Safety Switches with Plastic Housing

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

Contents

Safety Switches with Plastic Housing

About this catalog

The *Safety Switches with Plastic Housing* catalog gives you an overview of our safety switches and our rope pull switches. For numerous applications these switches are the right choice due to their economy and flexibility. You will find the technical data after the product overview. There is a reference to the page with the related technical data on the pages listing the products.

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 with plastic housing

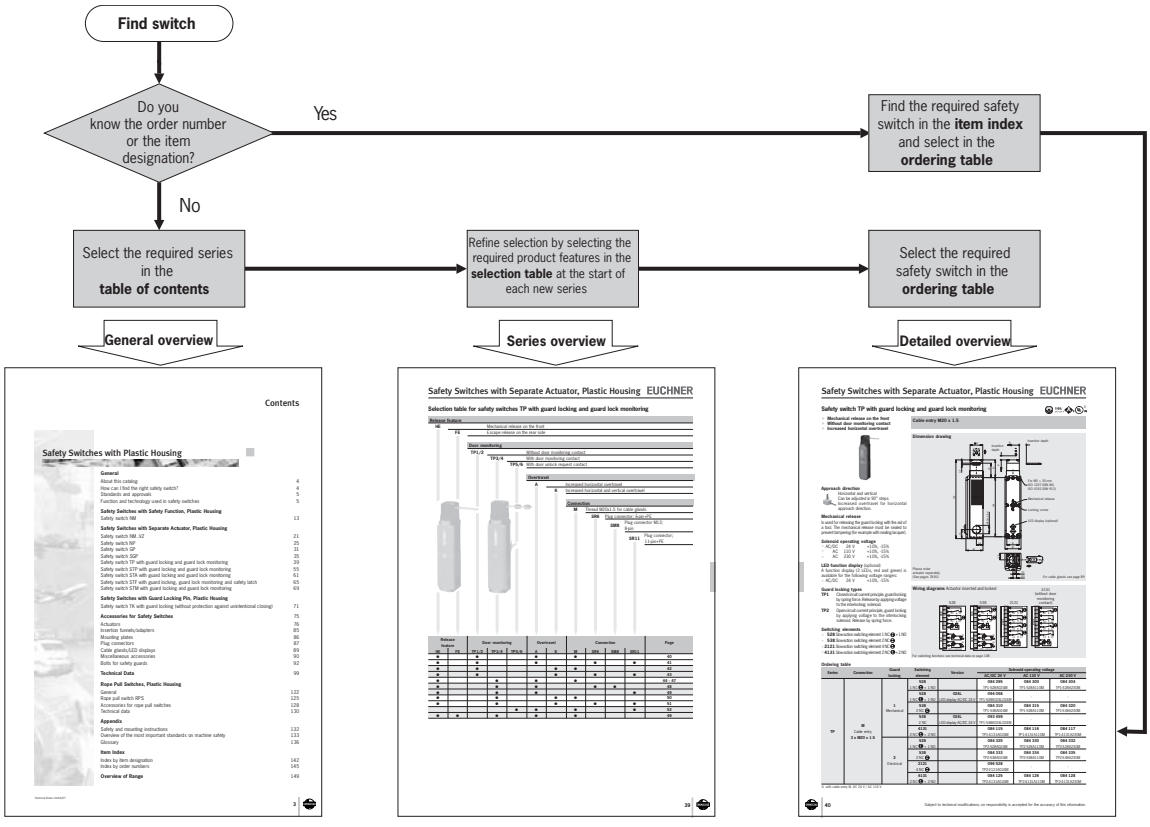
With safety function	With separate actuator									TK	Acces-sories	Rope pull switch
NM	Without guard locking				With guard locking and guard locking monitoring							RPS
	NM..VZ	NP	GP	SGP	TP	STP	STA*	STF	STM			
												
see page 13	see page 21	see page 25	see page 31	see page 35	see page 39	see page 55	see page 61	see page 65	see page 69	see page 71	see page 75	see page 122

* Switch interchangeable with the STP; in metal housing

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 142 or page 145).
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, e.g. by an employers' liability insurance association (BG) and are given in the lists from the BG.
Furthermore, numerous switches are listed by Underwriters Laboratories (UL) or other organizations. 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:

BG-PRÜFZERT	Switches with this symbol are approved by the German employers' liability insurance association (BG)
c UL us	Switches with this symbol are approved by Underwriters Laboratories (UL, Canada and USA)
SIBE Schweiz	Switches with this symbol are approved by SIBE (Switzerland)

Function and technology used in 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 poses 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 NC contact which is operated positively. The switching contacts are separated positively 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.

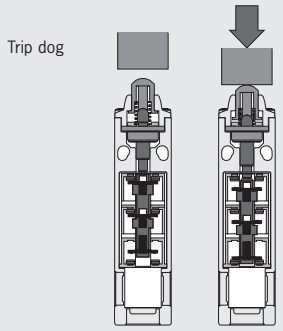

With safety function


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).
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 opened and the machine is shut down. A built-in spring in the switch 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.



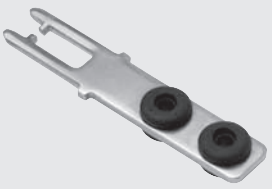
Safety switch with separate actuator with domed plunger

Safety switches with separate actuator

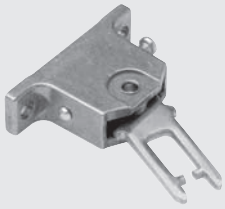
On safety switches with separate actuator, the actuating element is separate to the switch and is attached to the moving part of the safety guard to be monitored. The actuating elements are available in various versions to suit the safety guard that is to be monitored.
This catalog contains series NM.VZ, NP, GP, TP, STP and STM 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 NM.VZ, NP, GP, TP, STA, SGP. STF, STP and STM 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 a switch series are always the same shape.



Straight actuator



Hinged actuator

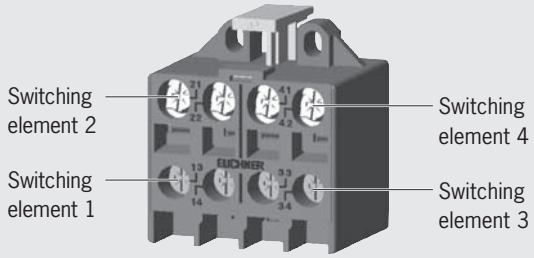
The positively driven contact in the switching element is closed by inserting the actuating element in the switch head. The positively driven contact is reliably opened by the positive application of force when the actuating element is removed - even if the contacts are welded together. In the open state, the machinery or systems are then safely interlocked against starting.
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 90 mm. For sliding doors and hinged doors with an adequately large pivoting radius, 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, for example, 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 switches offered in the catalog:

- 1 contact switching elements
- 2 contact switching elements with two independent switching elements
- 3 contact switching elements with three independent switching elements
- 4 contact switching elements with four independent switching elements



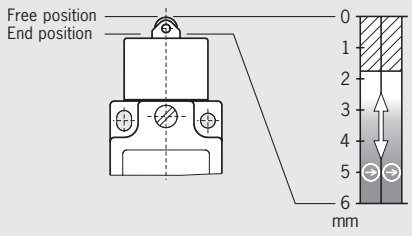
4 contact switching element

Only one switching element is fitted in each case in switches of the series NM, NP, GP, TP, STP, SGP, STF, STP and TK. Two switching elements are fitted to all series STM 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 solenoid (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

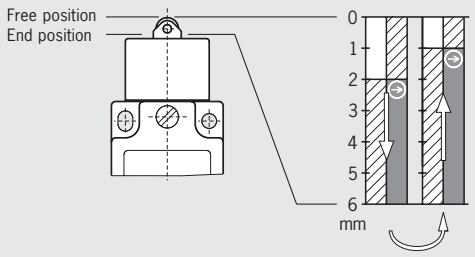
Slow-action switching elements are mostly used in safety switches. The opening of the switching element is directly dependent on the position of the actuator. The further the actuator is moved, the further the switching element is opened. The actuator travel is therefore directly proportional to the 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.



Travel diagram
Slow-action switching element

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. No snap-action switching elements are available for the safety switches in this catalog.



Travel diagram
Snap-action switching element

Positively driven contacts ⊖

Positively driven contacts are used in the switching elements. These are special switching elements that are designed to ensure 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 safety 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.

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 aspects:

Notation
1 NC ⊖ + 1 NO

Explanation
Normally closed contacts are represented by NC, normally open contacts by NO. The number defines how many contacts are available. The symbol after the NC defines that the 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.

Safety contacts

If contacts fulfill safety tasks, positively driven contacts must be used. These contacts are referred to as safety contacts.

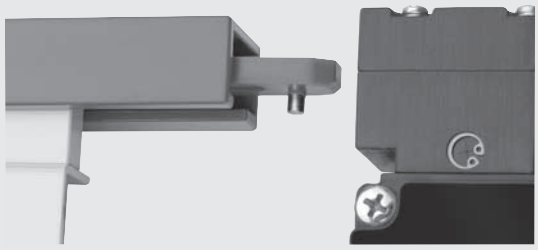
Auxiliary contacts

Door monitoring contact and solenoid monitoring contact
In addition to the safety contacts, auxiliary contacts are also required, for example, to indicate the position of the solenoid to the control system, or to indicate whether the safety guard is open. If these contacts do not have any safety function, either NC or NO contacts can be used.

Door unlock request contact
A special feature of the TP series is the door unlock request contact. When the actuator is in the locked state, positively driven contact 21-22 is opened by pulling the safety guard and a signal sent to the higher level PLC. Depending on the control concept, the safety guard can be unlocked automatically – when machine components which were still running have stopped.

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 must 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.



Guiding the actuator in a C rail

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 two locks) to protect against removal.

Lockout bar for two padlocks

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 TP, STA, STP and STM listed in this catalog are safety switches with separate actuator with guard locking. The safety switch TK also features guard locking but does not have protection against unintentional closing. It can therefore not be classified as a classic switch with safety function or separate actuator.

Safety switch
TP

Safety switch
STM

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 interlocking solenoid is required. This requirement can, for instance, be achieved by a safe standstill monitor or a safe time-delay. The safety switch must also provide a facility for monitoring the position of the solenoid.
The series TP, STP, STM and TK feature the guard lock monitoring required for this function and can therefore be used for protection of personnel.

Process protection

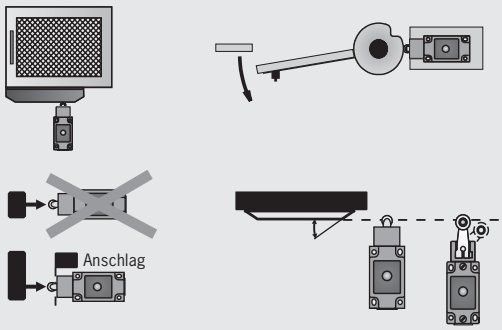
Often a safety guard is only to be locked to prevent interruption to the process due to unintentional opening of the safety guard. In this case the position of the interlocking solenoid does not need to be integrated in the safety circuit.

Housing material and actuating head

The safety switches in this catalog have a housing made of reinforced thermoplastic. Due to the durable housing material and the high degree of protection (up to IP 67), these switches can be used even under severe conditions. The degree of protection only applies to the space for the electrical wiring and not to the actuating head.
If there are increased demands on the load capability of the actuating head in operation, it is possible to choose an actuating head made of metal in the STM series. Alternatively, you can choose the STP series, which is equipped with a metal head as standard. This allows you to combine the economy of safety switches with a plastic housing with the ruggedness of safety switches made of metal.

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

Certain requirements must be met with respect to 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).



Attaching safety switches and actuators

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.

Changing the approach direction

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 NM, NP, GP, TP, STA, STF, SGP and STP can be very easily adjusted to the required direction.

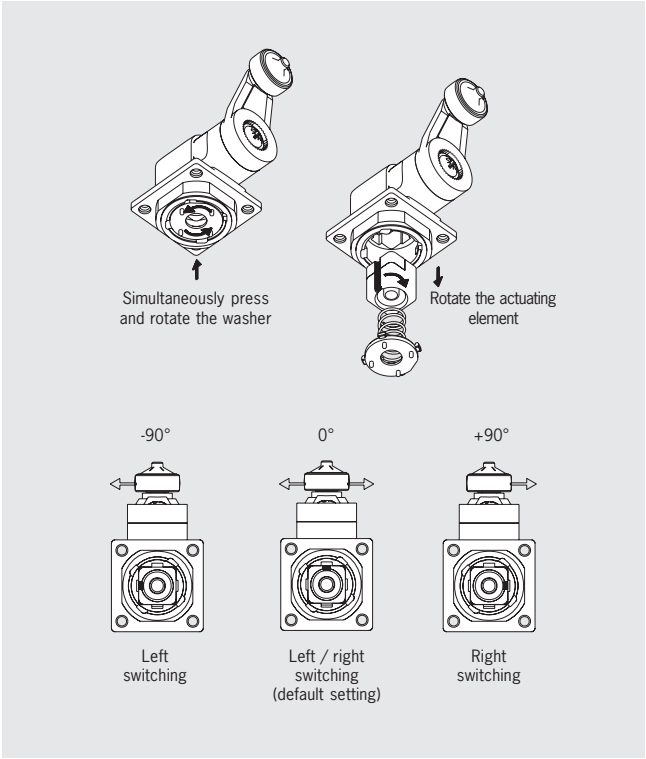
Changing the approach direction
Safety switch NM

Changing the approach direction
Safety switch TP

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.

Changing the switching direction

In addition, in the case of the NM.HB series, the actuating direction can be adjusted such that the actuator only switches in one direction.



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. All requirements, e.g. the mechanical end stop for the door and the exact guidance of the actuator, are optimally met by using bolts.

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 in this catalog are available with various plug connectors. The corresponding mating connectors are also available as accessories with permanently connected cables of different lengths.

Switch layout for STM series

- Locking arm

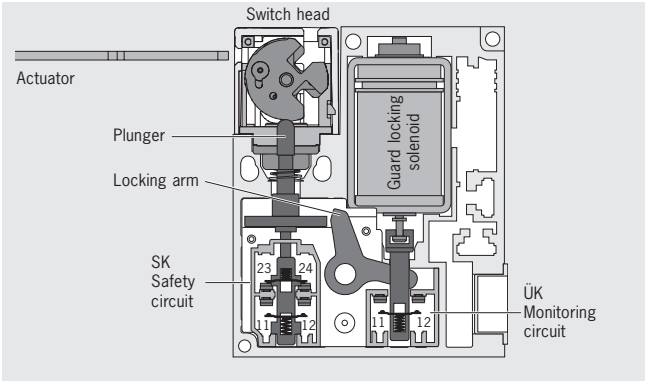
The locking arm ensures that the switch is guard locked by the solenoid. It acts directly on the switching element ÜK; the positively driven contacts can only be closed in the locked state (see *Protection against unintentional closing*, page 11).

- SK

The position of the switching elements of the SK switching element isdependent 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 switching elements 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.

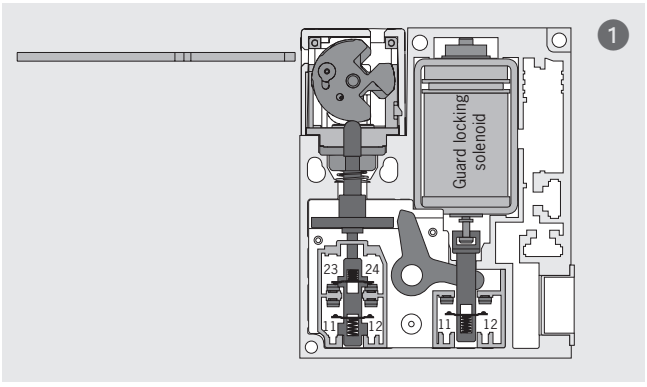


Principle of operation of STM

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

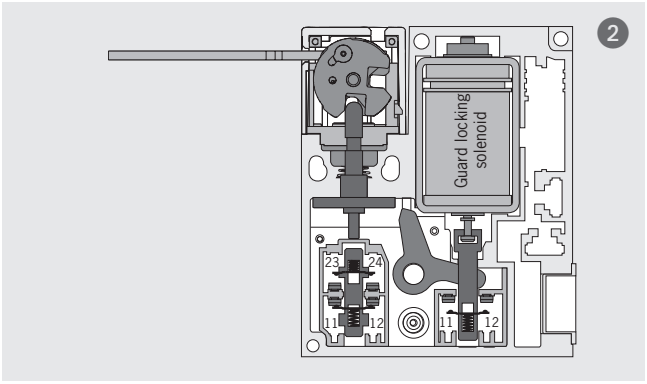
1 Door open and not locked

In the initial state (actuator removed/safety guard open) all positively driven contacts (SK and ÜK) are open. The NO contact 23-24 is closed and signals the condition *Door open and not locked*. Unintentional closing of the contacts on switching element ÜK is impossible due to the switch mechanism (see *Protection against unintentional closing*, page 11).



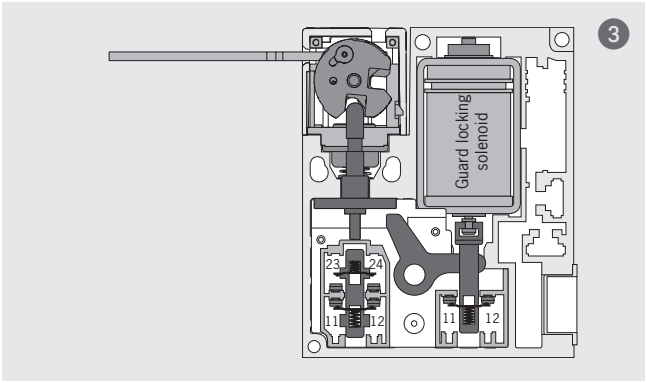
2 Door closed and not locked

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 of the switching element ÜK remain open as before.



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, the auxiliary contact 23-24 is open. The actuator and the safety guard are locked. This means that the machine connected to the safety circuit can be started.

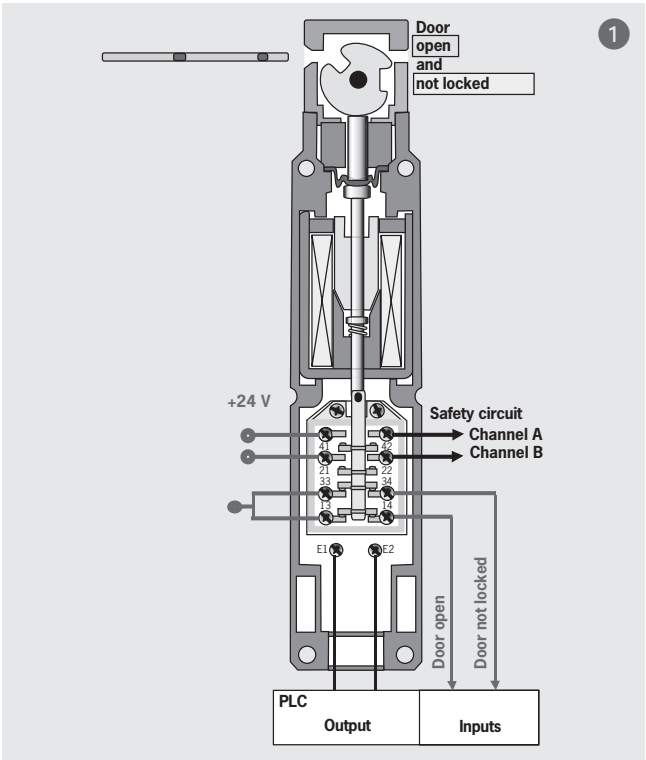


Principle of operation of TP/STA/STP

The sectional drawings show the safety switch TP/STP in its three switch states:

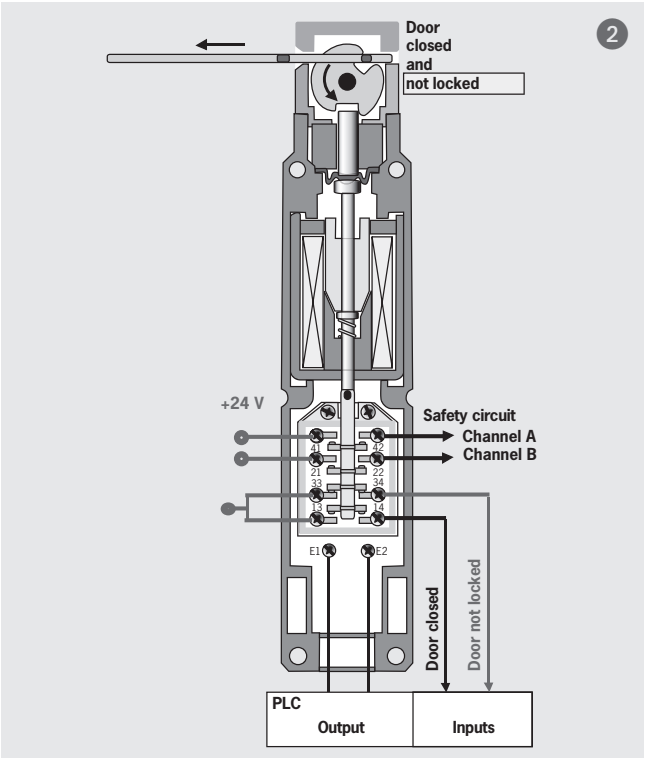
1 Door open and not locked

In the initial state (actuator removed/safety guard open) all positively driven contacts (here: 21-22 and 41-42) are open. The NO contact 13-14 is closed and signals the condition *Door open*. The NO contact 33-34 is also closed and signals the condition *Not locked*. Unintentional closing of the contacts 21-22 and 41-42 is impossible due to the switch mechanism (see *Protection against unintentional closing*, page 11).



