ1VZ-538E3VSM04-M	082 132 NZ1VZ-538E3VSM04L060-M	On request	090 345 NZ1VZ-538E3VSM04L220-M
						2 NC ⊖	-	-	-	-
						2131H	088 049 NZ1VZ-2131E3VSM04-M	-	-	-
						3 NC ⊖ + 1 NO	-	-	-	-
					07 ¹⁾ 110 V AC	1 NC ⊖ + 1 NO	088 046 NZ1VZ-538E3VSM07-M	On request	089 485 NZ1VZ-528E3VSM07L110-M	090 341 NZ1VZ-528E3VSM07L220-M
						538H	088 046 NZ1VZ-538E3VSM07-M	On request	090 340 NZ1VZ-538E3VSM07L110-M	On request
						2 NC ⊖	-	-	-	-
						2131H	088 038 NZ1VZ-2131E3VSM07-M	-	-	-
						3 NC ⊖ + 1 NO	-	-	-	-
						3131H	088 040 NZ1VZ-3131E3VSM07-M	-	-	-
09 ¹⁾ 230 V AC	1 NC ⊖ + 1 NO	088 045 NZ1VZ-528E3VSM09-M	On request	090 349 NZ1VZ-528E3VSM09L060-M	On request					
	538H	088 044 NZ1VZ-538E3VSM09-M	On request	On request	On request					
	2 NC ⊖	-	-	-	-					
	2131H	088 039 NZ1VZ-2131E3VSM09-M	-	-	-					
	3 NC ⊖ + 1 NO	-	-	-	-					
	3131H	088 041 NZ1VZ-3131E3VSM09-M	-	-	-					

¹⁾ Use only solenoid plug with integrated rectifier (see page 78)

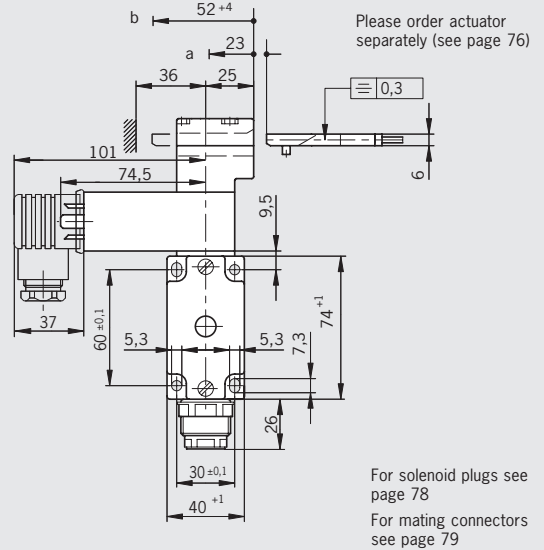
Plug connector SR6 6-pin + PE

Dimension drawings

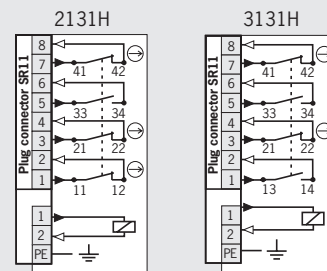
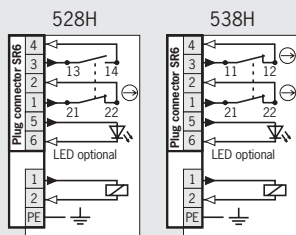


Plug connector SR11 11-pin + PE

Dimension drawings



Wiring diagrams



Ordering table

Series	Connection	Actuator	Approach direction	Locking	Solenoid-voltage	Switching element	Function display		
							Without LED	12-60V LED red	230 V LED red
NZ	2 Plug connector SR6	VZ Separate actuator	E3	VSM Mech. guard locking closed-circuit current principle	04 24 V DC	528H 1 NC ⊖ + 1 NO	037 299 NZ2VZ-528E3VSM04	045 856 NZ2VZ-528E3VSM04L060	070 039 NZ2VZ-528E3VSM04L220
						538H 2 NC ⊖	050 428 NZ2VZ-538E3VSM04	059 427 NZ2VZ-538E3VSM04L060	On request
					09 ¹⁾ 230 V AC	528H 1 NC ⊖ + 1 NO	055 718 NZ2VZ-528E3VSM09	On request	On request
						538H 2 NC ⊖	076 502 NZ2VZ-538E3VSM09	On request	On request
NZ	2 Plug connector SR11	VZ Separate actuator	E3	VSM Mech. guard locking closed-circuit current principle	04 24 V DC	2131H 3 NC ⊖ + 1 NO	074 471 NZ2VZ-2131E3VSM04	-	-
						3131H 2 NC ⊖ + 2 NO	074 472 NZ2VZ-3131E3VSM04	-	-

1) Use only solenoid plug with integrated rectifier (see page 78)

Safety switch NZ.VZ.VSE with guard locking

- ▶ Housing according to EN 50041
- ▶ Plug connector optional
- ▶ LED optional



Approach direction

- Horizontal
- Can be adjusted in 90°-steps.

Solenoid operating voltage and optional LED function display

A function display is available for the following voltage ranges:

- | | |
|-----------------|---------------------------------|
| Solenoid | LED |
| ▶ DC 24 V ±10% | AC/DC 12-60 V red |
| ▶ AC 110 V ±15% | AC 110 V ±15% red ¹⁾ |
| ▶ AC 230 V ±15% | AC 230 V ±15% red ¹⁾ |

Locking method

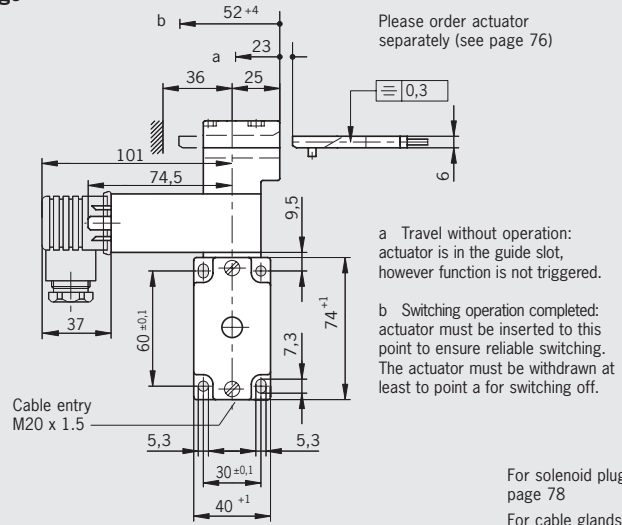
VSE Open-circuit current principle, locking by applying voltage to the solenoid. Release by spring force.

Switching elements (see also page 11)

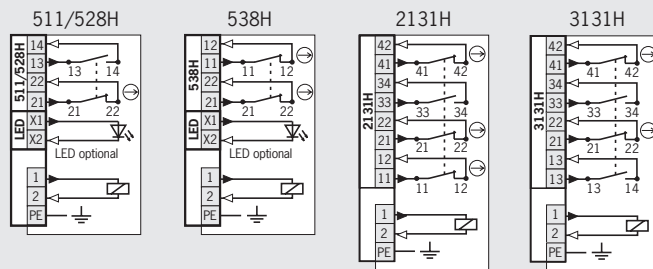
- ▶ **511** Snap-action contact element
1 NC ⊖ + 1 NO
- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **538H** Slow-action contact element 2 NC ⊖
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

Dimension drawings



Wiring diagrams



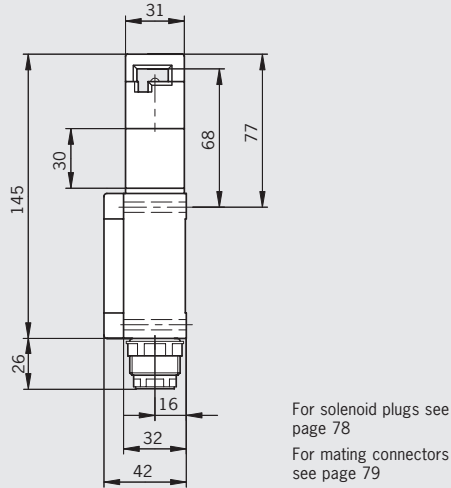
Ordering table

Series	Connection	Actuator	Approach direction	Locking	Solenoid-voltage	Switching element	Function display			
							Without LED	12-60V LED red	110 V LED red	230 V LED red
NZ	1 Cable entry M20 x 1,5	VZ Separate actuator	E3	VSE Elec. guard locking open-circuit current principle	04 24 V DC	511 1 NC ⊖ + 1 NO	090 343 NZ1VZ-511E3VSE04-M	On request	On request	On request
						528H 1 NC ⊖ + 1 NO	079 300 NZ1VZ-528E3VSE04-M	082 130 NZ1VZ-528E3VSE04L060-M	On request	091 738 NZ1VZ-528E3VSE04L220-M
						538H 2 NC ⊖	089 905 NZ1VZ-538E3VSE04-M	082 128 NZ1VZ-538E3VSE04L060-M	On request	On request
						2131H 3 NC ⊖ + 1 NO	082 134 NZ1VZ-2131E3VSE04-M	-	-	-
						3131H 2 NC ⊖ + 2 NO	088 051 NZ1VZ-3131E3VSE04-M	-	-	-
						07 ¹⁾ 110 V AC	528H 1 NC ⊖ + 1 NO	082 133 NZ1VZ-528E3VSE07-M	090 337 NZ1VZ-528E3VSE07L060-M	089 484 NZ1VZ-528E3VSE07L110-M
					538H 2 NC ⊖	088 048 NZ1VZ-538E3VSE07-M	On request	090 348 NZ1VZ-538E3VSE07L110-M	On request	
					2131H 3 NC ⊖ + 1 NO	088 036 NZ1VZ-2131E3VSE07-M	-	-	-	
					3131H 2 NC ⊖ + 2 NO	088 042 NZ1VZ-3131E3VSE07-M	-	-	-	
					09 ¹⁾ 230 V AC	528H 1 NC ⊖ + 1 NO	088 047 NZ1VZ-528E3VSE09-M	090 346 NZ1VZ-528E3VSE09L060-M	On request	090 335 NZ1VZ-528E3VSE09L220-M
					538H 2 NC ⊖	088 035 NZ1VZ-538E3VSE09-M	On request	On request	090 334 NZ1VZ-538E3VSE09L220-M	
					2131H 3 NC ⊖ + 1 NO	088 037 NZ1VZ-2131E3VSE09-M	-	-	-	
3131H 2 NC ⊖ + 2 NO	088 043 NZ1VZ-3131E3VSE09-M	-	-	-						

¹⁾ Use only solenoid plug with integrated rectifier (see page 78)

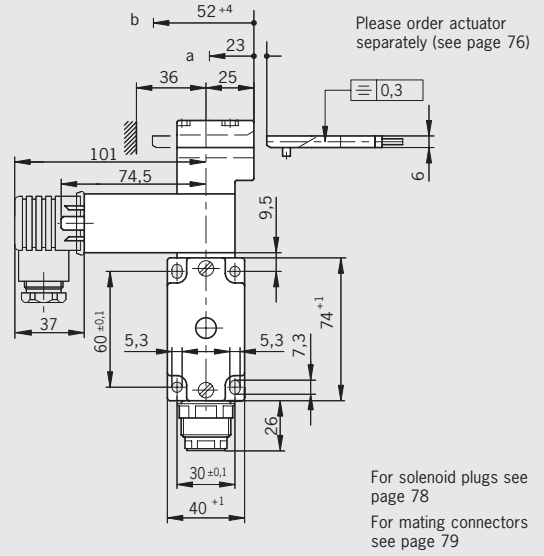
Plug connector SR6 6-pin + PE

Dimension drawings

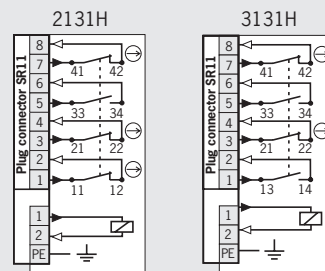
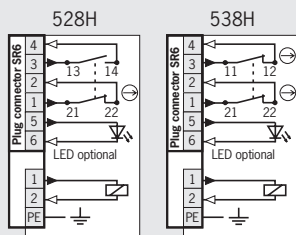


Plug connector SR11 11-pin + PE

Dimension drawings



Wiring diagrams



Ordering table

Series	Connection	Actuator	Approach direction	Locking	Solenoid-voltage	Switching element	Function display		
							Without LED	12-60V LED red	110 V LED red
NZ	2 Plug connector SR6	VZ Separate actuator	E3	VSE Elec. guard locking open-circuit current principle	04 24 V DC	528H 1 NC ⊖ + 1 NO	044 894 NZ2VZ-528E3VSE04	046 742 NZ2VZ-528E3VSE04L060	On request
						538H 2 NC ⊖	047 837 NZ2VZ-538E3VSE04	057 921 NZ2VZ-538E3VSE04L060	On request
						07 ¹⁾ 110 V AC	528H 1 NC ⊖ + 1 NO	On request	On request
NZ	2 Plug connector SR11	VZ Separate actuator	E3	VSE Elec. guard locking open-circuit current principle	04 24 V DC	2131H 3 NC ⊖ + 1 NO	074 473 NZ2VZ-2131E3VSE04	-	-
						3131H 2 NC ⊖ + 2 NO	074 474 NZ2VZ-3131E3VSE04	-	-

1) Use only solenoid plug with integrated rectifier (see page 78)

Safety switch NZ.VZ.VSH with guard locking

- ▶ Housing according to EN 50041
- ▶ Manual release
- ▶ Plug connector optional



Anfahrrichtung

Horizontal
Umstellbar in 90°-Schritten.

Locking method

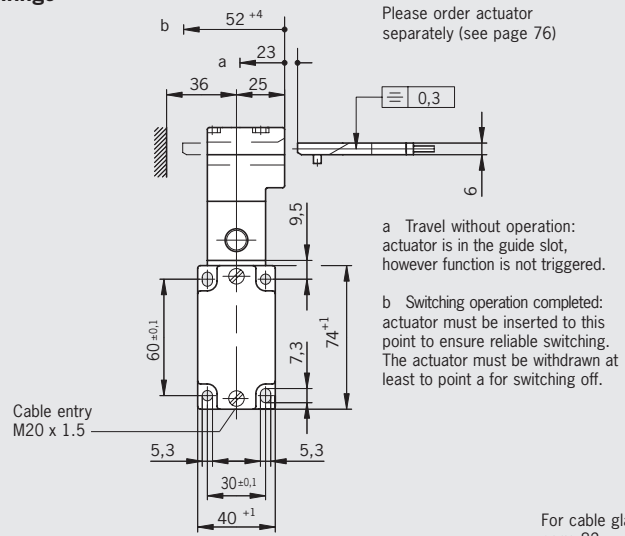
VSH Mechanical locking by spring force. Manual release.

Switching elements (see also page 11)

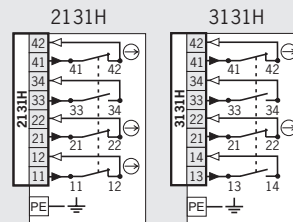
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

Dimension drawings



Wiring diagrams

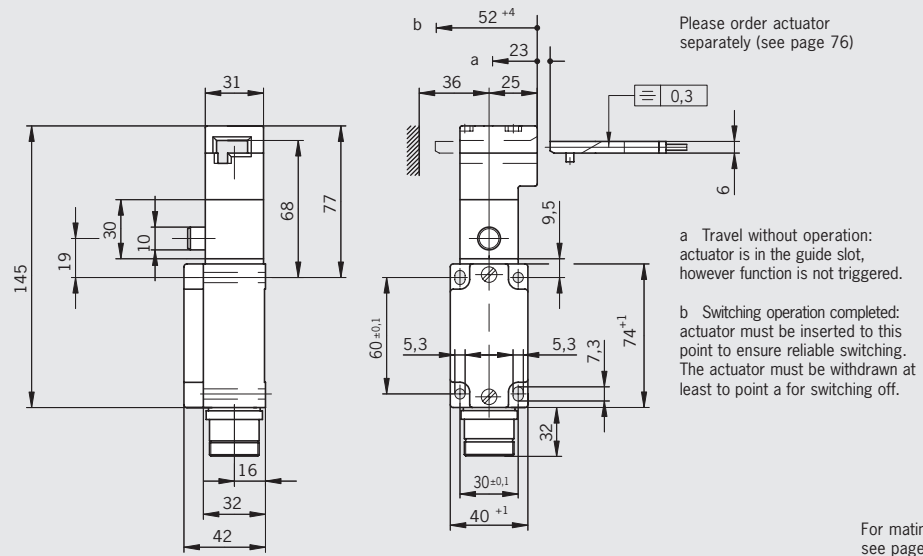


Ordering table

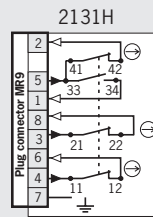
Series	Connection	Actuator	Approach direction	Locking	Switching element	Function display
						Without LED
NZ	1 Cable entry M20 x 1,5	VZ Separate actuator	E3	VSH Manual guard locking not powered	2131H 3 NC ⊖ + 1 NO	089 483 NZ1VZ-2131E3VSH-M
					3131H 2 NC ⊖ + 2 NO	089 915 NZ1VZ-3131E3VSH-M

Plug connector MR8
7-pin + PE

Dimension drawings



Wiring diagrams

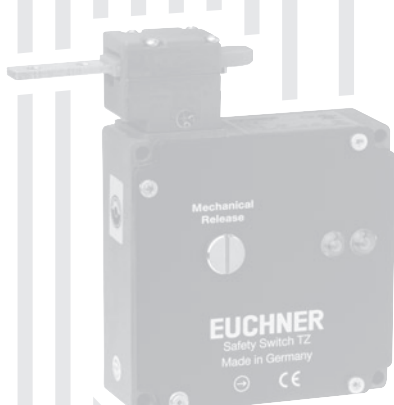


Ordering table

Series	Connection	Actuator	Approach direction	Locking	Switching element	Function display
NZ	1...8C Plug connector MR8	VZ Separate actuator	E3	VSH Manual guard locking not powered	2131H 3 NC \ominus + 1 NO	Without LED 093 611 NZ1VZ-2131E3VSH-8C-GMMF

Selection table for safety switches TZ with guard locking and guard locking monitoring

Release feature, front																								
HE	Mechanical release can be sealed																							
E	Mechanical release cannot be sealed																							
ND	Emergency release from the front (pushbutton)																							
NR	Emergency unlocking from the front (rotary knob can be sealed)																							
○	Without manual release feature																							
Release feature, rear																								
FS	Escape release from the rear (key button)																							
FD	Escape release from the rear (pushbutton)																							
Version																								
SB	Protective plate, tamper protection on the switch head																							
Enabling switch connection																								
BD4	Plug connector 4-pin																							
RC12	Plug connector 12-pin																							
Connection																								
M	Thread M20x1.5 for cable glands																							
SR6	Plug connector 6-pin + PE																							
MR8	Plug connector 7-pin + PE																							
MR10	Plug connector 9-pin + PE																							
SR11	Plug connector 11-pin + PE																							
MR12	Plug connector 11-pin + PE																							
RC18	Plug connector 18-pin + PE																							
Switching element																								
Two contacts		2 x (1 NC ⊖ + 1 NO)																						
Four contacts		2 x (4 NC ⊖) or 1 x (3 NC ⊖ + 1 NO) + 1 x (2 NC ⊖ + 2 NO)																						
Manual release																								
HE	E	ND	NR	○	FS	FD	SB	Enabling switch									Connection				Switching element		With version	Page
BD4	RC12	M	SR6	MR8	MR10	SR11	MR12	RC18	2 contacts	4 contacts														
•											•							•	•	C1925	56			
•												•						•		C1638	57			
•																		•		C1933	59			
•																		•	•	C1924	57			
•																		•	•	C1826	59			
•					•						•							•	•	C1815 / C1828	66			
•					•													•		C1815	67			
•					•													•	•	C1828	67			
•						•					•							•	•	C1684	68			
•						•												•	•	C1684	69			
•							•				•							•			60			
•												•						•	•	C1677	61			
•																		•	•		61			
•	•												•					•			58			
•	•												•					•	•	C1903	58			
		•									•							•	•	C1816 / C1823	62			
		•																•		C1816	63			
		•																•	•	C1823	63			
			•															•			64			
			•															•	•	C1937	65			
			•															•	•		65			
				•							•							•	•	C1623	70			
				•														•	•	C1902 / C1971	71			
				•								•						•		C1662	72			
				•														•	•	C1803	73			



Safety switch TZ with guard locking and guard locking monitoring



- ▶ Mechanical release on the front
- ▶ Two LEDs, red and green
- ▶ Plug connector optional
- ▶ Actuating head fitted left or right



Mechanical release

Is used for releasing the guard locking with the aid of a tool. A sealing wire can be fitted to protect against tampering. Lead sealing kit and tool included.

Solenoid operating voltage and LED function display

The following voltage ranges are available:

- ▶ 24 V AC/DC -15%, +10%
- ▶ 110 V AC -15%, +10%
- ▶ 230 V AC -15%, +10%

Locking methods

- TZ1** Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.
- TZ2** Open-circuit current principle, locking by applying voltage to the solenoid. Release by spring force.

Switching elements (see also page 11)

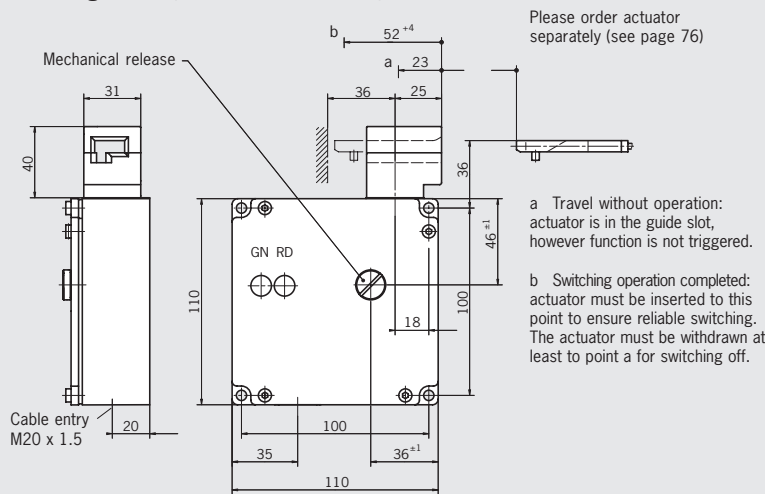
- SK** For monitoring the door/actuator position
- ÜK** For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **2121H** Slow-action contact element 4 NC ⊖
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

Dimension drawings actuating head on left is a mirror image

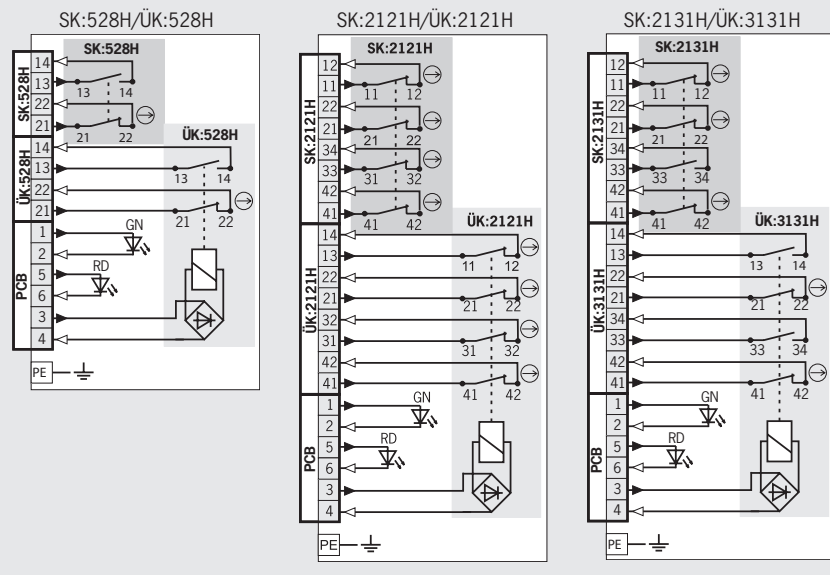


Please order actuator separately (see page 76)

- a Travel without operation: actuator is in the guide slot, however function is not triggered.
- b Switching operation completed: actuator must be inserted to this point to ensure reliable switching. The actuator must be withdrawn at least to point a for switching off.

For cable glands see page 82

Wiring diagram actuator inserted and locked



Ordering table

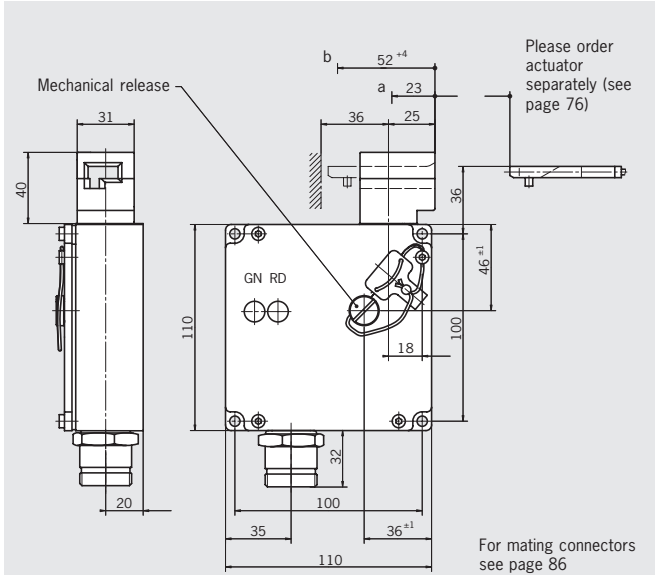
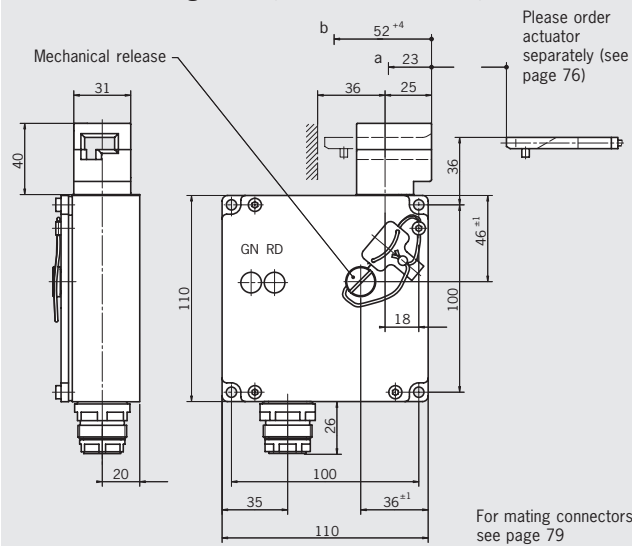
Series	Locking	Switch head	Switching element	Con- nection	Black cover			Red cover	
					24 V	110 V	230 V	24 V	110 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	082 050	083 160	083 166	083 164	083 168
			ÜK: 528H, 1 NC ⊖ + 1 NO	metr.	TZ1LE024M	TZ1LE110M	TZ1LE220M	TZ1LE024M-R	TZ1LE110M-R
			SK: 2121H, 4 NC ⊖	M	On request	On request	On request	089 464	On request
		ÜK: 2121H, 4 NC ⊖	metr.				TZ1LE024MVFGR-RC1925		
		SK: 2131H, 3 NC ⊖ + 1 NO	M	083 965	088 023	088 029	089 434	On request	
		ÜK: 3131H, 2 NC ⊖ + 2 NO	metr.	TZ1LE024MVAB	TZ1LE110MVAB	TZ1LE220MVAB	TZ1LE024MVAB-R		
	2 Electrical	RE Right	SK: 528H, 1 NC ⊖ + 1 NO	M	082 051	083 161	083 167	083 165	089 448
			ÜK: 528H, 1 NC ⊖ + 1 NO	metr.	TZ1RE024M	TZ1RE110M	TZ1RE220M	TZ1RE024M-R	TZ1RE110M-R
			SK: 2121H, 4 NC ⊖	M	On request	On request	On request	089 465	On request
		ÜK: 2121H, 4 NC ⊖	metr.				TZ1RE024MVFGR-RC1925		
		SK: 2131H, 3 NC ⊖ + 1 NO	M	083 966	088 024	088 030	083 233	On request	
		ÜK: 3131H, 2 NC ⊖ + 2 NO	metr.	TZ1RE024MVAB	TZ1RE110MVAB	TZ1RE220MVAB	TZ1RE024MVAB-R		
2 Electrical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	090 559	083 162	088 031	089 445	On request	
		ÜK: 528H, 1 NC ⊖ + 1 NO	metr.	TZ2LE024M	TZ2LE110M	TZ2LE220M	TZ2LE024M-R	On request	
		SK: 2131H, 3 NC ⊖ + 1 NO	M	088 070	088 025	088 027	On request	On request	
	ÜK: 3131H, 2 NC ⊖ + 2 NO	metr.	TZ2LE024MVAB	TZ2LE110MVAB	TZ2LE220MVAB				
	SK: 528H, 1 NC ⊖ + 1 NO	M	090 560	083 163	088 032	089 446	On request		
	ÜK: 528H, 1 NC ⊖ + 1 NO	metr.	TZ2RE024M	TZ2RE110M	TZ2RE220M	TZ2RE024M-R	On request		
2 Electrical	RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	M	088 071	088 026	088 028	On request	On request	
		ÜK: 3131H, 2 NC ⊖ + 2 NO	metr.	TZ2RE024MVAB	TZ2RE110MVAB	TZ2RE220MVAB			



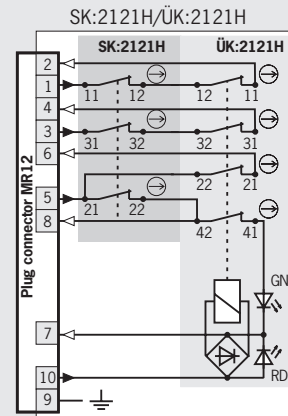
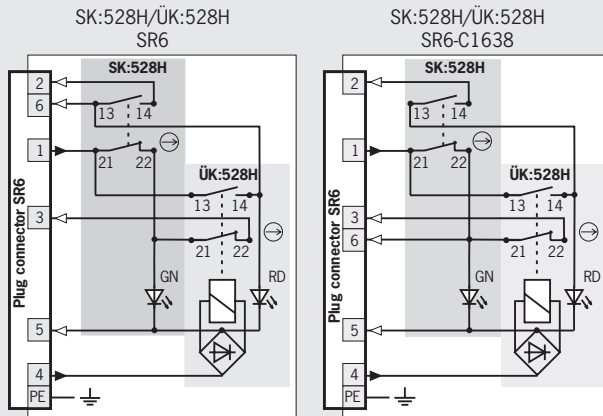
Plug connector SR6 6-pin + PE

Plug connector MR12 11-pin + PE

Dimension drawings actuating head on left is a mirror image



Wiring diagram actuator inserted and locked



Ordering table

Series	Locking	Switch head	Switching element	Con-nection	Version	Black cover			Red cover
						24 V	110 V	230 V	24 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	SR6 Plug connector	C1638 Wiring	046 502 TZ1LE024SR6	046 503 TZ1LE110SR6	046 504 TZ1LE220SR6	On request
			ÜK: 528H, 1 NC ⊖ + 1 NO			089 476 TZ1LE024SR6-C1638	On request	On request	On request
		RE Right	SK: 528H, 1 NC ⊖ + 1 NO	SR6 Plug connector	C1638 Wiring	046 190 TZ1RE024SR6	046 191 TZ1RE110SR6	051 879 TZ1RE220SR6	On request
	ÜK: 528H, 1 NC ⊖ + 1 NO	070 529 TZ1RE024SR6-C1638	On request			On request	On request		
	2 Electrical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	SR6 Plug connector	C1638 Wiring	049 159 TZ2LE024SR6	052 914 TZ2LE110SR6	045 450 TZ2LE220SR6	046 915 TZ2LE024SR6-R
			ÜK: 528H, 1 NC ⊖ + 1 NO			076 294 TZ2LE024SR6-C1638	On request	On request	On request
RE Right		SK: 528H, 1 NC ⊖ + 1 NO	SR6 Plug connector	C1638 Wiring	049 102 TZ2RE024SR6	049 238 TZ2RE110SR6	047 937 TZ2RE220SR6	059 672 TZ2RE024SR6-R	
ÜK: 528H, 1 NC ⊖ + 1 NO	055 819 TZ2RE024SR6-C1638	On request			On request	On request			
TZ	1 Mechanical	LE Left	SK: 2121H, 4 NC ⊖	MR12 Plug connector		On request	On request	On request	083 190 TZ1LE024BHAVFG-RC1924
		RE Right	SK: 2121H, 4 NC ⊖			MR12 Plug connector	On request	On request	On request

For safety instructions see page 103
For technical data see page 87





Safety switch TZ with guard locking and guard locking monitoring

- ▶ Mechanical release on the front
- ▶ Two LEDs, red and green
- ▶ Plug connector
- ▶ Actuating head fitted left or right



Mechanical release

Is used for releasing the guard locking with the aid of a tool. A lead seal can be fitted for protection against tampering (not with plug connector MR8/MR10). Lead sealing kit and tool included.

Solenoid operating voltage and LED function display

The following voltage ranges are available:

- ▶ 24 V AC/DC -15%, +10%
- ▶ 110 V AC -15%, +10%

Locking methods

- TZ1** Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.
- TZ2** Open-circuit current principle, locking by applying voltage to the solenoid. Release by spring force.

Switching elements (see also page 11)

- SK** For monitoring the door/actuator position
- ÜK** For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **2121H** Slow-action contact element 4 NC ⊖
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

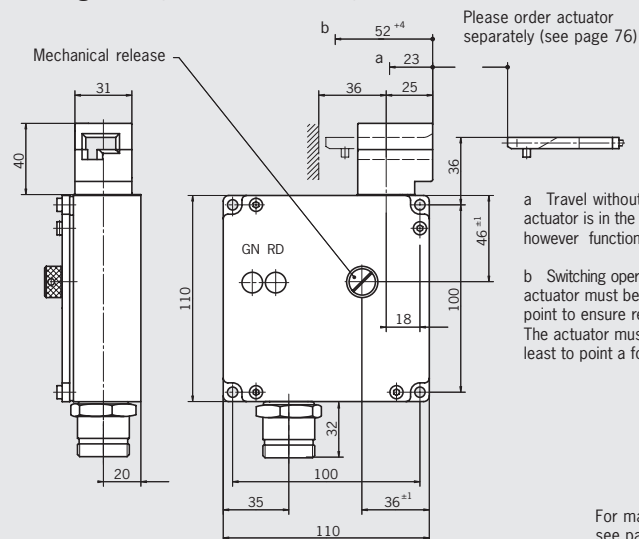
Ordering table

Series	Locking	Switch head	Switching element	Connection	Version	Black cover		Red cover
						24 V	110 V	24 V
TZ	1 Mechanical	LE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO	MR8 Plug connector	Mechanical release cannot be sealed	054 964 TZ1LE024PGOR8C	074 917 TZ1LE110PGOR8C	On request
		RE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO			059 920 TZ1RE024PGOR8C	074 916 TZ1RE110PGOR8C	On request
TZ	1 Mechanical	LE	SK: 2121H, 4 NC ⊖ ÜK: 2121H, 4 NC ⊖	MR10 Plug connector	Mechanical release cannot be sealed	On request	On request	082 095 TZ1LE024BHA-C1903
		RE	SK: 2121H, 4 NC ⊖ ÜK: 2121H, 4 NC ⊖			On request	On request	082 096 TZ1RE024BHA-C1903
	2 Electrical	LE	SK: 2121H, 4 NC ⊖ ÜK: 2121H, 4 NC ⊖	MR10 Plug connector	Mechanical release cannot be sealed	On request	On request	082 083 TZ2LE024BHA-C1903
		RE	SK: 2121H, 4 NC ⊖ ÜK: 2121H, 4 NC ⊖			On request	On request	082 084 TZ2RE024BHA-C1903

Plug connector MR8
7-pin + PE

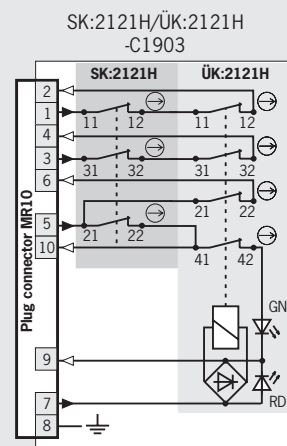
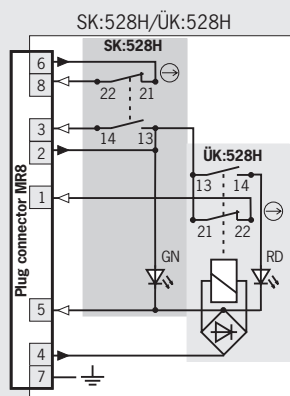
Plug connector MR10
9-pin + PE

Dimension drawings actuating head on left is a mirror image



For mating connectors see page 86

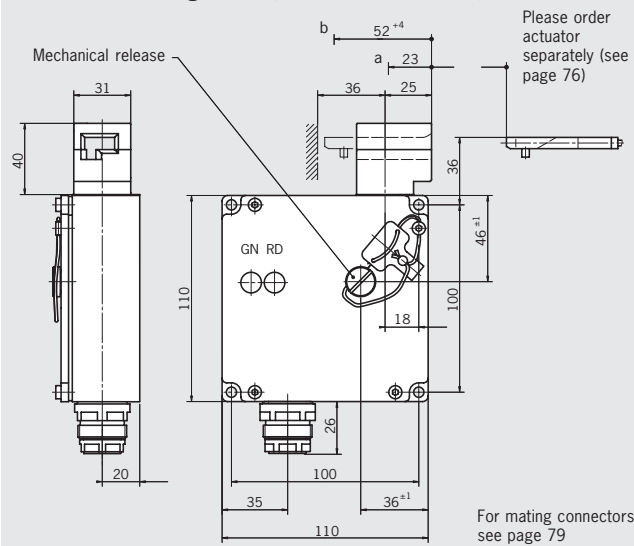
Wiring diagram actuator inserted and locked



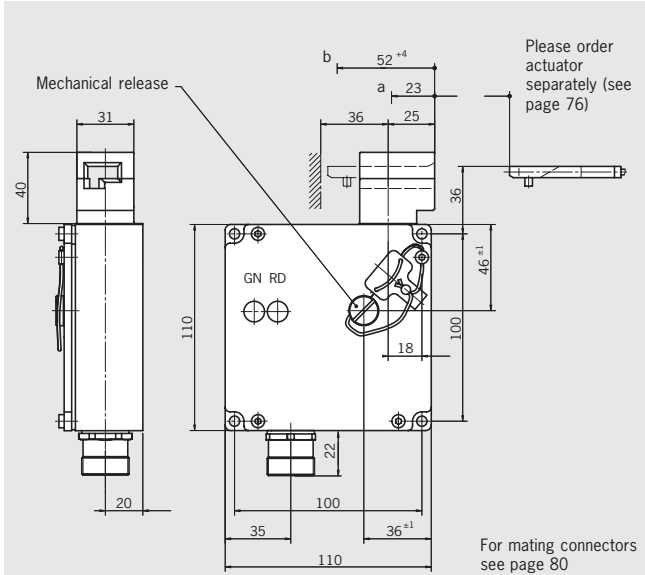


Plug connector SR11 11-pin + PE

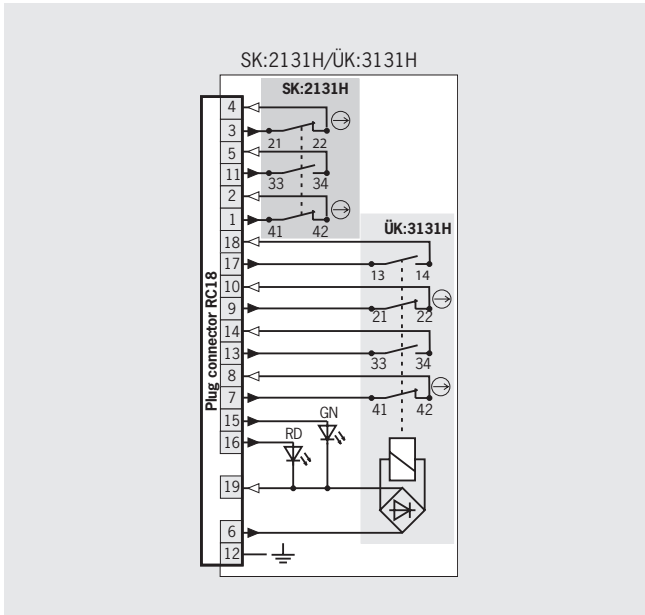
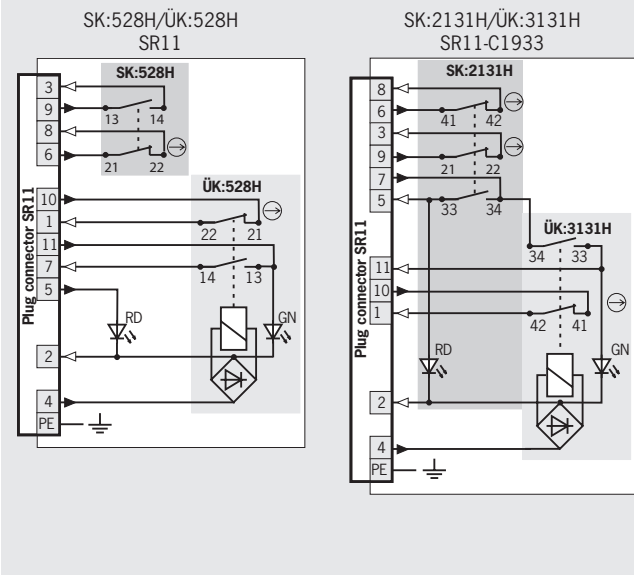
Dimension drawings actuating head on left is a mirror image



Plug connector RC18 18-pin + PE



Wiring diagram actuator inserted and locked



Ordering table

Series	Locking	Switch head	Switching element	Connection	Version	Black cover 24 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	SR11	C1933 Alternative wiring	070 828
			ÜK: 528H, 1 NC ⊕ + 1 NO	Plug connector		TZ1LE024SR11
		RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	SR11		083 230
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Plug connector		TZ1LE024SR11VAB-C1933
	2 Electrical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	SR11	070 826	
			ÜK: 528H, 1 NC ⊕ + 1 NO	Plug connector	TZ1RE024SR11	
TZ	1 Mechanical	RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	SR11	C1933 Alternative wiring	083 231
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Plug connector		TZ1RE024SR11VAB-C1933
		LE Left	SK: 528H, 1 NC ⊖ + 1 NO	SR11		070 958
			ÜK: 528H, 1 NC ⊕ + 1 NO	Plug connector		TZ2LE024SR11
	2 Electrical	RE Right	SK: 528H, 1 NC ⊖ + 1 NO	SR11	070 957	
			ÜK: 528H, 1 NC ⊕ + 1 NO	Plug connector	TZ2RE024SR11	
TZ	1 Mechanical	LE Left	SK: 2131H, 3 NC ⊖ + 1 NO	RC18 ¹⁾		084 246
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Plug connector		TZ1LE024RC18VAB-C1826
		RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	RC18 ¹⁾		084 247
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Plug connector		TZ1RE024RC18VAB-C1826
	2 Electrical	LE Left	SK: 2131H, 3 NC ⊖ + 1 NO	RC18 ¹⁾	085 180	
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Plug connector	TZ2LE024RC18VAB-C1826	
RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	RC18 ¹⁾	085 181			
	ÜK: 3131H, 2 NC ⊖ + 2 NO	Plug connector	TZ2RE024RC18VAB-C1826			

1) Suitable mating connector with option C1825

For safety instructions see page 103
For technical data see page 87



Safety switch TZ with guard locking and guard locking monitoring



- ▶ Mechanical release on the front
- ▶ Protective plate for switch head
- ▶ Two LEDs, red and green
- ▶ Plug connector optional
- ▶ Actuating head fitted left or right



Mechanical release

Is used for releasing the guard locking with the aid of a tool. A sealing wire can be fitted to protect against tampering. Lead sealing kit and tool included.

Protective plate for switch head

Makes it more difficult to tamper with the switch.

Solenoid operating voltage and LED function display

The following voltage range is available:

- ▶ 24 V AC/DC -15%, +10%

Locking methods

TZ1 Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.

TZ2 Open-circuit current principle, locking by applying voltage to the solenoid. Release by spring force.

Switching elements (see also page 11)

SK For monitoring the door/actuator position

ÜK For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

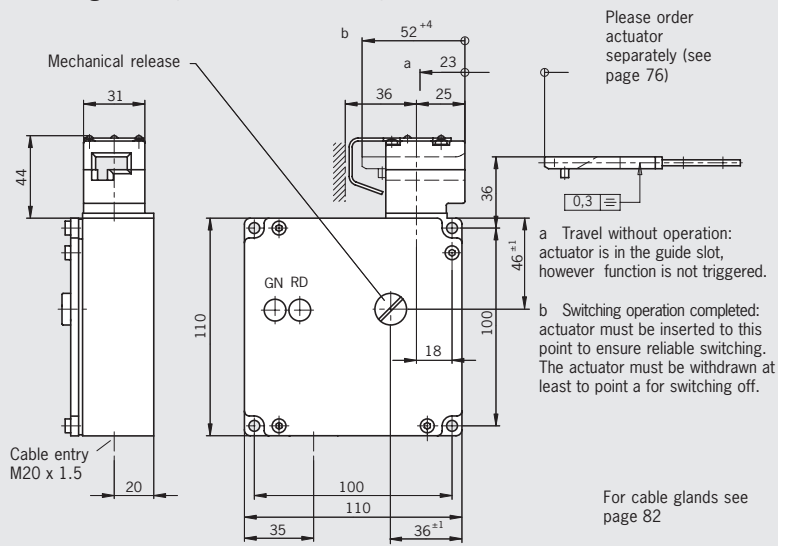
- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

Ordering table

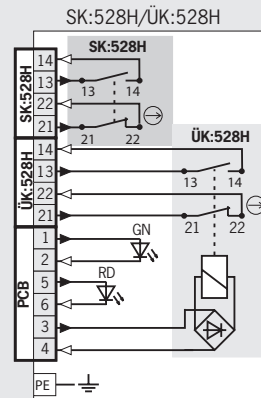
Series	Locking	Switch head	Switching element	Connection	Version	Black cover
						24 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	With	089 470
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	protective plate	TZ1LE024M-089470
		RE Right	SK: 528H, 1 NC ⊖ + 1 NO	M	With	089 471
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	protective plate	TZ1RE024M-089471

Cable entry M20 x 1.5

Dimension drawings actuating head on left is a mirror image



Wiring diagram actuator inserted and locked





Safety switch TZ with guard locking and guard locking monitoring

- ▶ Emergency release from the front with pushbutton
- ▶ Two LEDs, red and green
- ▶ Plug connector optional
- ▶ Actuating head fitted left or right



Emergency release

Is used for the manual release of the guard locking without tools. It is possible to remove the disable and return the switch to its operating state by hand without tools.

Solenoid operating voltage and LED function display

The following voltage range is available:
 ▶ 24 V AC/DC -15%, +10%

Locking methods

TZ1 Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.

TZ2 Open-circuit current principle, locking by applying voltage to the solenoid. Release by spring force.

Switching elements (see also page 11)

SK For monitoring the door/actuator position

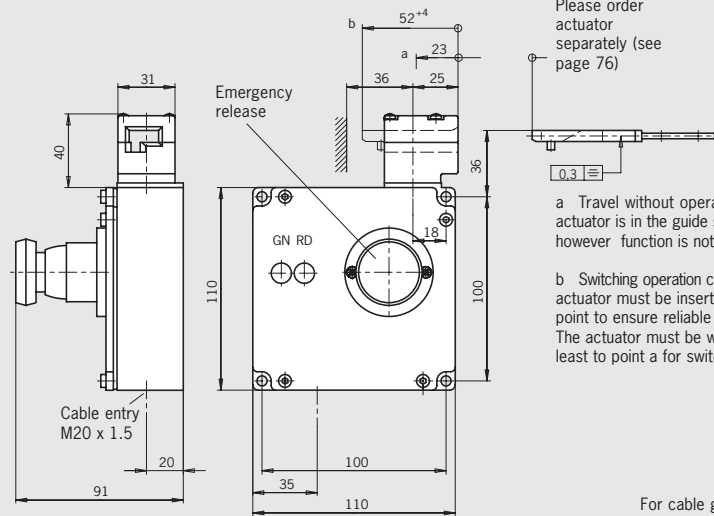
ÜK For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

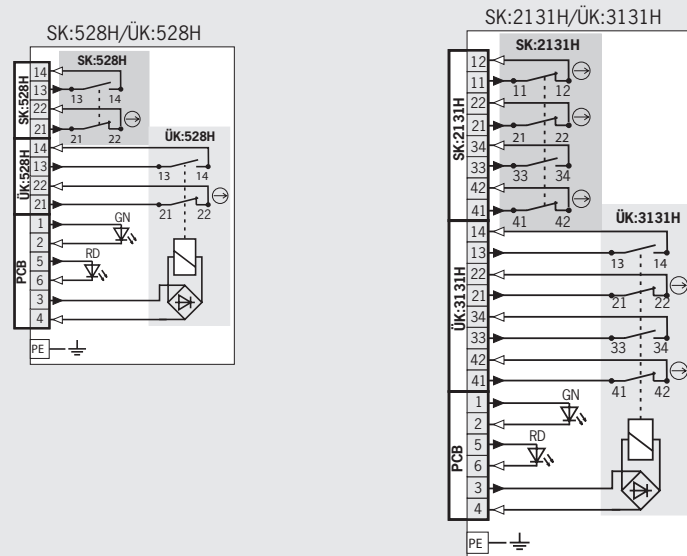
Cable entry M20 x 1.5

Dimension drawings actuating head on left is a mirror image



For cable glands see page 82

Wiring diagram actuator inserted and locked

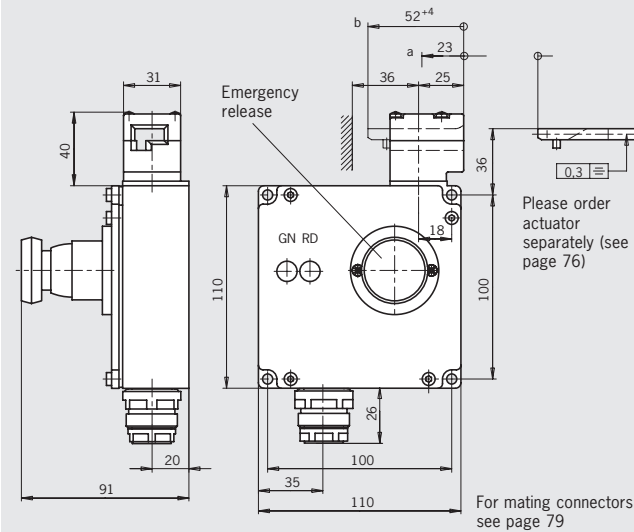


Ordering table

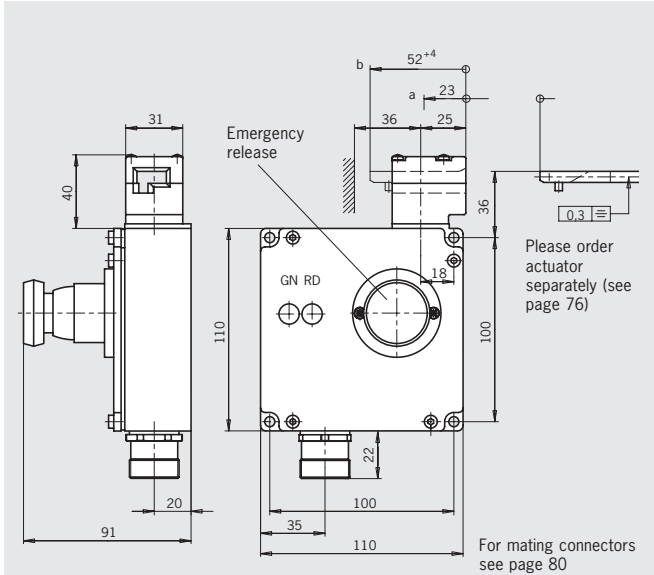
Series	Locking	Switch head	Switching element	Connection	Version	Black cover
						24 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	Emergency release	089 477
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	(blue pushbutton)	TZ1LE024M-C1816
		RE Right	SK: 528H, 1 NC ⊖ + 1 NO	M	Emergency release	On request
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	(blue pushbutton)	
	2 Electrical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	Emergency release	087 992
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	(blue pushbutton)	TZ2LE024M-C1816
		RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	M	Emergency release	089 455
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Metric	(blue pushbutton)	TZ2LE024MVAB-C1823
RE Right	SK: 528H, 1 NC ⊖ + 1 NO	M	Emergency release	087 993		
	ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	(blue pushbutton)	TZ2RE024M-C1816		
RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	M	Emergency release	089 456		
	ÜK: 3131H, 2 NC ⊖ + 2 NO	Metric	(blue pushbutton)	TZ2RE024MVAB-C1823		

Plug connector SR11 11-pin + PE

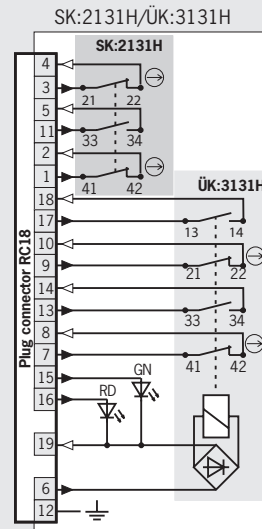
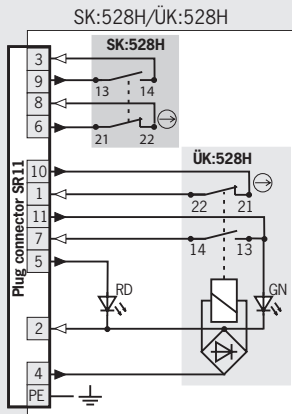
Dimension drawings actuating head on left is a mirror image



Plug connector RC18 18-pin + PE



Wiring diagram actuator inserted and locked



Ordering table

Series	Locking	Switch head	Switching element	Connection	Version	Black cover
						24 V
TZ	1 Mechanical	LE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO	SR11 Plug connector	Emergency release (blue pushbutton)	077 044 TZ1LE024SR11-C1816
		RE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO	SR11 Plug connector	Emergency release (blue pushbutton)	077 042 TZ1RE024SR11-C1816
TZ	1 Mechanical	LE	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Emergency release (blue pushbutton)	088 090 TZ1LE024RC18VAB-C1823
		RE	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Emergency release (blue pushbutton)	088 091 TZ1RE024RC18VAB-C1823

1) Suitable mating connector with option C1825

Safety switch TZ with guard locking and guard locking monitoring



- ▶ Emergency unlocking from the front with rotary knob
- ▶ Protective plate for switch head optional
- ▶ Two LEDs, red and green
- ▶ Plug connector
- ▶ Actuating head fitted left or right



Emergency unlocking

Is used for the manual release of the guard locking without tools. The emergency unlocking mechanism must be returned to the locked state manually. A sealing wire can be fitted to protect against tampering. Lead sealing kit and tool included.

Protective plate for switch head

Makes it more difficult to tamper with the switch.

Solenoid operating voltage and LED function display

The following voltage range is available:

- ▶ 24 V AC/DC -15%, +10%

Locking methods

TZ1 Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.

Switching elements (see also page 11)

SK For monitoring the door/actuator position

ÜK For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

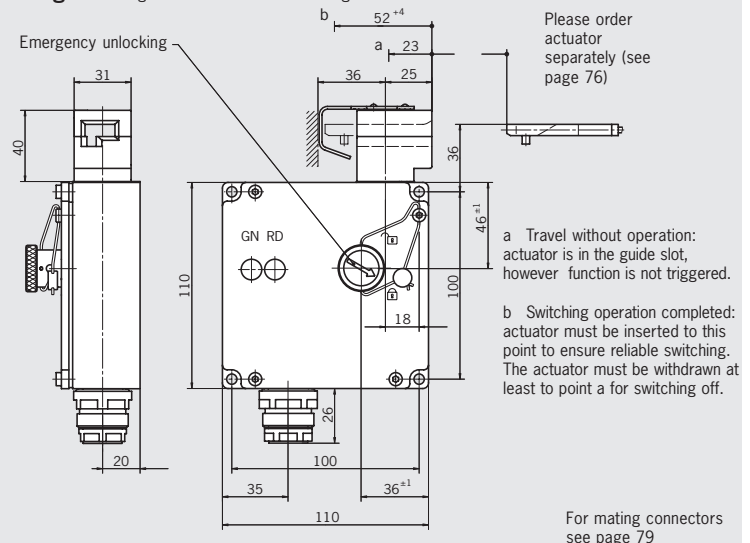
- ▶ **528H** Slow-action contact element
1 NC \ominus + 1 NO
- ▶ **2131H** Slow-action contact element
3 NC \ominus + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC \ominus + 2 NO

Ordering table

Series	Locking	Switch head	Switching element	Connection	Version	Black cover
						24 V
TZ	1	Left	SK: 528H, 1 NC \ominus + 1 NO	SR11	Emergency unlocking (rotary knob), with protective plate	094 342
			ÜK: 528H, 1 NC \ominus + 1 NO	Plug connector		TZ1LE024SR11-094342
		Right	SK: 528H, 1 NC \ominus + 1 NO	SR11	Emergency unlocking (rotary knob), with protective plate	094 343
			ÜK: 528H, 1 NC \ominus + 1 NO	Plug connector		TZ1RE024SR11-094343

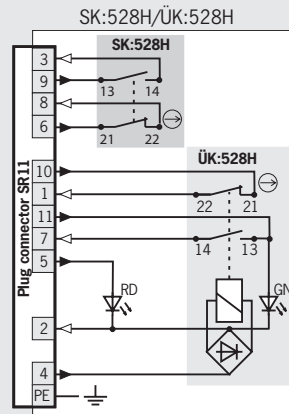
Plug connector SR11 with protective plate 11-pin + PE

Dimension drawings actuating head on left is a mirror image



For mating connectors see page 79

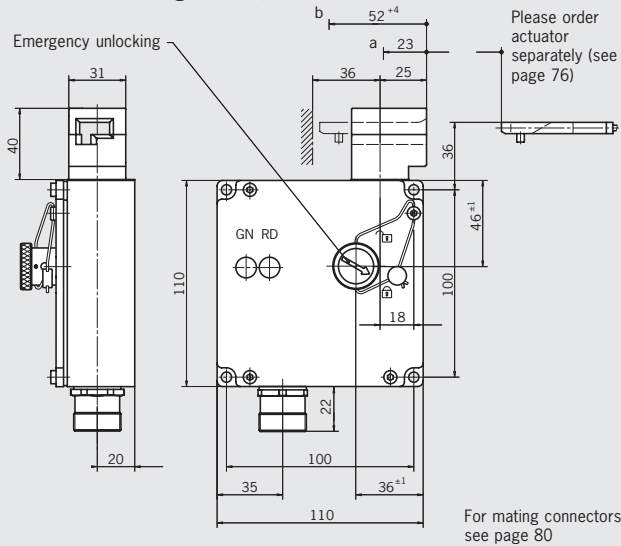
Wiring diagram actuator inserted and locked





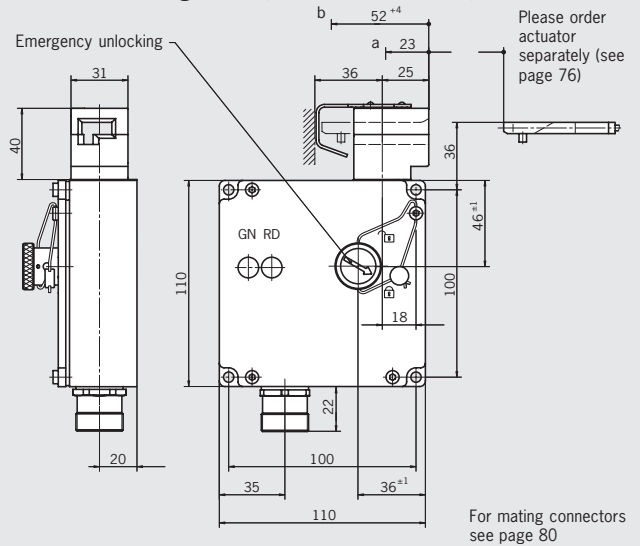
Plug connector RC18 18-pin + PE

Dimension drawings actuating head on left is a mirror image



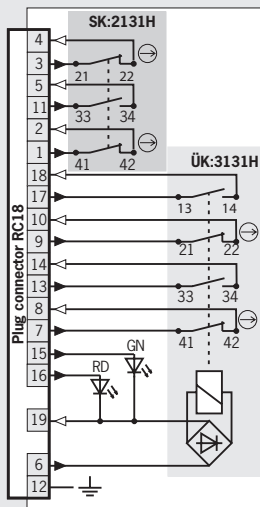
Plug connector RC18 with protective plate 18-pin + PE

Dimension drawings actuating head on left is a mirror image



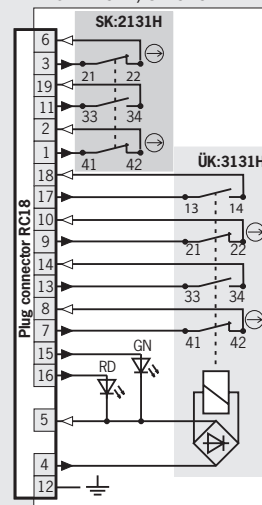
Wiring diagram actuator inserted and locked

SK:2131H/ÜK:3131H
RC18-C1937



Wiring diagram actuator inserted and locked

SK:2131H/ÜK:3131H



Ordering table

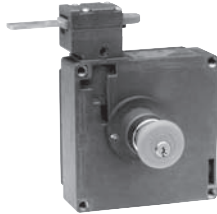
Series	Locking	Switch head	Switching element	Connection	Version	Black cover
						24 V
TZ	1 Mechanical	LE Left	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Emergency unlocking (rotary knob)	074 260 TZ1LE024RC18VAB-C1937
		RE Right	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Emergency unlocking (rotary knob)	074 261 TZ1RE024RC18VAB-C1937
		LE Left	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 Plug connector	Emergency unlocking (rotary knob), alternative wiring, with protective plate	092 998 TZ1LE024RC18VAB-092998
		RE Right	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 Plug connector	Emergency unlocking (rotary knob), alternative wiring, with protective plate	092 999 TZ1RE024RC18VAB-092999

1) Suitable mating connector with option C1825



Safety switch TZ with guard locking and guard locking monitoring

- ▶ Mechanical release on the front
- ▶ Escape release from the rear with key button
- ▶ Two LEDs, red and green
- ▶ Plug connector optional
- ▶ Actuating head fitted left or right



Escape release

Is used for the manual release of the guard locking from within the danger area without tools. The disable can only be removed and the switch returned to its operating state using a key included.

Solenoid operating voltage and LED function display

The following voltage range is available:
 ▶ 24 V AC/DC -15%, +10%

Locking methods

TZ1 Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.

TZ2 Open-circuit current principle, locking by applying voltage to the solenoid. Release by spring force.