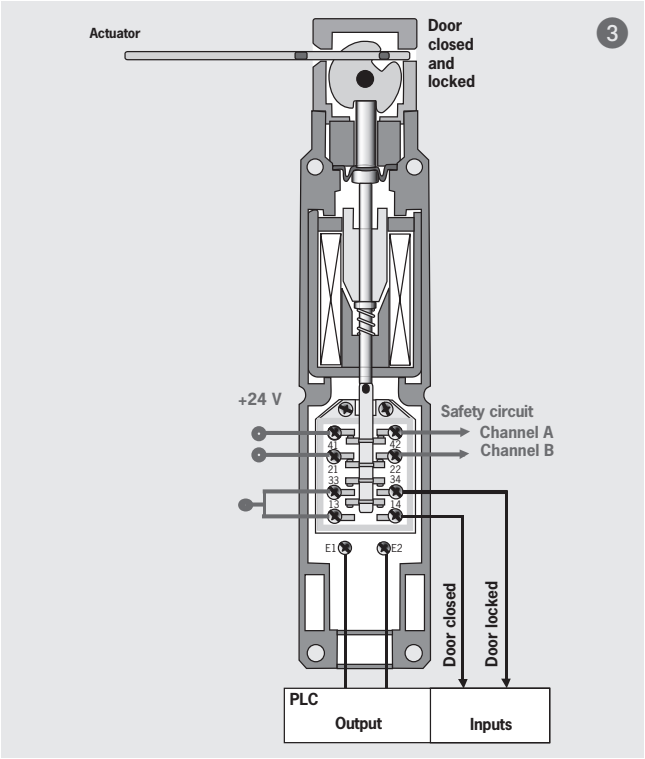
2 Door closed and not locked

The plunger is released by inserting the actuator into the switch head. The NO contact 13-14 is now open and signals the condition *Door closed*. The NO contact 33-34 remains closed and signals the condition *Not locked* as before. The positively driven contacts 21-22 and 41-42 remain open as before.



3 Door closed and locked

After the actuator has been inserted, it is possible to activate the switch's guard locking. When the interlocking solenoid is activated, NO contact 33-34 is opened and signals the condition *Locked*. The NO contact 13-14 signals the condition *Door closed* as before. The positively driven contacts 21-22 and 41-42 were closed when the interlocking solenoid was activated. The actuator and the safety guard are locked. This means that the machine connected to the safety circuit can be started.



Protection against unintentional closing

The design feature of a guard locking which ensures that the locking mechanism (solenoid plunger) cannot go into the interlock position if the safety guard is open is also referred to in BGI 575 as *Protection against unintentional closing*.

Selection table for safety switches NM with safety function

Actuating element

WO	Domed plunger	Approach direction vertical
RB	Roller plunger	Approach direction horizontal
KB	Roller arm	Approach direction horizontal
HB	Lever arm	Approach direction horizontal
AV	Hinged actuator	Solid shaft length 75 mm
AL	Hinged actuator	Solid shaft length 110 mm
AG	Hinged actuator	Hollow shaft internal diameter 10.2 mm
AK	Hinged actuator	Hollow shaft internal diameter 8.2 mm

Connection

M	Thread M16x1.5 for cable glands
SM4	Plug connector M12 4-pin

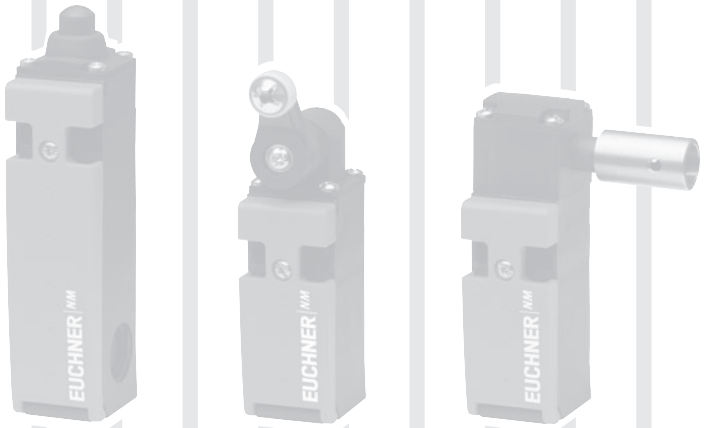
Housing

Short

Long

Switching element

One contact	1 NC ⊖
Two contacts	1 NC ⊖ +1 NO, 2 NC ⊖
Three contacts	2 NC ⊖ + 1 NO, 3 NC ⊖



Actuating element								Connection		Housing		Switching element			Page
WO	RB	KB	HB	AV	AL	AG	AK	M	SM4	Short	Long	One contact	Two contacts	Three contacts	
●								●		●		●	●		14
●								●			●		●	●	14
	●							●		●		●	●		15
	●							●			●		●	●	15
		●						●		●		●	●		16
		●						●			●		●	●	16
			●					●		●		●	●		17
			●					●			●		●	●	17
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					●			●			●		●	●	18
					●				●		●		●		18
						●		●		●		●	●		19
						●		●			●		●	●	19
						●			●		●		●		19
							●	●		●		●	●		20
							●	●			●		●	●	20

Safety switch NM..WO with domed plunger

Approach direction

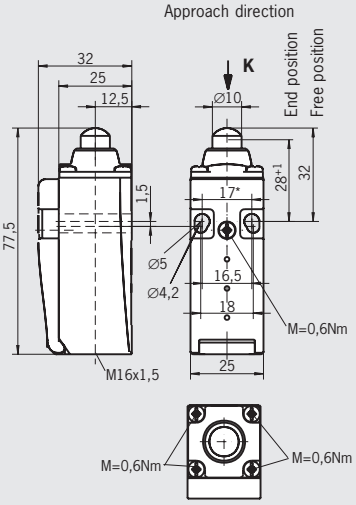
Vertical

Switching elements

- **ES01** Slow-action switching element 1 NC ⊖
- **ES11** Slow-action switching element 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching element 2 NC ⊖
- **ES12** Slow-action switching element 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching element 3 NC ⊖

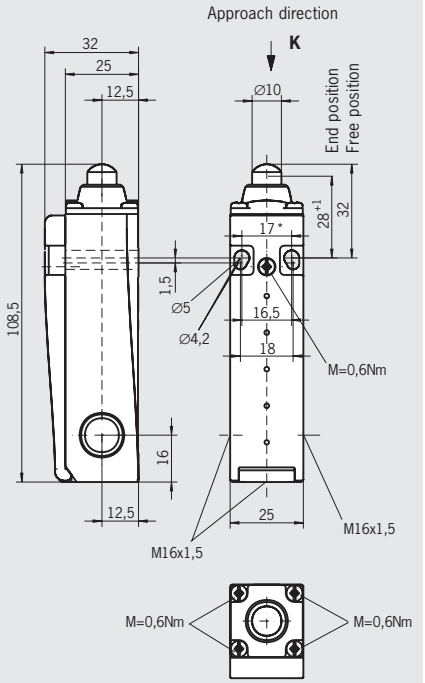
Cable entry M16 x 1.5
Short housing

Dimension drawing



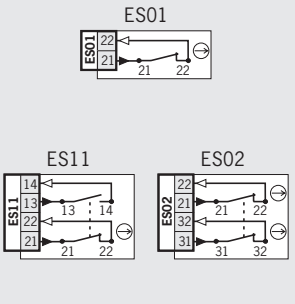
For cable glands see page 89

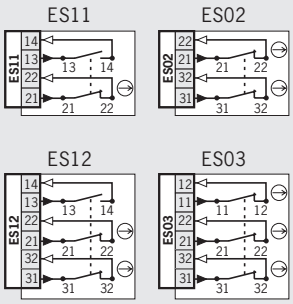
Cable entry M16 x 1.5
Long housing



For cable glands see page 89

Wiring diagrams Switch not actuated





Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	WO Domed plunger	Cable entry **1 x M16 x 1.5**	**Short**	**01** 1 NC ⊖	**084 495** NM01WOK-M
				11 1 NC ⊖ + 1 NO	**095 375** NM11WOK-MC2069
				02 2 NC ⊖	**095 374** NM02WOK-MC2069
		Cable entry **3 x M16 x 1.5**	**Long**	**11** 1 NC ⊖ + 1 NO	**084 496** NM11WOK-M
				02 2 NC ⊖	**084 497** NM02WOK-M
				12 2 NC ⊖ + 1 NO	**084 498** NM12WOK-M
				03 3 NC ⊖	**084 499** NM03WOK-M

Safety switch NM..RB with roller plunger

Approach direction

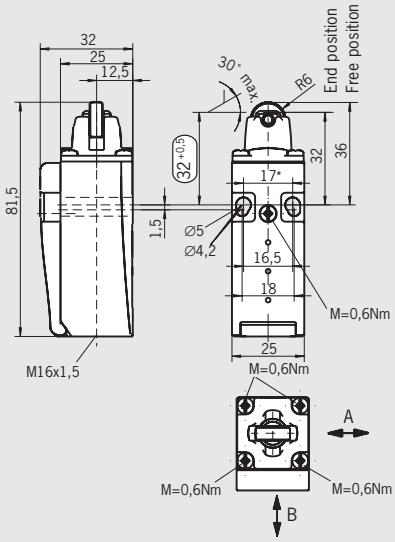
Horizontal
Can be adjusted in 90° steps.

Switching elements

- **ES01** Slow-action switching element 1 NC ⊖
- **ES11** Slow-action switching element 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching element 2 NC ⊖
- **ES12** Slow-action switching element 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching element 3 NC ⊖

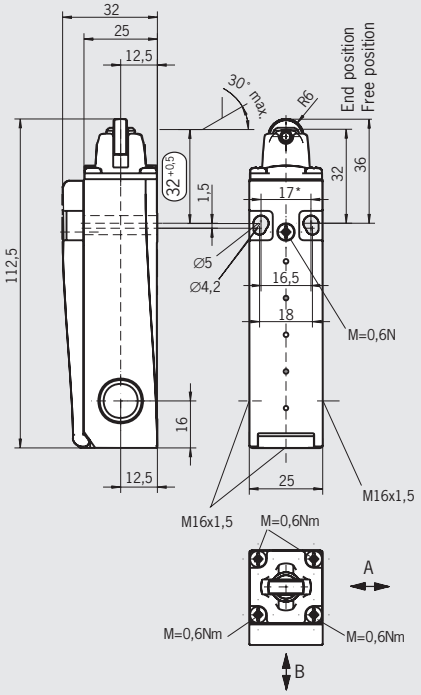
Cable entry M16 x 1.5
Short housing

Dimension drawing



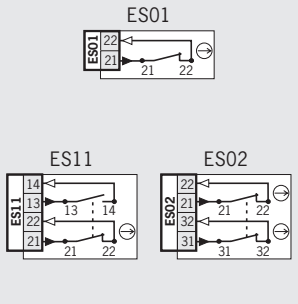
For cable glands see page 89

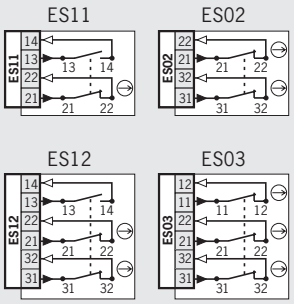
Cable entry M16 x 1.5
Long housing



For cable glands see page 89

Wiring diagrams Switch not actuated





Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	RB Roller plunger	Cable entry **1 x M16 x 1.5**	**Short**	**01** 1 NC ⊖	**084 515** NM01RBA-M
				11 1 NC ⊖ + 1 NO	**095 373** NM11RBA-MC2069
				02 2 NC ⊖	**095 372** NM02RBA-MC2069
		Cable entry **3 x M16 x 1.5**	**Long**	**11** 1 NC ⊖ + 1 NO	**084 516** NM11RBA-M
				02 2 NC ⊖	**084 517** NM02RBA-M
				12 2 NC ⊖ + 1 NO	**084 518** NM12RBA-M
				03 3 NC ⊖	**084 519** NM03RBA-M

For safety precautions see page 132
For technical data see page 99

Safety switch NM..KB with roller arm

Approach direction

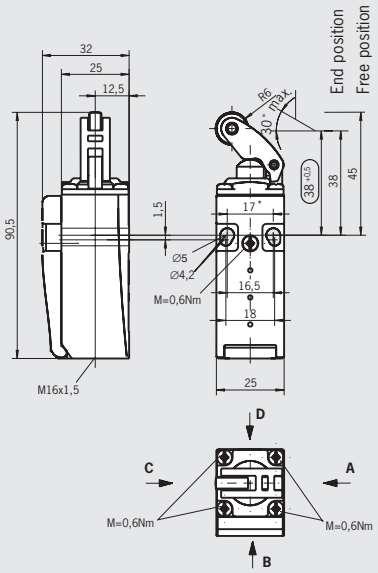
Horizontal
Can be adjusted in 90° steps.

Switching elements

- **ES01** Slow-action switching element 1 NC ⊖
- **ES11** Slow-action switching element 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching element 2 NC ⊖
- **ES12** Slow-action switching element 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching element 3 NC ⊖

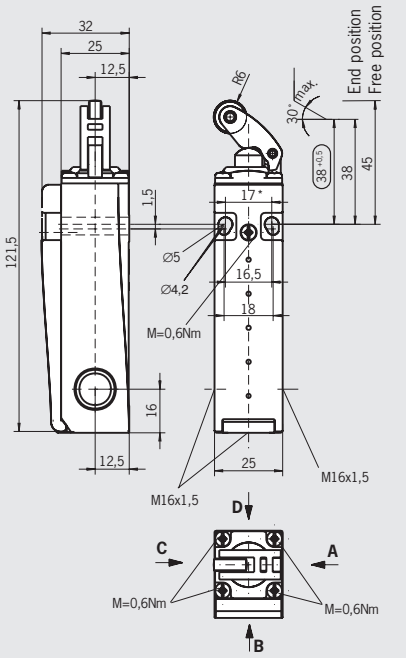
Cable entry M16 x 1.5
Short housing

Dimension drawing



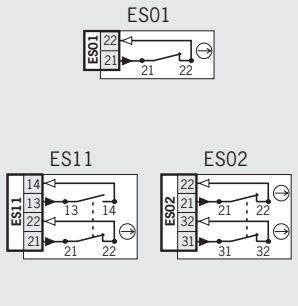
For cable glands see page 89

Cable entry M16 x 1.5
Long housing



For cable glands see page 89

Wiring diagrams Switch not actuated



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	KB Roller arm	Cable entry **1 x M16 x 1.5**	**Short**	**01** 1 NC ⊖	**084 522** NM01KBA-M
				11 1 NC ⊖ + 1 NO	**095 371** NM11KBA-MC2069
				02 2 NC ⊖	**095 370** NM02KBA-MC2069
		Cable entry **3 x M16 x 1.5**	**Long**	**11** 1 NC ⊖ + 1 NO	**084 523** NM11KBA-M
				02 2 NC ⊖	**084 524** NM02KBA-M
				12 2 NC ⊖ + 1 NO	**084 525** NM12KBA-M
				03 3 NC ⊖	**084 526** NM03KBA-M

Safety switch NM..HB with lever arm

Approach direction

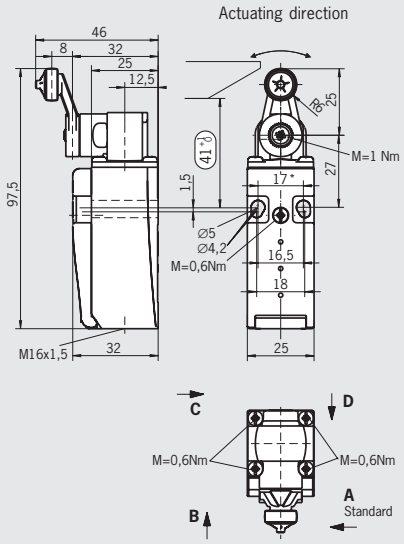
Horizontal
Can be adjusted in 90° steps.

Switching elements

- **ES01** Slow-action switching element 1 NC ⊖
- **ES11** Slow-action switching element 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching element 2 NC ⊖
- **ES12** Slow-action switching element 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching element 3 NC ⊖

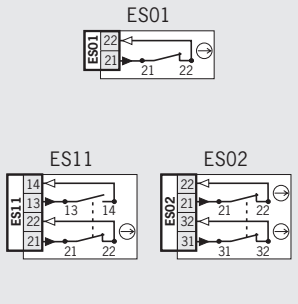
Cable entry M16 x 1.5
Short housing

Dimension drawing

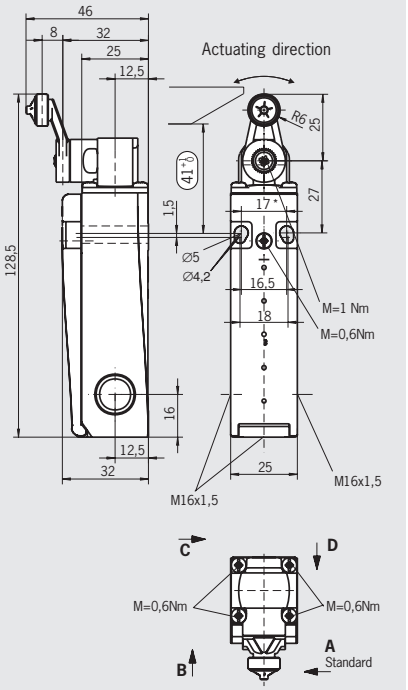


For cable glands see page 89

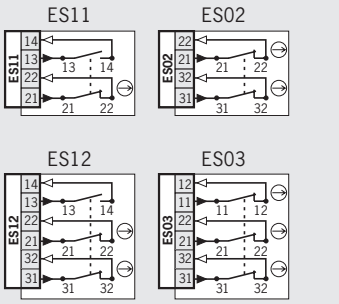
Wiring diagrams Switch not actuated



Cable entry M16 x 1.5
Long housing



For cable glands see page 89



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	HB Lever arm	Cable entry **1 x M16 x 1.5**	**Short**	**01** 1 NC ⊖	**084 527** NM01HBA-M
				11 1 NC ⊖ + 1 NO	**095 369** NM11HBA-MC2069
				02 2 NC ⊖	**095 368** NM02HBA-MC2069
		Cable entry **3 x M16 x 1.5**	**Long**	**11** 1 NC ⊖ + 1 NO	**084 528** NM11HBA-M
				02 2 NC ⊖	**084 529** NM02HBA-M
				12 2 NC ⊖ + 1 NO	**084 530** NM12HBA-M
				03 3 NC ⊖	**084 531** NM03HBA-M

For safety precautions see page 132
For technical data see page 99

Safety switch NM..AV / NM..AL

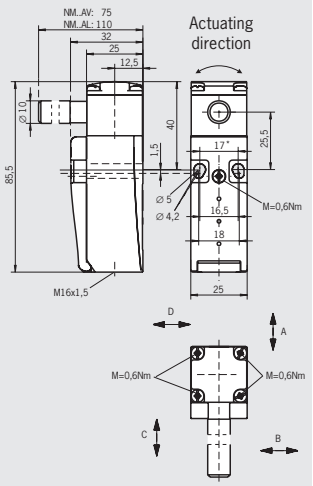
- **Hinged actuator as solid shaft**
- **Shaft length 75 mm or 110 mm**

Switching elements

- **ES01** Slow-action switching element 1 NC ⊖
- **ES11** Slow-action switching element 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching element 2 NC ⊖
- **ES12** Slow-action switching element 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching element 3 NC ⊖

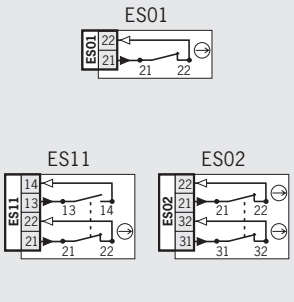
Cable entry M16 x 1.5
Short housing

Dimension drawing

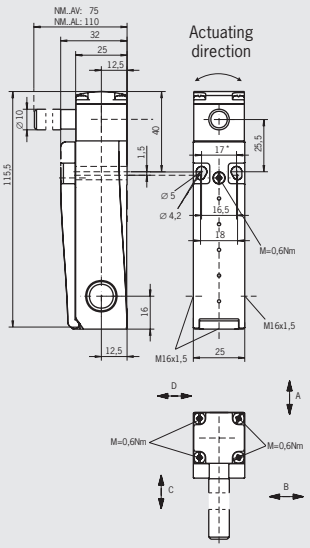


For cable glands see page 89

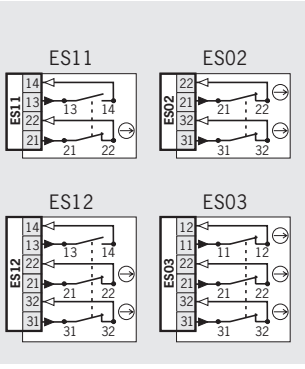
Wiring diagrams Switch not actuated



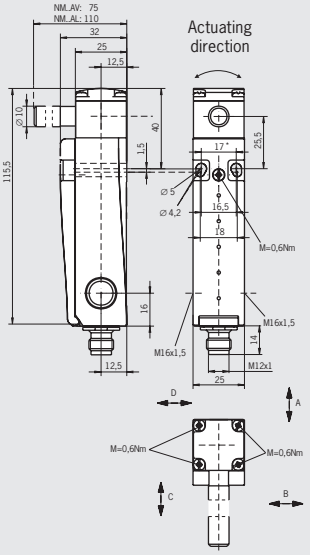
Cable entry M16 x 1.5
Long housing



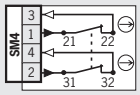
For cable glands see page 89



Plug connector M12
4-pin, long housing



For plug connectors see page 87



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	AV Hinged actuator solid shaft length 75 mm	Cable entry 1 x M16 x 1.5	Short	01 1 NC ⊖	084 545 NM01AV-M
				11 1 NC ⊖ + 1 NO	095 367 NM11AV-MC2069
				02 2 NC ⊖	095 366 NM02AV-MC2069
		Cable entry 3 x M16 x 1.5	Long	11 1 NC ⊖ + 1 NO	084 546 NM11AV-M
				02 2 NC ⊖	084 547 NM02AV-M
				12 2 NC ⊖ + 1 NO	084 548 NM12AV-M
				03 3 NC ⊖	084 549 NM03AV-M
	AL Hinged actuator solid shaft length 110 mm	Cable entry 1 x M16 x 1.5	Short	01 1 NC ⊖	079 117 NM01AL-M
				11 1 NC ⊖ + 1 NO	095 365 NM11AL-MC2069
				02 2 NC ⊖	095 364 NM02AL-MC2069
		Cable entry 3 x M16 x 1.5	Long	11 1 NC ⊖ + 1 NO	079 118 NM11AL-M
				02 2 NC	079 119 NM02AL-M
				12 2 NC ⊖ + 1 NO	079 120 NM12AL-M
				03 3 NC ⊖	079 121 NM03AL-M
		Plug connector M12	Long	02 2 NC ⊖	093 246 NM02AL-SM4