Switching elements (see also page 11)

SK For monitoring the door/actuator position

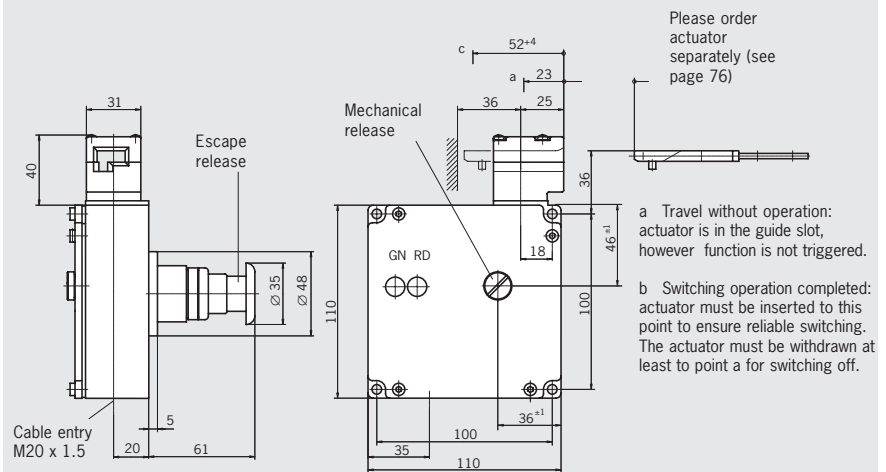
ÜK For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

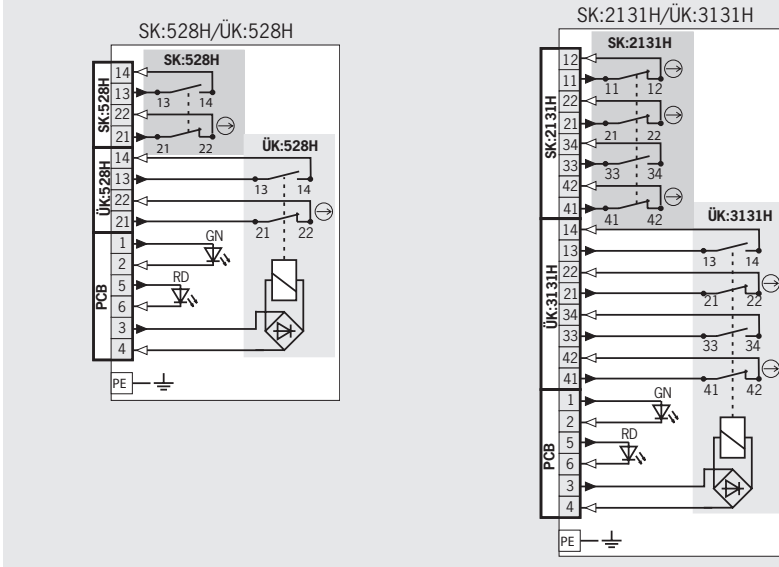
Cable entry M20 x 1.5

Dimension drawings actuating head on left is a mirror image



For cable glands see page 82

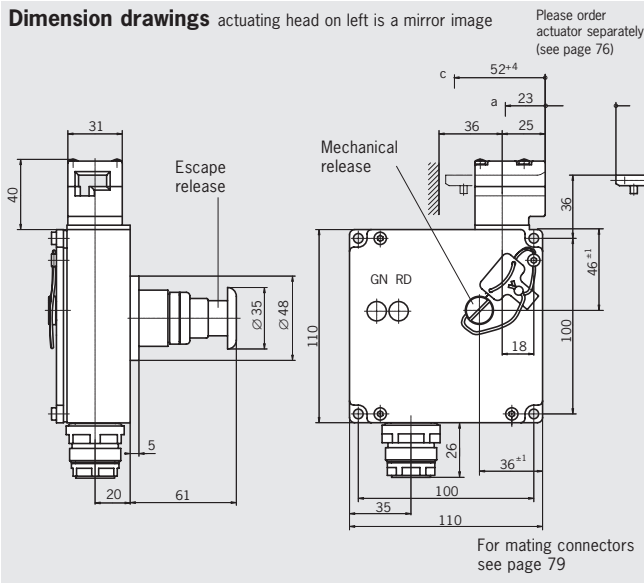
Wiring diagram actuator inserted and locked



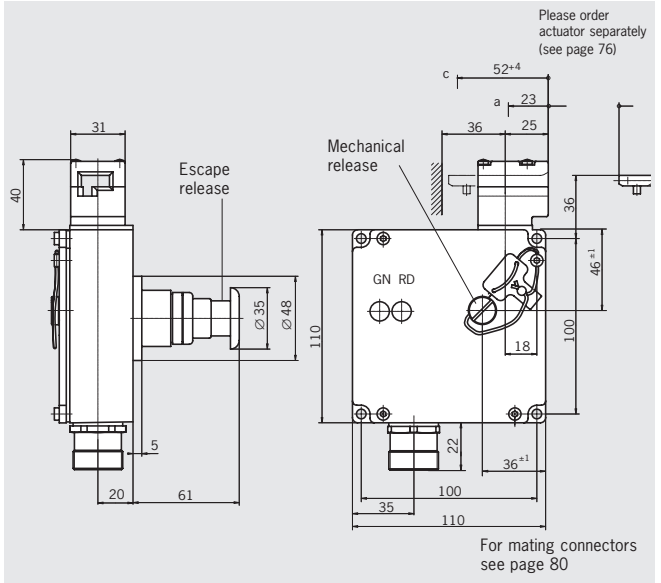
Ordering table

Series	Locking	Switch head	Switching element	Connection	Version	Black cover	
						24 V	110 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	Escape release	087 990	On request
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	(red key button)	TZ1LE024M-C1815	
		RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	M	Escape release	089 468	094 311
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Metric	(red key button)	TZ1LE024MVAB-C1828	TZ1LE110MVAB-C1828
	2 Electrical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	Escape release	087 991	On request
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	(red key button)	TZ1RE024M-C1815	
		RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	M	Escape release	089 469	094 312
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Metric	(red key button)	TZ1RE024MVAB-C1828	TZ1RE110MVAB-C1828
	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	Escape release	089 460	On request	
		ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	(red key button)	TZ2LE024M-C1815		
	RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	M	Escape release	087 290	On request	
		ÜK: 3131H, 2 NC ⊖ + 2 NO	Metric	(red key button)	TZ2LE024MVAB-C1828		
	RE Right	SK: 528H, 1 NC ⊖ + 1 NO	M	Escape release	089 461	On request	
		ÜK: 528H, 1 NC ⊖ + 1 NO	Metric	(red key button)	TZ2RE024M-C1815		
	RE Right	SK: 2131H, 3 NC ⊖ + 1 NO	M	Escape release	087 291	On request	
		ÜK: 3131H, 2 NC ⊖ + 2 NO	Metric	(red key button)	TZ2RE024MVAB-C1828		

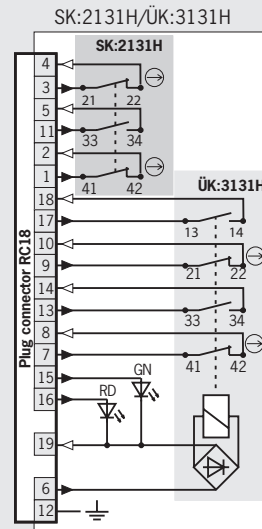
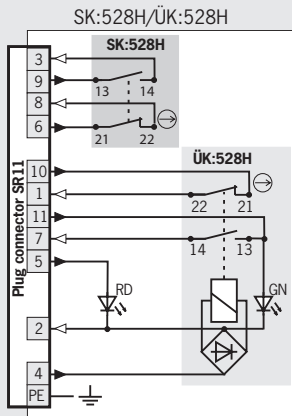
Plug connector SR11 11-pin + PE



Plug connector RC18 18-pin + PE



Wiring diagram actuator inserted and locked



Ordering table

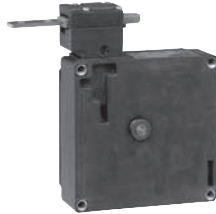
Series	Locking	Switch head	Switching element	Connection	Version	Black cover
						24 V
TZ	2 Electrical	LE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 2 NO	SR11 Plug connector	Escape release (key button)	079 660 TZ2LE024SR11-C1815
		RE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO	SR11 Plug connector	Escape release (key button)	079 661 TZ2RE024SR11-C1815
TZ	1 Mechanical	LE	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Escape release (key button)	090 352 TZ1LE024RC18VAB-C1828
		RE	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Escape release (key button)	090 353 TZ1RE024RC18VAB-C1828
	2 Electrical	LE	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Escape release (key button)	093 103 TZ2LE024RC18VAB-C1828
		RE	SK: 2131H, 3 NC ⊖ + 1 NO ÜK: 3131H, 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Escape release (key button)	093 104 TZ2RE024RC18VAB-C1828

1) Suitable mating connector with option C1825



Safety switch TZ with guard locking and guard locking monitoring

- ▶ Mechanical release on the front
- ▶ Escape release from the rear with pushbutton
- ▶ Two LEDs, red and green
- ▶ Plug connector optional
- ▶ Actuating head fitted left or right



Escape release

Is used for the manual release of the guard locking from within the danger area without tools.

Solenoid operating voltage and LED function display

The following voltage ranges are available:

- ▶ 24 V AC/DC -15%, +10%
- ▶ 110 V AC -15%, +10%

Locking methods

TZ1 Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.

Switching elements (see also page 11)

SK For monitoring the door/actuator position

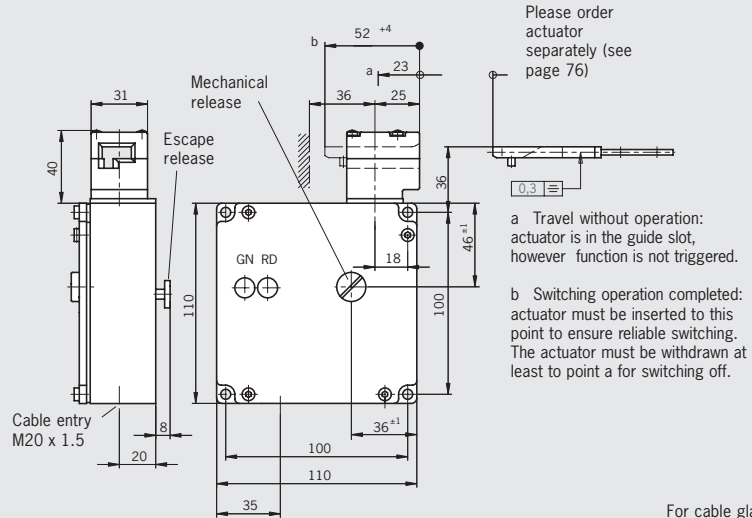
ÜK For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

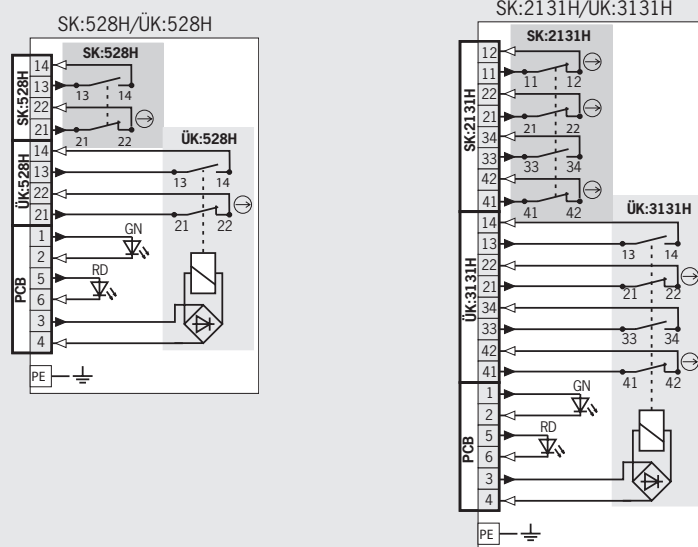
- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

Dimension drawings actuating head on left is a mirror image



Wiring diagram actuator inserted and locked

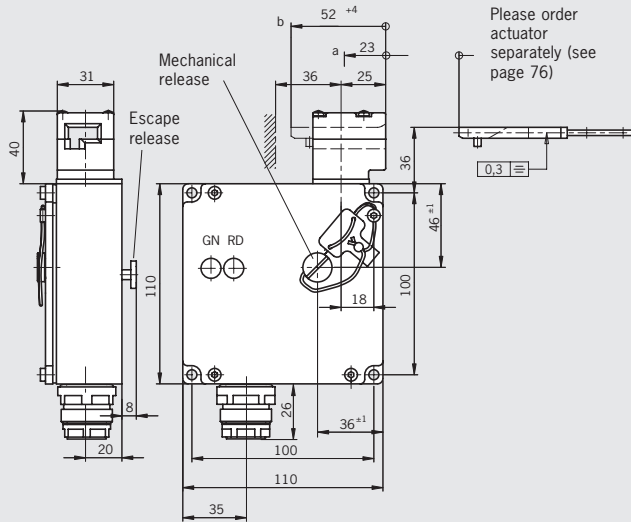


Ordering table

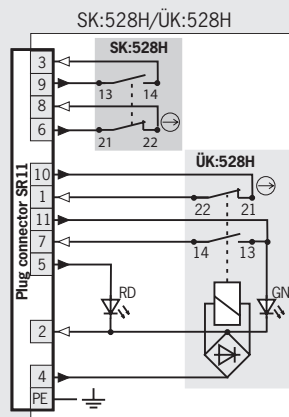
Series	Locking	Switch head	Switching element	Connection	Version	Black cover		
						24 V	110 V	230 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	Escape release	083 170	089 924	093 770
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metr.	(pushbutton)	TZ1LE024M-C1684	TZ1LE110M-C1684	TZ1LE220M-C1684
			SK: 2131H, 3 NC ⊖ + 1 NO	M	Escape release	084 820	On request	On request
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Metr.	(pushbutton)	TZ1LE024MVAB-C1684		
		RE Right	SK: 528H, 1 NC ⊖ + 1 NO	M	Escape release	083 171	089 475	093 771
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metr.	(pushbutton)	TZ1RE024M-C1684	TZ1RE110M-C1684	TZ1RE220M-C1684
			SK: 2131H, 3 NC ⊖ + 1 NO	M	Escape release	088 084	On request	On request
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Metr.	(pushbutton)	TZ1RE024MVAB-C1684		

Plug connector SR11 11-pin + PE

Dimension drawings actuating head on left is a mirror image



Wiring diagram actuator inserted and locked



Ordering table

Series	Locking	Switch head	Switching element	Connection	Version	Black cover
						24 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	SR11 Plug connector	Escape release (pushbutton)	070 886
			ÜK: 528H, 1 NC ⊖ + 1 NO			TZ1LE024SR11-C1684
		RE Right	SK: 528H, 1 NC ⊖ + 1 NO	SR11 Plug connector	Escape release (pushbutton)	070 884
			ÜK: 528H, 1 NC ⊖ + 1 NO			TZ1RE024SR11-C1684

Safety switch TZ with guard locking and guard locking monitoring



- ▶ Without mechanical release
- ▶ Protective plate for switch head
- ▶ Two LEDs, red and green
- ▶ Plug connector optional
- ▶ Actuating head fitted left or right



Protective plate for switch head

Makes it more difficult to tamper with the switch.

Solenoid operating voltage and LED function display

The following voltage ranges are available:

- ▶ 24 V AC/DC -15%, +10%
- ▶ 110 V AC -15%, +10%

Locking methods

TZ1 Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.

Switching elements (see also page 11)

SK For monitoring the door/actuator position

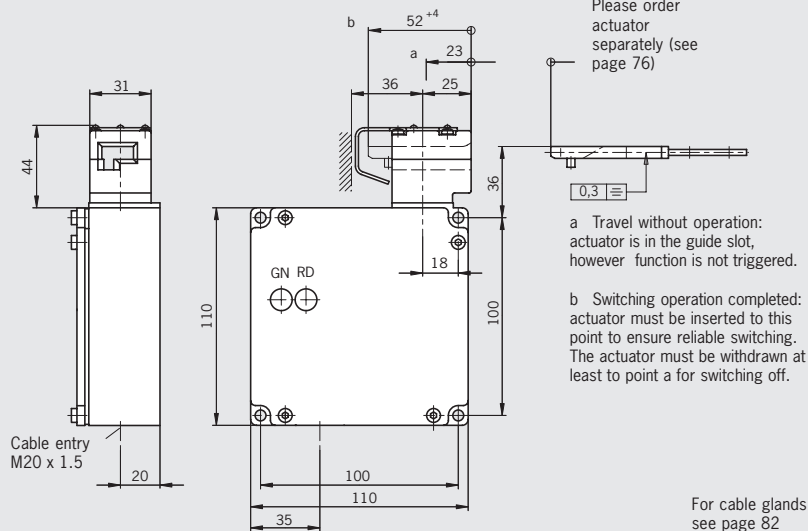
ÜK For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **2121H** Slow-action contact element
4 NC ⊖
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

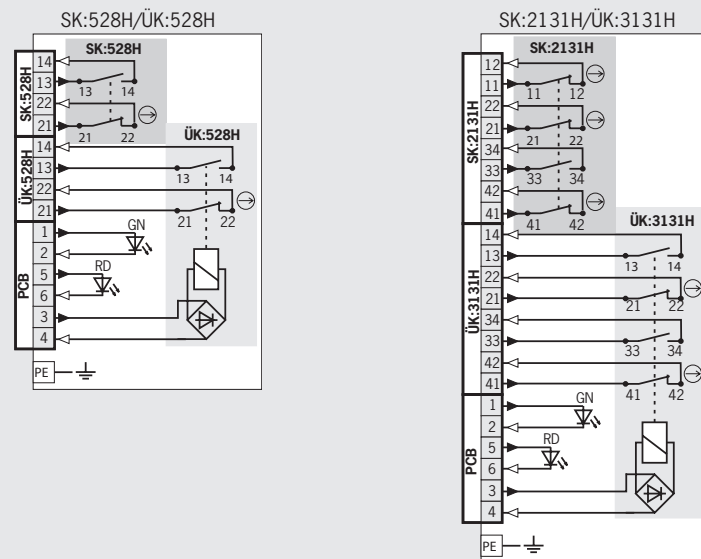
Cable entry M20 x 1.5

Dimension drawings actuating head on left is a mirror image



For cable glands see page 82

Wiring diagram actuator inserted and locked



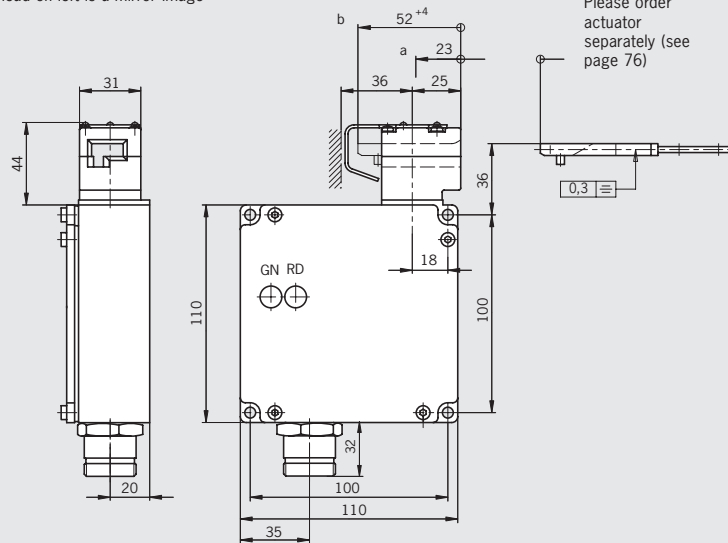
Ordering table

Series	Locking	Switch head	Switching element	Connection	Version	Black cover	
						24 V	110 V
TZ	1 Mechanical	LE Left	SK: 528H, 1 NC ⊖ + 1 NO	M	Without mechanical release,	083 246 TZ1LE024M-C1623	On request
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metr.	with protective plate		
			SK: 2131H, 3 NC ⊖ + 1 NO	M	Without mechanical release,	085 170 TZ1LE024MVAB-C1623	089 466 TZ1LE110MVAB-C1623
			ÜK: 3131H, 2 NC ⊖ + 2 NO	Metr.	with protective plate		
		RE Right	SK: 528H, 1 NC ⊖ + 1 NO	M	Without mechanical release,	083 247 TZ1RE024M-C1623	On request
			ÜK: 528H, 1 NC ⊖ + 1 NO	Metr.	with protective plate		
		SK: 2131H, 3 NC ⊖ + 1 NO	M	Without mechanical release,	085 171 TZ1RE024MVAB-C1623	088 063 TZ1RE110MVAB-C1623	
		ÜK: 3131H, 2 NC ⊖ + 2 NO	Metr.	with protective plate			



Plug connector MR12
11-pin + PE

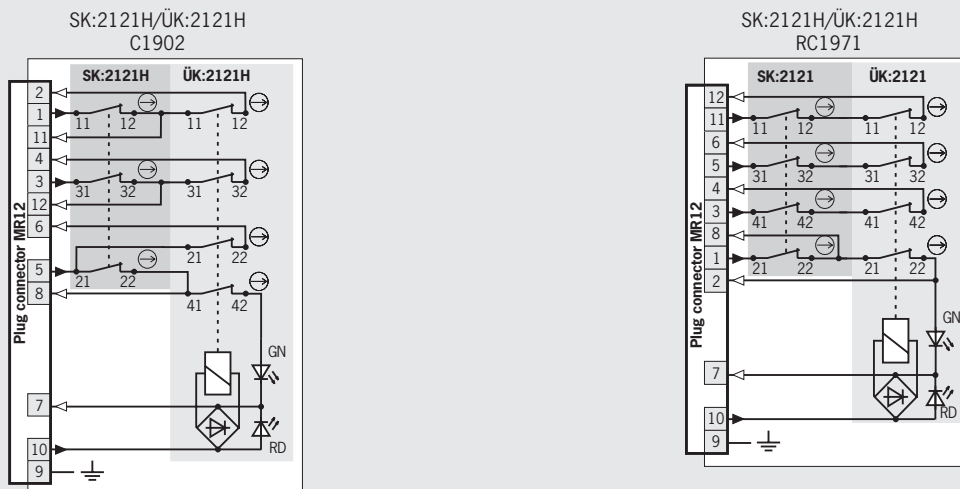
Dimension drawings actuating head on left is a mirror image



Please order actuator separately (see page 76)

For mating connectors see page 86

Wiring diagram actuator inserted and locked



Ordering table

Series	Locking	Switch head	Switching element	Connection	Version	Red cover
						24 V
TZ	1 Mechanical	LE Left	SK: 2121H , 4 NC ⊖ ÜK: 2121H , 4 NC ⊖	MR12 Plug connector	Without mechanical release, with protective plate	079 692 TZ1LE024BHA-C1902
					C1971 Alternative wiring, without mechanical release, with protective plate	085 569 TZ1LE024BHAVFG-RC1971
		RE Right	SK: 2121H , 4 NC ⊖ ÜK: 2121H , 4 NC ⊖	MR12 Plug connector	Without mechanical release, with protective plate	079 693 TZ1RE024BHA-C1902
					C1971 Alternative wiring, without mechanical release, with protective plate	085 570 TZ1RE024BHAVFG-RC1971

For safety instructions see page 103
For technical data see page 87



Safety switch TZ with guard locking and guard locking monitoring

- ▶ Without mechanical release
- ▶ Two LEDs, red and green
- ▶ Plug connector for switch connection
- ▶ Plug connector for enabling switch
- ▶ Actuating head fitted left or right



Solenoid operating voltage and LED function display

The following voltage range is available:

- ▶ 24 V AC/DC -15%, +10%

Locking methods

- TZ1** Closed-circuit current principle, locking by spring force. Release by applying voltage to the solenoid.
- TZ2** Open-circuit current principle, locking by applying voltage to the solenoid. Release by spring force.

Switching elements (see also page 11)

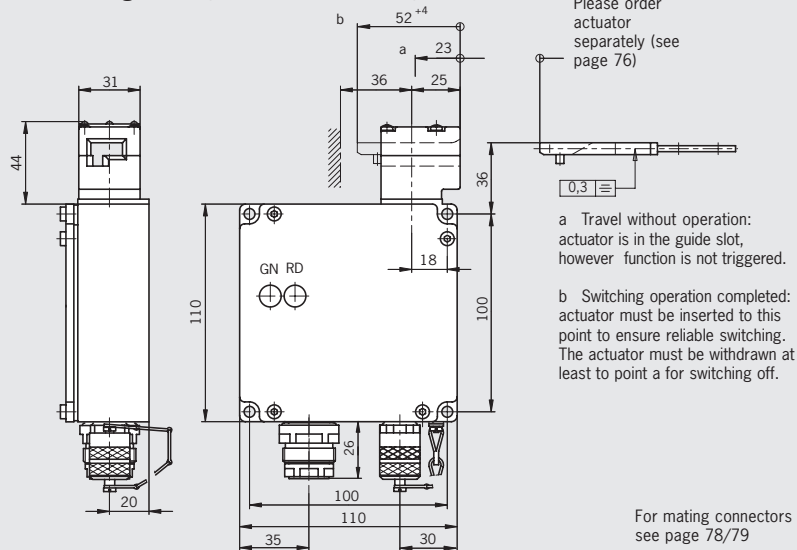
- SK** For monitoring the door/actuator position
- ÜK** For monitoring the guard locking (built-in solenoid)

For combinations available see ordering table:

- ▶ **528H** Slow-action contact element
1 NC ⊖ + 1 NO
- ▶ **2131H** Slow-action contact element
3 NC ⊖ + 1 NO
- ▶ **3131H** Slow-action contact element
2 NC ⊖ + 2 NO

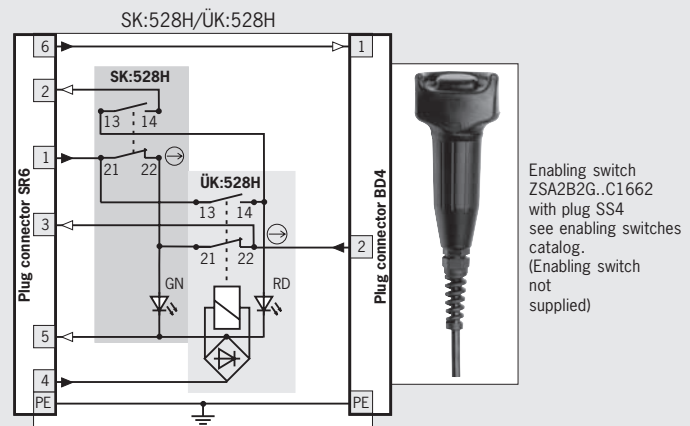
Plug connector SR6 and BD4 (enabling switch) 6-pin + PE / 4-pin

Dimension drawings actuating head on left is a mirror image



For mating connectors see page 78/79

Wiring diagram actuator inserted and locked

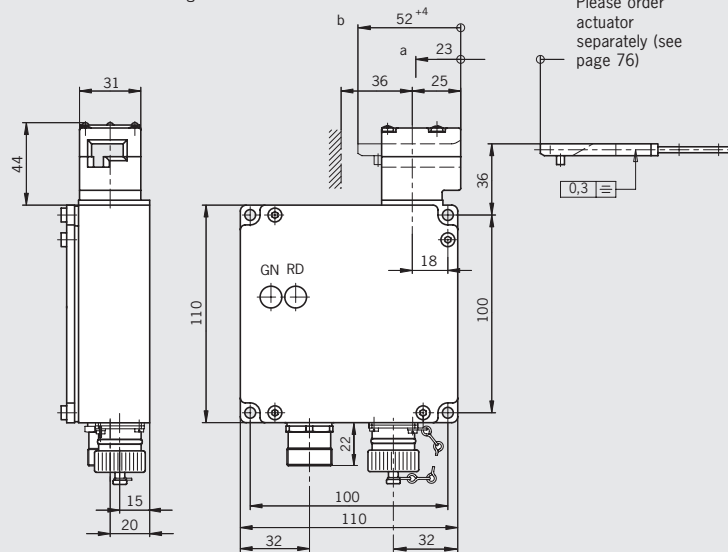


Ordering table

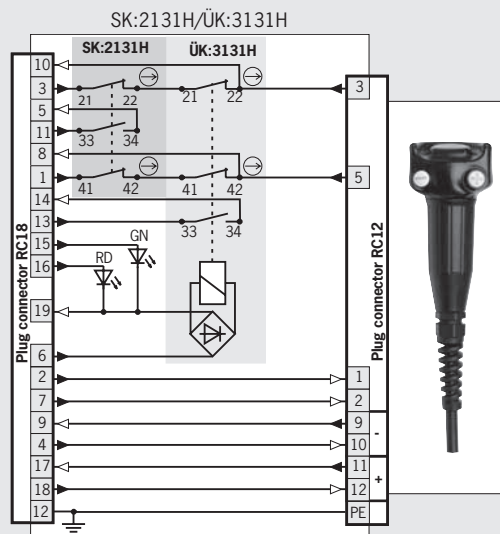
Series	Locking	Switch head	Switching element	Connection	Enabling switch Connection	Version	Black cover
							24 V
TZ	1 Mechanical	LE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO	SR6 Plug connector	Enabling switch plug BD4	Without mechanical release	070 527 TZ1LE024SR6-C1662
		RE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO	SR6 Plug connector	Enabling switch plug BD4	Without mechanical release	054 781 TZ1RE024SR6-C1662
TZ	2 Electrical	LE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO	SR6 Plug connector	Enabling switch plug BD4	Without mechanical release	059 307 TZ2LE024SR6-C1662
		RE	SK: 528H, 1 NC ⊖ + 1 NO ÜK: 528H, 1 NC ⊖ + 1 NO	SR6 Plug connector	Enabling switch plug BD4	Without mechanical release	059 305 TZ2RE024SR6-C1662

Plug connector RC18 and RC12 (enabling switch)
18-pin + PE / 12-pin

Dimension drawings actuating head on left is a mirror image



Wiring diagram actuator inserted and locked



Enabling switch ZSB077040 (077 040) or ZSA092141C2038 (092 141) with plug RC12, see enabling switches catalog. (Enabling switch not included)

Ordering table

Series	Locking	Switch head	Switching element	Connection	Enabling switch Connection	Version	Black cover
							24 V
TZ	1 Mechanical	LE	SK: 2131H , 3 NC ⊖ + 1 NO ÜK: 3131H , 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Enabling switch plug RC12	Without mechanical release	091 062 TZ1LE024RC18VAB-C1803
		RE	SK: 2131H , 3 NC ⊖ + 1 NO ÜK: 3131H , 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Enabling switch plug RC12	Without mechanical release	091 063 TZ1RE024RC18VAB-C1803
TZ	2 Electrical	LE	SK: 2131H , 3 NC ⊖ + 1 NO ÜK: 3131H , 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Enabling switch plug RC12	Without mechanical release	075 955 TZ2LE024RC18VAB-C1803
		RE	SK: 2131H , 3 NC ⊖ + 1 NO ÜK: 3131H , 2 NC ⊖ + 2 NO	RC18 ¹⁾ Plug connector	Enabling switch plug RC12	Without mechanical release	077 149 TZ2RE024RC18VAB-C1803

1) Suitable mating connector with option C1825

Selection table for accessories

Actuator												
Plug connector												
Cable glands												
Mounting plates												
Actuator	SS4	Solenoid	C16-1	RC12	SR6	SR11	RC18	SVM5	With cable	Cable glands	Mounting plates	Page
•												76
	•											78
		•										78
			•									78
				•								78
					•				•			79
						•			•			79
							•		•			80
							•		•			81
								•	•			82
											•	83

Actuators for safety switches NZ.VZ, NZ.VZ.VS and TZ

- ▶ Two stainless safety screws per actuator
- ▶ Increased overtravel optional
- ▶ Smaller door radii optional
- ▶ Packaging unit 25 pieces optional

Straight actuator

The straight actuator is used on sliding doors or hinged doors with door radii greater than 1000 mm. Safety screws prevent unscrewing of the actuator. The safety screws included can be inserted with a normal tool, but cannot be removed again.

Actuator with overtravel

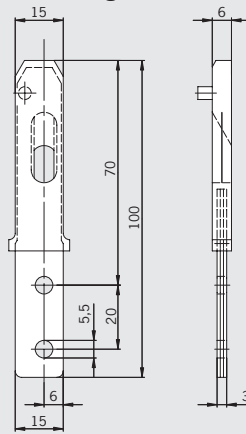
- ▶ **4 mm** for doors with normal play
- ▶ **16 mm** for doors with large play (optional)

Hinged actuator

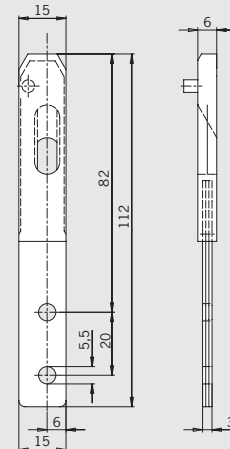
For door radii less than 1000 mm a hinged actuator should be used. The spring action movement of the actuator prevents damage due to the actuator jamming in the actuating head. Depending on the movement of the safety guard, the actuator must be selected for left, right, top or bottom.

Actuator Z-G straight
Overtravel 4 mm

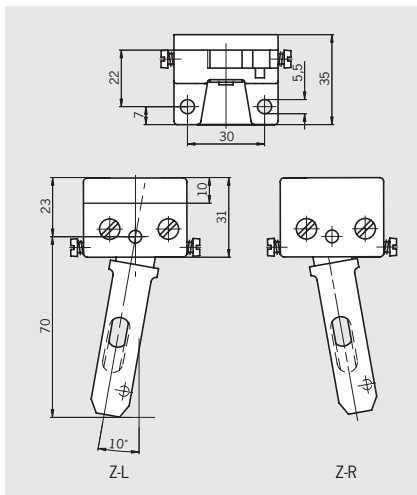
Dimension drawings



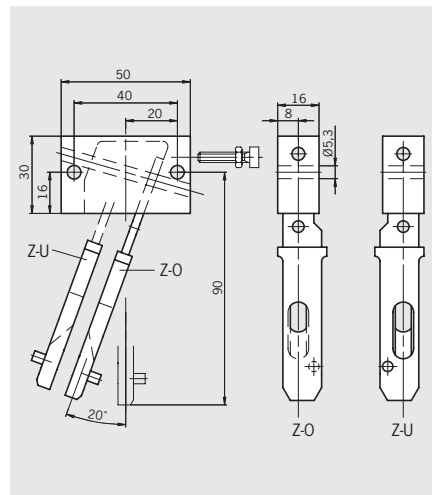
Actuator Z-GN straight
Overtravel 16 mm



Hinged actuator Z-R/Z-LL
Safety guard hinged on the right/left



Hinged actuator Z-U/Z-O
Safety guard hinged at bottom/top

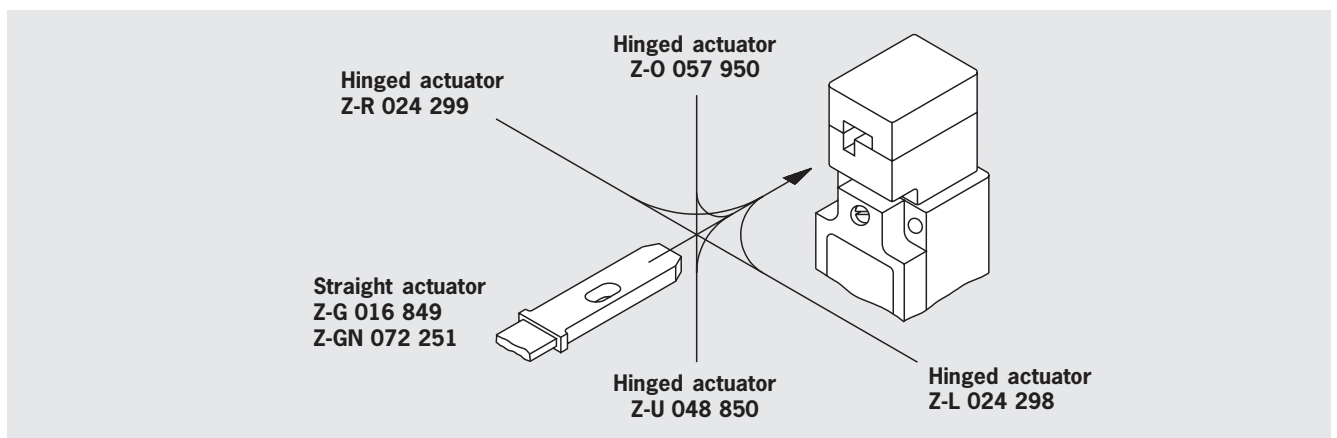


Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	
Actuator straight	Z-G 4 mm overtravel incl. 2 safety screws M5 x 10	≥ 1000	1 piece	016 849 ACTUATOR-Z-G
	Z-GN 16 mm overtravel incl. 2 safety screws M5x10	≥ 1000	25 pieces	074 411 ACTUATOR-Z-G/V25
Hinged actuator	Z-R Safety guard hinged on the left incl. 2 safety screws M5 x 16	≥ 400	1 piece	024 299 HINGED ACTUATOR-Z-R
	Z-L Safety guard hinged on the right incl. 2 safety screws M5 x 16	≥ 400	25 pieces	074 412 HINGED ACTUATOR-Z-R/V25
	Z-U Safety guard hinged at bottom incl. 2 safety screws M5 x 25	≥ 165	1 piece	024 298 HINGED ACTUATOR-Z-L
	Z-O Safety guard hinged at top incl. 2 safety screws M5 x 25	≥ 165	25 pieces	074 413 HINGED ACTUATOR-Z-L/V25
	Z-U Safety guard hinged at bottom incl. 2 safety screws M5 x 25	≥ 165	1 piece	048 850 HINGED ACTUATOR-Z-U
	Z-O Safety guard hinged at top incl. 2 safety screws M5 x 25	≥ 165	25 pieces	074 414 HINGED ACTUATOR-Z-U/V25
				057 950 HINGED ACTUATOR-Z-O
				074 415 HINGED ACTUATOR-Z-O/V25

Selection table for actuators

Actuator						
Actuator straight Z-G 016 849 overtravel 4 mm						
Actuator straight Z-GN 072 251 overtravel 16 mm						
Hinged actuator Z-L 024 298						
Hinged actuator Z-R 024 299						
Hinged actuator Z-U 048 850						
Hinged actuator Z-O 057 950						



For safety instructions see page 103
 For technical data see page 87

Plug connectors SS4, C16-1, RC12 and solenoid plugs

For safety switches series NZ and TZ

- ▶ Plugs and sockets
- ▶ Blanking plug
- ▶ Solenoid plug

Blanking plug

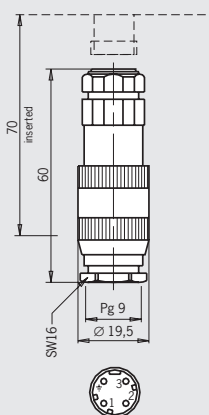
To cover the socket for the enabling switch on the safety switch TZ with socket RC12.

Plug connector for solenoid locking NZ.VZ.VS

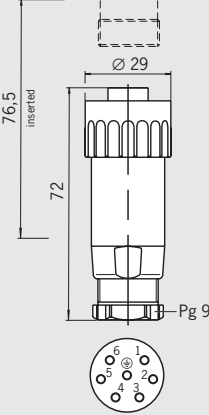
- ▶ Without rectifier
For the connection of DC.
- ▶ With rectifier
For the connection of AC 110 V - AC 230 V.

Plug SS4 3-pin + PE

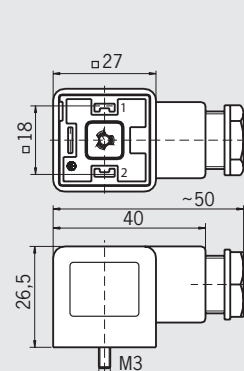
Dimension drawings



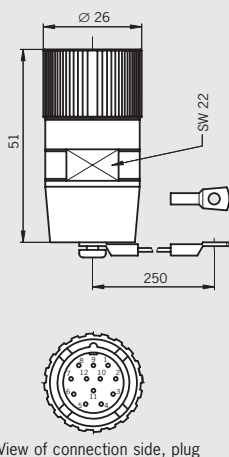
Female connector C16-1 6-pin + PE



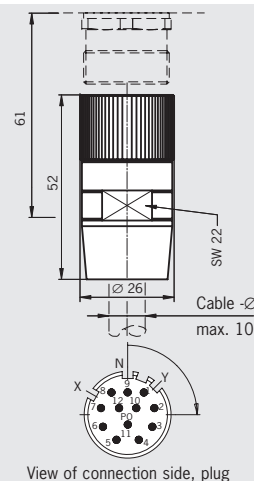
Solenoid plug NZ.VZ.VS 2-pin + PE



Blanking plug RC12 12-pin



Plug RC12 12-pin



Ordering table

Designation	Version	
SS4 3-pin + PE	Plug to socket BD4	002 787 SS4
C16-1 ¹⁾ 6-pin + PE	Female connector	043 861 Cable socket 6 + PE
RC12 ¹⁾ 12-pin	Plug	073 294 RC-12P1N8A8096
	Blanking plug without bridges	073 293 RC-12P1N8A8300
Solenoid plug NZ..VZ..VS 2-pin + PE	For DC without rectifier	028 345 Plug connector / DC
	For AC with rectifier AC 110 V - AC 230 V	028 338 Plug connector / AC

For information on crimp contacts see page 86.
1) Crimp contacts are included.

Plug connectors SR6 and SR11

For safety switches series NZ and TZ

- ▶ Plugs and sockets
- ▶ Crimp contacts
- ▶ 90° angled optional
- ▶ Cable optional
- ▶ Coding shells

Angled plug connector

On plug connectors with cables the direction of the cable exit can be chosen. On plug connectors without cables the direction can be adjusted.

Plug

For fitting to safety switches.

Coding shells

Two coding shells and screws. If used only matching connectors can be mated.

Cable (optional)

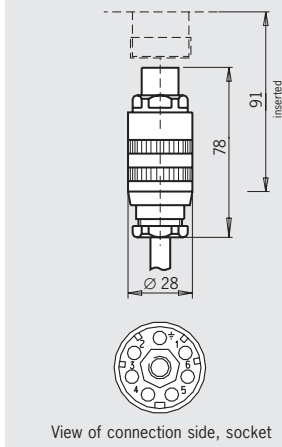
Cable sleeve PUR, color gray, wire cross-section 1.0 mm².

Pin assignment plug with cable

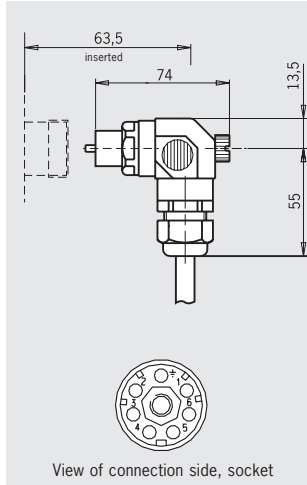
SR6		SR11	
Pin	Wire	Pin	Wire
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
⊕	7	7	7
		8	8
		9	9
		10	10
		11	11
		⊕	12

Female connector SR6 EF 6-pin + PE

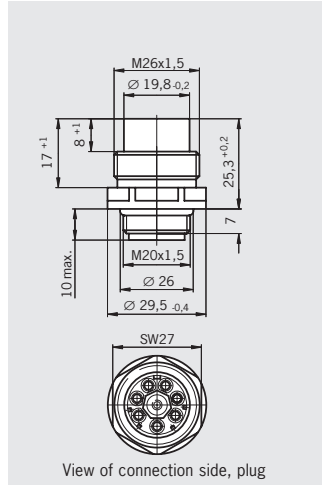
Dimension drawings



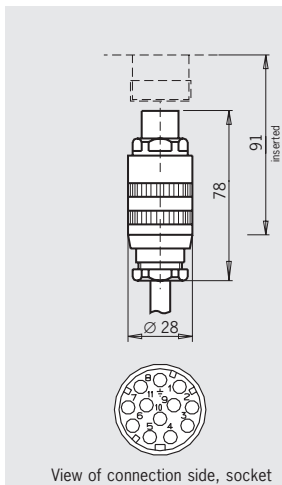
Female connector SR6 WF angled 6-pin + PE



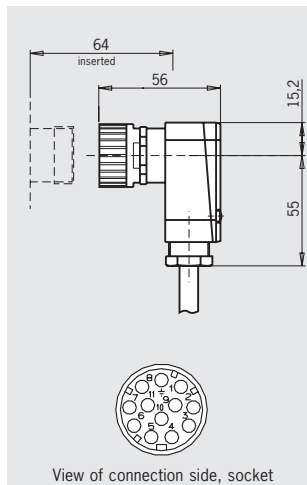
Plug SR6 AM 6-pin + PE



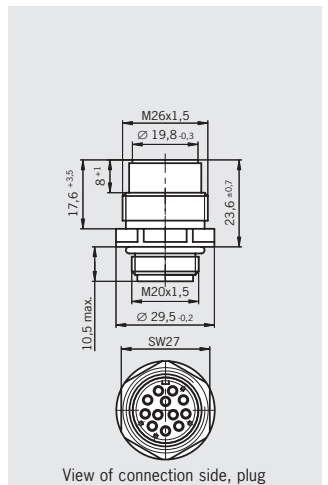
Female connector SR11 EF 11-pin + PE



Female connector SR11 WF angled 11-pin + PE



Plug SR11 AM 11-pin + PE



Ordering table

Designation	Version	Cable			
		None	5 m	10 m	15 m
SR6 ¹⁾ 6-pin + PE	EF Female connector	013 176 SR6EF	077 632 SR6EF-5000	077 633 SR6EF-10000	077 634 SR6EF-15000
	WF Female connector angled	024 999 SR6WF	077 638 SR6WF-5000	077 639 SR6WF-10000	077 640 SR6WF-15000
	K Coding shells	013 178 SR6K	-	-	-
	AM Plug, connection M20 x 1,5	087 180 SR6AM2-M20	-	-	-
SR11 ¹⁾ 11-pin + PE	EF Female connector	070 859 SR11EF	077 629 SR11EF-5000	077 630 SR11EF-10000	077 631 SR11EF-15000
	WF Female connector angled	054 773 SR11WF	077 635 SR11WF-5000	077 636 SR11WF-10000	077 637 SR11WF-15000
	AM Plug, connection M20 x 1,5	091 296 SR11AM2-M20	-	-	-
SR6 and SR11	Socket crimp contact Wire cross-section 0,5 - 1,5 mm	071 260 SRF	-	-	-
	Pin crimp contacts Wire cross-section 0,5 - 1,5 mm	071 261 SRM	-	-	-

For information on crimp contacts see page 86.
1) Crimp contacts are included.

Plug connector RC18

For safety switches TZ

- ▶ 90° angled optional
- ▶ Cable optional
- ▶ Halogen-free cable optional

Crimp contacts

For wire cross-section 0.75 - 1.00 mm².

Option C1825

With 16 crimp pins for wire cross-section 0.38 - 0.5 mm² and 3 pins for wire cross-section 0.75 - 1.0 mm² for control of the interlocking solenoid. This plug is easier to connect.

Plug connector angled (optional)

On plug connectors with cables the direction of the cable exit can be chosen on left/right. On plug connectors without cables the direction can be adjusted.

Cable (optional)

Cable sleeve PUR, color black, wire cross-section 0.5 mm² or 1.0 mm².

Cable halogen-free (optional)

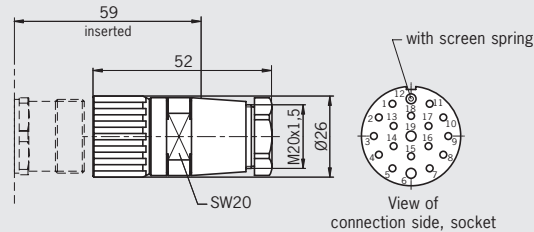
Cable sleeve PUR, color black, halogen-free, silicone-free. Reduction of toxic gases and smoke in case of fire.

Wire cross-section 0.5 mm² or 1.0 mm².

Female connector RC18 / RC18..C1825

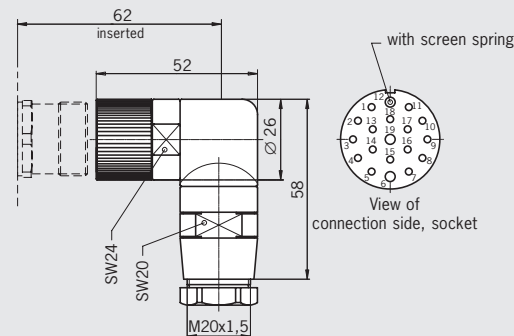
18-pin + PE

Dimension drawings



Female connector RC18 / RC18..C1825 angled

18-pin + PE



Ordering table

Designation	Version	Without cable
RC18 ²⁾ 18-pin + PE	EF Female connector ¹⁾	074 616 RC18EF
	WF Female connector angled ¹⁾	074 617 RC18WF
	Replacement socket crimp contacts ¹⁾ Wire cross-section 19 x 0,75 - 1 mm ²	094 309 Socket crimp contact RCM
	EF-C1825 Female connector	077 025 RC18EF-C1825
	WF-C1825 Female connector angled	077 026 RC187WF-C1825
	Replacement socket crimp contacts Wire cross-section 16 x 0,38 - 0,5 mm ² 3 x 0,75 - 1 mm ²	094 310 Socket crimp contact RCM-C1825

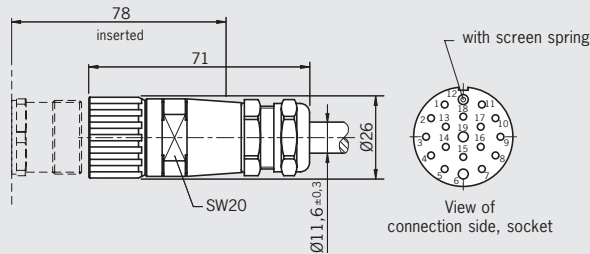
For information on crimp contacts see page 86.

1) Suitable for safety switches TZ without option C1825.

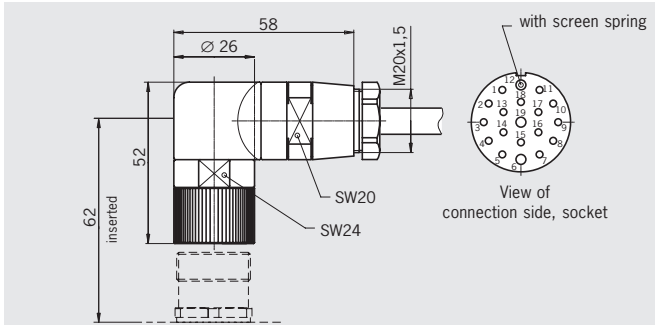
2) Crimp contacts are included.

Female connector RC18 / RC18..C1825 with cable 18-pin + PE

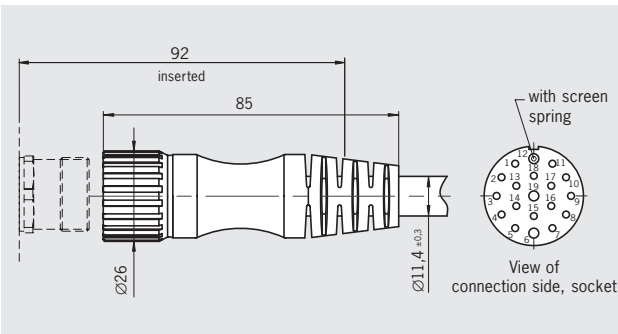
Dimension drawings



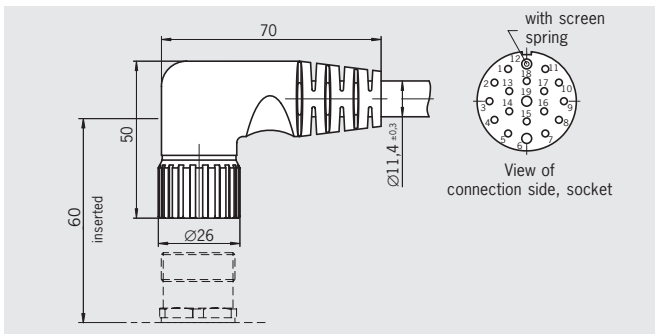
Female connector RC18 / RC18..C1825 angled with cable 18-pin + PE



Female connector RC18 / RC18..C1825 with cable halogen-free 18-pin + PE



Female connector RC18 / RC18..C1825 angled with cable halogen-free 18-pin + PE



Pin assignment plug RC18 with cable and option C1825

Pin	Wire color	Wire cross-section [mm]
1	VT	0.5
2	RD	0.5
3	GY	0.5
4	RD/BU	0.5
5	GN	0.5
6	BU	1.0
7	GY/PK	0.5
8	GN/WH	0.5
9	YE/WH	0.5

10	GY/WH	0.5
11	BK	0.5
12	GN/YE	1.0
13	PK	0.5
14	BN/GY	0.5
15	BN/YE	0.5
16	BN/GN	0.5
17	WH	0.5
18	YE	0.5
19	BN	1.0

Ordering table

Descrp.	Version	Cable							
		1,5 m	3 m	6 m	8 m	10 m	15 m	20 m	25 m
RC18 18-pin + PE with cable	EF-C1825 Female connector	092 761 RC18EF1,5M-C1825	092 816 RC18EF3M-C1825	077 014 RC18EF6M-C1825	077 015 RC18EF8M-C1825	092 898 RC18EF10M-C1825	077 016 RC18EF15M-C1825	092 726 RC18EF20M-C1825	092 727 RC18EF25M-C1825
	WFL-C1825 Female connector angled cable exit left	092 906 RC18WF1,5ML-C1825	092 908 RC18WF3ML-C1825	077 018 RC18WF6ML-C1825	077 019 RC18WF8ML-C1825	092 901 RC18WF10ML-C1825	077 020 RC18WF15ML-C1825	092 910 RC18WF20ML-C1825	092 912 RC18WF25ML-C1825
	WFR-C1825 Female connector angled cable exit right	092 907 RC18WF1,5MR-C1825	092 909 RC18WF3MR-C1825	085 194 RC18WF6MR-C1825	085 195 RC18WF8MR-C1825	092 902 RC18WF10MR-C1825	085 196 RC18WF15MR-C1825	092 911 RC18WF20MR-C1825	092 913 RC18WF25MR-C1825
RC18 18-pin + PE with cable halogen- free	EF-FC1825 Female connector	092 883 RC18EF1,5MF-C1825	092 884 RC18EF3MF-C1825	092 885 RC18EF6MF-C1825	092 886 RC18EF8MF-C1825	092 887 RC18EF10MF-C1825	092 888 RC18EF15MF-C1825	092 889 RC18EF20MF-C1825	092 890 RC18EF25MF-C1825
	WFL-FC1825 Female connector angled cable exit left	092 891 RC18WF1,5MLF-C1825	092 893 RC18WF3MLF-C1825	092 697 RC18WF3MLF-C1825	092 895 RC18WF8MLF-C1825	092 699 RC18WF10MLF-C1825	092 701 RC18WF15MLF-C1825	092 704 RC18WF20MLF-C1825	092 724 RC18WF25MLF-C1825
	WFR-FC1825 Female connector angled cable exit right	092 892 RC18WF1,5MRF-C1825	092 894 RC18WF3MRF-C1825	092 698 RC18WF6MRF-C1825	092 896 RC18WF8MRF-C1825	092 700 RC18WF10MRF-C1825	092 702 RC18WF15MRF-C1825	092 708 RC18WF20MRF-C1825	092 725 RC18WF25MRF-C1825

For safety instructions see page 103
For technical data see page 87

Plug connectors SGLF and SWLF with cable

For safety switches series NZ and N1A

- ▶ Plug connector M12 with cable
- ▶ 90° angled optional

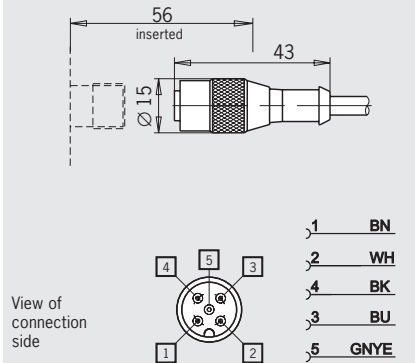
Cable

Cable sleeve PUR, color black, halogen-free, flame retardant. Reduction of toxic gases and smoke in case of fire. Wire cross-section 0.34 mm².

Plug connector SGLF with cable

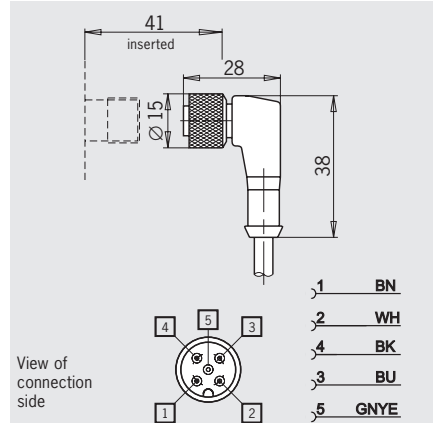
M12 plug, 5-pin

Dimension drawings



Plug connector SWLF with cable

angled, M12 plug, 5-pin



Ordering table

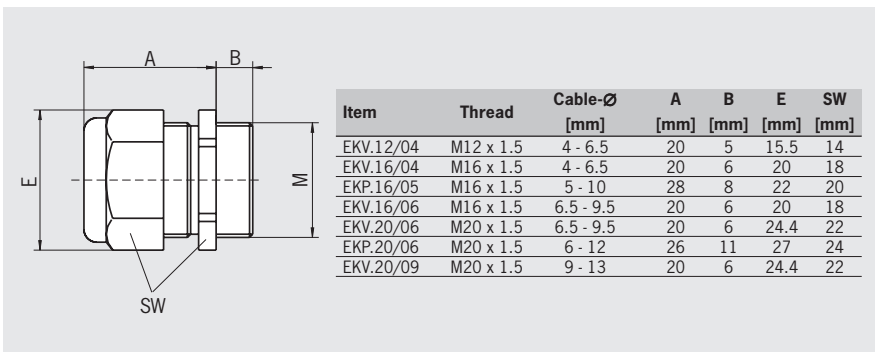
Type	Number of pins	Version	Cable length 5 m
SGLF	5	Female connector M12 for plug SVM5	073 461 SGLF5-5000P
SWLF	5	Female connector M12 angled for plug SVM5	073 462 SWLF5-5000P

Cable glands

- ▶ M12 x 1.5
- ▶ M16 x 1.5
- ▶ M20 x 1.5

Cable glands

Suitable for various cable diameters. Versions available in plastic and metal.



Ordering table

Thread	Version	Material	
		Metal	Plastic
M12 x 1,5	Cable diameter 4 - 6,5 mm	086 327 EKVM12/04	-
	Cable diameter 4 - 6,5 mm	086 328 EKVM16/04	-
M16 x 1,5	Cable diameter 5 - 10 mm	-	084 572 EKPM16/05
	Cable diameter 6,5 - 9,5 mm	086 330 EKVM16/06	-
M20 x 1,5	Cable diameter 6 - 12 mm	-	077 679 EKPM20/06
	Cable diameter 6,5 - 9,5 mm	077 683 EKVM20/06	-
	Cable diameter 9 - 13 mm	077 684 EKVM20/09	-

Mounting plates EMP for safety switches TZ

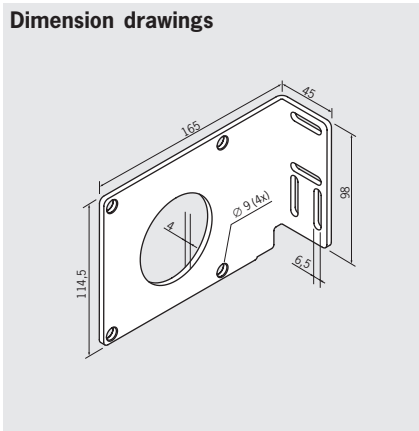
► Vertical and horizontal mounting of safety switch TZ

The mounting plates are used for fastening safety switches TZ and actuators to safety guards. The safety switches can be attached horizontally or vertically.

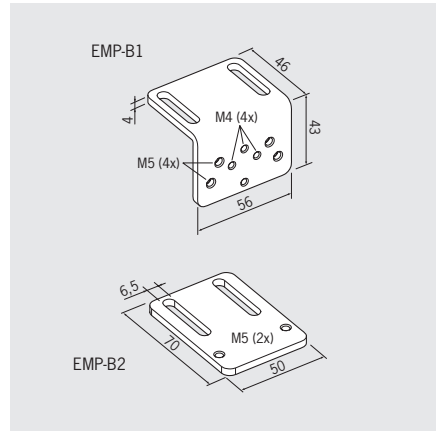
The mounting plate EMP-SA is also suitable for safety switches with escape release from the rear.

Mounting plate EMP-SA
For safety switch TZ

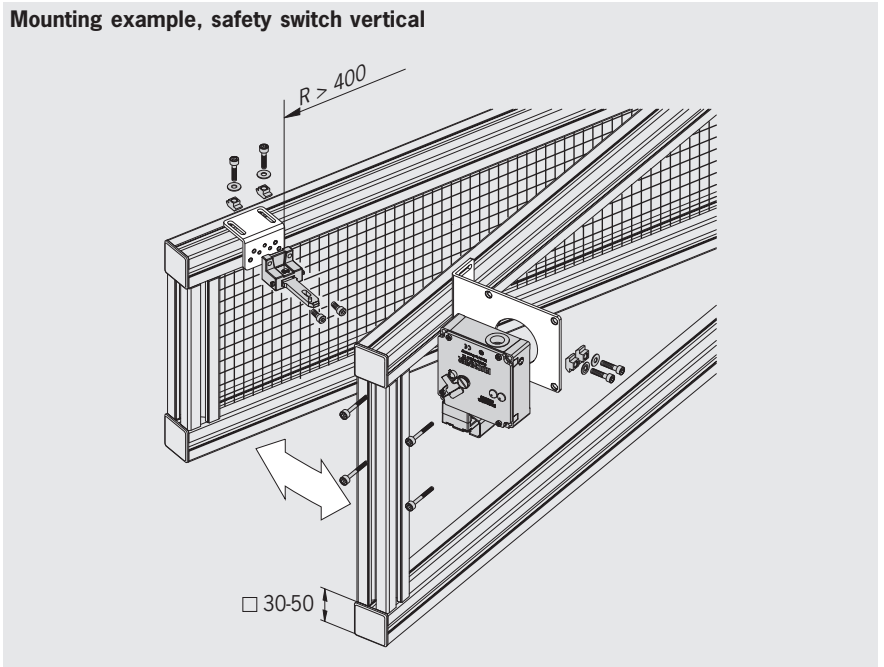
Dimension drawings



Mounting plates EMP-B1/EMP-B2
For actuators



Mounting example, safety switch vertical



Ordering table

Designation	Usage	
Mounting plate EMP-SA	For safety switch TZ horizontal and vertical mounting	094 401 EMP-SA
Mounting plate EMP-B.	For hinged actuator Z-R and Z-L	093 457 EMP-B1
	For hinged actuator Z-O and Z-U	093 458 EMP-B2

For safety instructions see page 103
For technical data see page 87

Miscellaneous accessories

- ▶ Lockout bar
- ▶ Protective plate
- ▶ Replacement head for NZ..VZ
- ▶ Lead seal kit
- ▶ LED function display
- ▶ Safety screws

Lockout bar

With the safety door open, can be slid into the actuating head on a switch with separate actuator (NZ..VZ and TZ). Removal can be prevented using a commercially available padlock. For the protection of people in areas with a possible hazard.

Cannot be used in combination with the protective plate.

Protective plate

Optimal protection against tampering on safety switches with separate actuator (NZ..VZ and TZ). The protective plate prevents modification of the switch via the actuator outlet opening.

Replacement head for NZ..VZ

Replacement head for a safety switch with separate actuator (NZ..VZ). With 4 safety screws and replacement screws. As the switches are safety components, in case of defects we recommend replacing the entire safety switch. **Not suitable for the safety switch TZ!**

Lead seal kit

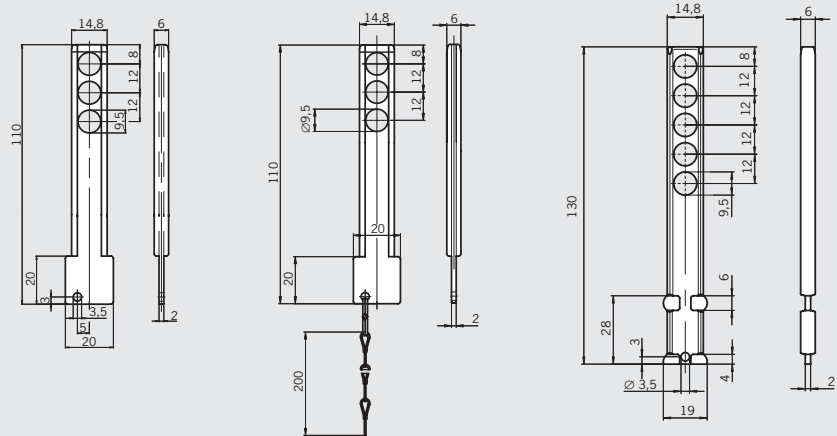
For sealing the mechanical release on the safety switch TZ. The locking screw is included.

Safety screws

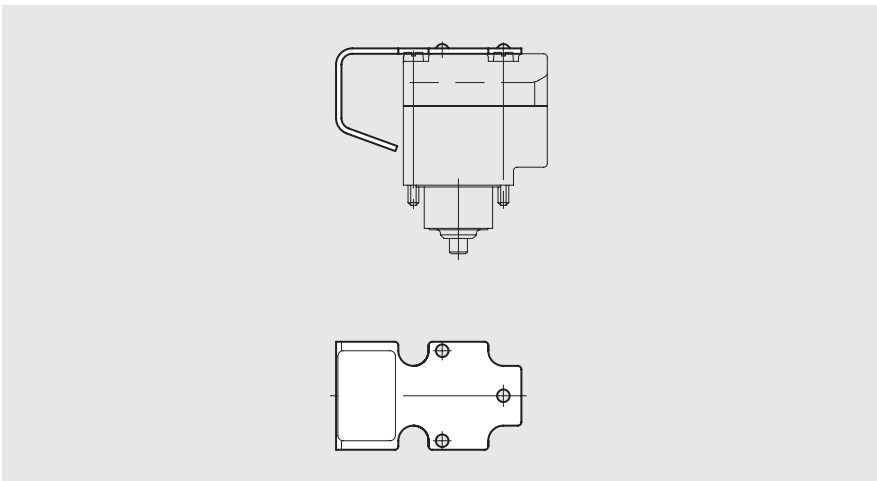
To prevent unscrewing of actuators and actuating heads. The screws can be tightened using a normal tool, but cannot be removed again.

Lockout bars

Dimension drawings



Protective plate



Ordering table

Designation	Version	Use	
Lockout bar	3 holes	For safety switch with separate actuator without protective plate	046 730 Lockout bar-Z
	3 holes with chain	For safety switch with separate actuator without protective plate	091 305 Lockout bar with chain
	5 holes	For safety switch with separate actuator without protective plate	086 538 Lockout bar-Z
Protective plate		For safety switch with separate actuator	059 136 Protective plate NZ/TZ
Replacement head NZ..VZ		Not suitable for safety switch TZ	076 250 Actuating head NZVZ
Lead seal kit	Comprising seal and sealing wire	For safety switch TZ with locking screw and key	048 257 Lead seal kit TZ
		For safety switch TZ with rotation emergency unlocking	087 256 Lead seal kit TZ-C1937
Safety screws packaging unit: 100 pieces	M5 x 10	For straight actuators 016849 and 072251	073 455 M5X10/V100
	M5 x 16	For hinged actuators 024299 and 024298	073 456 M5X16/V100
	M5 x 25	For hinged actuators 048850 and 057950	073 457 M5X25/V100
	M3 x 40	For actuatinghead NZ and TZ	075 530 M3X40/V100
	M3 x 70	For actuating head NZ..VZ..VSE and NZ..VZ..VSM	075 531 M3X70/V100

Miscellaneous accessories

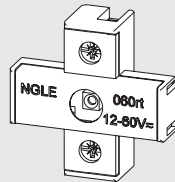
► LED function display

LED function display

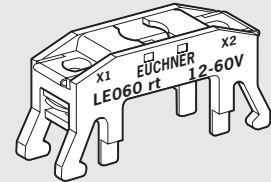
Upgrade kits with LEDs are available for the safety switches N1A and NZ. The intensity of the light from the indicators is always the same independent of the voltage applied.