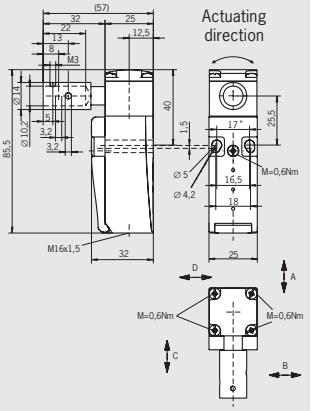
Safety switch NM..AG

- **Hinged actuator as hollow shaft**
- **Internal diameter 10.2 mm**

Switching elements

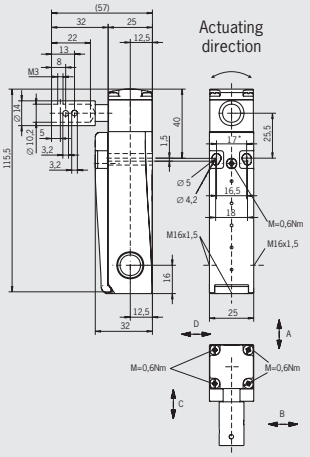
- **ES01** Slow-action switching element 1 NC ⊖
- **ES11** Slow-action switching element 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching element 2 NC ⊖
- **ES12** Slow-action switching element 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching element 3 NC ⊖

Cable entry M16 x 1.5
Short housing



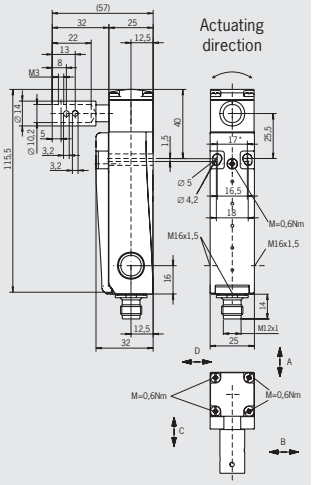
For cable glands see page 89

Cable entry M16 x 1.5
Long housing



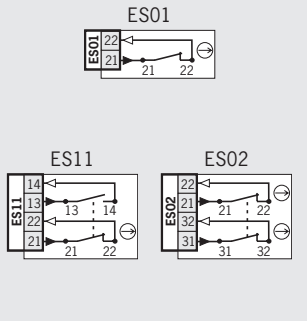
For cable glands see page 89

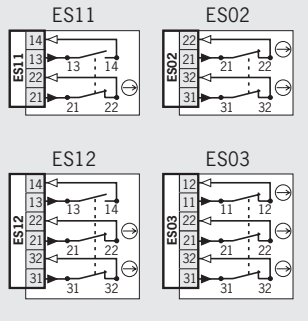
Plug connector M12
4-pin, long housing

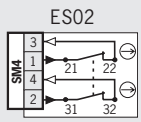


For plug connectors see page 87

Wiring diagrams Switch not actuated







Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	AG Hinged actuator hollow shaft ∅ 10.2 mm	Cable entry **1 x M16 x 1.5**	**Short**	**01** 1 NC ⊖	**084 553** NM01AG-M
				11 1 NC ⊖ + 1 NO	**095 360** NM11AG-MC2069
				02 2 NC ⊖	**095 361** NM02AG-MC2069
		Cable entry **3 x M16 x 1.5**	**Long**	**11** 1 NC ⊖ + 1 NO	**084 554** NM11AG-M
				02 2 NC ⊖	**084 555** NM02AG-M
				12 2 NC ⊖ + 1 NO	**084 556** NM12AG-M
				03 3 NC ⊖	**084 557** NM03AG-M
		Plug connector **M12**	**Long**	**02** 2 NC ⊖	**084 565** NM02AG-SM4

For safety precautions see page 132
For technical data see page 99

Safety switch NM..AK

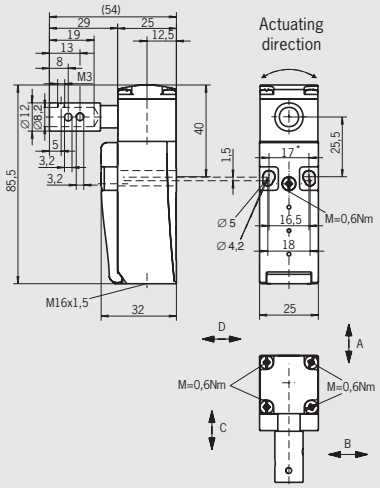
- **Hinged actuator as hollow shaft**
- **Internal diameter 8.2 mm**

Switching elements

- **ES01** Slow-action switching element 1 NC ⊖
- **ES11** Slow-action switching element 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching element 2 NC ⊖
- **ES12** Slow-action switching element 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching element 3 NC ⊖

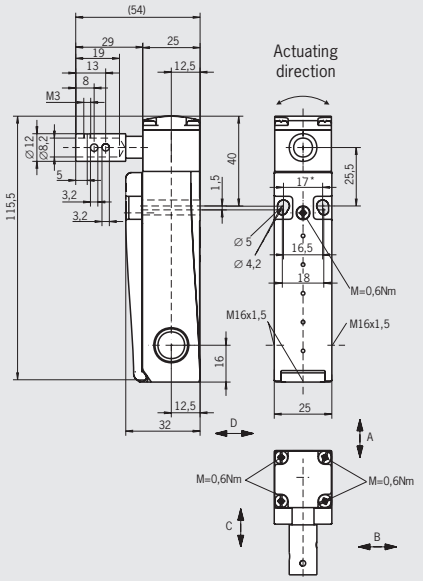
Cable entry M16 x 1.5
Short housing

Dimension drawing



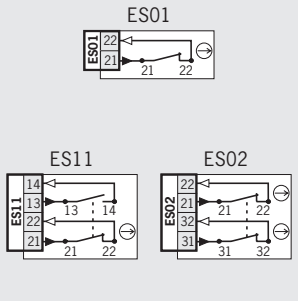
For cable glands see page 89

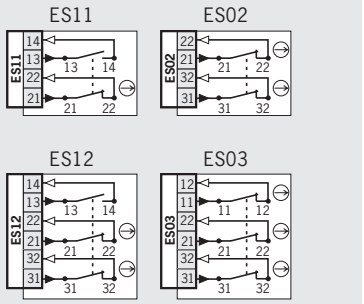
Cable entry M16 x 1.5
Long housing



For cable glands see page 89

Wiring diagrams Switch not actuated





Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	AK Hinged actuator hollow shaft ∅ 8.2 mm	Cable entry **1 x M16 x 1.5**	**Short**	**01** 1 NC ⊖	**084 559** NM01AK-M
				11 1 NC ⊖ + 1 NO	**095 363** NM11AK-MC2069
				02 2 NC ⊖	**095 362** NM02AK-MC2069
		Cable entry **3 x M16 x 1.5**	**Long**	**11** 1 NC ⊖ + 1 NO	**084 560** NM11AK-M
				02 2 NC ⊖	**084 561** NM02AK-M
				12 2 NC ⊖ + 1 NO	**084 562** NM12AK-M
				03 3 NC ⊖	**084 563** NM03AK-M

Selection table for safety switches NM with separate actuator

Connection

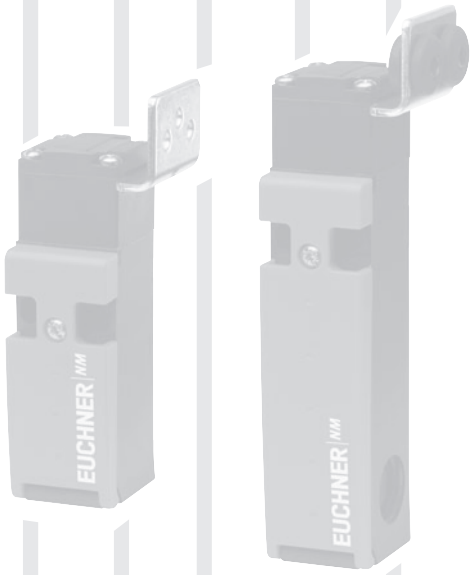
- **M** Thread M16x1.5 for cable glands
- **SM4** Plug connector M12 4-pin

Housing

- **Short**
- **Long**

Switching element

- **One contact** 1 NC ⊖
- **Two contacts** 1 NC ⊖ +1 NO, 2 NC ⊖
- **Three contacts** 2 NC ⊖ + 1 NO, 3 NC ⊖



Connection		Housing		Switching element				Page
M	SM4	Short	Long	One contact	Two contacts	Three contacts		
●		●		●	●			22
	●		●		●	●		23

Safety switch NM..VZ

- **Cable entry M16 x 1.5**
- **M12 plug connector optional**

Approach direction

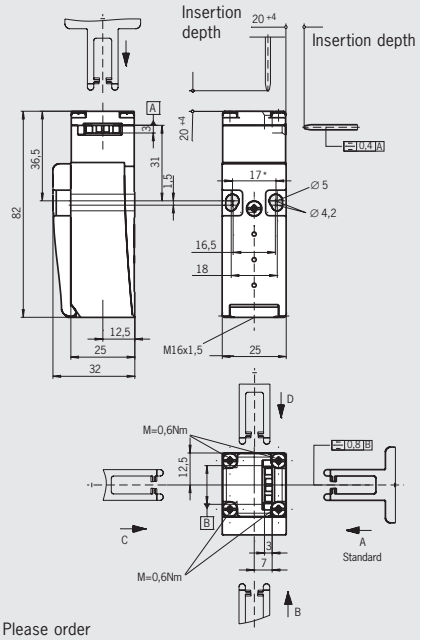
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- **ES01** Slow-action switching element 1 NC ⊖
- **ES11** Slow-action switching element 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching element 2 NC ⊖
- **ES12** Slow-action switching element 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching element 3 NC ⊖

Cable entry M16 x 1.5
Short housing

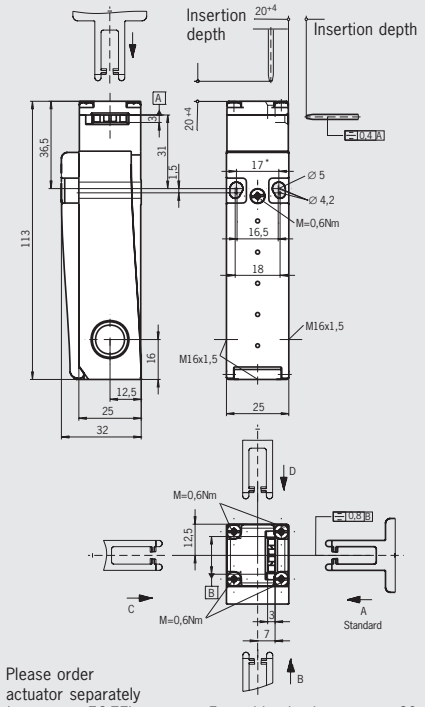
Dimension drawing



Please order actuator separately (see pages 76-77)

For cable glands see page 89

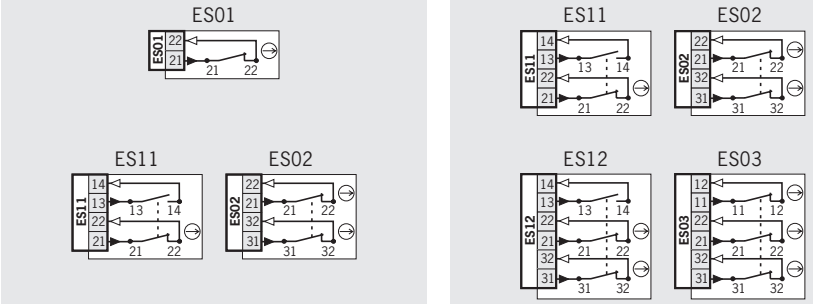
Cable entry M16 x 1.5
Long housing



Please order actuator separately (see pages 76-77)

For cable glands see page 89

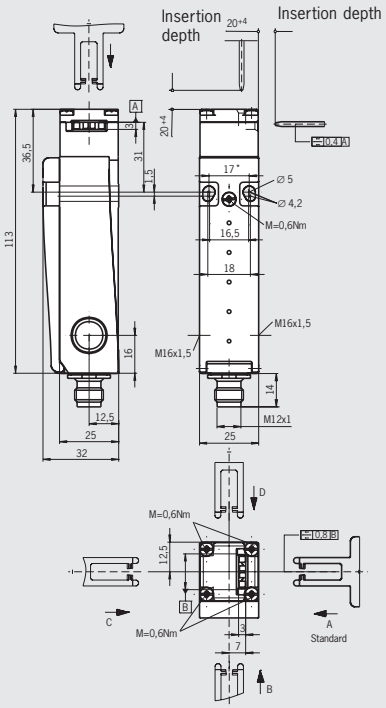
Wiring diagrams Actuator inserted



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	VZ Separate actuator	Cable entry **1 x M16 x 1.5**	**Short**	**01** 1 NC ⊖	**084 451** NM01VZA-M
				11 1 NC ⊖ + 1 NO	**094 471** NM11VZA-MC2069
				02 2 NC ⊖	**094 470** NM02VZA-MC2069
		Cable entry **3 x M16 x 1.5**	**Long**	**11** 1 NC ⊖ + 1 NO	**084 452** NM11VZA-M
				02 2 NC ⊖	**084 453** NM02VZA-M
				12 2 NC ⊖ + 1 NO	**084 454** NM12VZA-M
				03 3 NC ⊖	**084 455** NM03VZA-M

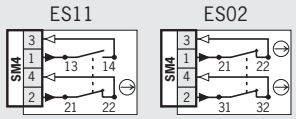
Plug connector M12
4-pin, long housing



Please order actuator separately (see pages 76-77)

For plug connectors see page 87

Wiring diagrams Actuator inserted



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order No. / Item
NM	**VZ** Separate actuator	Plug connector **M12**	**Long**	**11** 1 NC ⊖ + 1 NO	**085 626** NM11VZA-SM4
				02 2 Ö ⊖	**084 564** NM02VZA-SM4

For safety precautions see page 132
For technical data see page 99

Selection table for safety switches NP

Mounting

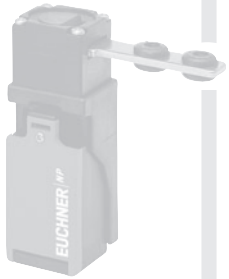
- **AS** — Mounting to DIN EN 50047
- **AB** — Mounting with 40 mm spacing

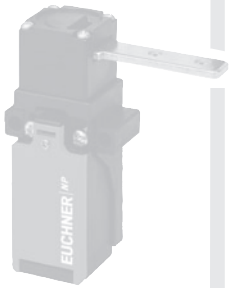
Connection

- **M** — Thread M20 x 1.5 for cable gland
- **SM4** — Plug connector M12 4-pin
- **SR6** — Plug connector; 6 pin + PE

Switching element

- **One contact** — 1 NC ⊖
- **Two contacts** — 1 NC ⊖ +1 NO, 2 NC ⊖
- **Three contacts** — 2 NC ⊖ + 1 NO





Mounting		Connection			Switching element			Page
AS	AB	M	SM	SR6	One contact	Two contacts	Three contacts	
●		●			●	●	●	26
●			●			●		27
●				●	●	●	●	27
	●	●			●	●	●	28
	●		●			●		29
	●			●	●	●		29

Safety switch NP

- **Mounting to DIN EN 50047**
- **Cable entry M20 x 1.5**
- **Plug connector optional**

Approach direction

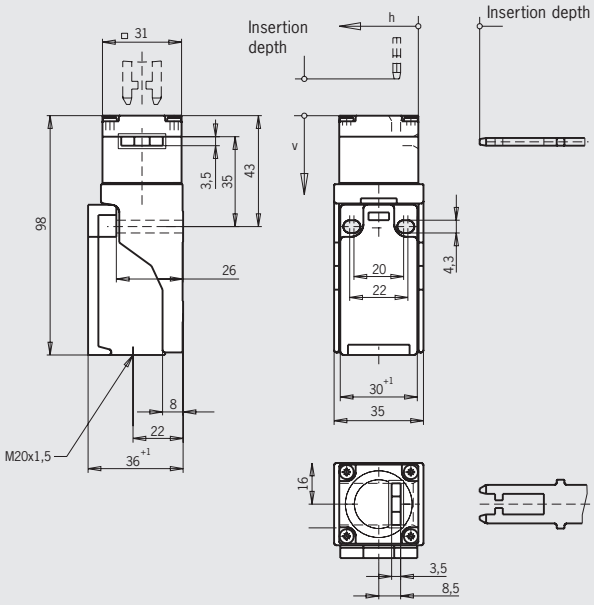
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- **618** Slow-action switching element 1 NC ⊖
- **628** Slow-action switching element 1 NC ⊖ + 1 NO
- **638** Slow-action switching element 2 NC ⊖
- **648** Slow-action switching element 2 NC ⊖ + 1 NO

Cable entry M20 x 1.5

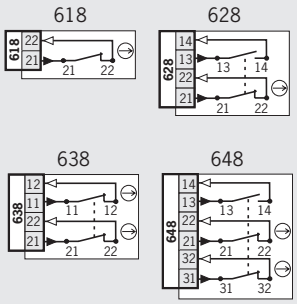
Dimension drawing



Please order actuator separately (see pages 78-81)

For cable glands see page 89

Wiring diagrams Actuator inserted



Ordering table

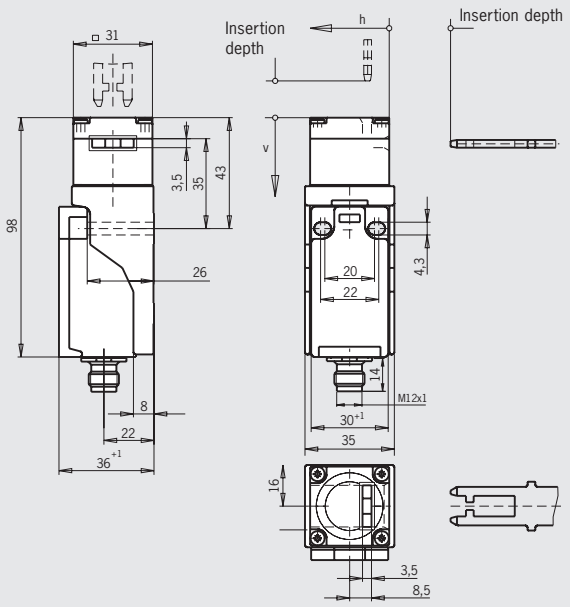
Series	Mounting	Connection	Switching element	Order No. / Item
NP	**AS** acc. to DIN EN 50047	**1** Cable entry **1 x M20 x 1.5**	**618** 1 NC ⊖	**083 685** NP1-618AS-M
			628 1 NC ⊖ + 1 NO	**083 688** NP1-628AS-M
			638 2 NC ⊖	**083 691** NP1-638AS-M
			648 1) 2 NC ⊖ + 1 NO	**082 280** NP1-648AS-M

1) No cULus approval

SIBE Schweiz

Plug connector SM4
M12 plug, 4-pin

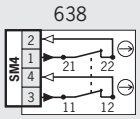
Dimension drawing



Please order actuator separately (see pages 78-81)

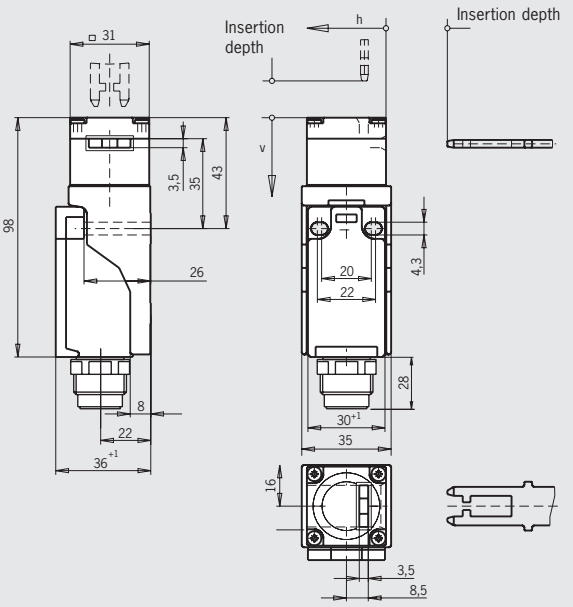
For plug connectors see page 87

Wiring diagrams Actuator inserted



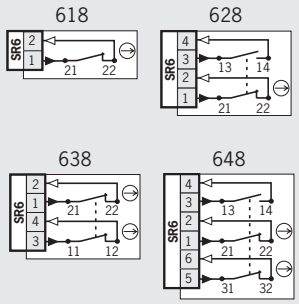
SIBE Schweiz

Plug connector SR6
6-pin + PE



Please order actuator separately (see pages 78-81)

For plug connectors see page 88



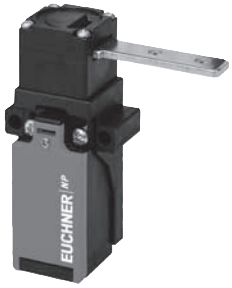
Ordering table

Series	Mounting	Connection	Switching element	Order No. / Item
NP	AS acc. to DIN EN 50047	3 Plug connector SM4	638 2 NC ⊖	084 400 NP3-638AS
		2 Plug connector SR6	618 1 NC ⊖	059 445 NP2-618AS
			628 1 NC ⊖ + 1 NO	059 447 NP2-628AS
			638 2 NC ⊖	059 449 NP2-638AS
			648 2 NC ⊖ + 1 NO	088 924 NP2-648AS

For safety precautions see page 132
For technical data see page 99

Safety switch NP

- **Mounting with 40 mm spacing**
- **Cable entry M20 x 1.5**
- **Plug connector optional**



Approach direction

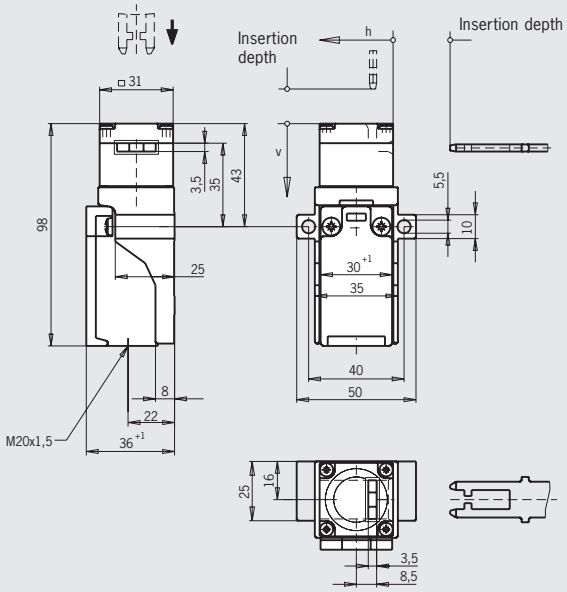
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- **618** Slow-action switching element
  1 NC ⊖
- **628** Slow-action switching element
  1 NC ⊖ + 1 NO
- **638** Slow-action switching element
  2 NC ⊖
- **648** Slow-action switching element
  2 NC ⊖ + 1 NO

Cable entry M20 x 1.5

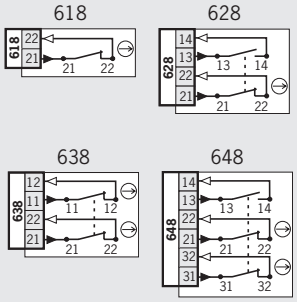
Dimension drawing



Please order actuator separately (see pages 78-81)

For cable glands see page 89

Wiring diagrams Actuator inserted



Ordering table

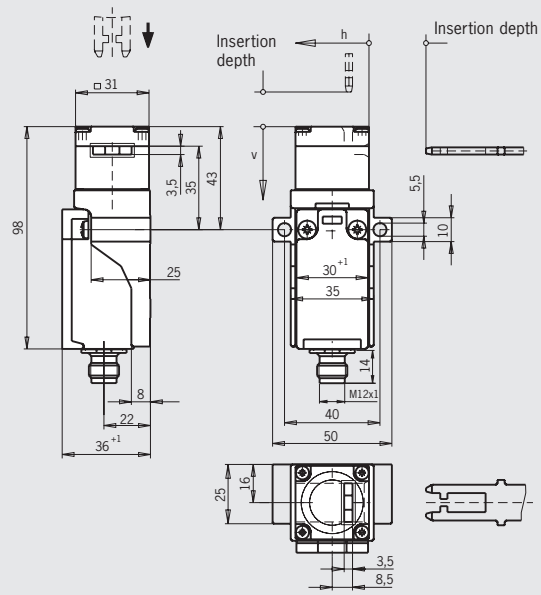
Series	Mounting	Connection	Switching element	Order No. / Item
NP	AB With 40 mm hole spacing	1 Cable entry 1 x M20 x 1.5	**618** 1 NC ⊖	**083 680** NP1-618AB-M
			628 1 NC ⊖ + 1 NO	**083 686** NP1-628AB-M
			638 2 NC ⊖	**083 690** NP1-638AB-M
			648 1) 2 NC ⊖ + 1 NO	**082 276** 1) NP1-648AB-M

1) No cULus approval

SIBE Schweiz

Plug connector SM4
M12 plug, 4-pin

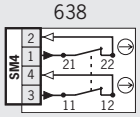
Dimension drawing



Please order actuator separately (see pages 78-81)

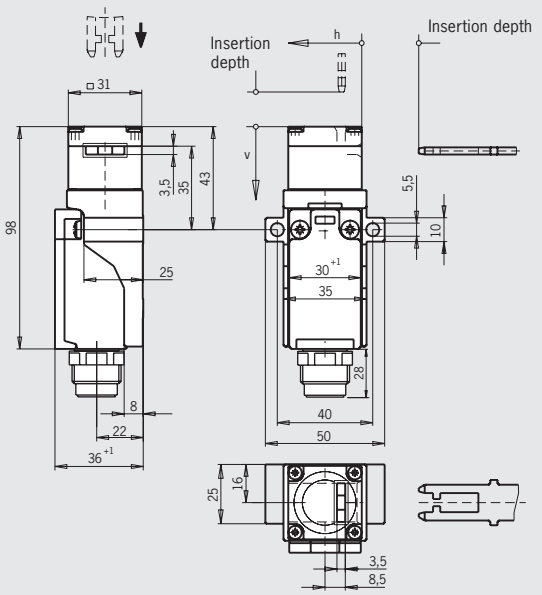
For plug connectors see page 87

Wiring diagrams Actuator inserted



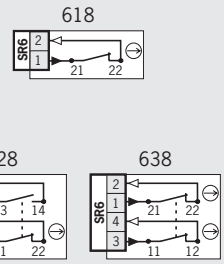
SIBE Schweiz

Plug connector SR6
6-pin + PE



Please order actuator separately (see pages 78-81)

For plug connectors see page 88



Ordering table

Series	Mounting	Connection	Switching element	Order No. / Item
NP	AB With 40 0mm spacing	3 Plug connector SM4	638 2 NC ⊖	094 509 NP3-638AB
		2 Plug connector SR6	618 1 NC ⊖	059 446 NP2-618AB
			628 1 NC ⊖ + 1 NO	059 448 NP2-628AB
			638 2 NC ⊖	059 450 NP2-638AB

For safety precautions see page 132
For technical data see page 99

Selection table for safety switches GP

Connection

- **M** — Thread M20 x 1.5 for cable gland
- **SR11** — Plug connector; 11 pin + PE

Switching element

- **Two contacts** — 1 NC ⊖ + 1 NO, 2 NC ⊖
- **Four contacts** — 2 NC ⊖ + 2 NO, 3 NC ⊖ + 1 NO, 4 NC

Connection		Switching element		Page
M	SR11	Two contacts	Four contacts	
●		●	●	32
	●		●	33

Safety switch GP

- **Cable entry M20 x 1.5**
- **Plug connector optional**

Approach direction

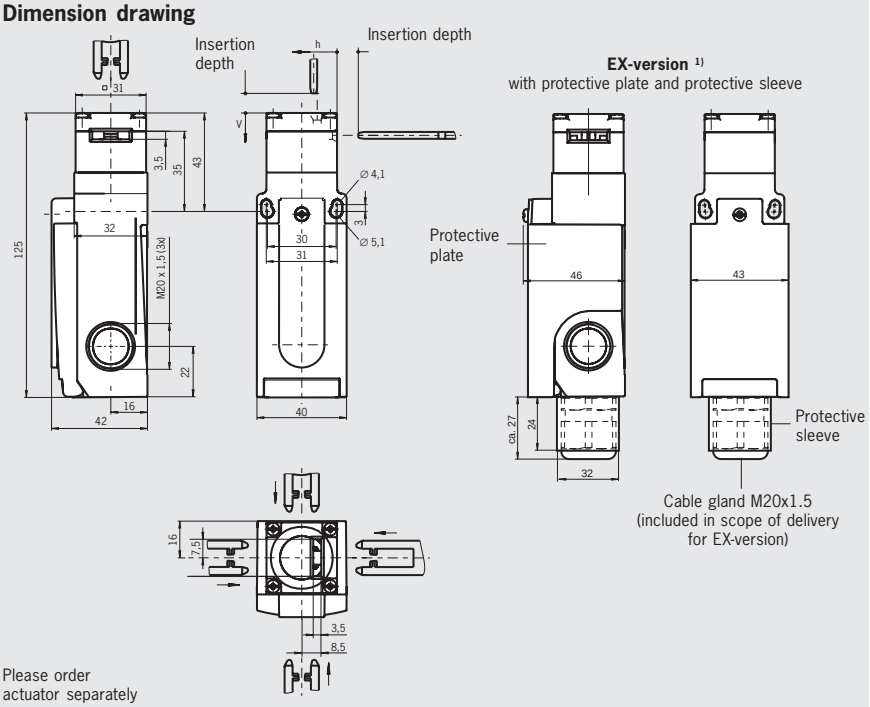
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- **528** Slow-action switching element 1 NC ⊖ + 1 NO
- **538** Slow-action switching element 2 NC ⊖
- **2121** Slow-action switching element 4 NC ⊖
- **2131** Slow-action switching element 3 NC ⊖ + 1 NO
- **3131** Slow-action switching element 2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

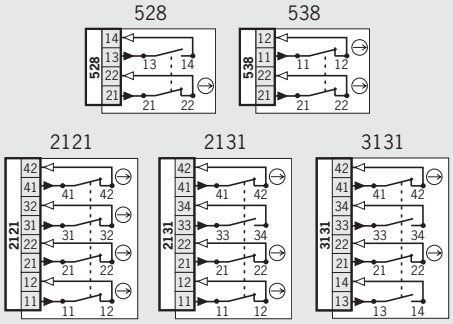
Dimension drawing



Please order actuator separately (see pages 78-81)

For cable glands see page 89

Wiring diagrams Actuator inserted



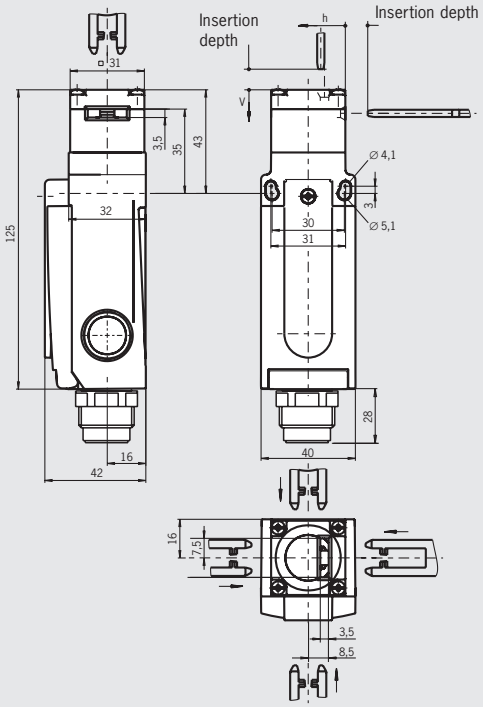
Ordering table

Series	Connection	Switching element	Version	Order No. / Item
GP	1 Cable entry 3 x M20 x 1.5	**528** 1 NC ⊖ + 1 NO		**089 725** GP1-528A-M
		538 2 NC ⊖		**090 250** GP1-538A-M
		2121 4 NC ⊖		**090 252** GP1-2121A-M
		2131 3 NC ⊖ + 1 NO		**090 255** GP1-2131A-M
		2131 3 NC ⊖ + 1 NO	ATEX Incl. cable gland	**095 702** 1) GP1-2131A-M-EX
		3131 2 NC ⊖ + 2 NO		**090 258** GP1-3131A-M

1) Ⓔx II 3 G Ex nC IIC T5
Ⓔx II 3 D Ex tD A22 T90°C

Plug connector SR11
11-pin + PE

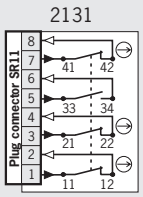
Dimension drawing



Please order actuator separately (see pages 78-81)

For plug connectors see page 88

Wiring diagrams Actuator inserted



Ordering table

Series	Connection	Switching element	Order No. / Item
GP	**2** Plug connector **SR11**	**2131** 3 NC ⊖ + 1 NO	**096 227** GP2-2131ASR11

For safety precautions see page 132
For technical data see page 99

Selection table for safety switches SGP

Connection		
M		Thread M20 x 1.5 for cable gland
SR11		Plug connector; 11 pin + PE
Switching element		
Four contacts		2 NC ⊖ + 2 NO, 3 NC ⊖ + 1 NO, 4 NC ⊖

Connection		Switching element	Page
M	**SR11**	**Four contacts**	
●		●	**36**
	●	●	**37**

Safety switch SGP

- **Actuating head made of metal**
- **Cable entry M20 x 1.5**
- **Plug connector optional**

Approach direction

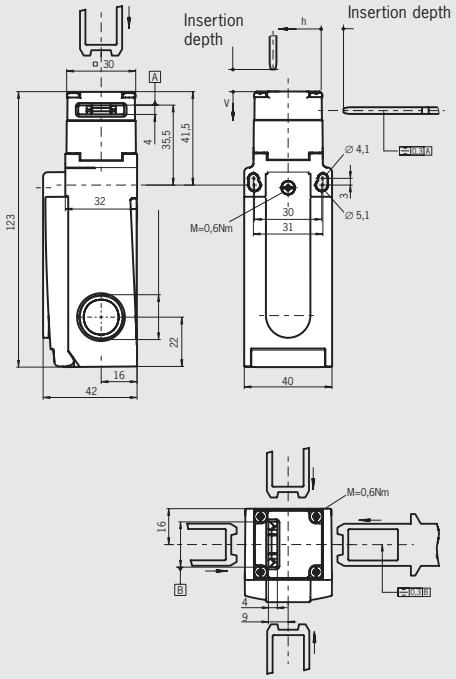
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- **2121** Slow-action switching element
  4 NC ⊖
- **2131** Slow-action switching element
  3 NC ⊖ + 1 NO
- **3131** Slow-action switching element
  2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

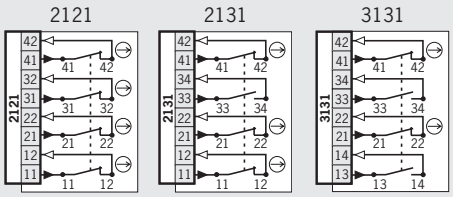
Dimension drawing



Please order actuator separately (see pages 82-84)

For cable glands see page 89

Wiring diagrams Actuator inserted

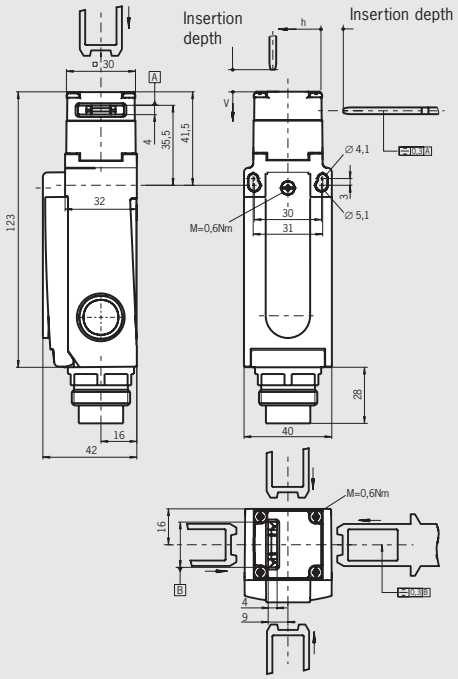


Ordering table

Series	Connection	Switching element	Version	Order No. / Item
SGP	1 Cable entry 3 x M20 x 1.5	2121 4 NC ⊖		097 705 SGP1E-2121A-M
		2131 3 NC ⊖ + 1 NO		097 706 SGP1E-2131A-M
		3131 2 NC ⊖ + 2 NO		097 707 SGP1E-3131A-M

Plug connector SR11
11-pin + PE

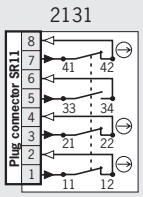
Dimension drawing



Please order actuator separately (see pages 82-84)

For plug connectors see page 88

Wiring diagrams Actuator inserted



Ordering table

Series	Connection	Switching element	Order No. / Item
SGP	**2** Plug connector **SR11**	**2131** 3 NC ⊖ + 1 NO	**099 084** SGP2E-2131ASR11

For safety precautions see page 132
For technical data see page 99

Selection table for safety switches TP with guard locking and guard lock monitoring

Release feature

- **HE** Mechanical release on the front
- **FE** Escape release on the rear side

Door monitoring

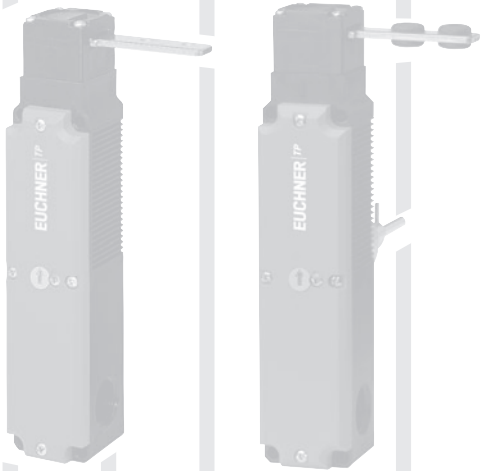
- **TP1/2** Without door monitoring contact
- **TP3/4** With door monitoring contact
- **TP5/6** With door unlock request contact

Overtravel

- **A** Increased horizontal overtravel
- **K** Increased horizontal and vertical overtravel

Connection

- **M** Thread M20x1.5 for cable glands
- **SR6** Plug connector; 6-pin+PE
- **SM8** Plug connector M12; 8-pin
- **SR11** Plug connector; 11-pin+PE



Release feature		Door monitoring			Overtravel		Connection				Page
HE	FE	TP1/2	TP3/4	TP5/6	A	K	M	SR6	SM8	SR11	
●		●			●		●				40
●		●			●			●		●	41
●		●				●	●				42
●		●				●		●		●	43
●			●		●		●				44 - 47
●			●		●			●	●		48
●			●		●					●	49
●			●			●	●				50
●			●			●		●		●	51
				●	●		●			●	52
●	●		●		●		●				49

Safety switch TP with guard locking and guard lock monitoring

- **Mechanical release on the front**
- **Without door monitoring contact**
- **Increased horizontal overtravel**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps
Increased overtravel for horizontal approach direction.

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

LED function display (optional)

A function display (2 LEDs, red and green) is available for the following voltage ranges:

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

Guard locking types

TP1 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

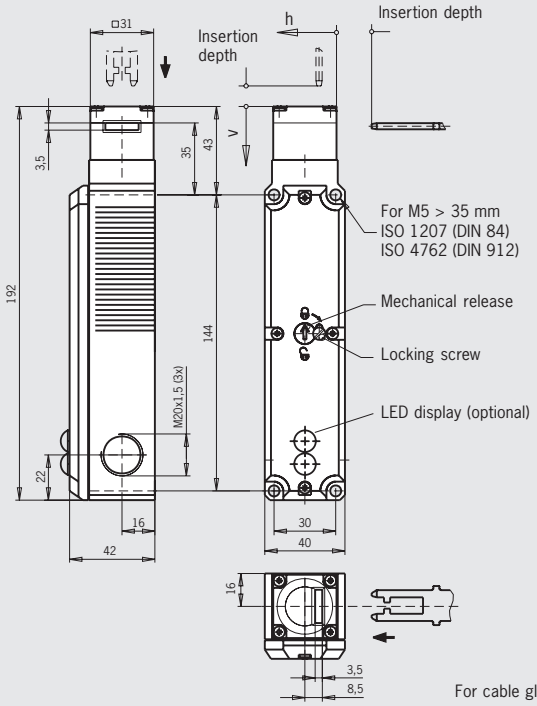
TP2 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements

- **528** Slow-action switching element 1 NC ⊖ + 1 NO
- **538** Slow-action switching element 2 NC ⊖
- **2121** Slow-action switching element 4 NC ⊖
- **4131** Slow-action switching element 2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

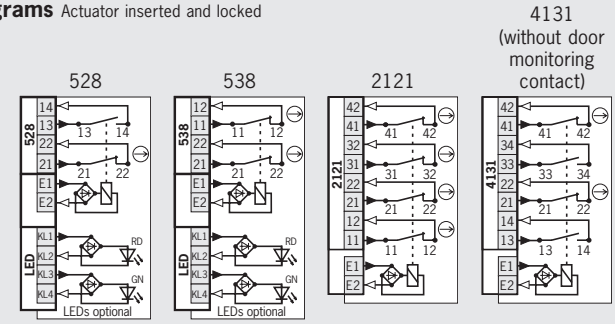
Dimension drawing



Please order actuator separately (see pages 78-81)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 108

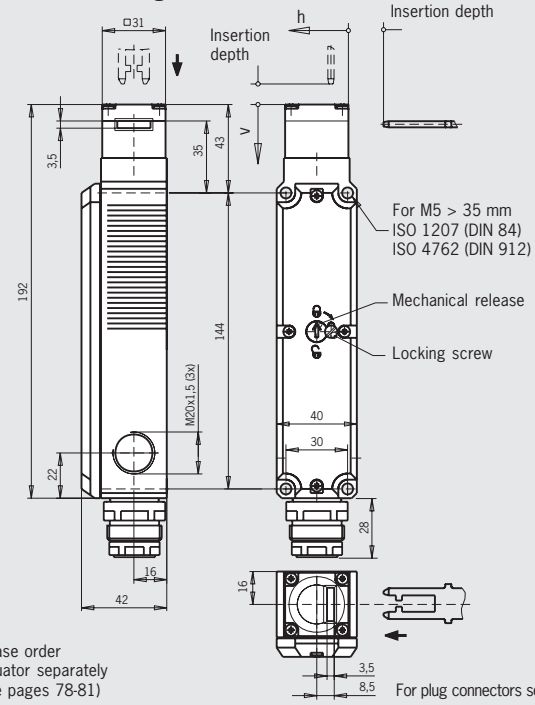
Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
TP	M Cable entry 3 x M20 x 1.5	1 Mechanical	**528** 1 NC ⊖ + 1 NO		**084 295** TP1-528A024M	**084 300** TP1-528A110M	**084 304** TP1-528A230M
			528 1 NC ⊖ + 1 NO	**024L** LED display AC/DC 24 V	**094 058** TP1-528A024L024M	-	-
			538 2 NC ⊖		**084 310** TP1-538A024M	**084 315** TP1-538A110M	**084 320** TP1-538A230M
			538 2 NC	**024L** LED display AC/DC 24 V	**093 459** TP1-538A024L024M	-	-
			4131 2 NC ⊖ + 2 NO		**084 115** TP1-4131A024M	**084 116** TP1-4131A110M	**084 117** TP1-4131A230M
		2 Electrical	**528** 1 NC ⊖ + 1 NO		**084 325** TP2-528A024M	**084 330** TP2-528A110M	**084 332** TP2-528A230M
			538 2 NC ⊖		**084 333** TP2-538A024M	**084 334** TP2-538A110M	**084 335** TP2-538A230M
			2121 4 NC ⊖		**096 528** TP2-2121A024M	-	-
			4131 2 NC ⊖ + 2 NO		**084 125** TP2-4131A024M	**084 126** TP2-4131A110M	**084 128** TP2-4131A230M