LED function display

Dimension drawings



NGLE...



LE...

Ordering table

Designation	Version	Voltage					
		12-60 V LED red	12-60 V yellow	12-60 V green	110 V LED red	230 V LED red	230 V LED yellow
LED function display NGLE	For safety switch NZ	029 220	029 222	029 221	045 822	045 825	045 827
		NGLE060RT	NGLE060GE	NGLE060GR	NGLE110RT	NGLE220RT	NGLE220GE
LED function display LE	For safety switch N1A	035 495	035 497	035 496	045 579	045 582	045 584
		LE060RT	LE060GE	LE060GR	LE110RT	LE220RT	LE220GE

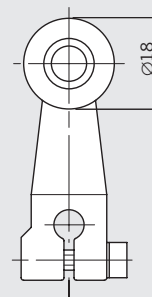
► Replacement roller arm

Replacement roller arm

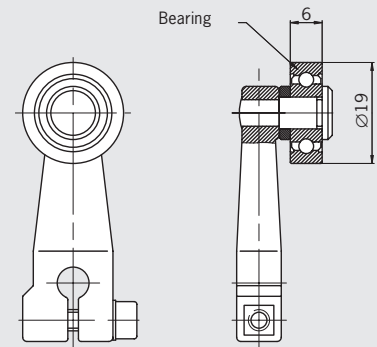
Replacement roller lever for safety switches with safety function with lever arm. As the switches are safety components, in case of defects we recommend replacing the entire switch. Complete switch heads are not available.

Replacement roller arm

Dimension drawings



NHS (steel roller)
NHB (plastic roller)



NHBC

Ordering table

Designation	Version	
Replacement roller arm	Replacement plunger for NZ.HS	012 043 Roller arm NHS
	Replacement plunger for NZ.HB	012 042 Roller arm NHB
	Replacement plunger for NZ.HB...C569	012 044 Roller arm NHBC569

For safety instructions see page 103
For technical data see page 87

List of plug connector suppliers

We provide no guarantee for the completeness and correctness of the ordering data given. The data was valid in October 2004. The related manufacturers reserve the right to make changes without notice. The plug connectors and accessories listed are also available from other manufacturers.

► Plug connectors and accessories

Type	Version	Manufacturer's designation	
SVM5 5 pins	Female connector M12	99-0436-57-05 Cable socket	Binder www.binder-connector.de
	Flange socket M12	09-3442-700-05 Flange socket with wires	
	Blanking plug M12	08-2425-000-000 Protective cap for socket with retaining strap	
CE5 3 pins + N + PE	Mating connector (socket)	CEE plug as per CEE standard	
C16-1 6 pins + PE	Flange socket	T3107 500 Appliance socket	Amphenol-Tuchel www.amphenol-tuchel.com
	Socket crimp contacts for C16-1, packaging unit 100 pcs.	VN02 016 0002 (1) Single contact, silver, 0,5-1,5 mm ²	
	Blanking plug	T6483 000 Sealing cap for appliance socket	
MR 7, 8, 9, 10 and 12 Pole	Straight female connector (7 pins), pre-assembled for built-in plug MR7	MIN-7FPX-.. Female plugs with cable	MENCOM www.mencomcorp.com
	Straight female connector (8 pins), pre-assembled for built-in plug MR8	MIN-8FPX-.. Female plugs with cable	
	Straight female connector (9 pins), pre-assembled for built-in plug MR9	MIN-9FP-.. Female plugs with cable	
	Straight female connector (10 pins), pre-assembled for built-in plug MR10	MIN-10FP-.. Female plugs with cable	
	Straight female connector (12 pins), pre-assembled for built-in plug MR12	MIN-12FP-.. Female plugs with cable	
HAN10 10 pins + PE	Flange socket 1 cable exit	19 20 010 0251 Socket housing 1 cable exit	Harting www.harting.com
	Socket contacts (installation for flange socket)	09 20 010 3101 Socket contact insert crimp connection	
	Socket contacts for crimping	09 33 000 6220 Crimp contacts socket 0,5 mm ²	
	Blanking plug	09 20 010 5425 Cover	
RC17-Y coded 17 pins	Flange socket, soldered to plug RC17Y	RC-17S1Y122000 Flange socket 17-pin	Coninvers www.coninvers.com
	Blanking plug	RC-17P1N8A83NN Protective cap for socket with retaining strap	

► Crimp and removal tool

For plug connectors	Function	Manufacturer's designation	
SR6 and SR11	Crimp tool	932 507-001 XCZ 0700	Hirschmann www.hirschmann.com
	Removal tool	931 812-001 XWA 164	
C16-1	Crimp tool	TA0500 + TA0000163 + TA0002016001 Crimp tool, jaws and contact receptacle	Amphenol-Tuchel www.amphenol-tuchel.com
	Removal tool	FG 0300 1461 Removal tool	
RC12	Crimp tool	RC-Z 2378 Crimp tool for turned contacts	Coninvers www.coninvers.com
	Removal tool	RC-Z 2097 Removal tool/insertion tool	
RC18	Crimp tool	RC-Z 2378 Crimp tool for turned contacts	Coninvers www.coninvers.com
	Removal tool	RC-Z 2274 Removal tool	
VP19	Crimp tool	T98143 DAK 83S-30 / 11-7576T3 Insertion tool	Litton/Veam www.littonveam.com
	Removal tool	46592-MT50 / 11-7576T3 Removal tool	
UT23	Crimp tool	Y16RCM Crimpingtool for machined contacts	Burdny www.burdny.com
	Removal tool	RX2025GE1 Extraction tool	
TB24	Crimp tool	WT10-04 Crimp tool	Thomas & Betts www.ttb.com
	Removal tool	TRT16 Contact removal tool	

Overview

Safety switch series	
N1A	Precision single limit switch
NB01	Single hole fixing limit switch, small design
NZ	Position switch NZ
NZ.VZ	Safety switch NZ.VZ
NZ.VZ.VS	Safety switch NZ.VZ.VS
TZ	Safety switch TZ

Accessories for safety switches	

Safety switch series						Accessories	Page
N1A	NB01	NZ	NZ.VZ	NZ.VZ.VS	TZ		
●							88
	●						90
		●					91
			●				95
				●			97
					●		99
						●	101

Single hole fixing limit switch N1A...

The technical data on switches and switching elements apply to all connection types. Further technical data are given for the connection type selected.



Switch						
Parameters		Value				Unit
Housing material		Die-cast aluminum, anodized				
Ambient temperature		- 25 ... + 80				°C
Weight		Approx. 0.25				kg
Approach speed, min.		0,1				m/min
		N1AD	N1AR	N1ARL	N1AW	
Approach speed max. ¹⁾ depending on actuator		40	80	20	10	m/min
Operating point accuracy depending on actuator		± 0,002	± 0,01	± 0,1	± 0,01	mm

Switching element				
Parameters		Value		Unit
Switching principle		Slow-action contact element	Snap-action contact element	
Switching element		508	-	
With 1 contact element		1 NC \ominus		
Switching element		-	514	
With 2 contact elements			1 NC \ominus + 1 S	
Mechanical life		30 x 10 ⁶ operating cycles	1 x 10 ⁶ operating cycles	
Actuating force, min.		15	30	N
Contact closing time		-	< 5	ms
Contact bounce time		-	< 3	ms
Switching current, min., at 24 V DC		10		mA
Switching current max.		6		A
Rated impulse withstand voltage U _{imp}		2,5		kV
Contact material		Silver alloy, gold flashed		

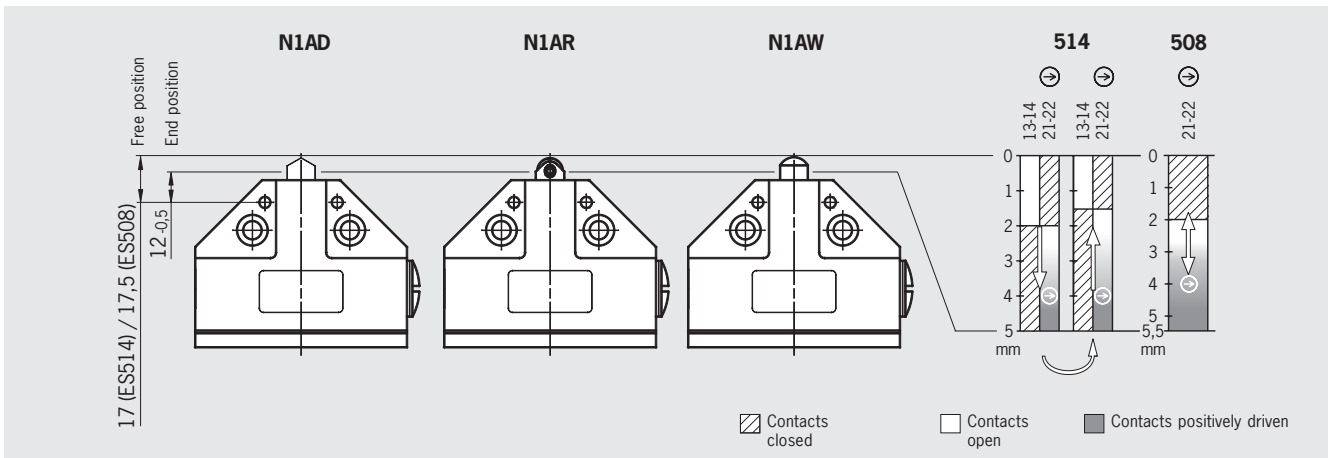
Connection, cable entry M16 x 1.5				
Parameters		Value		Unit
Connection		Screw terminals		
Version		M16 x 1.5		
Conductor cross-section max.		Per wire 1.5 mm ²		
Degree of protection according to IEC 60529		IP 67		
Rated insulation voltage U _i		250		AC/DC V
		508	514	
Conventional thermal current I _{th}		6	6	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		6	6	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 6 A U _e 230 V	I _e 2,5 A U _e 230 V	
	DC-13	I _e 6 A U _e 24 V	I _e 6 A U _e 24 V	

Connection, plug connector SVM 5 (M12)				
Parameters		Value		Unit
Connection		Plug connector		
Version		M12 (4-pin + PE)		
Degree of protection according to IEC 60529		IP 67 ²⁾		
Rated insulation voltage U _i		30		AC/DC V
		514		
Conventional thermal current I _{th}		4		A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4		A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 30 V		
	DC-13	I _e 4 A U _e 24 V		

1) The approach speed given applies in conjunction with EUCHNER trip dogs at an approach angle of 30°. At a smaller approach angle this approach speed can be exceeded.

2) Screwed tight with the related plug connector (see page 82)

Travel diagram N1AD/N1AR/N1AW



Travel diagram N1ARL



Single hole fixing limit switch NB01...

The technical data on switches and switching elements apply to all connection types. Further technical data are given for the connection type selected.



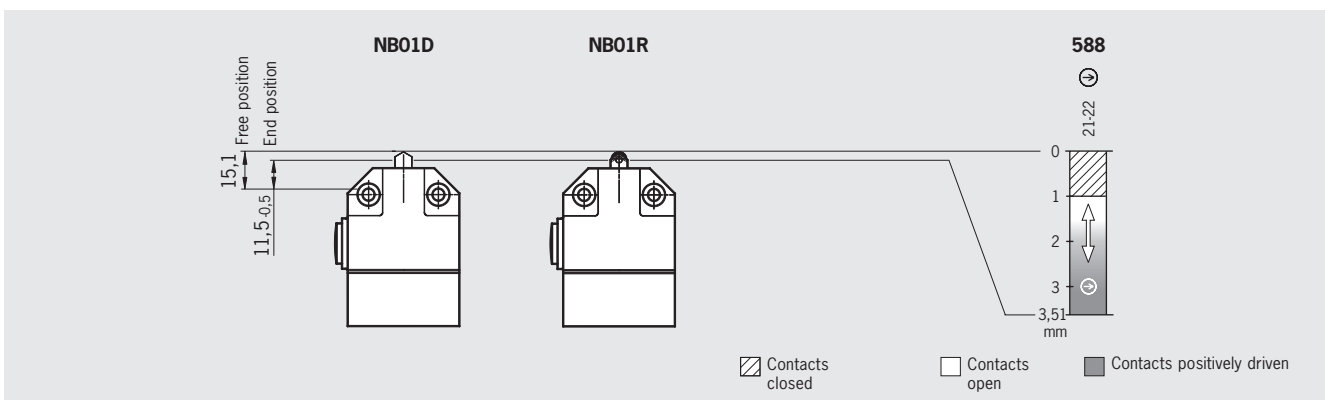
Switch			
Parameters		Value	Unit
Housing material		Die-cast aluminum, anodized	
Ambient temperature		- 5 ... + 60	°C
Weight		Approx. 0.2	kg
	NB01D	NB01R	
Approach speed max. ¹⁾ depending on actuator	20	50	m/min
Operating point accuracy depending on actuator	± 0,02	± 0,05	mm

Switching element			
Parameters		Value	Unit
Switching principle		Slow-action contact element	
Switching elements		588	
With 1 contact element		1 NC \ominus	
Mechanical life		10 x 10 ⁶ operating cycles	
Actuating force, min.		15	N
Switching current, min., at 24 V DC		1	mA
Switching current max.		6	A
Rated impulse withstand voltage U _{imp}		4	kV
Contact material		Silver alloy, gold flashed	

Connection, cable entry M12 x 1.5			
Parameters		Value	Unit
Connection		Screw terminals	
Version		M12 x 1.5	
Conductor cross-section max.		Per wire 1.5 mm ²	
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U _i		250	AC/DC V
		588	
Conventional thermal current I _{th}		6	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		6	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V	
	DC-13	I _e 3 A U _e 24 V	

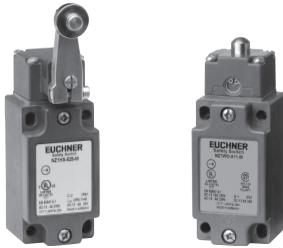
1) The approach speed given applies in conjunction with EUCHNER trip dogs at an approach angle of 30°. At a smaller approach angle this approach speed can be exceeded.

Travel diagram NB01D/NB01R



Position switches NZ...

The technical data on switches and switching elements apply to all connection types. Further technical data are given for the connection type selected.



Switch								Unit	
Parameters		Value						Unit	
Housing material		Anodized die-cast alloy							
Mechanical life		30 x 10 ⁶ operating cycles							
Ambient temperature		- 25 ... + 80						°C	
Weight		Approx. 0.3						kg	
Approach speed, min.		0,1						m/min	
Approach speed max. ¹⁾ depending on actuator		HB	HS	PB	PS	RG, RL, RS	RK	WO	
		300	60	120	30	20	80	10	m/min
Actuating force, min.		15						N	

Switching element				Unit
Parameters		Value		Unit
Switching principle	Snap-action contact element	Slow-action contact element		
Switching elements With 2 contact elements	511 1 NC ⊖ + 1 NO	528H 1 NC ⊖ + 1 NO	538H 2 NC ⊖	
Switching elements With 4 contact elements	-	2121H 4 NC ⊖	2131H 3 NC ⊖ + 1 NO	3131H 2 NC ⊖ + 2 NO
Switching current, min., at 24 V DC	10	1		mA
Switching current max.	6	4		A
Contact closing time	< 4	-		ms
Contact bounce time	< 3	-		ms
Rated impulse withstand voltage U _{imp}		2.5		kV
Contact material		Silver alloy, gold flashed		

Connection, cable entry M20 x 1.5			Unit
Parameters		Value	Unit
Connection		Screw terminals	
Version		M20 x 1.5	
Conductor cross-section max.		per wire 1.5 mm ²	
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U _i		250	AC/DC V
		Snap-action contact element 511	Slow-action contact element 528H, 538H, 2121H, 2131H, 3131H
Conventional thermal current I _{th}		6	4
Short circuit protection according to IEC 60269-1 (control circuit fuse)		6	4
Utilization category according to IEC 60947-5-1	AC-12	I _e 10 A U _e 230 V	-
	AC-15	I _e 6 A U _e 230 V	I _e 4 A U _e 230 V
	DC-13	I _e 6 A U _e 24 V	I _e 4 A U _e 24 V

Connection, plug connector SVM 5 (M12)			Unit
Parameters		Value	Unit
Connection		Plug connector	
Version		M12 (4-polig + PE)	
Degree of protection according to IEC 60529		IP 67 ²⁾	
Rated insulation voltage U _i		30	AC/DC V
		Snap-action contact element 511 , slow-action contact element 528H, 538H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 30 V	
	DC-13	I _e 4 A U _e 24 V	

1) The approach speed given applies in conjunction with EUCHNER trip dogs at an approach angle of 30°. At a smaller approach angle this approach speed can be exceeded.

2) Screwed tight with the related plug connector (see page 82)

Connection, plug connector SR6



Parameters		Value	Unit
Connection		Plug connector according to DIN 43651	
Version		SR6 (6-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ²⁾	
Rated insulation voltage U _i		250	AC/DC V
		Snap-action contact element 511	Slow-action contact element 528H, 538H
Conventional thermal current I _{th}		6	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		6	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 6 A U _e 230 V	I _e 4 A U _e 230 V
	DC-13	I _e 6 A U _e 24 V	I _e 4 A U _e 24 V

Connection, plug connector MR8



Parameters		Value	Unit
Connection		Plug connector	
Version		MR8 (7-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ²⁾	
Rated insulation voltage U _i		250	AC/DC V
		Slow-action contact element 3131H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 230 V	
	DC13	I _e 4 A U _e 24 V	

Connection, plug connector MR9



Parameters		Value	Unit
Connection		Plug connector	
Version		MR9 (8-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ²⁾	
Rated insulation voltage U _i		250	AC/DC V
		Slow-action contact element 2131H, 3131H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 230 V	
	DC13	I _e 4 A U _e 24 V	

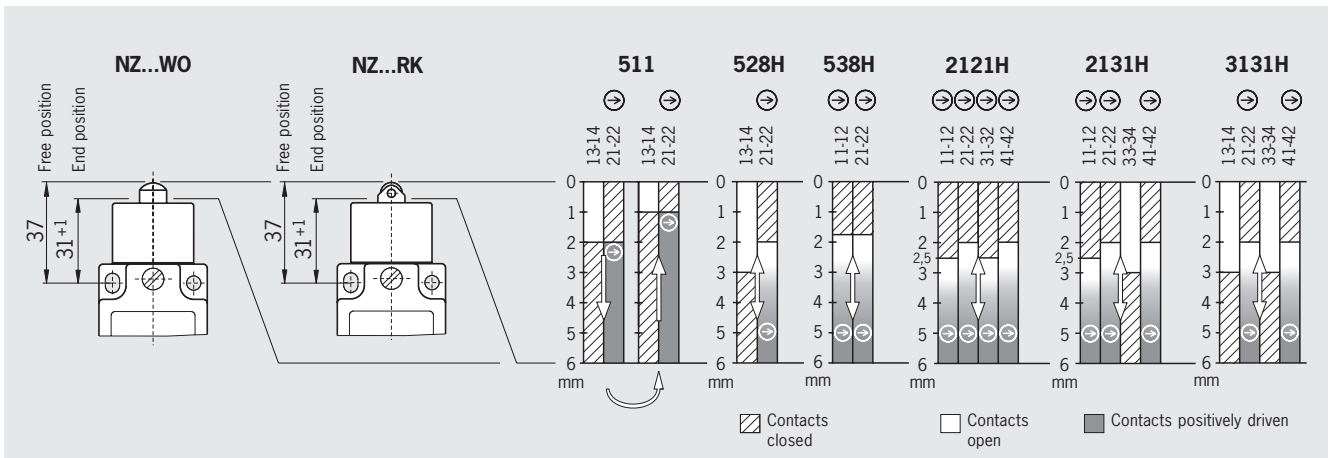
Connection, plug connector SR11



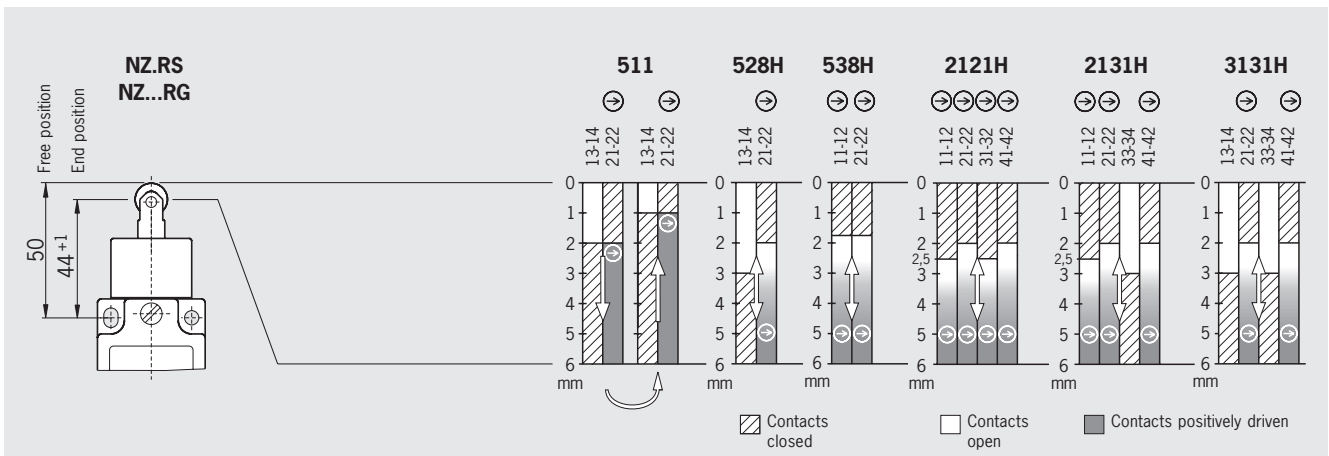
Parameters		Value	Unit
Connection		Plug connector	
Version		SR11 (11-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ²⁾	
Rated insulation voltage U _i		50	AC/DC V
		Slow-action contact element 2121H, 2131H, 3131H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 50 V	
	DC13	I _e 4 A U _e 24 V	

2) Screwed tight with the related plug connector (see page 79 and 86)

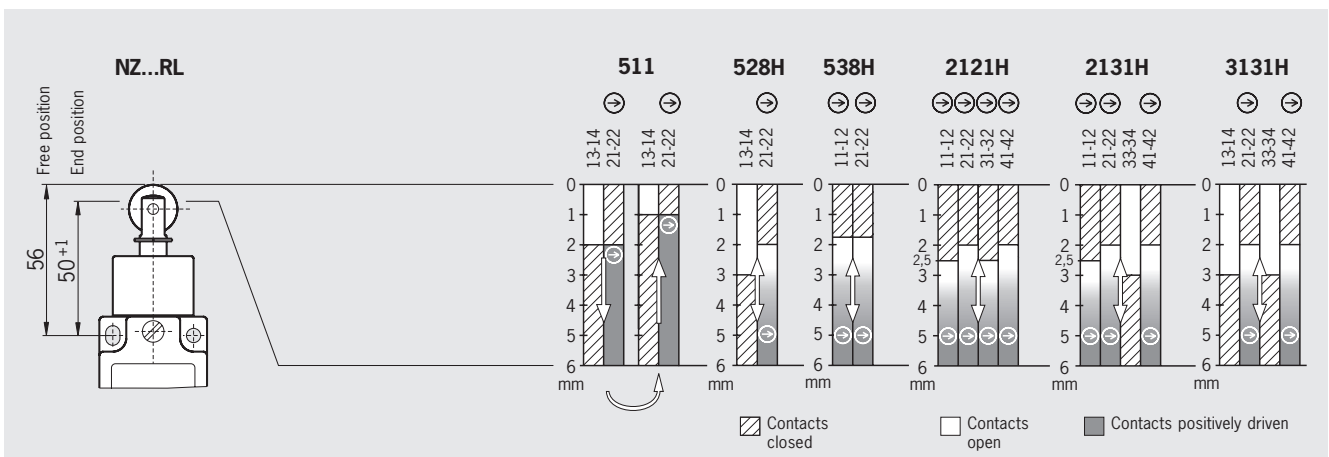
Travel diagram NZ.WO/NZ.RK



Travel diagram NZ.RS/NZ.RG



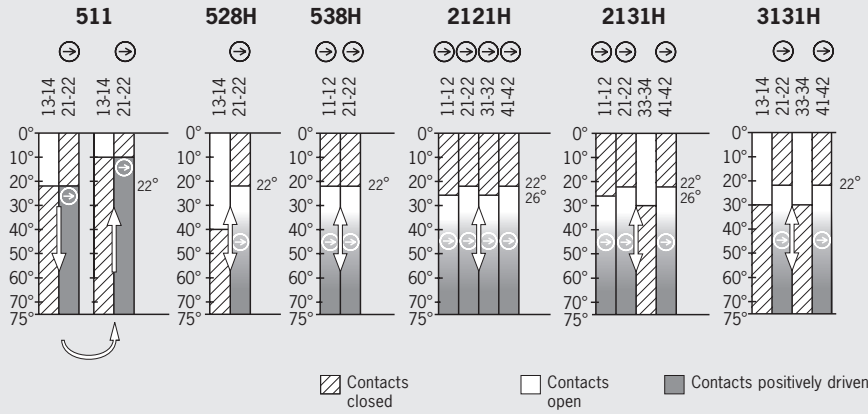
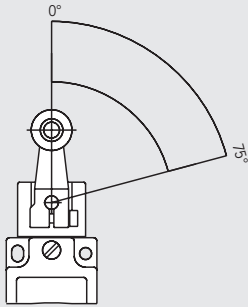
Travel diagram NZ.RL



Travel diagram NZ.HS/NZ.HB



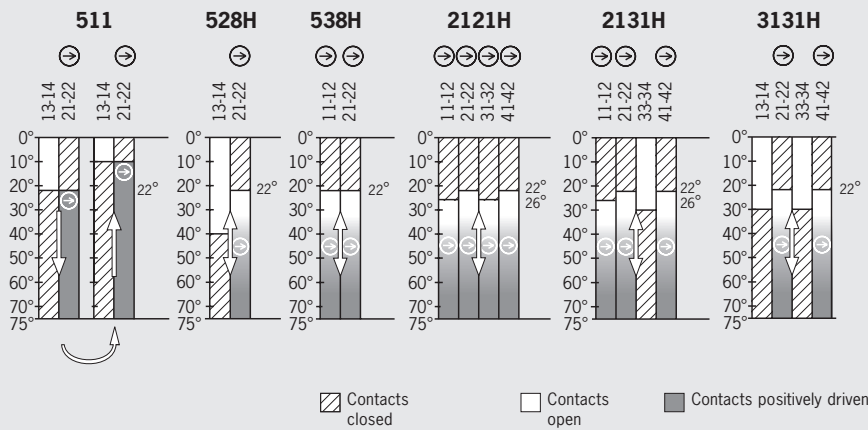
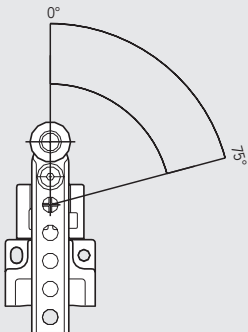
NZ...HS
NZ...HB



Travel diagram NZ.PS/NZ.PB




NZ...PS
NZ...PB






Safety switch NZ.VZ




The technical data on switches and switching elements apply to all connection types. Further technical data are given for the connection type selected.

Switch			Value	Unit
Parameters				
Housing material			Anodized die-cast alloy	
Mechanical life			2 x 10 ⁶ operating cycles	
Ambient temperature			- 25 ... + 80	°C
Weight			Approx. 0.3	kg
Approach speed, max.			20	m/min
Approach speed, min			0.02 (for switching element ES511)	m/min
Actuating / extraction force min.			35	N
Retention force			10	N

Switching element				Value	Einheit
Parameters					
Switching principle		Snap-action contact element	Slow-action contact element		
Switching elements		511	528H	538H	
With 2 contact elements		1 NC \ominus + 1 NO	1 NC \ominus + 1 NO	2 NC \ominus	
Switching elements		-	2121H	2131H	3131H
With 4 contact elements		-	4 NC \ominus	3 NC \ominus + 1 NO	2 NC \ominus + 2 NO
Switching current, min., at 24 V DC		10	1		mA
Switching current max.		6	4		A
Contact closing time		< 4	-		ms
Contact bounce time		< 3	-		ms
Rated impulse withstand voltage U _{imp}		2.5			kV
Contact material		Silver alloy, gold flashed			

Connection, cable entry M20 x 1.5			Value	Unit
Parameters				
Connection			Screw terminals	
Version			M20 x 1.5	
Conductor cross-section max.			Per wire 1.5 mm ²	
Degree of protection according to IEC 60529			IP 67	
Rated insulation voltage U _i			250	AC/DC V
		Snap-action contact element	Slow-action contact element	
		511	528H, 538H, 2121H, 2131H, 3131H	
Conventional thermal current I _{th}		6	4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		6	4	A gG
Utilization category according to IEC 60947-5-1	AC-12	I _e 10 A U _e 230 V	-	
	AC-15	I _e 6 A U _e 230 V	I _e 4 A U _e 230 V	
	DC-13	I _e 6 A U _e 24 V	I _e 4 A U _e 24 V	

Connection, plug connector SVM 5 (M12)			Value	Unit
Parameters				
Connection			Plug connector	
Version			M12 (4-pin + PE)	
Degree of protection according to IEC 60529			IP 67 ¹⁾	
Rated insulation voltage U _i			30	AC/DC V
		Slow-action contact element		
		538H		
Conventional thermal current I _{th}		4		A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4		A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 30 V		
	DC-13	I _e 4 A U _e 24 V		

1) Screwed tight with the related plug connector (see page 82)

Connection, plug connector C16-1



Parameters		Value	Unit
Connection		Plug connector	
Version		C16-1 (6-pin + PE)	
Degree of protection according to IEC 60529		IP 67 ¹⁾	
Rated insulation voltage U _i		250	V AC/DC
		Slow-action contact element	
		538H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 230 V	
	DC13	I _e 4 A U _e 24 V	

Connection, plug connector SR6



Parameters		Value	Unit
Connection		Plug connector according to DIN 43651	
Version		SR6 (6-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U _i		250	AC/DC V
		Snap-action contact element	
		511	
		Slow-action contact element	
		528H, 538H	
Conventional thermal current I _{th}		6	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		6	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 6 A U _e 230 V	
	DC-13	I _e 6 A U _e 24 V	

Connection, plug connector MR8



Parameters		Value	Unit
Connection		Plug connector	
Version		MR8 (7-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U _i		250	AC/DC V
		Slow-action contact element	
		2131H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 230 V	
	DC13	I _e 4 A U _e 24 V	

Connection, plug connector MR9



Parameters		Value	Unit
Connection		Plug connector	
Version		MR9 (8-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U _i		250	AC/DC V
		Slow-action contact element	
		2131H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 230 V	
	DC13	I _e 4 A U _e 24 V	

Connection, plug connector SR11




Parameters		Value	Unit
Connection		Plug connector	
Version		SR11 (11-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U _i		50	AC/DC V
		Slow-action contact element	
		2121H, 2131H, 3131H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 50 V	
	DC13	I _e 4 A U _e 24 V	



1) Screwed tight with the related plug connector (see page 78, 79 and 86)



Safety switches NZ.VZ.VS... with guard locking




The technical data on switches, switching elements and guard locking apply to all connection types. Further technical data are given for the connection type selected.