1) with cable entry M, DC 24 V / AC 110 V

Plug connector SR6
6-pin + PE

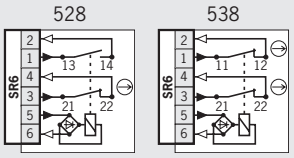
Dimension drawing



Please order actuator separately (see pages 78-81)

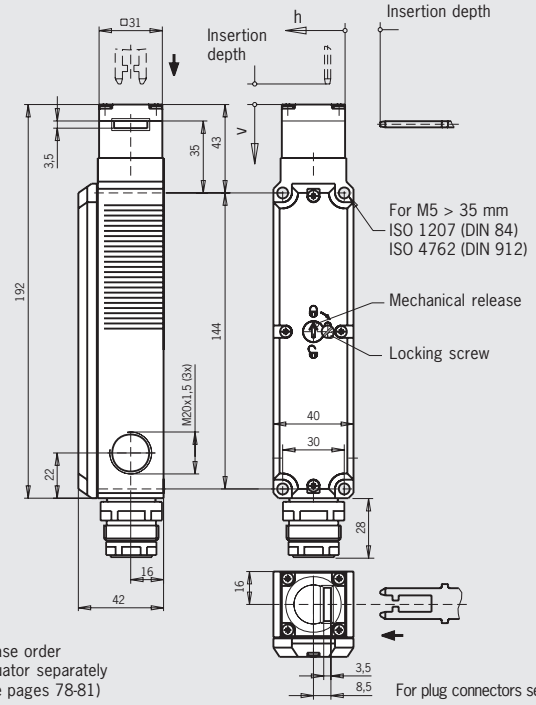
For plug connectors see page 88

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 108

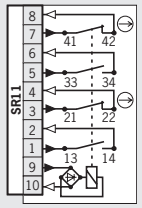
Plug connector SR11
11-pin + PE



Please order actuator separately (see pages 78-81)

For plug connectors see page 88

4131
(without door monitoring contact)



For switching functions see technical data on page 108

Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage		
				AC/DC 24 V	AC 110 V	AC 230 V
TP	SR6 Plug connector	1 Mechanical	528 1 NC ⊖ + 1 NO	087 431 TP1-528A024SR6	087 435 TP1-528A110SR6	087 438 TP1-528A230SR6
			538 2 NC ⊖	087 433 TP1-538A024SR6	087 436 TP1-538A110SR6	087 439 TP1-538A230SR6
		2 Electrical	528 1 NC ⊖ + 1 NO	087 441 TP2-528A024SR6	087 444 TP2-528A110SR6	087 448 TP2-528A230SR6
			538 2 NC ⊖	087 442 TP2-538A024SR6	087 446 TP2-538A110SR6	087 449 TP2-538A230SR6
	SR11 Plug connector	1 Mechanical	4131 2 NC ⊖ + 2 NO	088 202 TP1-4131A024SR11	-	-
		2 Electrical	4131 2 NC ⊖ + 2 NO	088 203 TP2-4131A024SR11	-	-

For safety precautions see page 132
For technical data see page 99

Safety switch TP with guard locking and guard lock monitoring

- **Mechanical release on the front**
- **Without door monitoring contact**
- **Increased overtravel for horizontal and vertical approach direction**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps
Increased overtravel for horizontal and vertical approach direction.

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

Guard locking types

TP1 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

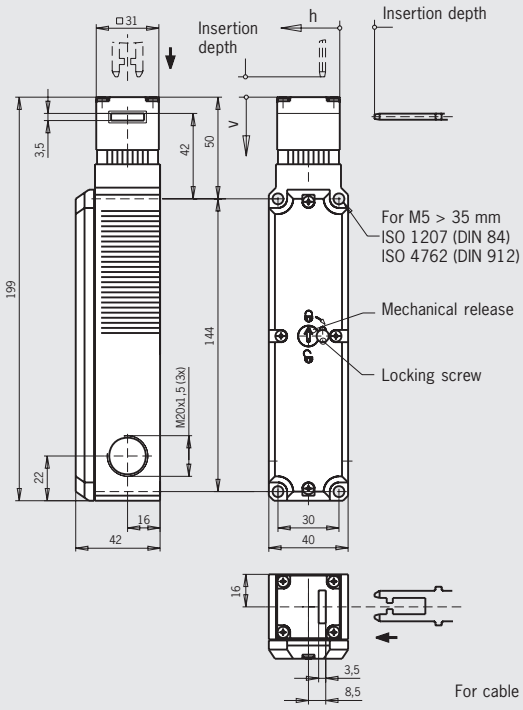
TP2 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements

- **528** Slow-action switching element 1 NC ⊖ + 1 NO
- **538** Slow-action switching element 2 NC ⊖
- **4131** Slow-action switching element 2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

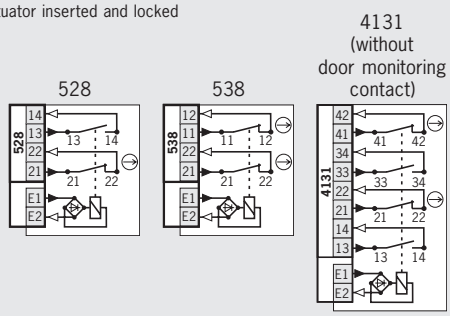
Dimension drawing



Please order actuator separately (see pages 78-81)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 108

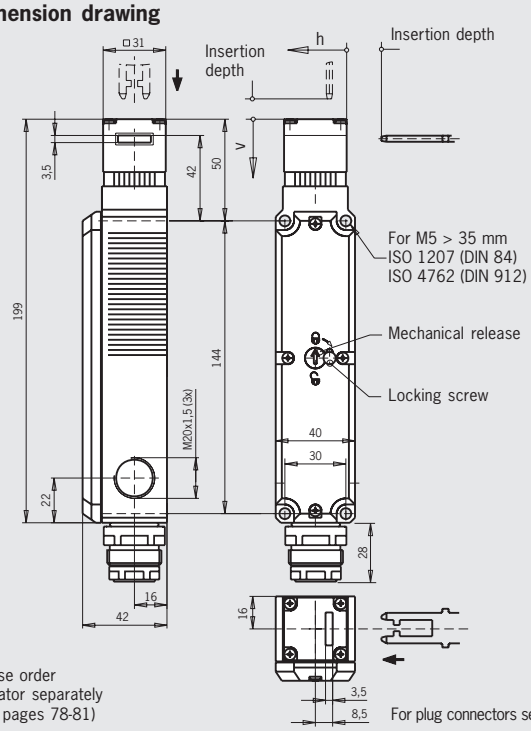
Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage		
				AC/DC 24 V	AC 110 V	AC 230 V
TP	M Cable entry 3 x M20 x 1.5	1 Mechanical	**528** 1 NC ⊖ + 1 NO	**084 342** TP1-528K024M	On request	On request
			538 2 NC ⊖	**084 343** TP1-538K024M	On request	On request
			4131 2 NC ⊖ + 2 NO	**084 150** TP1-4131K024M	**084 254** TP1-4131K110M	**084 255** TP1-4131K230M
		2 Electrical	**528** 1 NC ⊖ + 1 NO	**084 344** TP2-528K024M	On request	On request
			538 2 NC ⊖	**084 346** TP2-538K024M	On request	On request
			4131 2 NC ⊖ + 2 NO	**084 253** TP2-4131K024M	On request	On request

1) With cable entry M, DC 24 V / AC 110 V

Plug connector SR6
6-pin + PE

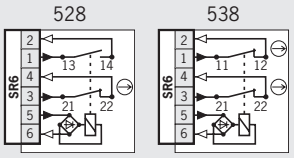
Dimension drawing



Please order actuator separately (see pages 78-81)

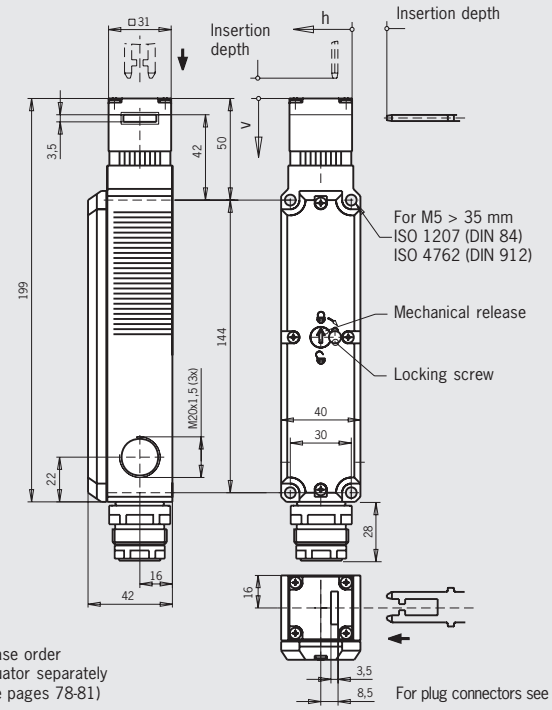
For plug connectors see page 88

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 108

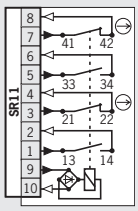
Plug connector SR11
11-pin + PE



Please order actuator separately (see pages 78-81)

For plug connectors see page 88

4131
(without door monitoring contact)



For switching functions see technical data on page 108

Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage		
				AC/DC 24 V	AC 110 V	AC 230 V
TP	SR6 Plug connector	1 Mechanical	**528** 1 NC ⊖ + 1 NO	**088 210** TP1-528K024SR6	On request	On request
			538 2 NC ⊖	**088 212** TP1-538K024SR6	On request	On request
		2 Electrical	**528** 1 NC ⊖ + 1 NO	**088 214** TP2-528K024SR6	On request	On request
			538 2 NC ⊖	**088 215** TP2-538K024SR6	On request	On request
	SR11 Plug connector	1 Mechanical	**4131** 2 NC ⊖ + 2 NO	**088 217** TP1-4131K024SR11	-	-
		2 Electrical	**4131** 2 NC ⊖ + 2 NO	**088 218** TP2-4131K024SR11	-	-

For safety precautions see page 132
For technical data see page 99

Safety switch TP with guard locking and guard lock monitoring

- **Mechanical release on the front**
- **With door monitoring contact**
- **Increased horizontal overtravel**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps
Increased overtravel for horizontal approach direction.

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

Guard locking types

TP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

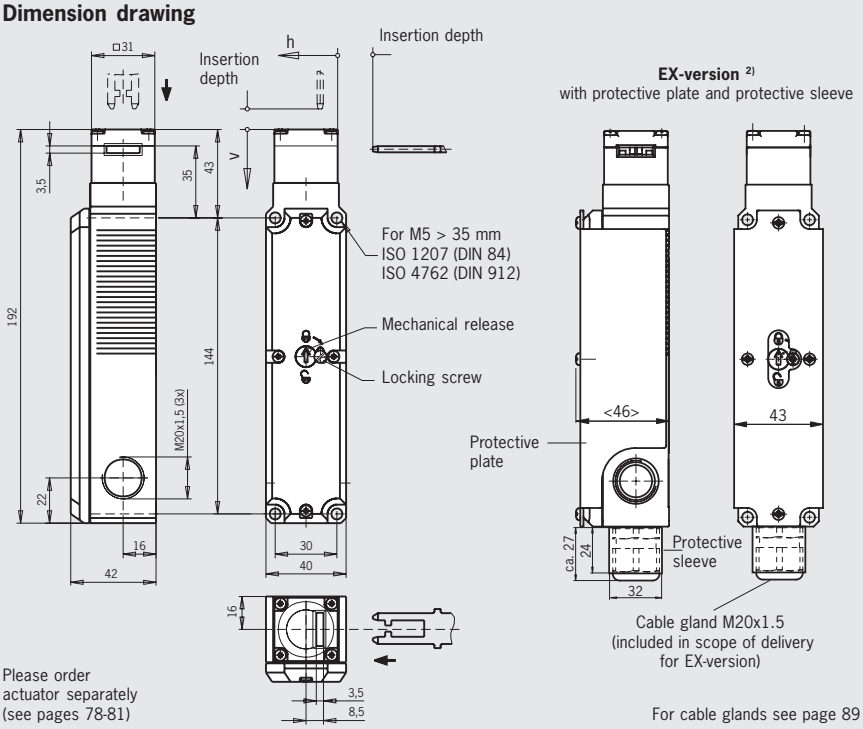
TP4 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements

- **537** Slow-action switching element
  1 NC ⊖ + 1 NC (door monitoring contact)
- **2131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NC (door monitoring contact)
- **4121** Slow-action switching element
  2 NC ⊖ + 1 NC / 1 NO (door monit. contact)
- **4131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NO (door monit. contact)
- **4141** Slow-action switching element
  2 NC ⊖ + 2NC (door monit. contacts)

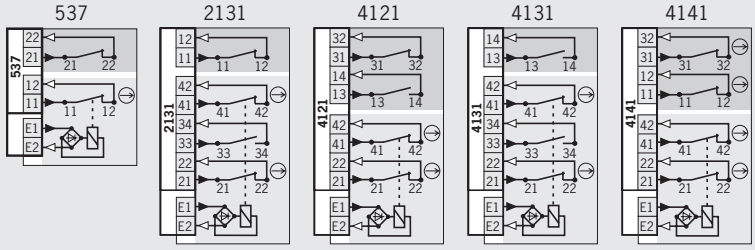
Cable entry M20 x 1.5

Dimension drawing



For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 109

Ordering table

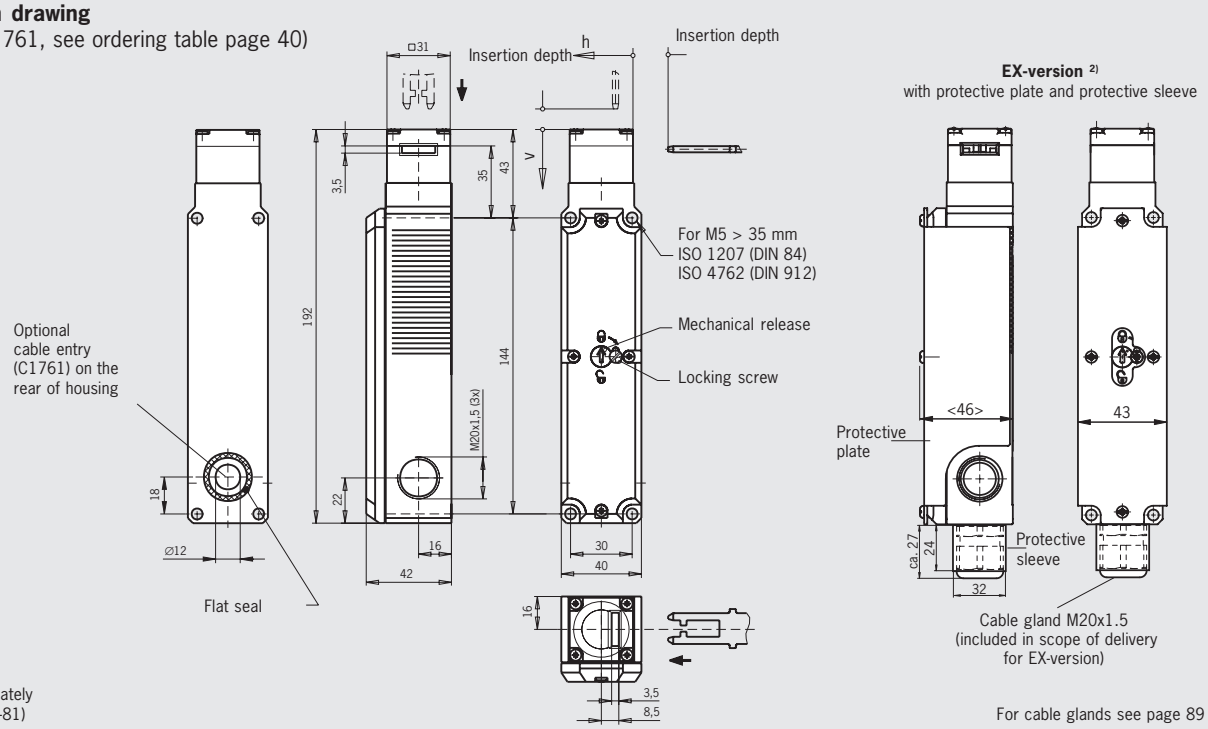
Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
TP	M Cable entry 3 x M20 x 1.5	3 Mechanical	**537** 1 NC ⊖ + 1 NC		**084 336** TP3-537A024M	**084 337** TP3-537A110M	**084 338** TP3-537A230M
			2131 2 NC ⊖ + 1 NO + 1NC		**084 142** TP3-2131A024M	**084 143** TP3-2131A110M	**084 144** TP3-2131A230M
				ATEX Incl. cable gland	**093 791** 2) TP3-2131A024M-EX	-	-
				C1761 Cable wiring in rear of housing	**084 290** 3) TP3-2131A024MC1761	-	-
			4121 2 NC ⊖ + 1 NC / 1 NO		**084 135** TP3-4121A024M	**084 137** TP3-4121A110M	**084 138** TP3-4121A230M
			4131 2 NC ⊖ + 1 NO + 1 NO		**084 129** TP3-4131A024M	**084 130** TP3-4131A110M	**084 131** TP3-4131A230M
			4141 2 NC ⊖ + 2 NC ⊖		**084 270** 5) TP3-4141A024M	**088 264** 5) TP3-4141A110M	-

1) With cable entry M, DC 24 V / AC 110 V 2) Ⓔx II 3 G Ex nC IIC T4 / Ⓔx II 3 D Ex tD A22 T110°C 3) No SIBE approvals

Ex 2)

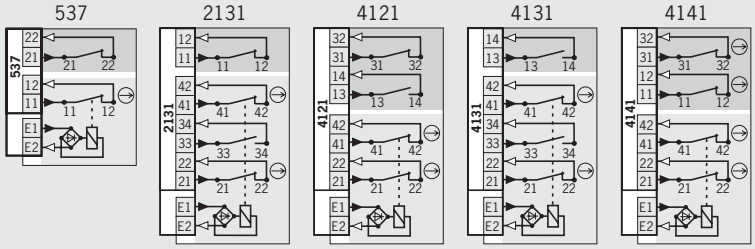
Cable entry M20 x 1.5

Dimension drawing
(Version C1761, see ordering table page 40)



For cable glands see page 89

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on page 109

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
TP	M Cable entry 3 x M20 x 1.5	4 Electrical	537 1 NC ⊖ + 1 NC		084 339 TP4-537A024M	084 340 TP4-537A110M	084 341 TP4-537A230M
			2131 2 NC ⊖ + 1 NO + 1NC		084 145 TP4-2131A024M	084 147 TP4-2131A110M	084 148 TP4-2131A230M
			2131 2 NC ⊖ + 1 NO + 1NC	ATEX Incl. cable gland	093 793 2) TP4-2131A024M-EX	-	-
			4121 2 NC ⊖ + 1 NC / 1 NO		084 139 TP4-4121A024M	084 140 TP4-4121A110M	084 141 TP4-4121A230M
			4131 2 NC ⊖ + 1 NO + 1 NO		084 132 TP4-4131A024M	084 133 TP4-4131A110M	084 134 TP4-4131A230M
			4141 2 NC ⊖ + 2 NC ⊖		084 275 4) TP4-4141A024M	-	-

2) Ex II 3 G Ex nC IIC T4 / Ex II 3 D Ex tD A22 T110°C
4) No SIBE approval

For safety precautions see page 132
For technical data see page 99

Safety switch TP with guard locking and guard lock monitoring

- **Mechanical release on the front**
- **With door monitoring contact**
- **Increased horizontal overtravel**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps
Increased overtravel for horizontal approach direction.