Switch			Value	Unit
Parameters				
Housing material			Anodized die-cast alloy	
Mechanical life			2 x 10 ⁶ operating cycles	
Ambient temperature			-25 ... +80	°C
Weight			Approx. 0,7	kg
Approach speed, max.			20	m/min
Approach speed, min.			0.02 (for switching element ES511)	m/min
Actuating / extraction force min.			40	N
Locking force max. (guard locking in locked position)			1500	N
Retention force			10	N

Switching element				Value	Unit
Parameters					
Switching principle		Snap-action contact element		Slow-action contact element	
Switching elements		511		528H 538H	
With 2 contact elements		1 NC \ominus + 1 NO		1 NC \ominus + 1 NO 2 NC \ominus	
Switching elements		-		2121H 2131H 3131H	
With 4 contact elements		-		4 NC \ominus 3 NC \ominus + 1 NO 2 NC \ominus + 2 NO	
Switching current, min., at 24 V DC		10		1	mA
Switching current max.		6		4	A
Contact closing time		< 4		-	ms
Contact bounce time		< 3		-	ms
Rated impulse withstand voltage U _{imp}				2.5	kV
Contact material				Silver alloy, gold flashed	

Guard locking (not for NZ.VZ.VSH)				Value	Unit
Parameters					
Solenoid operating voltage				DC 24 V +10/-15% AC 110 V +10/-15% ¹⁾ AC 230 V +10/-15% ¹⁾	
Connection				Switch mounted connector (2-pin + PE) according to 43 650	
Conductor cross-section				For technical data on the solenoid plug see page 101	
Duty cycle				100	%
Power consumption				< 10	W

Connection, cable entry M20 x 1.5			Value	Unit	
Parameters					
Connection			Screw terminals		
Version			M20 x 1,5		
Conductor cross-section max.			Per wire 1,5 mm ²		
Degree of protection according to IEC 60529			IP 65		
Rated insulation voltage U _i			250	AC/DC V	
		Snap-action contact element		Slow-action contact element	
Conventional thermal current I _{th}		511		528H, 538H, 2121H, 2131H, 3131H	
Short circuit protection according to IEC 60269-1 (control circuit fuse)		6		4	A
Utilization category according to IEC 60947-5-1		6		4	A gG
	AC-12	I _e 10 A U _e 230 V		-	
	AC-15	I _e 6 A U _e 230 V		I _e 4 A U _e 230 V	
	DC-13	I _e 6 A U _e 24 V		I _e 4 A U _e 24 V	

1) Use only solenoid plug with integrated rectifier

Connection, plug connector SR6



Parameters		Value	Unit
Connection		Plug connector according to DIN 43651	
Version		SR6 (6-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ²⁾	
Rated insulation voltage U _i		250	AC/DC V
		Slow-action contact element 528H, 538H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V	
	DC-13	I _e 4 A U _e 24 V	

Connection, plug connector MR8



Parameters		Value	Unit
Connection		Plug connector	
Version		MR8 (7-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ²⁾	
Rated insulation voltage U _i		250	AC/DC V
		Slow-action contact element 2131H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 230 V	
	DC13	I _e 4 A U _e 24 V	

Connection, plug connector SR11




Parameters		Value	Unit
Connection		Plug connector	
Version		SR11 (11-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ²⁾	
Rated insulation voltage U _i		50	AC/DC V
		Slow-action contact element 2131H, 3131H	
Conventional thermal current I _{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I _e 4 A U _e 50 V	
	DC13	I _e 4 A U _e 24 V	



2) Screwed tight with the related plug connector (see page 79 and 86)



Safety switch TZ with guard locking and guard locking monitoring





The technical data on switches, switching elements and guard locking apply to all connection types. Further technical data are given for the connection type selected.

Switch			Value	Unit
Parameters				
Housing material			Anodized die-cast alloy	
Mechanical life			2 x 10 ⁶ operating cycles	
Ambient temperature			- 25 ... + 80	°C
Weight			Approx. 1.2	kg
Approach speed, max.			20	m/min
Actuating / extraction force min.			35	N
Retention force			5	N
Locking force max. (guard locking in locked position)			1500	N

Switching element				Value	Unit
Parameters					
Switching principle				Slow-action contact element	
Switching elements				SK: 528H / UK: 528H	
With 2 contact elements				1 NC \ominus + 1 NO / 1 NC \ominus + 1 NO	
Switching elements				SK: 2131H / UK: 3131H	
With 4 contact elements				3 NC \ominus + 1 NO / 2 NC \ominus + 2 NO	
Switching elements				SK: 2121H / UK: 2121H	
With 4 contact elements				4 NC \ominus / NC \ominus	
Switching current, min., at 24 V				1	mA
Rated impulse withstand voltage U _{imp}				2.5	kV
Contact material				Silver alloy, gold flashed	

Guard locking				Value	Unit
Parameters					
Solenoid operating voltage				AC/DC 24 V +10/-15% AC 110 V +10/-15% AC 230 V +10/-15%	
Duty cycle				100	%
Power consumption				7	W

Connection, cable entry M20 x 1.5			Value	Unit
Parameters				
Connection			Screw terminals	
Version			M20x1.5	
Conductor cross-section max.			Per wire 1.5 mm ²	
Degree of protection according to IEC 60529		IP 67	IP 65: With escape release TZ...C1815, TZ...C1828 with emergency release TZ...C1816, TZ...C1823	
Rated insulation voltage U _i			250	AC/DC V
Conventional thermal current I _{th}			4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)			4	A gG
Utilization category according to IEC 60947-5-1	AC15		I _e 4 A U _e 230 V	
	DC13		I _e 4 A U _e 24 V	

Connection, plug connector SR6			Value	Unit
Parameters				
Connection			Plug connector	
Version			SR6 (6-pin + PE)	
Degree of protection according to IEC 60529			IP 65 ¹⁾	
Rated insulation voltage U _i			250	AC/DC V
Conventional thermal current I _{th}			4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)			4	A gG
Utilization category according to IEC 60947-5-1	AC15		I _e 4 A U _e 230 V	
	DC13		I _e 4 A U _e 24 V	

1) Screwed tight with the related plug connector (see page 79)

Connection, plug connector MR8



Parameters		Value	Unit
Connection		Plug connector	
Version		MR8 (7-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U_i		250	AC/DC V
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I_e 4 A U_e 230 V	
	DC13	I_e 4 A U_e 24 V	

Connection, plug connector MR10



Parameters		Value	Unit
Connection		Plug connector	
Version		MR10 (9-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U_i		250	AC/DC V
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I_e 4 A U_e 230 V	
	DC13	I_e 4 A U_e 24 V	

Connection, plug connector SR11



Parameters		Value	Unit
Connection		Plug connector	
Version		SR11 (11-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U_i		50	AC/DC V
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I_e 4 A U_e 50 V	
	DC13	I_e 4 A U_e 24 V	

Connection, plug connector MR12



Parameters		Value	Unit
Connection		Plug connector	
Version		MR12 (11-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U_i		230	AC/DC V
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I_e 4 A U_e 60 V	
	DC13	I_e 4 A U_e 24 V	


Connection, plug connector Rc18





Parameters		Value	Unit
Connection		Plug connector	
Version		RC18 (18-pin + PE)	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U_i		110	AC/DC V
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC15	I_e 4 A U_e 110 V	
	DC13	I_e 4 A U_e 24 V	


1) Screwed tight with the related plug connector (see page 79, 80 and 86)


Accessories, safety switches


Solenoid plug		
		
Parameters	Value	Unit
Housing material	Plastic	
Number of pins	3 (2 + PE)	
Nominal voltage max.	240	AC/DC V
Degree of protection according to IEC 60529 (inserted)	IP 65	
Connection	Pillar terminals and tab terminals	


SS4		
		
Parameters	Value	Unit
Housing material	Brass matt chromium plated	
Number of pins	4 (3 + PE)	
Cable diameter	6 - 8	mm
Nominal voltage max.	250	AC/DC V
Degree of protection according to IEC 60529 (inserted)	IP 67	
Connection	Soldered connections	

SR6		
		
Parameters	Value	Unit
Housing material	Plastic	
Number of pins	7 (6 + PE)	
Cable diameter	7 - 9	mm
Nominal voltage max.	250	AC/DC V
Degree of protection according to IEC 60529 (inserted)	IP 65	
Connection	Crimp contacts 0.5 to 1.5 mm ²	

SR11		
		
Parameters	Value	Unit
Housing material	Plastic	
Number of pins	12 (11 + PE)	
Cable diameter	8 - 10	mm
Nominal voltage max.	50	AC/DC V
Degree of protection according to IEC 60529 (inserted)	IP 65	
Connection	Crimp contacts 0.5 to 1.5 mm ²	

RC18		
		
Parameters	Value	Unit
Housing material	Metal	
Number of pins	19 (18 + PE)	
Cable diameter	10 - 14	mm
Nominal voltage max.	32	AC/DC V
Degree of protection according to IEC 60529 (inserted)	IP 65	
Connection	19 crimp contacts 0.75 to 1.0 mm ²	

RC18..C1825		
		
Parameters	Value	Unit
Housing material	Metal	
Number of pins	19 (18 + PE)	
Cable diameter	10 - 14	mm
Nominal voltage max.	32	AC/DC V
Degree of protection according to IEC 60529 (inserted)	IP 65	
Connection	16 crimp contacts 0.38 to 0.5 mm ² 3 crimp contacts 0.75 to 1.0 mm ²	

M12 with cable (SGLF, SWLF)		
		
Parameters	Value	Unit
Housing material	Metal / plastic	
Number of pins	5	
Nominal voltage max.	30	AC/DC V
Degree of protection according to IEC 60529 (inserted)	IP 68	
Connection	5 open cable ends	

Safety precautions

Safety switches perform a personal protection function. Incorrect installation or tampering can lead to severe injuries to personnel. Prior to installation, use and maintenance, it is imperative that you read the operating instructions. Also take into account the following points:

- ▶ Safety switches must **not** be bypassed (bridging of contacts), turned away, removed or otherwise rendered ineffective.
- ▶ The switching operation on safety switches with separate actuator must only be triggered by actuators specifically provided for this purpose which are permanently connected to the safety guard.
- ▶ Mounting and electrical connection must be performed only by authorized personnel.
- ▶ Safety switches and actuators must not be used as an end stop.
- ▶ Switching elements are not allowed to be replaced on safety switches.
- ▶ Series NZ..VZ..VS and TZ safety switches with locking solenoids are not allowed to be used in potentially explosive atmospheres.
- ▶ If damaged or worn, safety switches must be replaced as a unit.



Notes on installation

Position switches with safety function

- ▶ To obtain the direct opening travel according to IEC 60947-5-1, the trip dog setting distance shown in the dimension 52 (+1) must be observed (see technical data, travel diagrams). Actuation elements such as cam approach guides must be positively mounted in accordance with EN 1088, i.e. riveted, welded or otherwise secured against becoming loose.
- ▶ Safety switches must not be used as an end stop.
It must be ensured that the safety switch does not move after adjustment.
It must be possible to replace safety switches without the need for re-adjustment.



Safety switches with separate actuator

- ▶ The safety switch and actuator must be installed properly. The actuator must be positively mounted, e.g. by using safety screws (are included with the actuator) or by welding, riveting, or pinning.
- ▶ Safety switches must not be used as an end stop.
Safety switches must be mounted such that they can be replaced.
- ▶ A hazard analysis must be prepared as per the Machinery directive. The hazardous point must be classified with the aid of type C standards or EN 954-1 or its successor. Safety switches must be chosen to match this classification and the information given in DIN EN 1088.

Overview of the most important standards on machinery safety

Type A standards		
(EN 292-1) withdrawn	ISO 12100-1	Safety of machinery. Basic concepts, general principles for design. Part 1: Basic terminology, methodology
(EN 292-2) withdrawn	ISO 12100-2	Safety of machinery. Basic concepts, general principles for design. Part 2: Technical principles
EN 1050	ISO/DIS 14121	Safety of machinery. Principles for risk assessment
Type B standards		
EN 294		Safety of machinery. Safety distances to prevent danger zones being reached by the upper limbs
EN 418		Safety of machinery. Emergency stop equipment, functional aspects. Principles for design
EN 547-1		Safety of machinery. Human body measurements. Part 1: Principles for determining the dimensions required for openings for whole body access into machinery
EN 574		Safety of machinery. Two-hand control devices. Functional aspects. Principles for design
EN 811		Safety of machinery. Safety distances to prevent danger zones being reached by the lower limbs
EN 953		Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards
EN 954-1	ISO 13849-1	Safety of machinery. Safety related parts of control systems. Part 1: General principles for design
EN 954-2	ISO 13849-2	Safety of machinery. Safety related parts of control systems. Part 2: Validation
EN 954-100		Safety of machinery. Safety related parts of control systems. Guidelines on the use and application of EN 954-1
EN 999		Safety of machinery. The positioning of protective equipment in respect of approach speeds of parts of the human body
EN 1037		Safety of machinery. Prevention of unexpected start-up
EN 1088		Safety of machinery. Interlocking devices associated with guards. Principles for design and selection.
EN 60204-1	IEC 60204-1	Safety of machinery. Electrical equipment of machines. Part 1: General requirements
EN 60204-11	IEC 60204-11	Safety of machinery. Electrical equipment of machines. Part 11: Requirements for HV equipment for voltages above 1000 V a.c. or 1500 V d.c. and not exceeding 36 kV
EN 60204-31	IEC 60204-31	Safety of machinery. Electrical equipment of machines. Part 31: Particular safety and EMC requirements for sewing machines, units and systems
EN 60204-32	IEC 60204-32	Safety of machinery. Electrical equipment of machines. Part 32: Requirements for hoisting machines
EN 61496-1	IEC 61496-1	Safety of machinery. Electro-sensitive protective equipment. Part 1: General requirements and tests
EN 61496-3	IEC 61496-3	Safety of machinery. Electro-sensitive protective equipment. Part 3: Particular requirements for active opto-electronic protective devices responsive to diffuse reflection (AOPDDR)
EN 61508	IEC 61508	Functional safety of electrical/electronic/programmable electronic safety-related systems.
Type C standards		
EN 201		Rubber and plastics machines. Injection moulding machines. Safety requirements
EN 415-1		Safety of packaging machines. Part 1: Terminology and classification of packaging machines and associated equipment
EN 415-2		Safety of packaging machines. Part 2: Pre-formed rigid container packaging machines
EN 415-3		Safety of packaging machines. Part 3: Form, fill and seal machines
EN 415-4		Safety of packaging machines. Part 4: Palletizers and depalletizers
EN 422		Rubber and plastics. Machines. Safety. Blow moulding machines intended for the production of hollow articles. Requirements for the design and construction
EN 692		Mechanical presses. Safety
EN 693		Machine tools. Safety. Hydraulic presses
EN 775	ISO 10218	Industrial robots. Recommendations for safety
EN 931		Footwear manufacturing machines. Lasting machines. Safety requirements
EN 848-1		Safety of woodworking machines. One side moulding machines with rotating tool. Part 1: Single spindle vertical moulding machines

EN 848-2		Safety of woodworking machines. One side moulding machines with rotating tool. Part 2: Single spindle handfed/integrated fed routing machines
EN 848-3		Safety of woodworking machines. One side moulding machines with rotating tool. Part 3: Numerical control (NC) boring machines and routing machines
EN 972		Tannery machines. Reciprocating roller machines. Safety requirements
EN 1010		Safety of machinery. Safety requirements for the design and construction of printing and paper converting machines.
EN 1114-1		Rubber and plastics machines. Extruders and extrusion lines. Part 1: Safety requirements for extruders
EN 1114-2		Rubber and plastics machines. Extruders and extrusion lines. Part 2: Safety requirements for die face pelletizers
EN 1114-3		Rubber and plastics machines. Extruders and extrusion lines. Part 3: Safety requirements for haul-offs
EN 1218-1		Safety of woodworking machines. Tenoning machines. Part 1: Single end tenoning machines with sliding table
EN 1870-1		Safety of woodworking machines. Circular sawing machines. Part 1: Circular saw benches (with and without sliding table) and dimension saws
EN 1870-9		Safety of woodworking machines. Circular sawing machines. Part 9: Double blade circular sawing machines for cross-cutting with integrated feed and with manual loading and/or unloading
EN ISO 11111	ISO 11111	Textile machinery. Safety requirements
EN 12415		Safety of machine tools. Small numerically controlled turning machines and turning centres
EN 12417		Machine tools. Safety. Machining centres
EN 12478		Safety of machine tools. Large numerically controlled turning machines and turning centres
EN 12622		Safety of machine tools. Hydraulic press brakes

OSHA standards

29 CFR 1910.147		The Control of Hazardous Energy
29 CFR 1910.211		Definitions
29 CFR 1910	Subpart O	Machinery and Machine Guarding
29 CFR 1910.212		General Requirements for all machines
29 CFR 1910.213		Woodworking machinery requirements
29 CFR 1910.215		Abrasive wheel machinery
29 CFR 1910.217		Mechanical power presses
29 CFR 1910.217	App A	Mandatory requirements for certification / validation of safety systems for presence sensing device initiation of mechanical power presses
29 CFR 1910.217	App B	Nonmandatory guidelines for certification / validation of safety systems for presence sensing device initiation of mechanical power presses
29 CFR 1910.217	App C	Mandatory requirements for OSHA recognition of thirdparty validation organizations for the PDSI standard
29 CFR 1910.219		Mechanical Power-transmission Apparatus
29 CFR 1910	Subpart P	Hand and Portable Power Tools and Other Hand-Held Equipment
29 CFR 1910.242		Hand and portable powered tools and equipment, general
29 CFR 1910.243		Guarding of portable powered tools
29 CFR 1910	Subpart S	Electrical
29 CFR 1910.303		General requirements
29 CFR 1910.304		Wiring design and protection
29 CFR 1910.305		Wiring methods, components, and equipment for general use
29 CFR 1926.300		General Requirements
29 CFR 1926.301		Hand Tools
29 CFR 1926.302		Power-operated Hand Tools
29 CFR 1926.303		Abrasive Wheels and Tools

29 CFR 1926.304	Woodworking Tools
29 CFR 1926.307	Mechanical Power –Transmission Apparatus
29 CFR 1926.555	Conveyors
ANSI standards	
ANSI B5.37-1970	External Cylindrical Grinding Machines - Centerless
ANSI B5.42-198	External Cylindrical Grinding Machines – Universal
ANSI B5.52M-1980	Presses, General Purpose, Single Point Gap Type, Mechanical Power (Metric)
ANSI B7.1-2000	Safety Code for the Use, Care and Protection of Abrasive Wheels
ANSI B11.1-1988	Machine Tools – Mechanical Power Presses, Safety Requirement for Construction, Care, and Use
ANSI B11.3-1982	Power Press Brakes, Safety Requirements for the Construction, Care, and Use of
ANSI B11.4-1993	Shears - Safety Requirement for Construction, Care, and Use
ANSI B11.9-1975	Grinding Machines, Safety Requirements for the Construction, Care, and Use of
ANSI B11.12-1975	Roll-Forming and Roll-Bending Machines - Safety Requirement for Construction, Care, and Use
ANSI B11.19-1999	Performance Criteria for the Design, Construction, Care and Operation of Safeguarding when Referenced by the Other Machine Tool Safety Standards
ANSI B11.20	Manufacturing Systems/Cells
ANSI B11-TR3-2000	Risk Assessment and Risk Reduction - A Guide to Estimate, Evaluate and Reduce Risks Associated with Machine Tools
ANSI B15.1-53	Code for Mechanical Power Transmission Apparatus
ANSI B20.1-57	Safety Code for Conveyors, Cableways, and Related Equipment
ANSI B65.1-1995	Safety Standard – Printing Press Systems
ANSI O1.1-54	Safety Code for Woodworking Machinery
RIA, NFPA standards	
NFPA 79 (2002)	Electrical Standard for Industrial Machinery
RIA 15.06-1999	Industrial Robots and Robot Systems - Safety Requirements
JIS standards in English	
JIS B 6014:1980	General code of safety for machine tools
JIS B 6507:1981	General code of safety for wood working machinery
JIS B 6607:1983	Safety standards for construction of band saw machines with feed carriages
JIS B 9650:1988	General design rules for safety and sanitation of food processing machinery
JIS B 9651:1988	Design rules for safety and sanitation of baking machinery
JIS B 9652:1988	Design rules for safety and sanitation of cake making machinery
JIS B 9653:1988	Design rules for safety and sanitation of meat processing machinery
JIS B 9654:1988	Design rules for safety and sanitation of marine product machinery

Glossary

Actuating force

The actuating force is the minimum force required to perform a switching operation.

Actuation (electrical / mechanical)

Transition of a moving contact from one switch position to another. This will result in a change to the switch state of an item of switchgear. A differentiation is made between electrical actuation (e.g. switching on – switching off) and mechanical actuation (e.g. closing – opening).

Actuator/actuating element

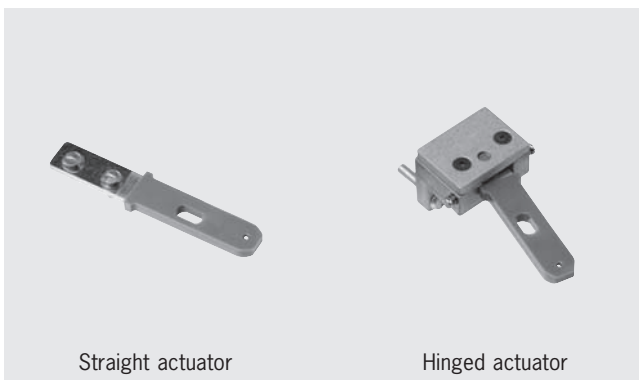
Switches with safety function:

Mechanical element on a safety position switch that triggers the switching operation. Actuators are available in different forms, for example as roller plungers, chisel plunger or roller arms.



Switches with separate actuator:

On switches *with separate actuator* the actuating element is separate from the *safety switch*. The design of the actuators is matched (coded) to the safety switch so that *tampering* using simple means (screwdriver, pieces of wire) is not possible.



Approach speed

Speed at which a position switch can be mechanically actuated. The permitted approach speed is dependent on the shape and material of the *actuating element* and the approach angle. The higher the approach speed, the shallower the approach angle should be chosen.

Automatic mode

The automatic mode is an *operating mode*, in which, unlike the *manual mode*, only system starting is triggered by human intervention. All other actions are performed automatically.

Bolt

Bolts function as follows: the bolt tongue mechanically guides the *actuator* when it is inserted in the *safety switch* actuating head. The bolt mounted on the door frame comprises a protruding bolt tongue,

the handle and the actuator, mounted offset somewhat to the rear. The switch holder with the safety switch is fitted to the frame. The bolt absorbs forces that act on the switch and the actuator and that could damage the switch and actuator.



Category

The *categories* according to EN 954 1 (B, 1, 2, 3 and 4) provide an assessment of the performance of safety-related parts of a control system on the occurrence of failures.

Closed-circuit current principle

On a *safety guard with guard locking* based on the closed-circuit current principle, the safety guard is locked by spring force until the interlocking solenoid is supplied with power. Unlocking is by solenoid force. The term *mechanical locking* is also used.

Cyclic mode

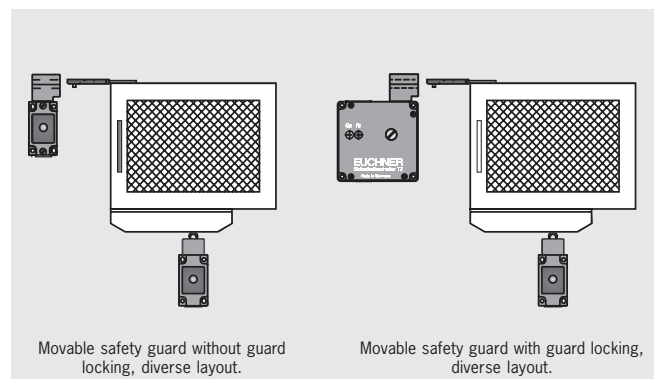
An *operating mode* in which each the working space on the machine is opened during every operating cycle and the operator therefore frequently needs to work in the *danger area*.

Degree of protection

The degree of protection is defined according to EN 60529 1 and is given as an IP. After the IP there are two digits; the first digit gives the degree of protection against the penetration of solid foreign bodies and the second digit gives the degree of protection against the penetration of liquids. For *safety switches* the degree of protection IP 55 is to be provided as a matter of preference (BGI 575).

Diversity

Diversity is the use of two different concepts to provide a function. For instance, the use of a switch *with safety function* and a switch *with separate actuator* on a *safety guard*. Here it is assumed that a single failure cannot affect two different concepts in the same way. Diversity also makes *tampering* more difficult and the safety of *redundant* systems is increased.



Danger area

Any area in or around a machine in which a person is subject to a risk of injury or a health hazard. The hazard can

- ▶ Either be present continuously on the correct use of the machine (movement of hazardous moving parts, arcs during welding, etc.)
- ▶ Or can occur unexpectedly (unintentional, unexpected starting, etc.).

Electrical locking

Locking using the *open-circuit current principle.

Emergency release

The emergency release is used to unlock *guard locking in an emergency. The guard locking can be unlocked without tools.



Safety switch with guard locking and emergency release

Emergency unlocking

The emergency unlocking is used to unlock *guard locking in an emergency. The guard locking can be unlocked without tools and from the access side. With the emergency unlocking, the switch engages in the unlocked position and can only be reset to its original position after an action similar to a repair.



Safety switch with guard locking and emergency unlocking

Enabling switch

If a *safety guard is open, movements are only to be possible if the controls are operated continuously. These are controls with automatic return to their original position. In general the term enabling switches is used here.



Enabling switch with +/- buttons

Escape release

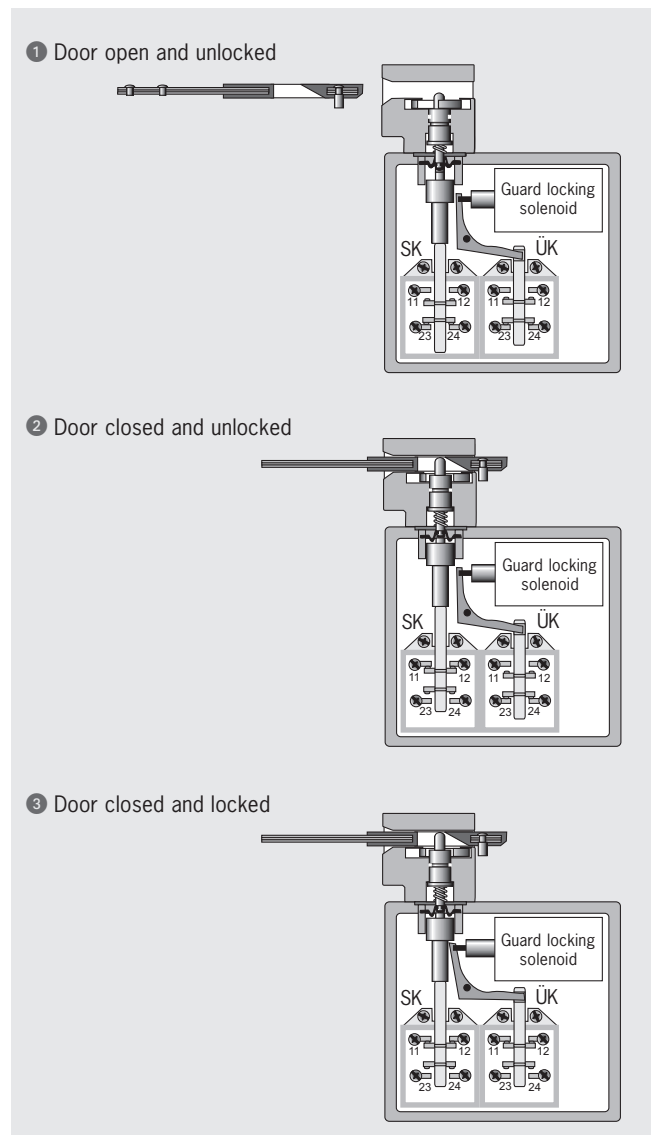
The escape release must make it possible to unlock the safety guard from within the *danger area without the use of tools. The device must be manually operated and must positively act on the locking mechanism. Actuation must not result in permanent disabling of the *guard locking.

Guard locking

The guard locking retains a movable safety guard in the closed position until the machine is no longer producing any risk of injury. With the guard locking open, unintentional starting of the machine is prevented.

Guard locking monitoring

The guard locking monitoring monitors the position of the interlocking solenoids. This device is positively linked to the switching element ÜK via a locking arm. On intentional or unintentional unlocking of the interlocking solenoid, the positively driven contact in this switching element is actuated and therefore signals the position of the interlocking solenoid. The sectional drawings show the safety switch TZ in its three switch states:

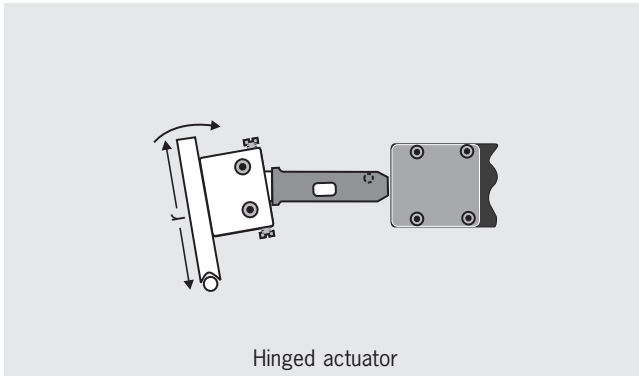


Hazardous states

Are states that could result in injury. *Safety switches, if the *safety guard is correctly used, prevent this hazard (cf. *safe state).

Hinged actuator

The hinged actuator is, unlike the straight actuator, spring mounted and as a result the actuator can be inserted in the actuator head without problems even with small door radii. With larger radii, a straight actuator can be used.



Interlocking, interlocking device

According to EN 1088 an interlocking device is a mechanical, electrical or other device with the purpose of preventing operation of the machine under certain conditions (usually as long as a *movable safety guard* is not closed).

Locking force (locked)

The locking force is the force that *guard locking* can withstand on switches *with separate actuator*.

Manual mode

Manual mode is an *operating mode* in which the machine movements are not performed automatically, but using individual commands from the user.

Mechanical locking

Locking using the *closed-circuit* current principle.

Mechanical release

On the failure of *guard locking*, the locking can be released from the access side using a mechanical release. Unlocking is performed using a tool or a key. The mechanical release should be protected against misuse (seal, lacquer).



Mounting safety switches and actuators

Safety switches must be mounted such that they are adequately secured against changes to their position. Easy bypassing of the safety switch must be prevented.

Movable safety guard

A movable *safety guard* is the part of the machine that is used as a barrier to protect against hazards. Movable safety guards form a physical barrier to the *danger area*. They can be, e.g. safety doors, covers, fences, housings, etc.

Open-circuit current principle

On a *safety guard* with *guard locking* based on the open-circuit current principle, the safety guard is locked until the power supply to the interlocking solenoid is interrupted. Unlocking is by spring force. The term *electrical locking* is also used.

Operating modes

Every machine can have one or more operating modes that are defined by the type of machine and their application. If the selection of an operating mode can cause a hazardous situation, the selection of this operating mode must be prevented by suitable means (e.g. key-operated switch, access code). The selection of an operating mode on its own is not allowed to trigger machine operation. A separate action on the part of the operator must be required to start the operation of the machine. A means of indication of the selected operating mode is to be provided (e.g. the position of an operating mode selector switch, an indicator, a screen indication, etc.). Technical protective measures must remain effective for all operating modes. If it is necessary to disable technical protective measures (e.g. for setting up or maintenance work), a device for operating mode selection is to be provided that can be secured in the required operating mode (e.g. locked with a key) so that automatic operation can be prevented. In addition, one or more of the following devices should be provided:

- ▶ Movement enable using an *enabling switch*. The machine only runs as long as the enabling switch is operated.
- ▶ A portable control unit with a device for shutting down in an emergency or an enabling device. If a portable control unit is used, it must only be possible to trigger a movement from this point
- ▶ Movement speed or movement energy restriction
- ▶ Movement area restriction

PDF

The abbreviation PDF can have several meanings in safety engineering:

1 Probability of Dangerous Failure

According to EN 61508, PDF is the probability of failure of a component and is used to determine the Safety Integrity Level (*SIL*) for the overall machine.

2 Proximity Devices with defined behaviour under Fault conditions

Proximity switches with defined behavior under fault conditions (see EN 60947 5 3).

Position switch

Position switches are used to acquire the position of axes or moving *safety guards*. As soon as a position switch is used as a safety-relevant component, the term position switch with safety function or safety-related position switch is used. In this case the switching element must contain at least one *positively driven contact*.

Positive actuation

Positive actuation is the positive movement of a moving mechanical component together with another component – either by direct contact or via rigid parts. The second component is, as a result, moved positively by the first.

Positively driven, positively driven contact

The achievement of contact separation by a positive movement of the *actuating element* is termed positively driven. *Switching elements* with this switching behavior are termed positively driven contacts. These normally closed contacts are drawn with the symbol shown below. Switches must also meet the requirements of EN 60947-5-1 annex K.



Symbol for a positively driven contact

Protective plate

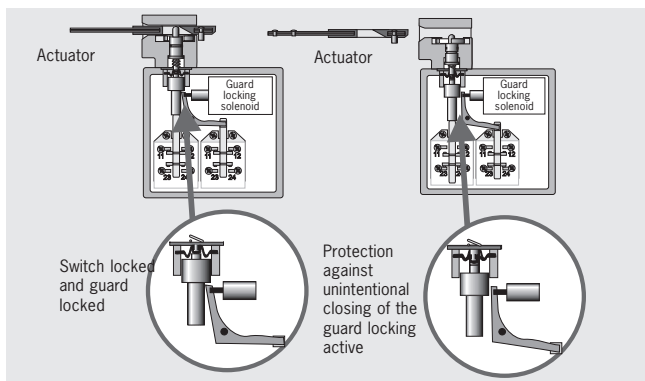
For switches with separate actuator, a protective plate is available as an option; this plate makes it more difficult to tamper with the actuating head.