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

LED function display

A function display (2 LEDs, red and green) is available for the following voltage ranges:

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

Guard locking types

TP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

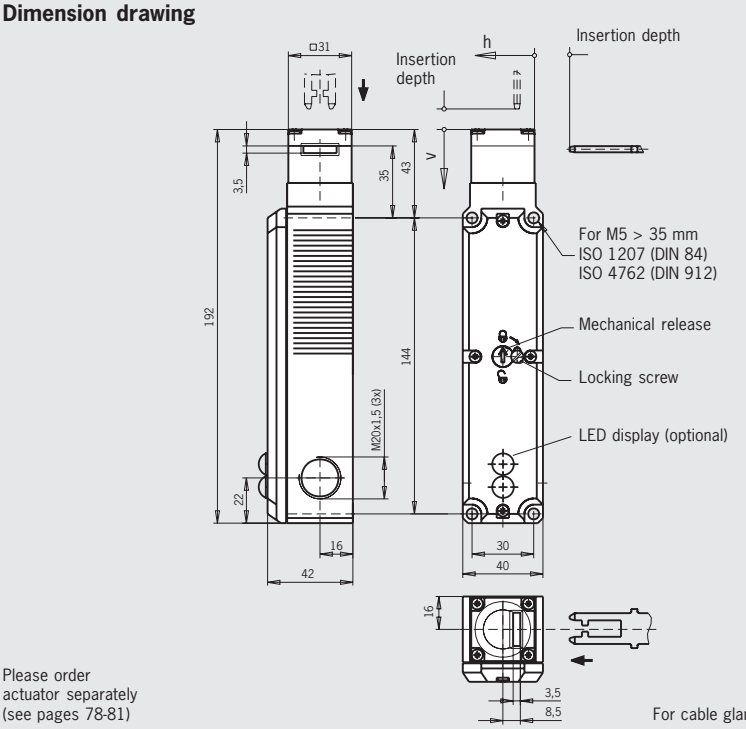
TP4 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements

- **537** Slow-action switching element
  1 NC ⊖ + 1 NC (door monitoring contact)
- **2131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NC (door monit. contact)
- **4121** Slow-action switching element
  2 NC ⊖ + 1 NC / 1 NO (door monit. contact)
- **4131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NO (door monit. contact)

Cable entry M20 x 1.5

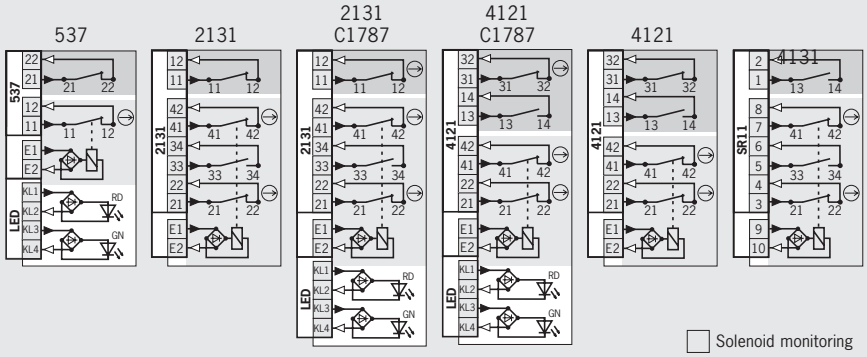
Dimension drawing



Please order actuator separately (see pages 78-81)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



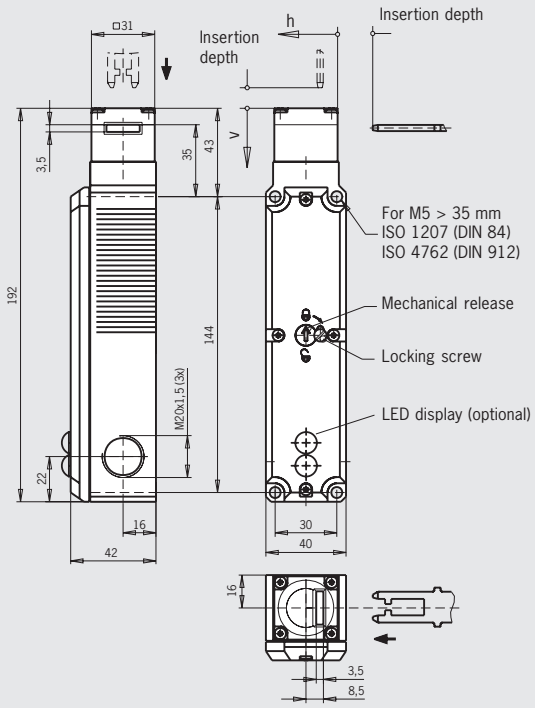
For switching functions see technical data on page 109

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V
TP	M Cable entry 3 x M20 x 1.5	3 Mechanical	**537** 1 NC ⊖ + 1 NC	**024L** LED display AC/DC 24 V	**093 460** TP3-537A024L024M
			2131 2 NC ⊖ + 1 NO + 1NC	**024L** LED display AC/DC 24 V	**093 634** TP3-2131A024L024M
			2131 2 NC ⊖ + 1 NO + 1 NC ⊖	**C1787** 3 positively driven contacts	**084 289** TP3-2131A024MC1787
			4121 2 NC ⊖ + 1 NC/ 1NO	**024L** LED display AC/DC 24 V	**093 636** TP3-4121A024L024M
			4121 2 NC ⊖ + 1 NC ⊖ + 1 NO	**C1787** 3 positively driven contacts	**084 158** TP3-4121A024MC1787
			4131 2 NC ⊖ + 1 NO + 1NO	**024L** LED display AC/DC 24 V	**098 403** TP3-4131A024L024M

Cable entry M20 x 1.5

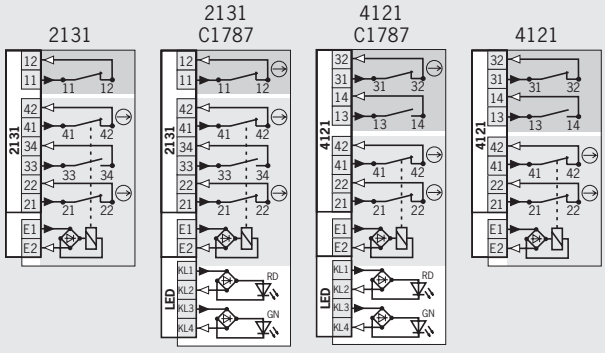
Dimension drawing



Please order actuator separately (see pages 78-81)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 109

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V
TP	M Cable entry 3 x M20 x 1.5	4 Electrical	**2131** 2 NC ⊖ + 1 NO + 1NC	**024L** LED display AC/DC 24 V	**093 635** TP4-2131A024L024M
			2131 2 NC ⊖ + 1 NO + 1 NC ⊖	**C1787** 3 positively driven contacts	**084 159** TP4-2131A024MC1787
			4121 2 NC ⊖ + 1 NC / 1 NO	**024L** LED display AC/DC 24 V	**093 637** TP4-4121A024L024M
			4121 2 NC ⊖ + 1 NC ⊖ + 1 S	**C1787** 3 positively driven contact	**084 160** TP4-4121A024MC1787

For safety precautions see page 132
For technical data see page 99

Safety switch TP with guard locking and guard lock monitoring

- **Mechanical release on the front**
- **With door monitoring contact**
- **Increased horizontal overtravel**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps
Increased overtravel for horizontal approach direction.

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

Guard locking types

TP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

TP4 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

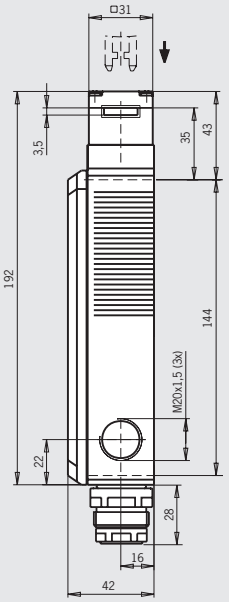
Switching elements

- **537** Slow-action switching element
  1 NC ⊖ + 1 NC (door monitoring contact)
- **2131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NC (door monit. contact)
- **4121** Slow-action switching element
  2 NC ⊖ + 1 NC / 1 NO (door monit. contact)
- **4131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NO (door monit. contact)
- **4141** Slow-action switching element
  2 NC ⊖ + 2NC ⊖ (door monit. contacts)

Plug connector SR6
6-pin + PE

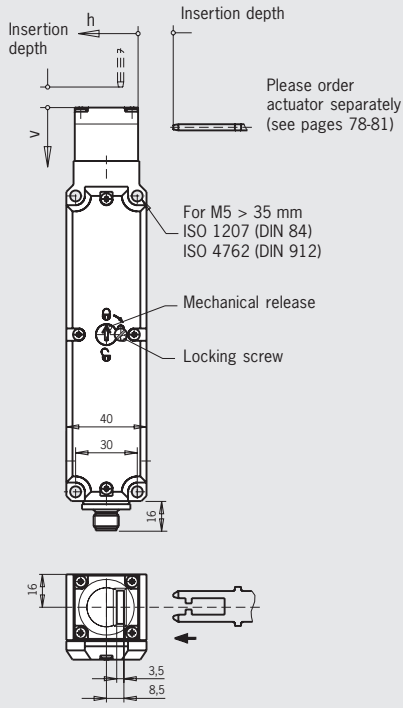
Plug connector SM8
Plug M12, 8-pin

Dimension drawing

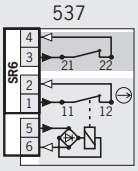


Please order actuator separately (see pages 78-81)

For plug connectors see page 88

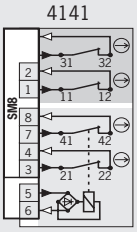


Wiring diagrams Actuator inserted and locked



☐ Solenoid monitoring
☐ Door monitoring

For switching functions see technical data on page 109



☐ Solenoid monitoring
☐ Door monitoring

For switching functions see technical data on page 109

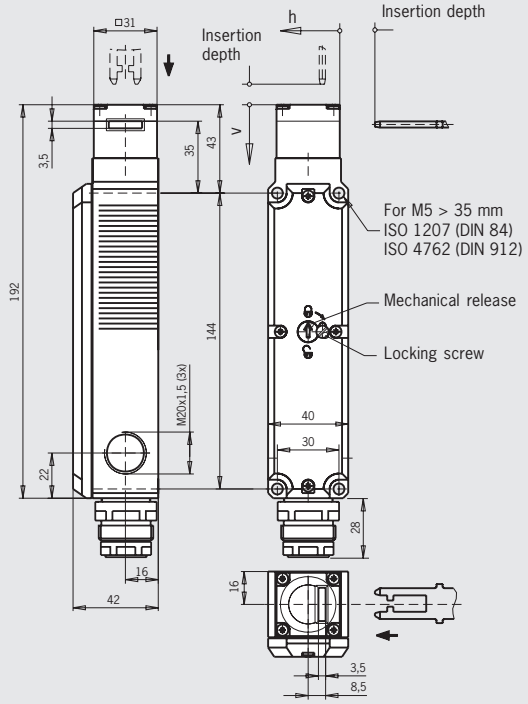
Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
TP	**SR6** Plug connector	**3** Mechanical	**537** 1 NC ⊖ + 1 NC		**087 434** TP3-537A024SR6	**087 437** TP3-537A110SR6	**087 440** TP3-537A230SR6
		4 Electrical	**537** 1 NC ⊖ + 1 NC		**087 443** TP4-537A024SR6	**087 447** TP4-537A110SR6	**087 450** TP4-537A230SR6
	SM8 Plug connector **M12**	**3** Mechanical	**4141** 2 NC ⊖ + 2 NC ⊖	**C1992** Direct connection to safe bus module	**087 377** [1] TP3-4141A024SM8C1992	-	-
		4 Electrical	**4141** 2 NC ⊖ + 2 NC ⊖	**C1992** Direct connection to safe bus module	**087 378** [1] TP4-4141A024SM8C1992	-	-

1) No SIBE approval and no BG approval

Plug connector SR11
11-pin + PE

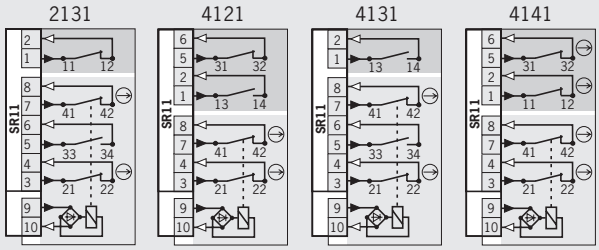
Dimension drawing



Please order actuator separately (see pages 78-81)

For plug connectors see page 88

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 109

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
TP	SR11 Plug connector	3 Mechanical	**2131** 2 NC ⊖ + 1 NO + 1NC		**088 205** TP3-2131A024SR11	-	-
			4121 2 NC ⊖ + 1 NC / 1 NO		**088 206** TP3-4121A024SR11	-	-
			4131 2 NC ⊖ + 1 NO + 1 NO		**088 204** TP3-4131A024SR11	-	-
			4141 2 NC ⊖ + 2 NC ⊖		**088 922** TP3-4141A024SR11	-	-
		4 Electrical	**2131** 2 NC ⊖ + 1 NO + 1NC		**088 208** TP4-2131A024SR11	-	-
			4121 2 NC ⊖ + 1 NC / 1 NO		**088 209** TP4-4121A024SR11	-	-
			4131 2 NC ⊖ + 1 NO + 1 NO		**088 207** TP4-4131A024SR11	-	-
			4141 2 NC ⊖ + 2 NC ⊖		**088 923** [1] TP4-4141A024SR11	-	-

For safety precautions see page 132
For technical data see page 99

Safety switch TP with guard locking and guard lock monitoring

- **Mechanical release on the front**
- **With door monitoring contact**
- **Increased overtravel for horizontal and vertical approach direction**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps
Increased overtravel for horizontal and vertical approach direction.

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

Guard locking types

TP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

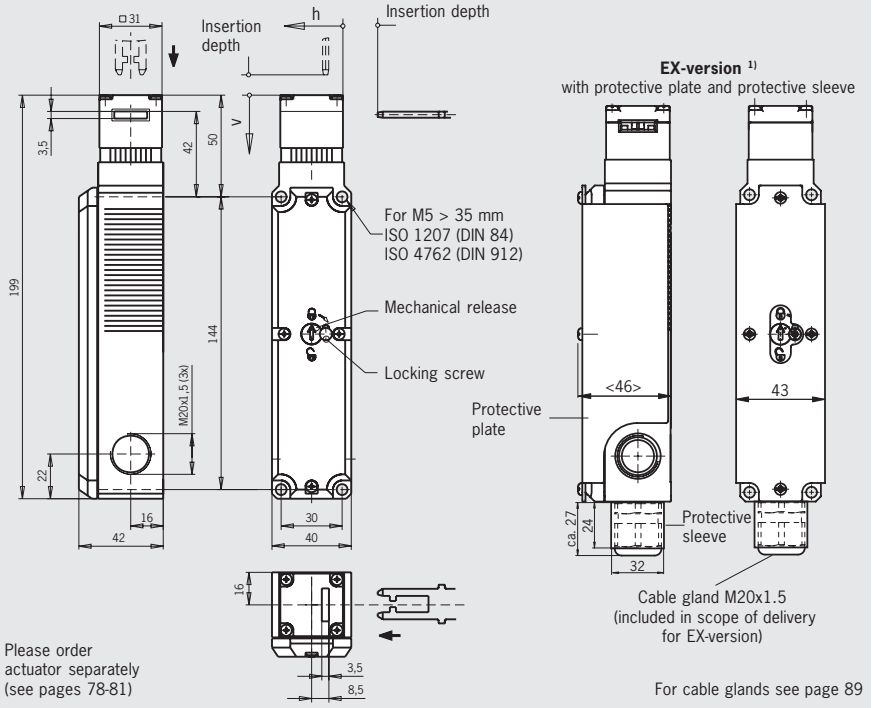
TP4 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements

- **537** Slow-action switching element
  1 NC ⊖ + 1 NC (door monitoring contact)
- **2131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NC (door monit. contact)
- **4121** Slow-action switching element
  2 NC ⊖ + 1 NC / 1 NO (door monit. contact)
- **4131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NO (door monit. contact)
- **4141** Slow-action switching element
  2 NC ⊖ + 2 NC (door monit. contact)

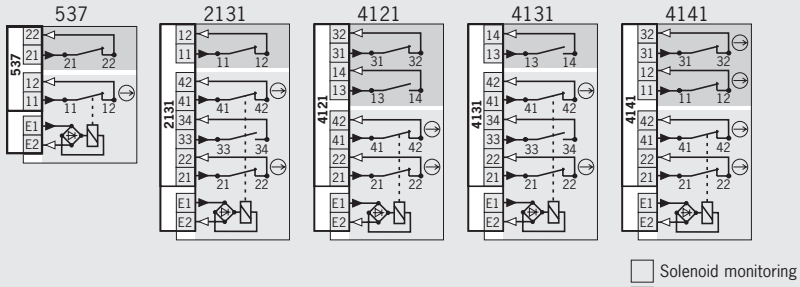
Cable entry M20 x 1.5

Dimension drawing



For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 109

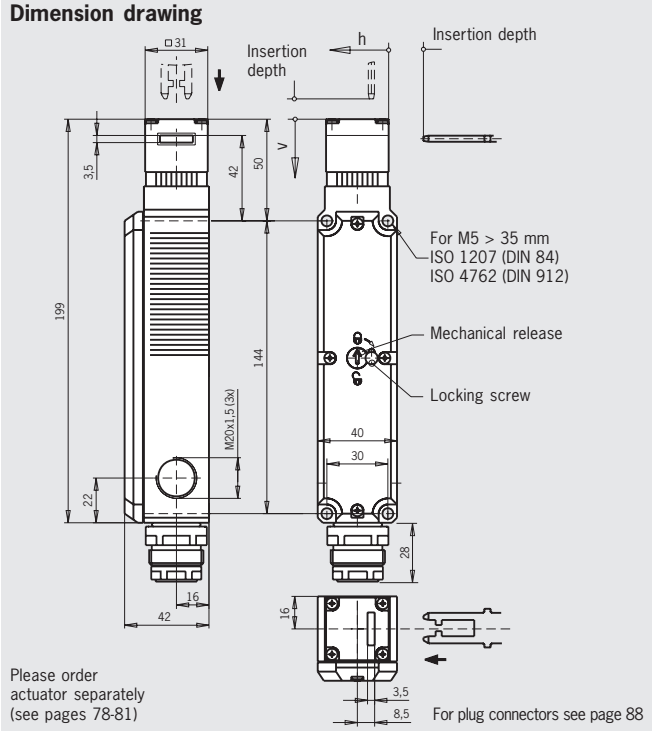
Ordering table

Series	Connection	Guard locking	Switching element		Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
TP	M Cable entry 3 x M20 x 1.5	3 Mechanical	537 1 NC ⊖ + 1 NO		084 347 TP3-537K024M	On request	On request
			2131 2 NC ⊖ + 1 NO + 1 NC		084 264 TP3-2131K024M	On request	084 265 TP3-2131K230M
			4121 2 NC ⊖ + 1 NC + 1 NO		084 260 TP3-4121K024M	084 261 TP3-4121K110M	084 262 TP3-4121K230M
			4121 2 NC ⊖ + 1 NC / 1 NO	ATEX Incl. Cable gland	094 152 2) TP3-4121K024M-EX	-	-
			4131 2 NC ⊖ + 1 NO + 1NO		084 256 TP3-4131K024M	084 257 TP3-4131K110M	084 258 TP3-4131K230M
		4 Electrical	537 1 NC ⊖ + 1 NO		084 348 TP4-537K024M	084 349 TP4-537K110M	On request
			2131 2 NC ⊖ + 1 NO + 1 NC		084 266 TP4-2131K024M	On request	On request
			4121 2 NC ⊖ + 1 NC / 1 NO		084 263 TP4-4121K024M	084 380 TP4-4121K110M	On request
			4131 2 NC ⊖ + 1 NO + 1NO		084 259 TP4-4131K024M	On request	On request
			4141 2 Ö ⊖ + 2 Ö ⊖		096 296 3) TP4-4141K024M	-	-

1) With cable entry M, DC 24 V / AC 110 V 2) Ⓔx II 3 G Ex nC IIC T4 / Ⓔx II 3 D Ex tD A22 T110°C 3) No SIBE approval

Plug connector SR6
6-pin + PE

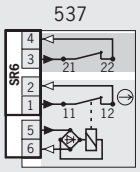
Dimension drawing



Please order actuator separately (see pages 78-81)

For plug connectors see page 88

Wiring diagrams Actuator inserted and locked

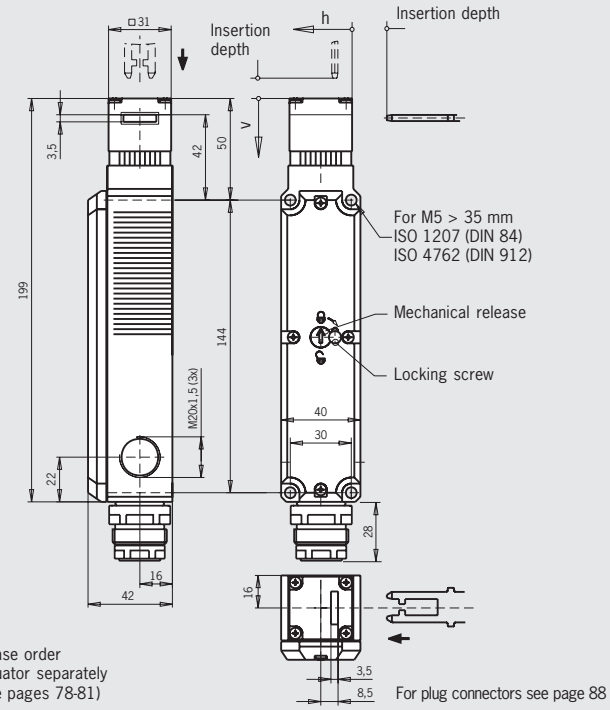


Solenoid monitoring
Door monitoring

For switching functions see technical data on page 109

Plug connector SR11
11-pin + PE

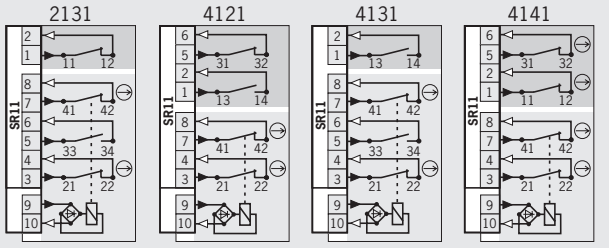
Dimension drawing



Please order actuator separately (see pages 78-81)

For plug connectors see page 88

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on page 109

Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage AC/DC 24 V
TP	SR6 Plug connector	3 Mechanical	537 1 NC ⊖ + 1 NO	088 213 TP3-537K024SR6
		4 Electrical	537 1 NC ⊖ + 1 NO	088 216 TP4-537K024SR6
	SR11 Plug connector	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	088 220 TP3-2131K024SR11
			4121 2 NC ⊖ + 1 NC / 1 NO	088 221 TP3-4121K024SR11
			4131 2 NC ⊖ + 1 NO + 1NO	088 219 TP3-4131K024SR11
		4 Electrical	2131 2 NC ⊖ + 1 NO + 1 NC	088 223 TP4-2131K024SR11
			4121 2 NC ⊖ + 1 NC / 1 NO	088 224 TP4-4121K024SR11
			4131 2 NC ⊖ + 1 NO + 1NO	088 222 TP4-4131K024SR11
			4141 2 NC ⊖ + 2 NC ⊖	088 230 [3] TP4-4141K024SR11

3) No SIBE approval

For safety precautions see page 132
For technical data see page 99

Safety switch TP with guard locking and guard lock monitoring

- **Auxiliary shutdown feature on the front**
- **With door unlock request contact**
- **Increased horizontal overtravel**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps
Increased overtravel for horizontal approach direction.

Auxiliary shutdown feature
When actuated, positively driven contacts 21-22 are opened. The safety guard remains locked. The auxiliary shutdown feature must be sealed to prevent tampering (for example with sealing lacquer).

Door unlock request contact
When the actuator is in the locked state positively driven contact 21-22 is opened by pulling the safety guard (6 mm actuator stroke) as a result of which a signal is forwarded to the controlling PLC. Depending on the control concept, the safety guard can be unlocked automatically – when machine components which were still running have stopped.