Protective plate on safety switch without guard locking

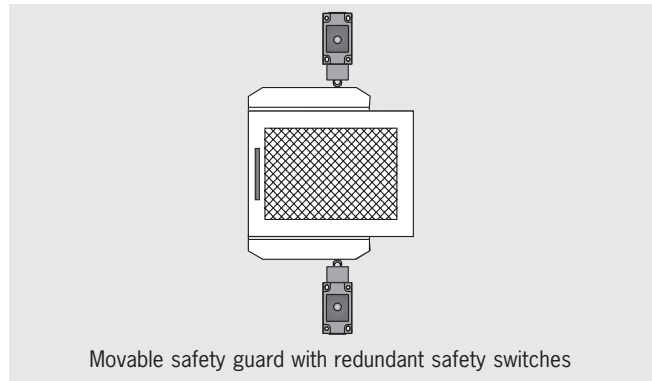
Protection against unintentional closing

Protection against unintentional closing of an interlocking device with *guard locking* mechanically prevents the *safety switch* changing to the locked position with the *safety guard* open and therefore signaling a safe state.



Redundancy

Redundancy is the use of more than one system to always maintain the same safety function even on the failure of individual components. Even on the use of a position switch with two positively driven normally closed contacts, often the term redundant (dual-channel) system is used. However, here it is to be noted that only duplication of the safety contacts is achieved, the mechanical drive (trip dog and plunger) remains single-channel as before. To setup a redundant system (from safety category 3 according to EN 954 1) both the mechanism (two position switches) and the electronics should be of dual-channel layout. The safety of a redundant system is further increased by *diversity*.



Movable safety guard with redundant safety switches

Release path

A release path is used to generate a safety-related output signal. Release paths act to the exterior like normally open contacts.

Risk

The combination of the probability and the severity of injury in a hazardous situation.

Risk assessment

The *standard* EN 1050 contains procedures necessary to perform a risk assessment. The risk assessment initially involves a risk analysis and a subsequent risk evaluation. In EN 954 1 there is a simple procedure for determining the required *category* to match the *risk*.

Retention force

The retention force is the maximum force that is allowed to be applied to the *actuator* with the *safety switch* in the locked state so that the switch cannot be unlocked.

Safe state

A safe state is provided if no hazard can be produced by a system or machine on correct use (cf. *hazardous situations*).

Safety guard

A safety guard is intended to protect people, products and the environment from hazards. A differentiation is made between *movable* safety guards and fixed safety guards.

Safety relay

Safety relays are used to evaluate switchgear connected (safety switches, emergency stop switchgear, etc.). They ensure that the OSSD (Output Signal Switching Device) is opened.



Safety relay ESM

Safety switch

A safety switch is part of a safety chain. It provides a safe signal in the input circuit. A stop signal is generated when the *safety guard* is opened. In this way unintentional machine starting is prevented when the safety guard is open, that is *interlocking* is achieved.

SIL (Safety Integrity Level)

According to EN 61508 the objective for the probability of failure on the execution of risk-reducing functions. The standard defines the requirements that are necessary to achieve a specific safety level (SIL).

Single-fault tolerance

Single-fault tolerance means that even after the occurrence of a single failure, the agreed safe function continues to be provided.

Slow-action contact element

A slow-action contact element is characterized by the opening of the switching element as a function of the speed at which the *actuator* is moved.

Snap-action contact element

On snap-action contact elements the *switching element* jumps to the other switch state from a defined *actuator* position. The movement of the switching element is independent of the speed at which the actuator is moved. Snap-action contact elements typically have hysteresis.

Standards

The European Machinery directive states that if harmonized standards are observed, it is allowed to assume that the directive is met. Standards specify the requirements of the directive in more detail and as a rule represent the *general state-of-the-art*. Manufacturers of *safety switches* must comply with EN 60947 5. All EUCHNER safety switches comply with this standard.

Start (automatic or manual)

An item of safety switchgear (e.g. *safety relay*) can be started manually or automatically. On a manual start, an enable signal is generated after the Start button is pressed and a *safe state* has been detected. This function is also termed static operation and is stipulated for emergency stop devices (EN 60204-1).

On an automatic start, an enable signal is generated after a safe state has been detected without any manual enable. This function is also termed dynamic operation and is not allowed for emergency stop devices (EN 60204-1).

Stop category

EN 60204-1 defines various stop categories; here stopping refers to the shutdown of the machine.

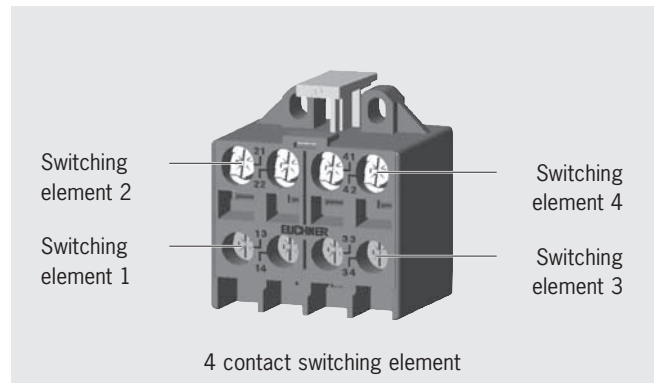
Stop category 0 means that the machine is shutdown by the immediate shutdown of the power.

Stop category 1 means that the machine is shutdown in a controlled manner while the supply of power is maintained to bring the machine to a standstill. Once standstill has been reached, the power is interrupted.

Stop category 2 means that the machine is shutdown in a controlled manner while the supply of power is maintained to bring the machine to a standstill. The power is not interrupted at standstill. This stop category is not allowed to be used for shutdown in an emergency according to EN 60204-1.

Switching elements

Switching elements are fitted in position switches. Switching elements are available with a normally closed function, with a normally open function and as *positively driven contacts*. EUCHNER supplies switching elements with one, two, three and four contacts for the various switch types. Switching elements can be *slow-action contact elements* or *snap-action contact elements*.



Tampering

Tampering is the conscious disabling or bypassing of *safety guards* and their components. *Safety switches* and other safety device must be designed such that the protective function cannot be changed or bypassed by hand or using one simple action. Simple actions include using:

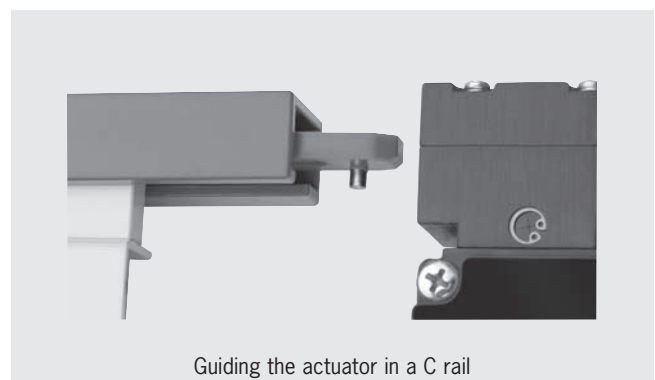
- ▶ Screwdrivers
- ▶ Ball-point pens
- ▶ Nails
- ▶ Pieces of wire
- ▶ Adhesive tape
- ▶ etc.

Actions that are not regarded as simple are actions that require more than one work step with tools.

The inability to *bypass by simple means* (BGI 575) is:

- ▶ The dismantling of parts
- ▶ The turning of the safety switch away from its protective position
- ▶ The use of a second *actuator*
- ▶ The bridging of the contacts

It should be taken into account in the design that, despite safety guards, straightforward and correct operation of machines and systems must be possible. If this aspect is not taken into account, the probability of bypassing safety measures will increase.

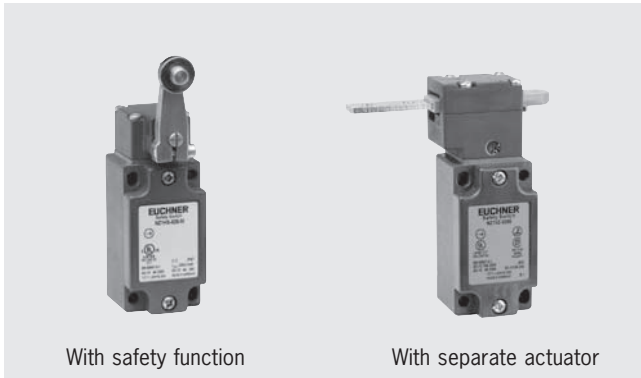


Testing

Testing is intended to ensure that a safety system functions correctly. Testing can be performed automatically, by the control system, in the form of monitoring or testing during the process. Depending on the requirements, a combination of automatic and manual testing is also possible. The testing must be repeated at defined intervals as a function of the risk analysis. Testing is required for *category 2* and *4* according to EN 954 1 and should also be performed for category 3.

With safety function and with separate actuator (switches)

♦ Safety switches are divided into two different functional types. On switches with safety function the ♦ *actuator* is permanently connected to the switch, on switches with separate actuator, the actuator is separate and is mounted on the ♦ *safety guard*.



With safety function

With separate actuator

Item Index

Index by item designation

Item	Order No.	Page	Item	Order No.	Page
Actuating head NZVZ	076 250	84	N1AW508LE110-M	087 223	19
ACTUATOR-ZG	016 849	76	N1AW508LE220-M	087 226	19
ACTUATOR-ZG/V25	074 411	76	N1AW508-M	087 205	19
ACTUATOR-ZGN	072 251	76	N1AW514-M	083 850	19
Cable socket 6 + PE	043 861	78	N1AW514SVM5-M	090 743	19
EKPM16/05	084 572	82	NB01D588-M	088 584	20
EKPM20/06	077 679	82	NB01R588-M	088 583	20
EKVM12/04	086 327	82	NGLE060GE	029 222	85
EKVM16/04	086 328	82	NGLE060GR	029 221	85
EKVM16/06	086 330	82	NGLE060RT	029 220	85
EKVM20/06	077 683	82	NGLE110RT	045 822	85
EKVM20/09	077 684	82	NGLE220GE	045 827	85
EMP-B1	093 457	83	NGLE220RT	045 825	85
EMP-B2	093 458	83	NZ1HB-2131-9C-GMMF	077 390	35
EMP-SA	094 401	83	NZ1HB-2131-M	090 968	34
HINGED ACTUATOR-ZL	024 298	76	NZ1HB-3131-M	090 969	34
HINGED ACTUATOR-ZL/V25	074 413	76	NZ1HB-511L060GE-M	086 525	34
HINGED ACTUATOR-ZO	057 950	76	NZ1HB-511L060-M	090 039	34
HINGED ACTUATOR-ZO/V25	074 415	76	NZ1HB-511L060-MC569	091 091	40
HINGED ACTUATOR-ZR	024 299	76	NZ1HB-511L220-M	090 040	34
HINGED ACTUATOR-ZR/V25	074 412	76	NZ1HB-511-M	079 952	34
HINGED ACTUATOR-ZU	048 850	76	NZ1HB-511-MC569	079 965	40
HINGED ACTUATOR-ZU/V25	074 414	76	NZ1HB-528L060GE-M	086 527	34
LE060GE	035 497	85	NZ1HB-528L060-M	090 965	34
LE060GR	035 496	85	NZ1HB-528L060-MC569	091 330	40
LE060RT	035 495	85	NZ1HB-528L220-M	090 051	34
LE110RT	045 579	85	NZ1HB-528-M	088 199	34
LE220GE	045 584	85	NZ1HB-528-MC569	079 946	40
LE220RT	045 582	85	NZ1HB-538L060-M	090 967	34
Lead seal kit TZ	048 257	84	NZ1HB-538-M	090 966	34
Lead seal kit TZ-C1937	087 256	84	NZ1HB-538-MC569	079 999	40
Lockout bar with chain	091 305	84	NZ1HS-2121-M	090 254	32
Lockout bar Z	046 730	84	NZ1HS-2131-9C-GMMF	077 391	33
Lockout bar Z	086 538	84	NZ1HS-2131-M	090 973	32
M3X40/V100	075 530	84	NZ1HS-3131-8C-Ford / PT60577-101K01	086 574	33
M3X70/V100	075 531	84	NZ1HS-3131-9C-GMMF	073 508	33
M5X10/V100	073 455	84	NZ1HS-3131-M	090 747	32
M5X16/V100	073 456	84	NZ1HS-3131-MEX	094 167	32
M5X25/V100	073 457	84	NZ1HS-511L060GE-M	090 038	32
N1AB508-M	087 245	16	NZ1HS-511L060-M	090 035	32
N1AB514-M	087 247	16	NZ1HS-511L110-M	090 036	32
N1AD508AM-M	090 546	15	NZ1HS-511L220-M	090 037	32
N1AD508LE060-M	087 218	14	NZ1HS-511-M	079 953	32
N1AD508LE110-M	087 221	14	NZ1HS-528L060GE-M	090 049	32
N1AD508LE220-M	087 224	14	NZ1HS-528L060-M	090 971	32
N1AD508-M	083 886	14	NZ1HS-528L110-M	090 050	32
N1AD508-MC1292	087 193	14	NZ1HS-528L220-M	090 052	32
N1AD508-MC1293	087 197	14	NZ1HS-528-M	090 970	32
N1AD514AM-M	091 261	15	NZ1HS-538L060-M	090 760	32
N1AD514-M	083 849	14	NZ1HS-538-M	090 972	32
N1AD514SVM5-M	087 603	15	NZ1PB-2131-M	090 872	38
N1AR508AM-M	090 547	17	NZ1PB-3131-M	090 873	38
N1AR508LE060-M	087 219	16	NZ1PB-511-M	088 618	38
N1AR508LE110-M	087 222	16	NZ1PB-528-M	090 870	38
N1AR508LE220-M	087 225	16	NZ1PB-538-M	090 871	38
N1AR508-M	083 887	16	NZ1PS-2131-M	090 876	36
N1AR508-MC1293	087 198	16	NZ1PS-3131-M	090 877	36
N1AR514AM-M	087 158	17	NZ1PS-511-M	088 613	36
N1AR514-M	078 487	16	NZ1PS-528L060-M	090 430	36
N1AR514SVM5-M	087 604	17	NZ1PS-528L220GE-M	093 523	36
N1ARL508-M	087 147	18	NZ1PS-528L220-M	093 521	36
N1ARL514-M	087 204	18	NZ1PS-528-M	090 874	36
N1AW508LE060-M	087 220	19	NZ1PS-538-M	090 875	36

Item Index

Item	Order No.	Page
NZ1RG-2131-M	090 934	28
NZ1RG-3131-M	090 935	28
NZ1RG-511L060-M	089 052	28
NZ1RG-511L220-M	089 054	28
NZ1RG-511-M	088 605	28
NZ1RG-528L060-M	090 008	28
NZ1RG-528-M	090 932	28
NZ1RG-538L060-M	090 009	28
NZ1RG-538-M	090 933	28
NZ1RK-2131-M	090 907	24
NZ1RK-3131-M	090 908	24
NZ1RK-511L060-M	090 354	24
NZ1RK-511L220-M	090 355	24
NZ1RK-511-M	088 608	24
NZ1RK-528L060GE-MC1912	086 408	24
NZ1RK-528L060-M	090 358	24
NZ1RK-528-M	090 905	24
NZ1RK-528-MC1912	090 572	24
NZ1RK-538-M	090 906	24
NZ1RL-2131-M	090 941	30
NZ1RL-3131-M	090 942	30
NZ1RL-511L060-M	088 996	30
NZ1RL-511L110-M	089 080	30
NZ1RL-511L220-M	089 079	30
NZ1RL-511-M	088 614	30
NZ1RL-528L060-M	090 938	30
NZ1RL-528L220-M	089 084	30
NZ1RL-528-M	090 937	30
NZ1RL-538L060-M	090 940	30
NZ1RL-538-M	090 939	30
NZ1RS-2121-M	087 595	26
NZ1RS-2131-9C-GMMF	077 362	27
NZ1RS-2131-M	089 633	26
NZ1RS-3131-9C-GMMF	087 074	27
NZ1RS-3131-M	089 631	26
NZ1RS-3131-M-EX	094 169	26
NZ1RS-511L060GE-M	086 528	26
NZ1RS-511L060-M	089 053	26
NZ1RS-511L220-M	089 055	26
NZ1RS-511-M	079 960	26
NZ1RS-511-MC1588	091 352	39
NZ1RS-528L060-M	086 413	26
NZ1RS-528L220-M	091 291	26
NZ1RS-528-M	089 627	26
NZ1RS-528-MC1588	091 339	39
NZ1RS-538L060GE-M	090 424	26
NZ1RS-538L060-M	090 555	26
NZ1RS-538-M	090 936	26
NZ1VZ-2121E-M	089 486	42
NZ1VZ-2121E-MC1233	089 914	44
NZ1VZ-2131E3VSE04-M	082 134	50
NZ1VZ-2131E3VSE07-M	088 036	50
NZ1VZ-2131E3VSE09-M	088 037	50
NZ1VZ-2131E3VSH-8C-GMMF	093 611	53
NZ1VZ-2131E3VSH-M	089 483	52
NZ1VZ-2131E3VSM04-M	088 049	48
NZ1VZ-2131E3VSM07-M	088 038	48
NZ1VZ-2131E3VSM09-M	088 039	48
NZ1VZ-2131E-8C-GMMF	092 355	43
NZ1VZ-2131E-9C-GMMF	077 363	43
NZ1VZ-2131E-M	082 123	42
NZ1VZ-2131E-MC1233	093 859	44
NZ1VZ-2131E-M-EX	093 660	42

Item	Order No.	Page
NZ1VZ-3131E3VSE04-M	088 051	50
NZ1VZ-3131E3VSE07-M	088 042	50
NZ1VZ-3131E3VSE09-M	088 043	50
NZ1VZ-3131E3VSH-M	089 915	52
NZ1VZ-3131E3VSM04-M	088 050	48
NZ1VZ-3131E3VSM07-M	088 040	48
NZ1VZ-3131E3VSM09-M	088 041	48
NZ1VZ-3131E-M	082 122	42
NZ1VZ-511E3VSE04-M	090 343	50
NZ1VZ-511E3VSM04L060-M	090 344	48
NZ1VZ-511E3VSM04-M	090 339	48
NZ1VZ-511E-M	089 479	42
NZ1VZ-528E3VSE04L060-M	082 130	50
NZ1VZ-528E3VSE04L220-M	091 738	50
NZ1VZ-528E3VSE04-M	079 300	50
NZ1VZ-528E3VSE07L060-M	090 337	50
NZ1VZ-528E3VSE07L110-M	089 484	50
NZ1VZ-528E3VSE07L220-M	090 336	50
NZ1VZ-528E3VSE07-M	082 133	50
NZ1VZ-528E3VSE09L060-M	090 346	50
NZ1VZ-528E3VSE09L220-M	090 335	50
NZ1VZ-528E3VSE09-M	088 047	50
NZ1VZ-528E3VSM04L060-M	082 126	48
NZ1VZ-528E3VSM04L220-M	089 488	48
NZ1VZ-528E3VSM04-M	082 125	48
NZ1VZ-528E3VSM07L110-M	089 485	48
NZ1VZ-528E3VSM07L220-M	090 341	48
NZ1VZ-528E3VSM07-M	082 129	48
NZ1VZ-528E3VSM09L060-M	090 349	48
NZ1VZ-528E3VSM09L220-M	090 342	48
NZ1VZ-528E3VSM09-M	088 045	48
NZ1VZ-528EL060-M	090 566	42
NZ1VZ-528EL060-MC1233	089 497	44
NZ1VZ-528EL110-M	089 480	42
NZ1VZ-528EL220-M	082 121	42
NZ1VZ-528E-M	090 671	42
NZ1VZ-528E-MC1233	082 137	44
NZ1VZ-538E3VSE04L060-M	082 128	50
NZ1VZ-538E3VSE04-M	089 905	50
NZ1VZ-538E3VSE07L110-M	090 348	50
NZ1VZ-538E3VSE07-M	088 048	50
NZ1VZ-538E3VSE09L220-M	090 334	50
NZ1VZ-538E3VSE09-M	088 035	50
NZ1VZ-538E3VSM04L060-M	082 132	48
NZ1VZ-538E3VSM04L220-M	090 345	48
NZ1VZ-538E3VSM04-M	082 131	48
NZ1VZ-538E3VSM07L110-M	090 340	48
NZ1VZ-538E3VSM07-M	088 046	48
NZ1VZ-538E3VSM09-M	088 044	48
NZ1VZ-538EL060-M	082 119	42
NZ1VZ-538EL110-M	089 481	42
NZ1VZ-538EL220-M	089 482	42
NZ1VZ-538EL220-MC1233	089 496	44
NZ1VZ-538E-M	085 676	42
NZ1VZ-538E-MC1233	093 858	44
NZ1WO-2131-M	089 629	22
NZ1WO-3131-M	089 626	22
NZ1WO-511L060GE-M	089 058	22
NZ1WO-511L060-M	089 057	22
NZ1WO-511L110-M	089 059	22
NZ1WO-511L220-M	089 060	22
NZ1WO-511-M	088 611	22
NZ1WO-528L060-M	089 078	22

Item Index

Item	Order No.	Page	Item	Order No.	Page
NZ1WO-528-M	089 624	22	NZ2RL-2121	090 975	31
NZ1WO-538L060-M	089 076	22	NZ2RL-2131	090 958	31
NZ1WO-538-M	090 878	22	NZ2RL-3131	090 959	31
NZ2HB-2131	090 136	35	NZ2RL-511	090 025	31
NZ2HB-3131	090 137	35	NZ2RL-511L060	090 955	31
NZ2HB-511	089 091	35	NZ2RL-511SVM5	090 028	30
NZ2HB-511L060	089 092	35	NZ2RL-528	090 956	31
NZ2HB-511L060C1630	054 121	35	NZ2RL-528L060	091 282	31
NZ2HB-511L060C1631	054 122	35	NZ2RL-538	090 957	31
NZ2HB-511L060GE	090 719	35	NZ2RL-538L060	091 278	31
NZ2HB-511SVM5	090 861	34	NZ2RS-2121	090 974	27
NZ2HB-528	090 845	35	NZ2RS-2131	090 149	27
NZ2HB-528L060	090 846	35	NZ2RS-3131	090 954	27
NZ2HB-528L060C1630	091 346	35	NZ2RS-511	090 024	27
NZ2HB-528L060C1631	091 347	35	NZ2RS-511L060	090 147	27
NZ2HB-528L060GE	091 301	35	NZ2RS-511L060C1630	082 400	27
NZ2HB-528L220	091 281	35	NZ2RS-511L060C1631	079 350	27
NZ2HB-528SVM5	090 864	34	NZ2RS-511L060GE	089 622	27
NZ2HB-538	090 847	35	NZ2RS-511L110	091 302	27
NZ2HB-538L060	090 848	35	NZ2RS-511SVM5	090 027	26
NZ2HB-538SVM5	090 862	34	NZ2RS-528	090 950	27
NZ2HS-2121	091 264	33	NZ2RS-528L060	088 197	27
NZ2HS-2131	090 146	33	NZ2RS-528SVM5	090 963	26
NZ2HS-3131	090 856	33	NZ2RS-538	090 951	27
NZ2HS-511	089 093	33	NZ2RS-538L060	090 952	27
NZ2HS-511L060	089 094	33	NZ2RS-538SVM5	090 964	26
NZ2HS-511L060C1630	078 473	33	NZ2VZ-2121E	088 852	43
NZ2HS-511L060GE	090 697	33	NZ2VZ-2131E	090 144	43
NZ2HS-511SVM5	090 867	32	NZ2VZ-2131E3VSE04	074 473	51
NZ2HS-528	090 852	33	NZ2VZ-2131E3VSM04	074 471	49
NZ2HS-528L060	088 196	33	NZ2VZ-2131EC1233	093 857	45
NZ2HS-528SVM5	090 868	32	NZ2VZ-3131E	090 145	43
NZ2HS-538	090 853	33	NZ2VZ-3131E3VSE04	074 474	51
NZ2HS-538L060	090 854	33	NZ2VZ-3131E3VSM04	074 472	49
NZ2HS-538SVM5	090 869	32	NZ2VZ-511EL060	045 551	43
NZ2PS-2121	091 268	37	NZ2VZ-528E	084 885	43
NZ2PS-2131	090 151	37	NZ2VZ-528E3VSE04	044 894	51
NZ2PS-3131	090 150	37	NZ2VZ-528E3VSE04L060	046 742	51
NZ2PS-511	093 112	37	NZ2VZ-528E3VSE07L110	070 290	51
NZ2PS-511L060	090 152	37	NZ2VZ-528E3VSM04	037 299	49
NZ2PS-538L060	091 632	37	NZ2VZ-528E3VSM04L060	045 856	49
NZ2RG-2131	090 947	29	NZ2VZ-528E3VSM04L220	070 039	49
NZ2RG-3131	090 948	29	NZ2VZ-528E3VSM09	055 718	49
NZ2RG-511	090 032	29	NZ2VZ-528EL060	045 801	43
NZ2RG-511L060	091 284	29	NZ2VZ-528EL110	059 467	43
NZ2RG-511L060C1631	074 562	29	NZ2VZ-528EL220	038 129	43
NZ2RG-511SVM5	090 026	28	NZ2VZ-538E	090 143	43
NZ2RG-528	090 943	29	NZ2VZ-538E3VSE04	047 837	51
NZ2RG-528L060	090 944	29	NZ2VZ-538E3VSE04L060	057 921	51
NZ2RG-528SVM5	090 961	28	NZ2VZ-538E3VSM04	050 428	49
NZ2RG-538	090 945	29	NZ2VZ-538E3VSM04L060	059 427	49
NZ2RG-538L060	090 946	29	NZ2VZ-538E3VSM09	076 502	49
NZ2RG-538SVM5	090 962	28	NZ2VZ-538EC1233	077 229	45
NZ2RK-2131	090 921	25	NZ2VZ-538EC1420	043 296	45
NZ2RK-3131	090 922	25	NZ2VZ-538EC1701	071 200	45
NZ2RK-511	090 016	25	NZ2VZ-538EL060	052 108	43
NZ2RK-511L110	088 180	25	NZ2VZ-538EL110	072 234	43
NZ2RK-511SVM5	089 007	24	NZ2VZ-538EL220	059 004	43
NZ2RK-528	090 919	25	NZ2VZ-538ESVM5	084 905	42
NZ2RK-528L060	091 292	25	NZ2WO-2121	090 976	23
NZ2RK-528SVM5	090 930	24	NZ2WO-2131	090 912	23
NZ2RK-538	090 920	25	NZ2WO-3131	090 913	23
NZ2RK-538SVM5	089 018	24	NZ2WO-511	090 909	23

Item Index

Item	Order No.	Page
NZ2WO-511L060	091 280	23
NZ2WO-511L060C1630	059 481	23
NZ2WO-511L060C1631	059 482	23
NZ2WO-511SVM5	089 014	22
NZ2WO-528	090 910	23
NZ2WO-528L060	091 279	23
NZ2WO-528SVM5	090 923	22
NZ2WO-538	090 911	23
NZ2WO-538L060	087 558	23
NZ2WO-538SVM5	090 924	22
Plug connector / AC	028 338	78
Plug connector / DC	028 345	78
Protective plate NZ/TZ	059 136	84
RC-12P1N8A8096	073 294	78
RC-12P1N8A8300	073 293	78
RC187WF-C1825	077 026	80
RC18EF	074 616	80
RC18EF1,5M-C1825	092 761	81
RC18EF1,5MF-C1825	092 883	81
RC18EF10M-C1825	092 898	81
RC18EF10MF-C1825	092 887	81
RC18EF15M-C1825	077 016	81
RC18EF15MF-C1825	092 888	81
RC18EF20M-C1825	092 726	81
RC18EF20MF-C1825	092 889	81
RC18EF25M-C1825	092 727	81
RC18EF25MF-C1825	092 890	81
RC18EF3M-C1825	092 816	81
RC18EF3MF-C1825	092 884	81
RC18EF6M-C1825	077 014	81
RC18EF6MF-C1825	092 885	81
RC18EF8M-C1825	077 015	81
RC18EF8MF-C1825	092 886	81
RC18EF-C1825	077 025	80
RC18WF	074 617	80
RC18WF1,5ML-C1825	092 906	81
RC18WF1,5MLF-C1825	092 891	81
RC18WF1,5MR-C1825	092 907	81
RC18WF1,5MRF-C1825	092 892	81
RC18WF10ML-C1825	092 901	81
RC18WF10MLF-C1825	092 699	81
RC18WF10MR-C1825	092 902	81
RC18WF10MRF-C1825	092 700	81
RC18WF15ML-C1825	077 020	81
RC18WF15MLF-C1825	092 701	81
RC18WF15MR-C1825	085 196	81
RC18WF15MRF-C1825	092 702	81
RC18WF20ML-C1825	092 910	81
RC18WF20MLF-C1825	092 704	81
RC18WF20MR-C1825	092 911	81
RC18WF20MRF-C1825	092 708	81
RC18WF25ML-C1825	092 912	81
RC18WF25MLF-C1825	092 724	81
RC18WF25MR-C1825	092 913	81
RC18WF25MRF-C1825	092 725	81
RC18WF3ML-C1825	092 908	81
RC18WF3MLF-C1825	092 893	81
RC18WF3MLF-C1825	092 697	81
RC18WF3MR-C1825	092 909	81
RC18WF3MRF-C1825	092 894	81
RC18WF6ML-C1825	077 018	81
RC18WF6MR-C1825	085 194	81
RC18WF6MRF-C1825	092 698	81

Item	Order No.	Page
RC18WF8ML-C1825	077 019	81
RC18WF8MLF-C1825	092 895	81
RC18WF8MR-C1825	085 195	81
RC18WF8MRF-C1825	092 896	81
Roller arm NHB	012 042	85
Roller arm NHBC569	012 044	85
Roller arm NHS	012 043	85
Socket crimp contact RCM	094 309	80
Socket crimp contact RCM-C1825	094 310	80
SR11AM2-M20	091 296	79
SR11EF	070 859	79
SR11EF-10000	077 630	79
SR11EF-15000	077 631	79
SR11EF-5000	077 629	79
SR11WF	054 773	79
SR11WF-10000	077 636	79
SR11WF-15000	077 637	79
SR11WF-5000	077 635	79
SR6AM2-M20	087 180	79
SR6EF	013 176	79
SR6EF-10000	077 633	79
SR6EF-15000	077 634	79
SR6EF-5000	077 632	79
SR6K	013 178	79
SR6WF	024 999	79
SR6WF-10000	077 639	79
SR6WF-15000	077 640	79
SR6WF-5000	077 638	79
SRF	071 260	79
SRM	071 261	79
SS4	002 787	78
TZ1LE024BHA-C1902	079 692	71
TZ1LE024BHA-C1903	082 095	58
TZ1LE024BHAVFG-RC1924	083 190	57
TZ1LE024BHAVFG-RC1971	085 569	71
TZ1LE024M	082 050	56
TZ1LE024M-089470	089 470	60
TZ1LE024M-C1623	083 246	70
TZ1LE024M-C1684	083 170	68
TZ1LE024M-C1815	087 990	66
TZ1LE024M-C1816	089 477	62
TZ1LE024M-R	083 164	56
TZ1LE024MVAB	083 965	56
TZ1LE024MVAB-C1623	085 170	70
TZ1LE024MVAB-C1684	084 820	68
TZ1LE024MVAB-C1828	089 468	66
TZ1LE024MVAB-R	089 434	56
TZ1LE024MVFG-RC1925	089 464	56
TZ1LE024PGOR8C	054 964	58
TZ1LE024RC18VAB-092998	092 998	65
TZ1LE024RC18VAB-093862	093 862	61
TZ1LE024RC18VAB-C1803	091 062	73
TZ1LE024RC18VAB-C1823	088 090	63
TZ1LE024RC18VAB-C1826	084 246	59
TZ1LE024RC18VAB-C1828	090 352	67
TZ1LE024RC18VAB-C1937	074 260	65
TZ1LE024SR11	070 828	59
TZ1LE024SR11-093860	093 860	61
TZ1LE024SR11-094342	094 342	64
TZ1LE024SR11-C1684	070 886	69
TZ1LE024SR11-C1816	077 044	63
TZ1LE024SR11VAB-C1933	083 230	59
TZ1LE024SR6	046 502	57

Item Index

Item	Order No.	Page	Item	Order No.	Page
TZ1LE024SR6-C1638	089 476	57	TZ2LE024M-C1815	089 460	66
TZ1LE024SR6-C1662	070 527	72	TZ2LE024M-C1816	087 992	62
TZ1LE024SR6-C1677	059 694	61	TZ2LE024M-R	089 445	56
TZ1LE110M	083 160	56	TZ2LE024MVAB	088 070	56
TZ1LE110M-C1684	089 924	68	TZ2LE024MVAB-C1823	089 455	62
TZ1LE110M-R	083 168	56	TZ2LE024MVAB-C1828	087 290	66
TZ1LE110MVAB	088 023	56	TZ2LE024RC18VAB-C1803	075 955	73
TZ1LE110MVAB-C1623	089 466	70	TZ2LE024RC18VAB-C1826	085 180	59
TZ1LE110MVAB-C1828	094 311	66	TZ2LE024RC18VAB-C1828	093 103	67
TZ1LE110PGOR8C	074 917	58	TZ2LE024SR11	070 958	59
TZ1LE110SR6	046 503	57	TZ2LE024SR11-C1815	079 660	67
TZ1LE220M	083 166	56	TZ2LE024SR6	049 159	57
TZ1LE220M-C1684	093 770	68	TZ2LE024SR6-C1638	076 294	57
TZ1LE220MVAB	088 029	56	TZ2LE024SR6-C1662	059 307	72
TZ1LE220SR6	046 504	57	TZ2LE024SR6-C1677	059 852	61
TZ1RE024BHA-C1902	079 693	71	TZ2LE024SR6-R	046 915	57
TZ1RE024BHA-C1903	082 096	58	TZ2LE110M	083 162	56
TZ1RE024BHAVFG-RC1924	083 191	57	TZ2LE110MVAB	088 025	56
TZ1RE024BHAVFG-RC1971	085 570	71	TZ2LE110SR6	052 914	57
TZ1RE024M	082 051	56	TZ2LE220M	088 031	56
TZ1RE024M-089471	089 471	60	TZ2LE220MVAB	088 027	56
TZ1RE024M-C1623	083 247	70	TZ2LE220SR6	045 450	57
TZ1RE024M-C1684	083 171	68	TZ2RE024BHA-C1903	082 084	58
TZ1RE024M-C1815	087 991	66	TZ2RE024M	090 560	56
TZ1RE024M-R	083 165	56	TZ2RE024M-C1815	089 461	66
TZ1RE024MVAB	083 966	56	TZ2RE024M-C1816	087 993	62
TZ1RE024MVAB-C1623	085 171	70	TZ2RE024M-R	089 446	56
TZ1RE024MVAB-C1684	088 084	68	TZ2RE024MVAB	088 071	56
TZ1RE024MVAB-C1828	089 469	66	TZ2RE024MVAB-C1823	089 456	62
TZ1RE024MVAB-R	083 233	56	TZ2RE024MVAB-C1828	087 291	66
TZ1RE024MVFG-RC1925	089 465	56	TZ2RE024RC18VAB-C1803	077 149	73
TZ1RE024PGOR8C	059 920	58	TZ2RE024RC18VAB-C1826	085 181	59
TZ1RE024RC18VAB-092999	092 999	65	TZ2RE024RC18VAB-C1828	093 104	67
TZ1RE024RC18VAB-093863	093 863	61	TZ2RE024SR11	070 957	59
TZ1RE024RC18VAB-C1803	091 063	73	TZ2RE024SR11-C1815	079 661	67
TZ1RE024RC18VAB-C1823	088 091	63	TZ2RE024SR6	049 102	57
TZ1RE024RC18VAB-C1826	084 247	59	TZ2RE024SR6-C1638	055 819	57
TZ1RE024RC18VAB-C1828	090 353	67	TZ2RE024SR6-C1662	059 305	72
TZ1RE024RC18VAB-C1937	074 261	65	TZ2RE024SR6-C1677	059 699	61
TZ1RE024SR11	070 826	59	TZ2RE024SR6-R	059 672	57
TZ1RE024SR11-093861	093 861	61	TZ2RE110M	083 163	56
TZ1RE024SR11-094343	094 343	64	TZ2RE110MVAB	088 026	56
TZ1RE024SR11-C1684	070 884	69	TZ2RE110SR6	049 238	57
TZ1RE024SR11-C1816	077 042	63	TZ2RE220M	088 032	56
TZ1RE024SR11VAB-C1933	083 231	59	TZ2RE220MVAB	088 028	56
TZ1RE024SR6	046 190	57	TZ2RE220SR6	047 937	57
TZ1RE024SR6-C1638	070 529	57			
TZ1RE024SR6-C1662	054 781	72			
TZ1RE024SR6-C1677	059 692	61			
TZ1RE110M	083 161	56			
TZ1RE110M-C1684	089 475	68			
TZ1RE110M-R	089 448	56			
TZ1RE110MVAB	088 024	56			
TZ1RE110MVAB-C1623	088 063	70			
TZ1RE110MVAB-C1828	094 312	66			
TZ1RE110PGOR8C	074 916	58			
TZ1RE110SR6	046 191	57			
TZ1RE220M	083 167	56			
TZ1RE220M-C1684	093 771	68			
TZ1RE220MVAB	088 030	56			
TZ1RE220SR6	051 879	57			
TZ2LE024BHA-C1903	082 083	58			
TZ2LE024M	090 559	56			

Item Index

Index by order number

Order No.	Item	Page
002 787	SS4	78
012 042	Roller arm NHB	85
012 043	Roller arm NHS	85
012 044	Roller arm NHBC569	85
013 176	SR6EF	79
013 178	SR6K	79
016 849	ACTUATOR-Z-G	76
024 298	HINGED ACTUATOR-ZL	76
024 299	HINGED ACTUATOR-Z-R	76
024 999	SR6WF	79
028 338	Plug connector / AC	78
028 345	Plug connector / DC	78
029 220	NGLE060RT	85
029 221	NGLE060GR	85
029 222	NGLE060GE	85
035 495	LE060RT	85
035 496	LE060GR	85
035 497	LE060GE	85
037 299	NZ2VZ-528E3VSM04	49
038 129	NZ2VZ-528EL220	43
043 296	NZ2VZ-538EC1420	45
043 861	Cable socket 6 + PE	78
044 894	NZ2VZ-528E3VSE04	51
045 450	TZ2LE220SR6	57
045 551	NZ2VZ-511EL060	43
045 579	LE110RT	85
045 582	LE220RT	85
045 584	LE220GE	85
045 801	NZ2VZ-528EL060	43
045 822	NGLE110RT	85
045 825	NGLE220RT	85
045 827	NGLE220GE	85
045 856	NZ2VZ-528E3VSM04L060	49
046 190	TZ1RE024SR6	57
046 191	TZ1RE110SR6	57
046 502	TZ1LE024SR6	57
046 503	TZ1LE110SR6	57
046 504	TZ1LE220SR6	57
046 730	Lockout bar Z	84
046 742	NZ2VZ-528E3VSE04L060	51
046 915	TZ2LE024SR6-R	57
047 837	NZ2VZ-538E3VSE04	51
047 937	TZ2RE220SR6	57
048 257	Lead seal kit TZ	84
048 850	HINGED ACTUATOR-Z-U	76
049 102	TZ2RE024SR6	57
049 159	TZ2LE024SR6	57
049 238	TZ2RE110SR6	57
050 428	NZ2VZ-538E3VSM04	49
051 879	TZ1RE220SR6	57
052 108	NZ2VZ-538EL060	43
052 914	TZ2LE110SR6	57
054 121	NZ2HB-511L060C1630	35
054 122	NZ2HB-511L060C1631	35
054 773	SR11WF	79
054 781	TZ1RE024SR6-C1662	72
054 964	TZ1LE024PGOR8C	58
055 718	NZ2VZ-528E3VSM09	49
055 819	TZ2RE024SR6-C1638	57
057 921	NZ2VZ-538E3VSE04L060	51
057 950	HINGED ACTUATOR-Z-O	76
059 004	NZ2VZ-538EL220	43
059 136	Protective plate NZ/TZ	84

Order No.	Item	Page
059 305	TZ2RE024SR6-C1662	72
059 307	TZ2LE024SR6-C1662	72
059 427	NZ2VZ-538E3VSM04L060	49
059 467	NZ2VZ-528EL110	43
059 481	NZ2WO-511L060C1630	23
059 482	NZ2WO-511L060C1631	23
059 672	TZ2RE024SR6-R	57
059 692	TZ1RE024SR6-C1677	61
059 694	TZ1LE024SR6-C1677	61
059 699	TZ2RE024SR6-C1677	61
059 852	TZ2LE024SR6-C1677	61
059 920	TZ1RE024PGOR8C	58
070 039	NZ2VZ-528E3VSM04L220	49
070 290	NZ2VZ-528E3VSE07L110	51
070 527	TZ1LE024SR6-C1662	72
070 529	TZ1RE024SR6-C1638	57
070 826	TZ1RE024SR11	59
070 828	TZ1LE024SR11	59
070 859	SR11EF	79
070 884	TZ1RE024SR11-C1684	69
070 886	TZ1LE024SR11-C1684	69
070 957	TZ2RE024SR11	59
070 958	TZ2LE024SR11	59
071 200	NZ2VZ-538EC1701	45
071 260	SRF	79
071 261	SRM	79
072 234	NZ2VZ-538EL110	43
072 251	ACTUATOR-Z-GN	76
073 293	RC-12P1N8A8300	78
073 294	RC-12P1N8A8096	78
073 455	M5X10/V100	84
073 456	M5X16/V100	84
073 457	M5X25/V100	84
073 508	NZ1HS-3131-9C-GMMF	33
074 260	TZ1LE024RC18VAB-C1937	65
074 261	TZ1RE024RC18VAB-C1937	65
074 411	ACTUATOR-Z-G/V25	76
074 412	HINGED ACTUATOR-Z-R/V25	76
074 413	HINGED ACTUATOR-Z-L/V25	76
074 414	HINGED ACTUATOR-Z-U/V25	76
074 415	HINGED ACTUATOR-Z-O/V25	76
074 471	NZ2VZ-2131E3VSM04	49
074 472	NZ2VZ-3131E3VSM04	49
074 473	NZ2VZ-2131E3VSE04	51
074 474	NZ2VZ-3131E3VSE04	51
074 562	NZ2RG-511L060C1631	29
074 616	RC18EF	80
074 617	RC18WF	80
074 916	TZ1RE110PGOR8C	58
074 917	TZ1LE110PGOR8C	58
075 530	M3X40/V100	84
075 531	M3X70/V100	84
075 955	TZ2LE024RC18VAB-C1803	73
076 250	Actuating head NZVZ	84
076 294	TZ2LE024SR6-C1638	57
076 502	NZ2VZ-538E3VSM09	49
077 014	RC18EF6M-C1825	81
077 015	RC18EF8M-C1825	81
077 016	RC18EF15M-C1825	81
077 018	RC18WF6ML-C1825	81
077 019	RC18WF8ML-C1825	81
077 020	RC18WF15ML-C1825	81
077 025	RC18EF-C1825	80

Item Index

Order No.	Item	Page	Order No.	Item	Page
077 026	RC187WF-C1825	80	083 164	TZ1LE024MR	56
077 042	TZ1RE024SR11-C1816	63	083 165	TZ1RE024MR	56
077 044	TZ1LE024SR11-C1816	63	083 166	TZ1LE220M	56
077 149	TZ2RE024RC18VAB-C1803	73	083 167	TZ1RE220M	56
077 229	NZ2VZ-538EC1233	45	083 168	TZ1LE110MR	56
077 362	NZ1RS-2131-9C-GMMF	27	083 170	TZ1LE024MC1684	68
077 363	NZ1VZ-2131E-9C-GMMF	43	083 171	TZ1RE024M-C1684	68
077 390	NZ1HB-2131-9C-GMMF	35	083 190	TZ1LE024BHAVFG-RC1924	57
077 391	NZ1HS-2131-9C-GMMF	33	083 191	TZ1RE024BHAVFG-RC1924	57
077 629	SR11EF-5000	79	083 230	TZ1LE024SR11VAB-C1933	59
077 630	SR11EF-10000	79	083 231	TZ1RE024SR11VAB-C1933	59
077 631	SR11EF-15000	79	083 233	TZ1RE024MVAB-R	56
077 632	SR6EF-5000	79	083 246	TZ1LE024M-C1623	70
077 633	SR6EF-10000	79	083 247	TZ1RE024M-C1623	70
077 634	SR6EF-15000	79	083 849	N1AD514-M	14
077 635	SR11WF-5000	79	083 850	N1AW514-M	19
077 636	SR11WF-10000	79	083 886	N1AD508-M	14
077 637	SR11WF-15000	79	083 887	N1AR508-M	16
077 638	SR6WF-5000	79	083 965	TZ1LE024MVAB	56
077 639	SR6WF-10000	79	083 966	TZ1RE024MVAB	56
077 640	SR6WF-15000	79	084 246	TZ1LE024RC18VAB-C1826	59
077 679	EKPM20/06	82	084 247	TZ1RE024RC18VAB-C1826	59
077 683	EKVM20/06	82	084 572	EKPM16/05	82
077 684	EKVM20/09	82	084 820	TZ1LE024MVAB-C1684	68
078 473	NZ2HS-511L060C1630	33	084 885	NZ2VZ-528E	43
078 487	N1AR514-M	16	084 905	NZ2VZ-538ESVM5	42
079 300	NZ1VZ-528E3VSE04-M	50	085 170	TZ1LE024MVAB-C1623	70
079 350	NZ2RS-511L060C1631	27	085 171	TZ1RE024MVAB-C1623	70
079 660	TZ2LE024SR11-C1815	67	085 180	TZ2LE024RC18VAB-C1826	59
079 661	TZ2RE024SR11-C1815	67	085 181	TZ2RE024RC18VAB-C1826	59
079 692	TZ1LE024BHA-C1902	71	085 194	RC18WF6MR-C1825	81
079 693	TZ1RE024BHA-C1902	71	085 195	RC18WF8MR-C1825	81
079 946	NZ1HB-528-MC569	40	085 196	RC18WF15MR-C1825	81
079 952	NZ1HB-511-M	34	085 569	TZ1LE024BHAVFG-RC1971	71
079 953	NZ1HS-511-M	32	085 570	TZ1RE024BHAVFG-RC1971	71
079 960	NZ1RS-511-M	26	085 676	NZ1VZ-538E-M	42
079 965	NZ1HB-511-MC569	40	086 327	EKVM12/04	82
079 999	NZ1HB-538-MC569	40	086 328	EKVM16/04	82
082 050	TZ1LE024M	56	086 330	EKVM16/06	82
082 051	TZ1RE024M	56	086 408	NZ1RK-528L060GE-MC1912	24
082 083	TZ2LE024BHA-C1903	58	086 413	NZ1RS-528L060-M	26
082 084	TZ2RE024BHA-C1903	58	086 525	NZ1HB-511L060GE-M	34
082 095	TZ1LE024BHA-C1903	58	086 527	NZ1HB-528L060GE-M	34
082 096	TZ1RE024BHA-C1903	58	086 528	NZ1RS-511L060GE-M	26
082 119	NZ1VZ-538EL060-M	42	086 538	Lockout bar Z	84
082 121	NZ1VZ-528EL220-M	42	086 574	NZ1HS-3131-8C-Ford / PT60577-101K01	33
082 122	NZ1VZ-3131E-M	42	087 074	NZ1RS-3131-9C-GMMF	27
082 123	NZ1VZ-2131E-M	42	087 147	N1ARL508-M	18
082 125	NZ1VZ-528E3VSM04-M	48	087 158	N1AR514AM-M	17
082 126	NZ1VZ-528E3VSM04L060-M	48	087 180	SR6AM2-M20	79
082 128	NZ1VZ-538E3VSE04L060-M	50	087 193	N1AD508-MC1292	14
082 129	NZ1VZ-528E3VSM07-M	48	087 197	N1AD508-MC1293	14
082 130	NZ1VZ-528E3VSE04L060-M	50	087 198	N1AR508-MC1293	16
082 131	NZ1VZ-538E3VSM04-M	48	087 204	N1ARL514-M	18
082 132	NZ1VZ-538E3VSM04L060-M	48	087 205	N1AW508-M	19
082 133	NZ1VZ-528E3VSE07-M	50	087 218	N1AD508LE060-M	14
082 134	NZ1VZ-2131E3VSE04-M	50	087 219	N1AR508LE060-M	16
082 137	NZ1VZ-528E-MC1233	44	087 220	N1AW508LE060-M	19
082 400	NZ2RS-511L060C1630	27	087 221	N1AD508LE110-M	14
083 160	TZ1LE110M	56	087 222	N1AR508LE110-M	16
083 161	TZ1RE110M	56	087 223	N1AW508LE110-M	19
083 162	TZ2LE110M	56	087 224	N1AD508LE220-M	14
083 163	TZ2RE110M	56	087 225	N1AR508LE220-M	16

Item Index

Order No.	Item	Page
087 226	N1AW508LE220-M	19
087 245	N1AB508-M	16
087 247	N1AB514-M	16
087 256	Lead seal kit TZ-C1937	84
087 290	TZ2LE024MVAB-C1828	66
087 291	TZ2RE024MVAB-C1828	66
087 558	NZ2WO-538L060	23
087 595	NZ1RS-2121-M	26
087 603	N1AD514SVM5-M	15
087 604	N1AR514SVM5-M	17
087 990	TZ1LE024MC1815	66
087 991	TZ1RE024MC1815	66
087 992	TZ2LE024MC1816	62
087 993	TZ2RE024MC1816	62
088 023	TZ1LE110MVAB	56
088 024	TZ1RE110MVAB	56
088 025	TZ2LE110MVAB	56
088 026	TZ2RE110MVAB	56
088 027	TZ2LE220MVAB	56
088 028	TZ2RE220MVAB	56
088 029	TZ1LE220MVAB	56
088 030	TZ1RE220MVAB	56
088 031	TZ2LE220M	56
088 032	TZ2RE220M	56
088 035	NZ1VZ-538E3VSE09-M	50
088 036	NZ1VZ-2131E3VSE07-M	50
088 037	NZ1VZ-2131E3VSE09-M	50
088 038	NZ1VZ-2131E3VSM07-M	48
088 039	NZ1VZ-2131E3VSM09-M	48
088 040	NZ1VZ-3131E3VSM07-M	48
088 041	NZ1VZ-3131E3VSM09-M	48
088 042	NZ1VZ-3131E3VSE07-M	50
088 043	NZ1VZ-3131E3VSE09-M	50
088 044	NZ1VZ-538E3VSM09-M	48
088 045	NZ1VZ-528E3VSM09-M	48
088 046	NZ1VZ-538E3VSM07-M	48
088 047	NZ1VZ-528E3VSE09-M	50
088 048	NZ1VZ-538E3VSE07-M	50
088 049	NZ1VZ-2131E3VSM04-M	48
088 050	NZ1VZ-3131E3VSM04-M	48
088 051	NZ1VZ-3131E3VSE04-M	50
088 063	TZ1RE110MVAB-C1623	70
088 070	TZ2LE024MVAB	56
088 071	TZ2RE024MVAB	56
088 084	TZ1RE024MVAB-C1684	68
088 090	TZ1LE024RC18VAB-C1823	63
088 091	TZ1RE024RC18VAB-C1823	63
088 180	NZ2RK-511L110	25
088 196	NZ2HS-528L060	33
088 197	NZ2RS-528L060	27
088 199	NZ1HB-528-M	34
088 583	NB01R588-M	20
088 584	NB01D588-M	20
088 605	NZ1RG-511-M	28
088 608	NZ1RK-511-M	24
088 611	NZ1WO-511-M	22
088 613	NZ1PS-511-M	36
088 614	NZ1RL-511-M	30
088 618	NZ1PB-511-M	38
088 852	NZ2VZ-2121E	43
088 996	NZ1RL-511L060-M	30
089 007	NZ2RK-511SVM5	24
089 014	NZ2WO-511SVM5	22

Order No.	Item	Page
089 018	NZ2RK-538SVM5	24
089 052	NZ1RG-511L060-M	28
089 053	NZ1RS-511L060-M	26
089 054	NZ1RG-511L220-M	28
089 055	NZ1RS-511L220-M	26
089 057	NZ1WO-511L060-M	22
089 058	NZ1WO-511L060GE-M	22
089 059	NZ1WO-511L110-M	22
089 060	NZ1WO-511L220-M	22
089 076	NZ1WO-538L060-M	22
089 078	NZ1WO-528L060-M	22
089 079	NZ1RL-511L220-M	30
089 080	NZ1RL-511L110-M	30
089 084	NZ1RL-528L220-M	30
089 091	NZ2HB-511	35
089 092	NZ2HB-511L060	35
089 093	NZ2HS-511	33
089 094	NZ2HS-511L060	33
089 434	TZ1LE024MVAB-R	56
089 445	TZ2LE024M-R	56
089 446	TZ2RE024M-R	56
089 448	TZ1RE110M-R	56
089 455	TZ2LE024MVAB-C1823	62
089 456	TZ2RE024MVAB-C1823	62
089 460	TZ2LE024M-C1815	66
089 461	TZ2RE024M-C1815	66
089 464	TZ1LE024MVFGR-1925	56
089 465	TZ1RE024MVFGR-1925	56
089 466	TZ1LE110MVAB-C1623	70
089 468	TZ1LE024MVAB-C1828	66
089 469	TZ1RE024MVAB-C1828	66
089 470	TZ1LE024M-089470	60
089 471	TZ1RE024M-089471	60
089 475	TZ1RE110M-C1684	68
089 476	TZ1LE024SR6-C1638	57
089 477	TZ1LE024M-C1816	62
089 479	NZ1VZ-511E-M	42
089 480	NZ1VZ-528EL110-M	42
089 481	NZ1VZ-538EL110-M	42
089 482	NZ1VZ-538EL220-M	42
089 483	NZ1VZ-2131E3VSH-M	52
089 484	NZ1VZ-528E3VSE07L110-M	50
089 485	NZ1VZ-528E3VSM07L110-M	48
089 486	NZ1VZ-2121E-M	42
089 488	NZ1VZ-528E3VSM04L220-M	48
089 496	NZ1VZ-538EL220-MC1233	44
089 497	NZ1VZ-528EL060-MC1233	44
089 622	NZ2RS-511L060GE	27
089 624	NZ1WO-528-M	22
089 626	NZ1WO-3131-M	22
089 627	NZ1RS-528-M	26
089 629	NZ1WO-2131-M	22
089 631	NZ1RS-3131-M	26
089 633	NZ1RS-2131-M	26
089 905	NZ1VZ-538E3VSE04-M	50
089 914	NZ1VZ-2121E-MC1233	44
089 915	NZ1VZ-3131E3VSH-M	52
089 924	TZ1LE110M-C1684	68
090 008	NZ1RG-528L060-M	28
090 009	NZ1RG-538L060-M	28
090 016	NZ2RK-511	25
090 024	NZ2RS-511	27
090 025	NZ2RL-511	31

Item Index

Order No.	Item	Page	Order No.	Item	Page
090 026	NZ2RG-511SVM5	28	090 848	NZ2HB-538L060	35
090 027	NZ2RS-511SVM5	26	090 852	NZ2HS-528	33
090 028	NZ2RL-511SVM5	30	090 853	NZ2HS-538	33
090 032	NZ2RG-511	29	090 854	NZ2HS-538L060	33
090 035	NZ1HS-511L060-M	32	090 856	NZ2HS-3131	33
090 036	NZ1HS-511L110-M	32	090 861	NZ2HB-511SVM5	34
090 037	NZ1HS-511L220-M	32	090 862	NZ2HB-538SVM5	34
090 038	NZ1HS-511L060GE-M	32	090 864	NZ2HB-528SVM5	34
090 039	NZ1HB-511L060-M	34	090 867	NZ2HS-511SVM5	32
090 040	NZ1HB-511L220-M	34	090 868	NZ2HS-528SVM5	32
090 049	NZ1HS-528L060GE-M	32	090 869	NZ2HS-538SVM5	32
090 050	NZ1HS-528L110-M	32	090 870	NZ1PB-528-M	38
090 051	NZ1HB-528L220-M	34	090 871	NZ1PB-538-M	38
090 052	NZ1HS-528L220-M	32	090 872	NZ1PB-2131-M	38
090 136	NZ2HB-2131	35	090 873	NZ1PB-3131-M	38
090 137	NZ2HB-3131	35	090 874	NZ1PS-528-M	36
090 143	NZ2VZ-538E	43	090 875	NZ1PS-538-M	36
090 144	NZ2VZ-2131E	43	090 876	NZ1PS-2131-M	36
090 145	NZ2VZ-3131E	43	090 877	NZ1PS-3131-M	36
090 146	NZ2HS-2131	33	090 878	NZ1WO-538-M	22
090 147	NZ2RS-511L060	27	090 905	NZ1RK-528-M	24
090 149	NZ2RS-2131	27	090 906	NZ1RK-538-M	24
090 150	NZ2PS-3131	37	090 907	NZ1RK-2131-M	24
090 151	NZ2PS-2131	37	090 908	NZ1RK-3131-M	24
090 152	NZ2PS-511L060	37	090 909	NZ2WO-511	23
090 254	NZ1HS-2121-M	32	090 910	NZ2WO-528	23
090 334	NZ1VZ-538E3VSE09L220-M	50	090 911	NZ2WO-538	23
090 335	NZ1VZ-528E3VSE09L220-M	50	090 912	NZ2WO-2131	23
090 336	NZ1VZ-528E3VSE07L220-M	50	090 913	NZ2WO-3131	23
090 337	NZ1VZ-528E3VSE07L060-M	50	090 919	NZ2RK-528	25
090 339	NZ1VZ-511E3VSM04-M	48	090 920	NZ2RK-538	25
090 340	NZ1VZ-538E3VSM07L110-M	48	090 921	NZ2RK-2131	25
090 341	NZ1VZ-528E3VSM07L220-M	48	090 922	NZ2RK-3131	25
090 342	NZ1VZ-528E3VSM09L220-M	48	090 923	NZ2WO-528SVM5	22
090 343	NZ1VZ-511E3VSE04-M	50	090 924	NZ2WO-538SVM5	22
090 344	NZ1VZ-511E3VSM04L060-M	48	090 930	NZ2RK-528SVM5	24
090 345	NZ1VZ-538E3VSM04L220-M	48	090 932	NZ1RG-528-M	28
090 346	NZ1VZ-528E3VSE09L060-M	50	090 933	NZ1RG-538-M	28
090 348	NZ1VZ-538E3VSE07L110-M	50	090 934	NZ1RG-2131-M	28
090 349	NZ1VZ-528E3VSM09L060-M	48	090 935	NZ1RG-3131-M	28
090 352	TZ1LE024RC18VAB-C1828	67	090 936	NZ1RS-538-M	26
090 353	TZ1RE024RC18VAB-C1828	67	090 937	NZ1RL-528-M	30
090 354	NZ1RK-511L060-M	24	090 938	NZ1RL-528L060-M	30
090 355	NZ1RK-511L220-M	24	090 939	NZ1RL-538-M	30
090 358	NZ1RK-528L060-M	24	090 940	NZ1RL-538L060-M	30
090 424	NZ1RS-538L060GE-M	26	090 941	NZ1RL-2131-M	30
090 430	NZ1PS-528L060-M	36	090 942	NZ1RL-3131-M	30
090 546	N1AD508AM-M	15	090 943	NZ2RG-528	29
090 547	N1AR508AM-M	17	090 944	NZ2RG-528L060	29
090 555	NZ1RS-538L060-M	26	090 945	NZ2RG-538	29
090 559	TZ2LE024M	56	090 946	NZ2RG-538L060	29
090 560	TZ2RE024M	56	090 947	NZ2RG-2131	29
090 566	NZ1VZ-528E060-M	42	090 948	NZ2RG-3131	29
090 572	NZ1RK-528-MC1912	24	090 950	NZ2RS-528	27
090 671	NZ1VZ-528E-M	42	090 951	NZ2RS-538	27
090 697	NZ2HS-511L060GE	33	090 952	NZ2RS-538L060	27
090 719	NZ2HB-511L060GE	35	090 954	NZ2RS-3131	27
090 743	N1AW514SVM5-M	19	090 955	NZ2RL-511L060	31
090 747	NZ1HS-3131-M	32	090 956	NZ2RL-528	31
090 760	NZ1HS-538L060-M	32	090 957	NZ2RL-538	31
090 845	NZ2HB-528	35	090 958	NZ2RL-2131	31
090 846	NZ2HB-528L060	35	090 959	NZ2RL-3131	31
090 847	NZ2HB-538	35	090 961	NZ2RG-528SVM5	28

Item Index

Order No.	Item	Page
090 962	NZ2RG-538SVM5	28
090 963	NZ2RS-528SVM5	26
090 964	NZ2RS-538SVM5	26
090 965	NZ1HB-528L060-M	34
090 966	NZ1HB-538-M	34
090 967	NZ1HB-538L060-M	34
090 968	NZ1HB-2131-M	34
090 969	NZ1HB-3131-M	34
090 970	NZ1HS-528-M	32
090 971	NZ1HS-528L060-M	32
090 972	NZ1HS-538-M	32
090 973	NZ1HS-2131-M	32
090 974	NZ2RS-2121	27
090 975	NZ2RL-2121	31
090 976	NZ2WO-2121	23
091 062	TZ1LE024RC18VAB-C1803	73
091 063	TZ1RE024RC18VAB-C1803	73
091 091	NZ1HB-511L060-MC569	40
091 261	N1AD514AM-M	15
091 264	NZ2HS-2121	33
091 268	NZ2PS-2121	37
091 278	NZ2RL-538L060	31
091 279	NZ2WO-528L060	23
091 280	NZ2WO-511L060	23
091 281	NZ2HB-528L220	35
091 282	NZ2RL-528L060	31
091 284	NZ2RG-511L060	29
091 291	NZ1RS-528L220-M	26
091 292	NZ2RK-528L060	25
091 296	SR11AM2-M20	79
091 301	NZ2HB-528L060GE	35
091 302	NZ2RS-511L110	27
091 305	Lockout bar with chain	84
091 330	NZ1HB-528L060-MC569	40
091 339	NZ1RS-528-MC1588	39
091 346	NZ2HB-528L060C1630	35
091 347	NZ2HB-528L060C1631	35
091 352	NZ1RS-511-MC1588	39
091 632	NZ2PS-538L060	37
091 738	NZ1VZ-528E3VSE04L220-M	50
092 355	NZ1VZ-2131E-8C-GMMF	43
092 697	RC18WF3MLF-C1825	81
092 698	RC18WF6MRF-C1825	81
092 699	RC18WF10MLF-C1825	81
092 700	RC18WF10MRF-C1825	81
092 701	RC18WF15MLF-C1825	81
092 702	RC18WF15MRF-C1825	81
092 704	RC18WF20MLF-C1825	81
092 708	RC18WF20MRF-C1825	81
092 724	RC18WF25MLF-C1825	81
092 725	RC18WF25MRF-C1825	81
092 726	RC18EF20M-C1825	81
092 727	RC18EF25M-C1825	81
092 761	RC18EF1,5M-C1825	81
092 816	RC18EF3M-C1825	81
092 883	RC18EF1,5MF-C1825	81
092 884	RC18EF3MF-C1825	81
092 885	RC18EF6MF-C1825	81
092 886	RC18EF8MF-C1825	81
092 887	RC18EF10MF-C1825	81
092 888	RC18EF15MF-C1825	81
092 889	RC18EF20MF-C1825	81
092 890	RC18EF25MF-C1825	81

Order No.	Item	Page
092 891	RC18WF1,5MLF-C1825	81
092 892	RC18WF1,5MRF-C1825	81
092 893	RC18WF3MLF-C1825	81
092 894	RC18WF3MRF-C1825	81
092 895	RC18WF8MLF-C1825	81
092 896	RC18WF8MRF-C1825	81
092 898	RC18EF10M-C1825	81
092 901	RC18WF10ML-C1825	81
092 902	RC18WF10MR-C1825	81
092 906	RC18WF1,5ML-C1825	81
092 907	RC18WF1,5MR-C1825	81
092 908	RC18WF3ML-C1825	81
092 909	RC18WF3MR-C1825	81
092 910	RC18WF20ML-C1825	81
092 911	RC18WF20MR-C1825	81
092 912	RC18WF25ML-C1825	81
092 913	RC18WF25MR-C1825	81
092 998	TZ1LE024RC18VAB-092998	65
092 999	TZ1RE024RC18VAB-092999	65
093 103	TZ2LE024RC18VAB-C1828	67
093 104	TZ2RE024RC18VAB-C1828	67
093 112	NZ2PS-511	37
093 457	EMP-B1	83
093 458	EMP-B2	83
093 521	NZ1PS-528L220-M	36
093 523	NZ1PS-528L220GE-M	36
093 611	NZ1VZ-2131E3VSH-8C-GMMF	53
093 660	NZ1VZ-2131E-MEX	42
093 770	TZ1LE220M-C1684	68
093 771	TZ1RE220M-C1684	68
093 857	NZ2VZ-2131EC1233	45
093 858	NZ1VZ-538E-MC1233	44
093 859	NZ1VZ-2131E-MC1233	44
093 860	TZ1LE024SR11-093860	61
093 861	TZ1RE024SR11-093861	61
093 862	TZ1LE024RC18VAB-093862	61
093 863	TZ1RE024RC18VAB-093863	61
094 167	NZ1HS-3131-MEX	32
094 169	NZ1RS-3131-MEX	26
094 309	Socket crimp contact RCM	80
094 310	Socket crimp contact RCM-C1825	80
094 311	TZ1LE110MVAB-C1828	66
094 312	TZ1RE110MVAB-C1828	66
094 342	TZ1LE024SR11-094342	64
094 343	TZ1RE024SR11-094343	64
094 401	EMP-SA	83

Product Catalog

Automation



Position Switches

- ▶ Position Switches
- ▶ Position Switches according to EN 50 041

Precision Multiple Limit Switches

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