Solenoid operating voltage
- AC/DC 24 V +10%, -15%
- AC 110 V +10%, -15%
- AC 230 V +10%, -15%

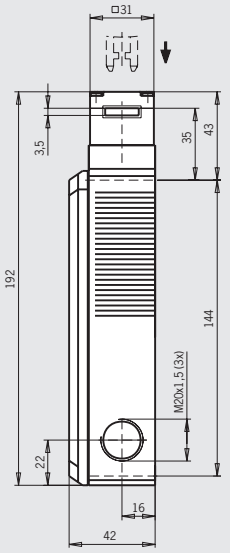
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

Guard locking types
TP5 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.
TP6 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements
- **4120** Slow-action switching element
  1 NC ⊖ (door unlock request contact) +
  1 NC ⊖ + 1 NO (solenoid monit. contact)

Cable entry M20 x 1.5

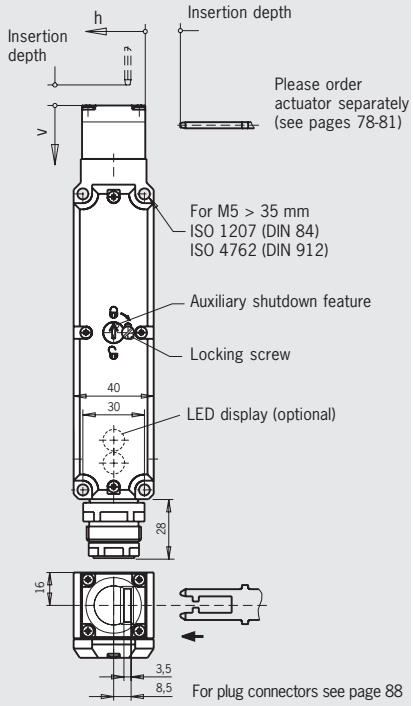
Dimension drawing



Please order actuator separately (see pages 78-81)

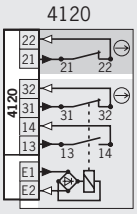
For cable glands see page 89

Plug connector SR11
11-pin + PE



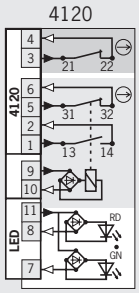
For plug connectors see page 88

Wiring diagrams Actuator inserted and locked



☐ Solenoid monitoring
☐ Door unlock request contact

For switching functions see technical data on page 109



☐ Solenoid monitoring
☐ Door unlock request contact

For switching functions see technical data on page 109

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
TP	**M** Cable entry **3 x M20 x 1.5**	**5** Mechanical	**4120** 1 NC ⊖ + 1 NC ⊖ + 1 NO		**084 279** TP5-4120A024M	On request	**088 241** TP5-4120A230M
		6 Electrical	**4120** 1 NC ⊖ + 1 NC ⊖ + 1 NO		**084 280** TP6-4120A024M	On request	On request
	SR11 Plug connector	**5** Mechanical	**4120** 1 NC ⊖ + 1 NC ⊖ + 1 NO		**094 895** TP5-4120A024SR11	-	-
		5 Mechanical	**4120** 1 NC ⊖ + 1 NC ⊖ + 1 NO	**024L** LED display AC/DC 24 V	**094 902** TP5-4120A024L024SR11	-	-
		6 Electrical	**4120** 1 NC ⊖ + 1 NC ⊖ + 1 NO		**096 204** TP6-4120A024SR11	-	-

Safety switch TP with guard locking and guard lock monitoring

- **Escape release from the rear**
- **With door monitoring contact**
- **Increased horizontal overtravel**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps
Increased overtravel for horizontal approach direction.

Escape release

Is used for the manual release of the guard locking from within the danger area without tools. With identification of On/Off position.

Solenoid operating voltage

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

Guard locking types

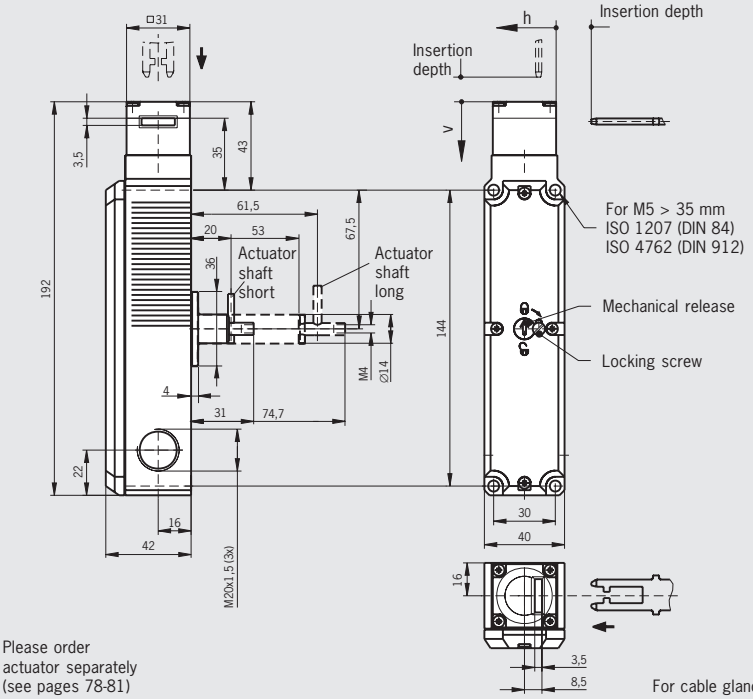
TP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

Switching elements

- **2131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NC
  (door monitoring contact)
- **4121** Slow-action switching element
  2 NC ⊖ + 1 NC / 1 NO
  (door monitoring contact)
- **4141** Slow-action switching element
  2 NC ⊖ + 2NC ⊖
  (door monitoring contacts)

Cable entry M20 x 1.5

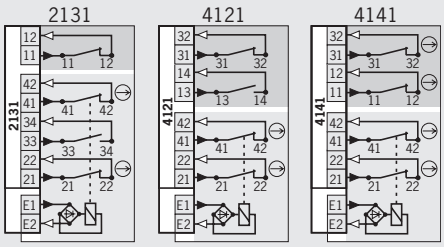
Dimension drawing



Please order actuator separately (see pages 78-81)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on page 109

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V
TP	**M** Cable entry **3 x M20 x 1.5**	**3** Mechanical	**2131** 2 NC ⊖ + 1 NO + 1NC	**C1743** Short actuator shaft	**084 285** TP3-2131A024MC1743
				C1993 Long actuator shaft	**087 400** TP3-2131A024MC1993
			4121 2 NC ⊖ + 1 NC / 1 NO	**C1743** Short actuator shaft	**087 427** TP3-4121A024MC1743
			4141 2 NC ⊖ + 2 NC ⊖	**C1743** Short actuator shaft	**086 165** TP3-4141A024MC1743

For safety precautions see page 132
For technical data see page 99

Selection table for safety switches STP with guard locking and guard lock monitoring

Release feature

- **HE** Mechanical release on the front
- **FE** Escape release on the rear side

Door monitoring

- **STP3/4** With door monitoring contact
- **STP1/2** Without door monitoring contact

Connection

- **M** Thread M20x1.5 for cable glands
- **SR11** Plug connector; 11-pin+PE

Release feature		Door monitoring		Connection		Page
HE	FE	STP3/4	STP1/2	M	SR11	
●		●		●	●	56 - 57
●			●	●		58
	●	●		●		59

Safety switch STP with guard locking and guard lock monitoring

- **Actuating head made of metal**
- **Mechanical release on the front**
- **With door monitoring contact**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps

Mechanical release
Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage
- AC/DC 24 V +10%, -15%
- AC 110 V +10%, -15%
- AC 230 V +10%, -15%

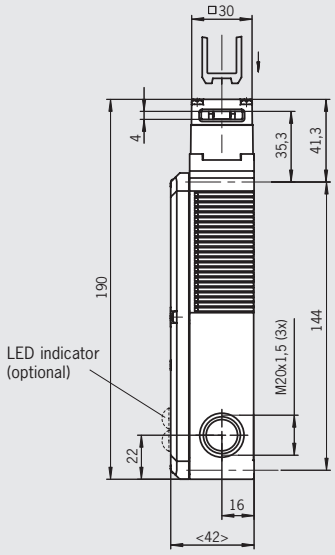
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

Guard locking types
STP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.
STP4 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements
- **537** Slow-action switching element
  1 NC ⊖ + 1 NC (door monitoring contact)
- **2131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NC (door monit. contact)
- **4121** Slow-action switching element
  2 NC ⊖ + 1 NC / 1 NO (door monit. contact)
- **4131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NO (door monit. contact)
- **4141** Slow-action switching element
  2 NC ⊖ + 2NC ⊖ (door monit. contacts)

Cable entry M20 x 1.5

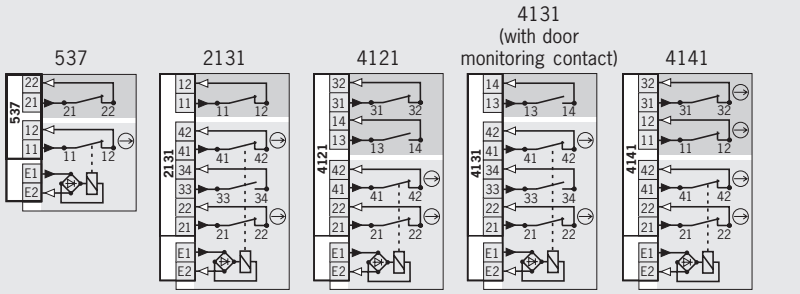
Dimension drawing



Please order actuator separately (see pages 82-84)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 111

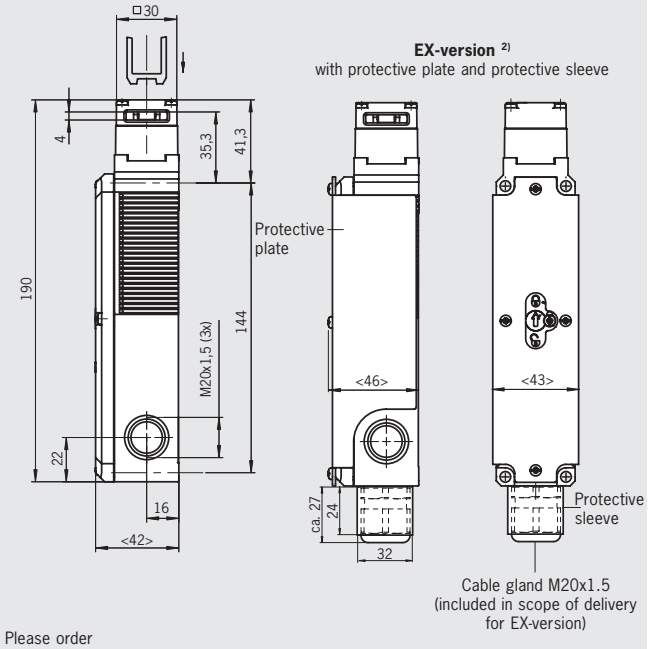
Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
STP	M Cable entry 3 x M20x1.5	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC		091 493 STP3A-2131A024M	099 326 STP3A-2131A110M	On request
				024L LED display AC/DC 24 V	091 748 STP3A-2131A024L024M	On request	On request
			4121 2 NC ⊖ + 1 NC / 1 NO		096 890 STP3A-4121A024M	On request	094 792 STP3A-4121A230M
			4131 2 NC ⊖ + 1 NO + 1 NO		091 776 STP3A-4131A024M	On request	On request
			4141 2 NC ⊖ + 2 NC		099 272 STP3A-4141A024M	On request	On request
		4 Electrical	537 1 NC ⊖ + 1 NC		092 259 STP4A-537A024M	On request	On request
			2131 2 NC ⊖ + 1 NO + 1 NC		091 494 STP4A-2131A024M	097 754 STP4A-2131A110M	On request
				024L LED display AC/DC 24 V	091 749 STP4A-2131A024L024M	On request	On request
			4121 2 NC ⊖ + 1 NC / 1 NO		093 159 STP4A-4121A024M	094 793 STP4A-4121A110M	094 794 STP4A-4121A230M
			4131 2 NC ⊖ + 1 NO + 1 NO		093 158 STP4A-4131A024M	On request	On request
			4141 2 NC ⊖ + 2 NC ⊖		099 314 STP4A-4141A024M	On request	On request

1) With cable entry M, DC 24 V / AC 110 V

Cable entry M20 x 1.5

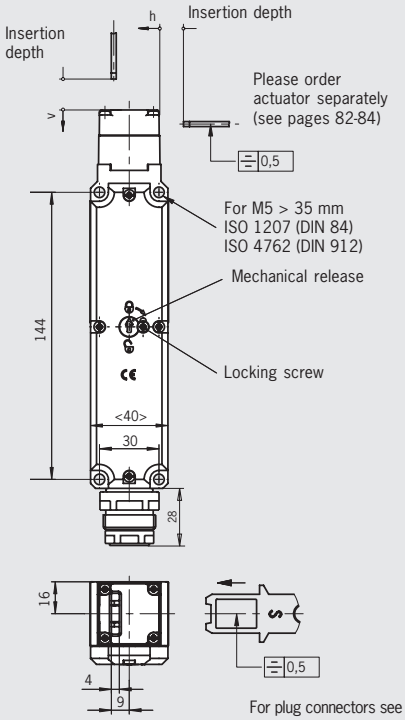
Dimension drawing



Please order actuator separately (see pages 82-84)

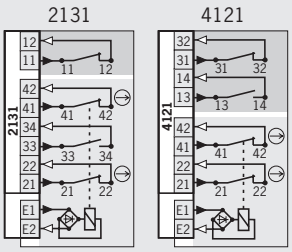
Plug connector SR11

11-pin + PE



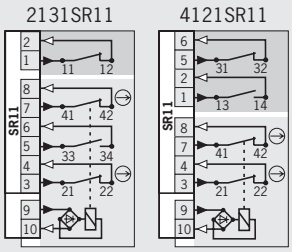
For plug connectors see page 88

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 111

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 111

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage		
					AC/DC 24 V	AC 110 V	AC 230 V
STP	M Cable entry 3 x M20x1.5	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	ATEX Incl. cable gland	093 794 2) STP3A-2131A024M-EX	On request	On request
			4121 2 NC ⊖ + 1 NC / 1 NO	ATEX Incl. cable gland	097 626 STP3A-4121A024M-EX	On request	On request
		4 Electrical	2131 2 NC ⊖ + 1 NO + 1 NC	ATEX Incl. cable gland	093 795 2) STP4A-2131A024M-EX	On request	On request
	SR11 Plug connector	3 Mechanical	4121 2 NC ⊖ + 1 NC / 1 NO		096 318 STP3A-4121A024SR11	-	-
		4 Electrical	2131 2 NC ⊖ + 1 NO + 1 NC		097 565 STP4A-2131A024SR11	-	-
			4121 2 NC ⊖ + 1 NC / 1 NO		099 301 STP4A-4121A024SR11	-	-

1) With cable entry M, DC 24 V/AC 110 V 2) Ex 3 G EEx nC IIC T4 / Ex 3 D Ex tD A22 T110°C

For safety precautions see page 132
For technical data see page 99

Safety switch STP with guard locking and guard lock monitoring

- **Actuating head made of metal**
- **Mechanical release on the front**
- **Without door monitoring contact**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps

Mechanical release
Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage
- AC/DC 24 V +10%, -15%
- AC 110 V +10%, -15%
- AC 230 V +10%, -15%

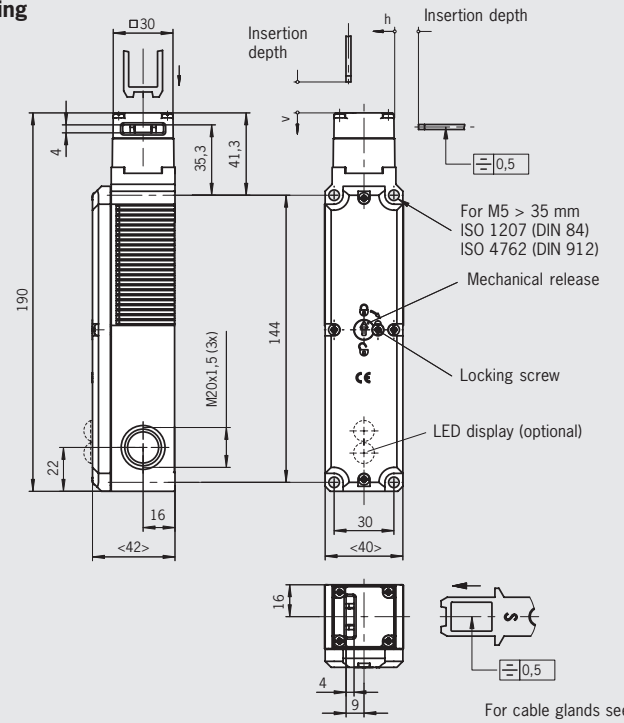
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

Guard locking types
STP1 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.
STP2 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements
- **528** Slow-action switching element 1 NC ⊖ + 1 NO
- **538** Slow-action switching element 2 NC ⊖
- **4131** Slow-action switching element 2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

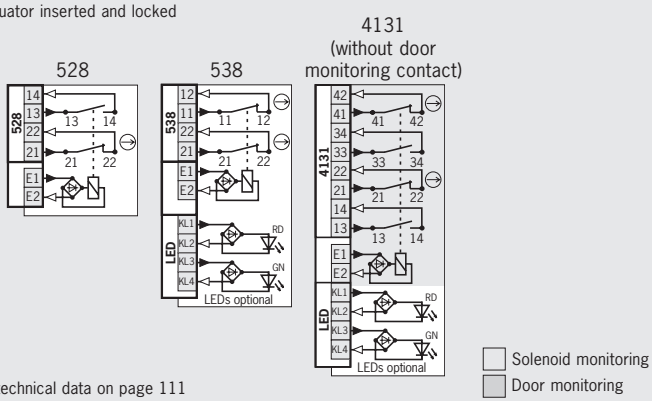
Dimension drawing



Please order actuator separately (see pages 82-84)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 111

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
STP	M Cable entry 3 x M20 x 1.5	1 Mechanical	528 1 NC ⊖ + 1 NO		092 266 STP1A-528A024M	On request	On request
			538 2 NC ⊖		092 258 STP1A-538A024M	On request	On request
				024L LED display AC/DC 24 V with pre-assembled insertion funnel	092 489 STP1D-538A024L024M	On request	On request
			4131 2 NC ⊖ + 2 NO		091 491 STP1A-4131A024M	On request	On request
				024L LED display AC/DC 24 V	091 746 STP1A-4131A024L024M	On request	On request
		2 Electrical	538 2 NC ⊖		092 260 STP2A-538A024M	On request	On request
				024L LED display AC/DC 24 V	092 490 STP2A-538A024L024M	On request	On request
			4131 2 NC ⊖ + 2 NO		091 492 STP2A-4131A024M	On request	On request
				024L LED display AC/DC 24 V	091 747 STP2A-4131A024L024M	On request	On request

Safety switch STP with guard locking and guard lock monitoring

- **Escape release on the rear side**
- **With door monitoring contact**
- **Increased horizontal overtravel**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps

Escape release

Is used for the manual release of the guard locking from within the danger area without tools. With identification of On/Off position.

Solenoid operating voltage

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

Guard locking types

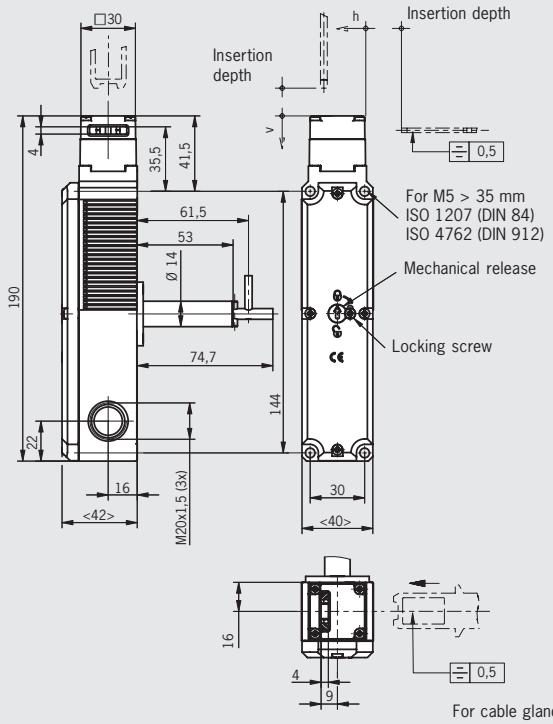
STP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

Switching elements

- **4121** Slow-action switching element
  2 NC ⊖ + 1 NC / 1 NO
  (door monitoring contact)

Cable entry M20 x 1.5

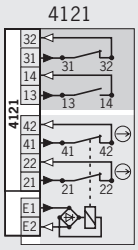
Dimension drawing



Please order actuator separately (see pages 82-84)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



☐ Solenoid monitoring
☐ Door monitoring

For switching functions see technical data on page 111

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V
STP	**M** Cable entry **3 x M20 x 1.5**	**3** Mechanical	**4121** 2 NC ⊖ + 1 NC / 1 NO	**C1993** Long actuator shaft	**096 885** STP3A-4121A024MC1993

For safety precautions see page 132
For technical data see page 99

Selection table for safety switches STA with guard locking and guard lock monitoring

Release feature

HE Mechanical release on the front

Door monitoring

STA3/4 With door monitoring contact

STA1/2 Without door monitoring contact

Connection

M Thread M20x1.5 for cable gland

Release feature	Door monitoring		Connection	Page
HE	STA3/4	STA1/2	M	
●	●		●	62
●		●	●	63

Note
This safety switch is 100 % interchangeable with the STP, but due to the metal housing is suitable for harsh environments.

Safety switch STA with guard locking and guard lock monitoring

- **Metal housing with metal actuating head**
- **Mechanical release on the front**
- **With door monitoring contact**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps

Mechanical release
Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

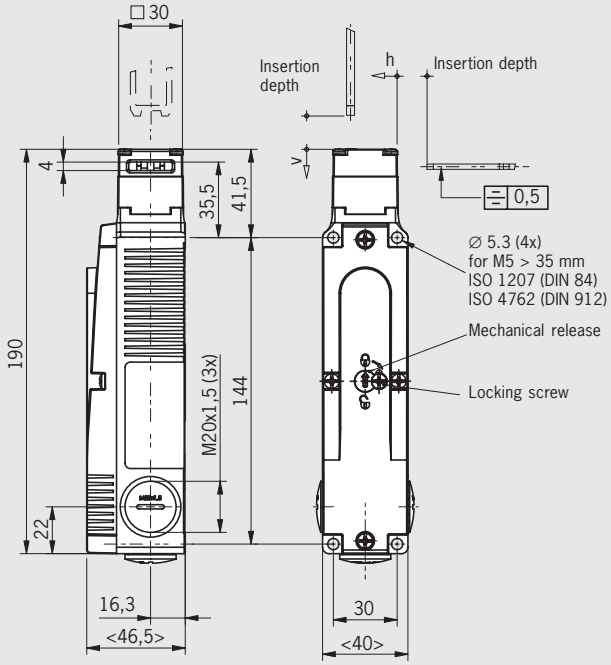
Solenoid operating voltage
- AC/DC 24 V +10%, -15%

Guard locking types
STA3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.
STA4 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements
- **2131** Slow-action switching element 2 NC ⊖ + 1 NO + 1 NC (door monitoring contact)
- **4121** Slow-action switching element 2 NC ⊖ + 1 NC / 1 NO (door monitoring contact)
- **4131** Slow-action switching element 2 NC + 1 NO + 1 NO (door monitoring contact)
- **4141** Slow-action switching element 2 NC ⊖ + 2NC ⊖ (door monitoring contacts)

Cable entry M20 x 1.5

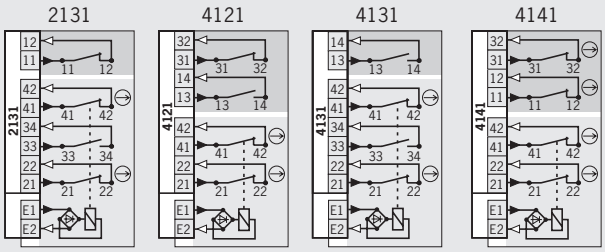
Dimension drawing



Please order actuator separately (see pages 82-84)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 113

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V
STA	M Cable entry 3 x M20x1.5	3 Mechanical	**2131** 2 NC ⊖ + 1 NO + 1 NC		**096 938** STA3A-2131A024M
			4121 2 NC ⊖ + 1 NC / 1 NO		**096 936** STA3A-4121A024M
			4131 2 NC ⊖ + 1 NO + 1 NO		**099 480** STA3A-4131A024M
			4141 2 NC ⊖ + 2 NC ⊖		**099 274** STA3A-4141A024M
		4 Electrical	**2131** 2 NC ⊖ + 1 NO + 1 NC		**096 939** STA4A-2131A024M
			4121 2 NC ⊖ + 1 NC / 1 NO		**096 937** STA4A-4121A024M
			4131 2 NC ⊖ + 1 NO + 1 NC		**099 481** STA4A-4131A024M

Safety switch STA with guard locking and guard lock monitoring

- **Metal housing with metal actuating head**
- **Mechanical release on the front**
- **Without door monitoring contact**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps

Mechanical release
Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

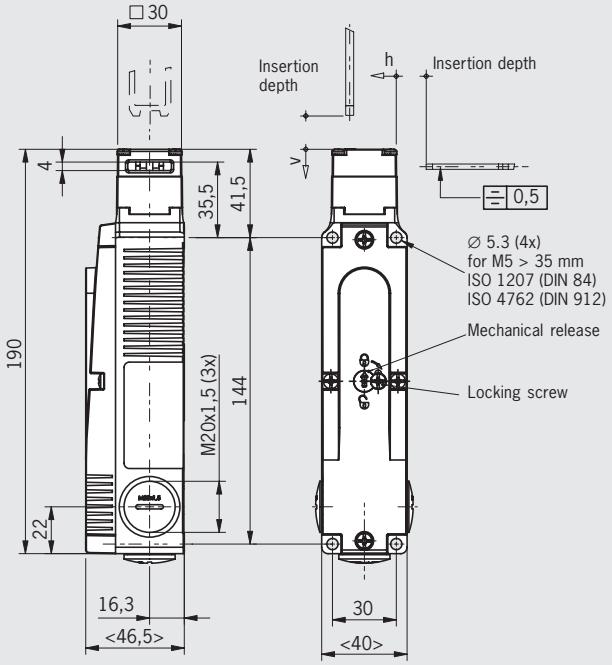
Solenoid operating voltage
- AC/DC 24 V +10%, -15%

Guard locking types
STA1 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.
STA2 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

Switching elements
- **4131** Slow-action switching element
  2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

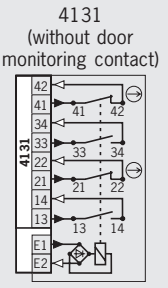
Dimension drawing



Please order actuator separately (see pages 82-84)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on page 113

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V
STA	**M** Cable entry **3 x M20x1.5**	**1** Mechanical	**4131** 2 NC ⊖ + 2 NO		**096 439** STA1A-4131A024M
		2 Electrical	**4131** 2 NC ⊖ + 2 NO		**096 935** STA2A-4131A024M

For safety precautions see page 132
For technical data see page 99

Safety switch STF with guard locking, guard lock monitoring and safety latch

Release feature

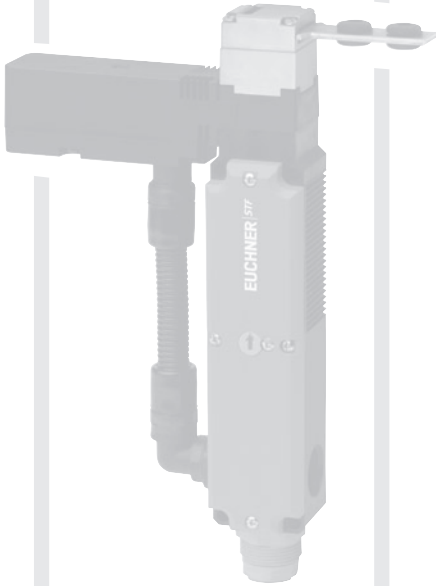
HE Mechanical release on the front

Door monitoring

STF3 With door monitoring contact

Connection

SR11 Plug connector; 11-pin + PE



Release feature HE	Door monitoring STF3	Connection SR11	Page
●	●	●	66

Safety switch STF with guard locking, guard lock monitoring and safety latch

- **Actuating head made of metal**
- **Mechanical release on the front**
- **With safety latch**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

Guard locking types

STF3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

Safety latch

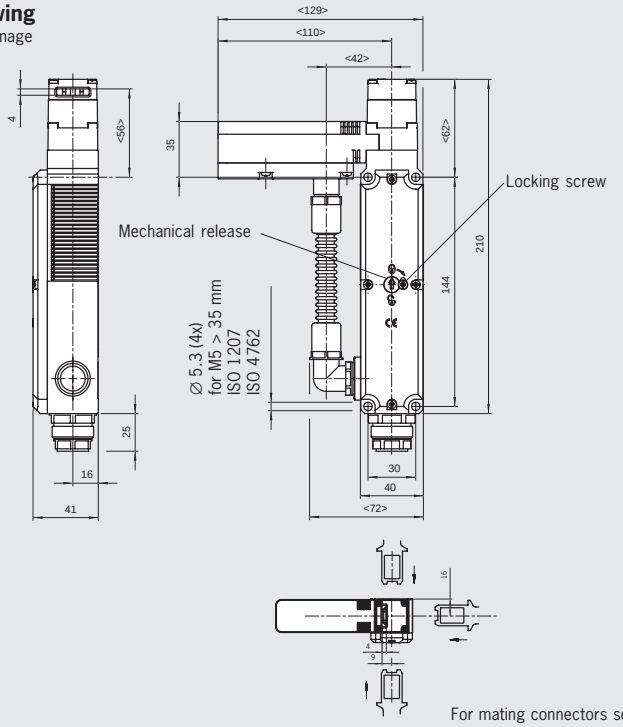
The switch also has a latch for the guard locking pin. The guard locking pin can only be moved if it has been released by the latch. This situation prevents persons unintentionally locking themselves inside if the safety door is open in case of a power failure or if the machine is switched off and that the guard locking is deactivated on a power failure.

Switching elements

- **ES01** Slow-action switching element
  1 NC ⊖ (latch)
- **2131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NC
  (door monitoring contact)

Plug connector SR11
11-pin + PE

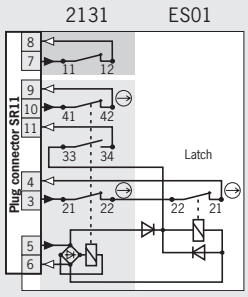
Dimension drawing
Solenoid right mirror image



Please order actuator separately (see pages 82-84)

For mating connectors see page 88

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on page 115

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage
					AC/DC 24 V
STF	SR11 Plug connector	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	Solenoid left	099 436 STF3A-L-2131A024SR11
				Solenoid right	099 437 STF3A-R-2131A024SR11

Safety switch STF with guard locking, guard lock monitoring and safety latch

- **Actuating head made of metal**
- **With pre-assembled insertion funnel**
- **Mechanical release on the front**
- **With safety latch**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

Guard locking types

STF3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

Insertion funnel

Due to the insertion funnel, even inexactly positioned actuators are inserted reliably in the actuating head due to the large opening aperture, thus protecting the safety switch against mechanical influences.

Safety latch

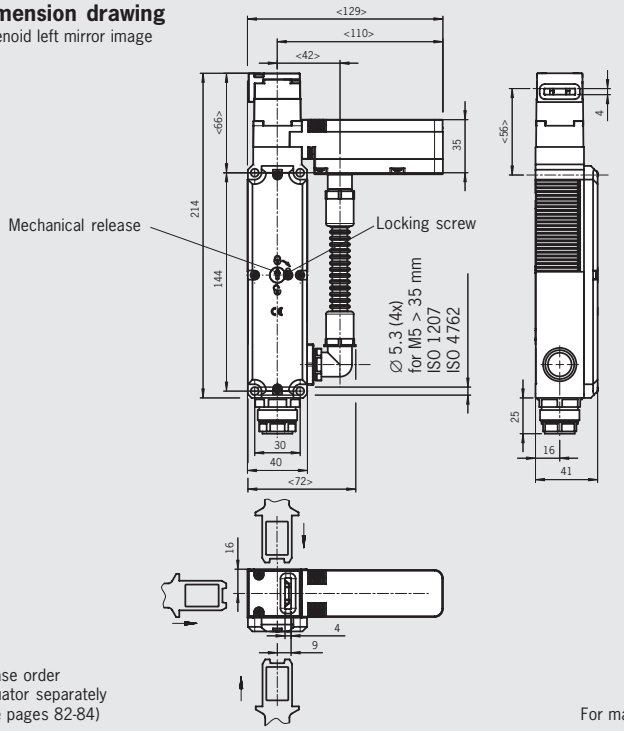
The switch also has a latch for the guard locking pin. The guard locking pin can only be moved if it has been released by the latch. This situation prevents persons unintentionally locking themselves inside if the safety door is open in case of a power failure or if the machine is switched off and that the guard locking is deactivated on a power failure.

Switching elements

- **ES01** Slow-action switching element
  1 NC ⊖ (latch)
- **2131** Slow-action switching element
  2 NC ⊖ + 1 NO + 1 NC
  (door monitoring contact)

Plug connector SR11
11-pin + PE

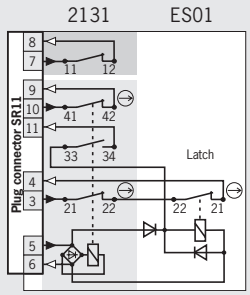
Dimension drawing
Solenoid left mirror image



Please order actuator separately (see pages 82-84)

For mating connectors see page 88

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on page 115

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage
					AC/DC 24 V
STF	SR11 Plug connector	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	Solenoid left with insertion funnel	**095 587** STF3D-L-2131A024SR11
				Solenoid right with insertion funnel	**097 744** STF3D-R-2131A024SR11

For safety precautions see page 132
For technical data see page 99

Selection table for safety switches STM with guard locking and guard lock monitoring

Release feature, front

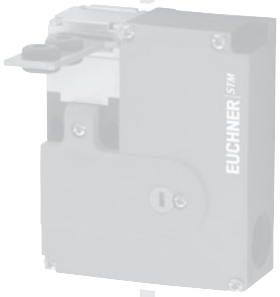
HE Mechanical release on the front

Connection

M Thread M20x1.5 for cable glands

Switching element

1 NC ⊖ (ÜK) + 2 NC ⊖ (SK) or
1 NC ⊖ (ÜK) + 1 NC ⊖ (SK) + 1 NO (SK)



Manual release HE	Connection M	Switching element three contacts	Page
●	●	●	70

Safety switch STM with guard locking and guard lock monitoring

- **Actuating head optionally made of metal or plastic**
- **Mechanical release on the front**

Approach direction

Horizontal and vertical
Can be adjusted in 90° steps

Mechanical release

Is used for releasing the guard locking with the aid of a tool. The mechanical release must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage

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

Guard lockingtypes

STM1 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.

STM2 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

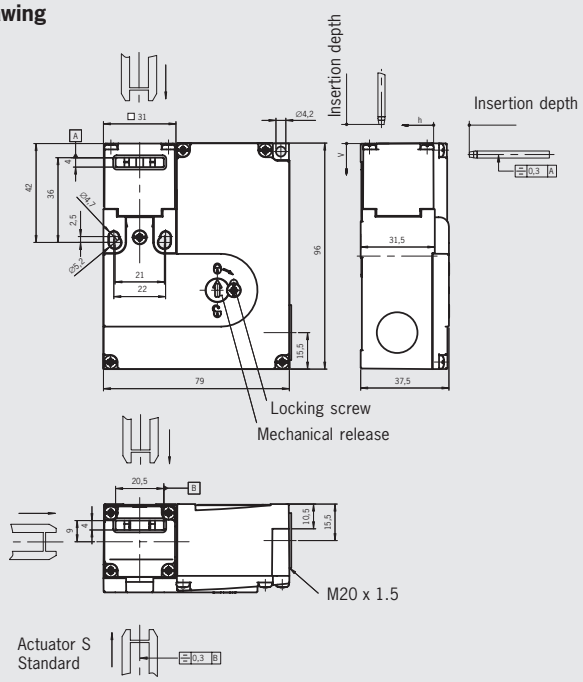
Switching elements

ÜK For monitoring the guard locking (built-in solenoid)
Slow-action switching element 1 NC ⊖

SK For monitoring the door/actuator position
222 Slow-action switching element 2 NC ⊖
242 Slow-action switching element 1 NC ⊖ +1 NO

Cable entry M20 x 1.5

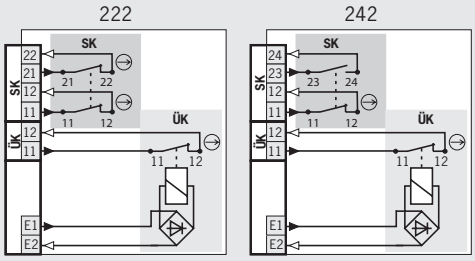
Dimension drawing



Please order actuator separately (see pages 82-84)

For cable glands see page 89

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on page 117

Ordering table

Series	Connection	Guard locking	Actuating head	Switching element	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
STM	Cable entry **1 x M20 x 1.5**	**1** Mechanical	**N** Plastic	ÜK: 1 NC ⊖ SK: **222** 2 NC ⊖	**091 865** STM1N-222B024-M	On request	On request
				ÜK: 1 NC ⊖ SK: **242** 1 NC ⊖ + 1 NO	**092 031** STM1N-242B024-M	On request	On request
			A Metal	ÜK: 1 NC ⊖ SK: **222** 2 NC ⊖	**095 396** STM1A-222B024-M	On request	On request
				ÜK: 1 NC ⊖ SK: **242** 1 NC ⊖ + 1 NO	**095 397** STM1A-242B024-M	On request	**098 036** STM1A-242B230-M
		2 Electrical	**N** Plastic	ÜK: 1 NC ⊖ SK: **222** 2 NC ⊖	**092 048** STM2N-222B024-M	On request	On request
				ÜK: 1 NC ⊖ SK: **242** 1 NC ⊖ + 1 NO	**092 050** STM2N-242B024-M	On request	On request
			A Metal	ÜK: 1 NC ⊖ SK: **222** 2 NC ⊖	095 398 STM2A-222B024-M	On request	On request
				ÜK: 1 NC SK: **242** 1 NC ⊖ + 1 NO	**095 399** STM2A-242B024-M	On request	On request

Selection table for safety switch TK with guard locking (without protection against unintentional closing)

Release feature

HE Mechanical release on the switch head

Guard locking pin

A Right

C Left

Connection

M Thread M20x1.5 for cable gland

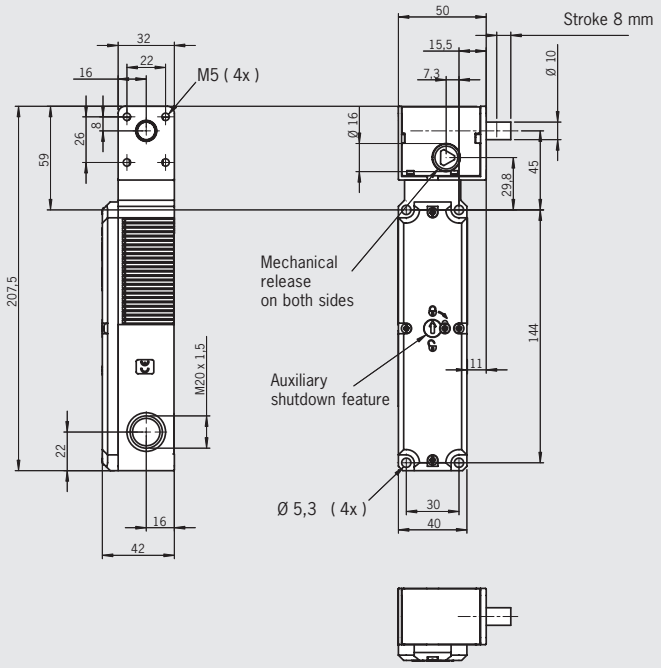
Release feature	Guard locking pin		Connection	Page
HE	A	C	M	
●	●		●	72
●		●	●	73

Safety switch TK with guard locking (without protection against unintentional closing)

- **Mounting on plastic housing TP with actuating head and guard locking pin made of metal**
- **High locking forces of well above 5000 N**
- **Mechanical release on the switch head**
- **Actuating element for auxiliary shutdown on front**
- **Cable entry M20 x 1.5**

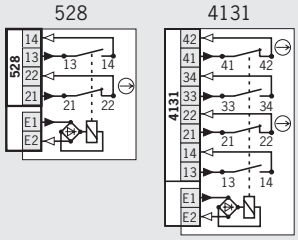
Cable entry M20 x 1.5
Guard locking pin right

Dimension drawing



For cable glands see page 89

Wiring diagrams Switch locked



For switching functions see technical data on page 119

Function
Guard locking is by movement of the locking pin, which is inserted in a “recess”.

Mechanical release
This releases the guard locking after operation with a triangular key (DIN 22417).

Auxiliary shutdown feature
When actuated, positively driven NC contacts 21-22 are opened. The safety guard remains locked. The auxiliary shutdown feature must be sealed to prevent tampering (for example with sealing lacquer).

Solenoid operating voltage
- AC/DC 24 V +10%, -15%
- AC 110 V +10%, -15%
- AC 230 V +10%, -15%

Guard locking types
TK1 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the interlocking solenoid.
TK2 Open-circuit current principle, guard locking by applying voltage to the interlocking solenoid. Release by spring force.

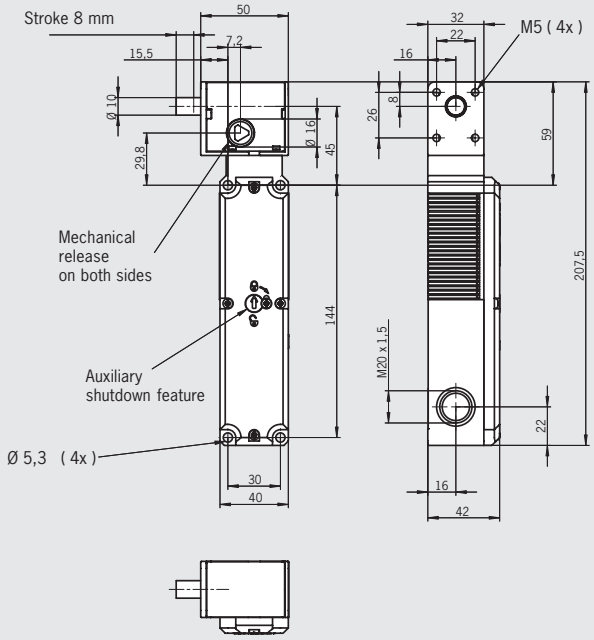
Switching elements
- **528** Slow-action switching element 1 NC ⊖ + 1 NO
- **4131** Slow-action switching element 2 NC ⊖ + 2 NO

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage		
					AC/DC 24 V	AC 110 V	AC 230 V
TK	M Cable entry 3 x M20 x 1.5	1 Mechanical	528 1 NC ⊖ + 1 NO	A Guard locking pin right	094 652 TK1-528AB024M	-	-
			4131 2 NC ⊖ + 2 NO	A Guard locking pin right	099 686 TK1-4131AB024M	-	-
		2 Electrical	4131 2 NC ⊖ + 2 NO	A Guard locking pin right	099 690 TK2-4131AB024M	-	-

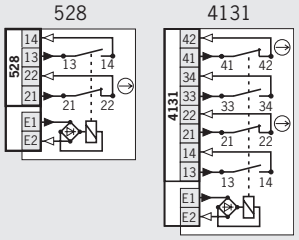
Cable entry M20 x 1.5
Guard locking pin left

Dimension drawing



For cable glands see page 89

Wiring diagrams Switch locked



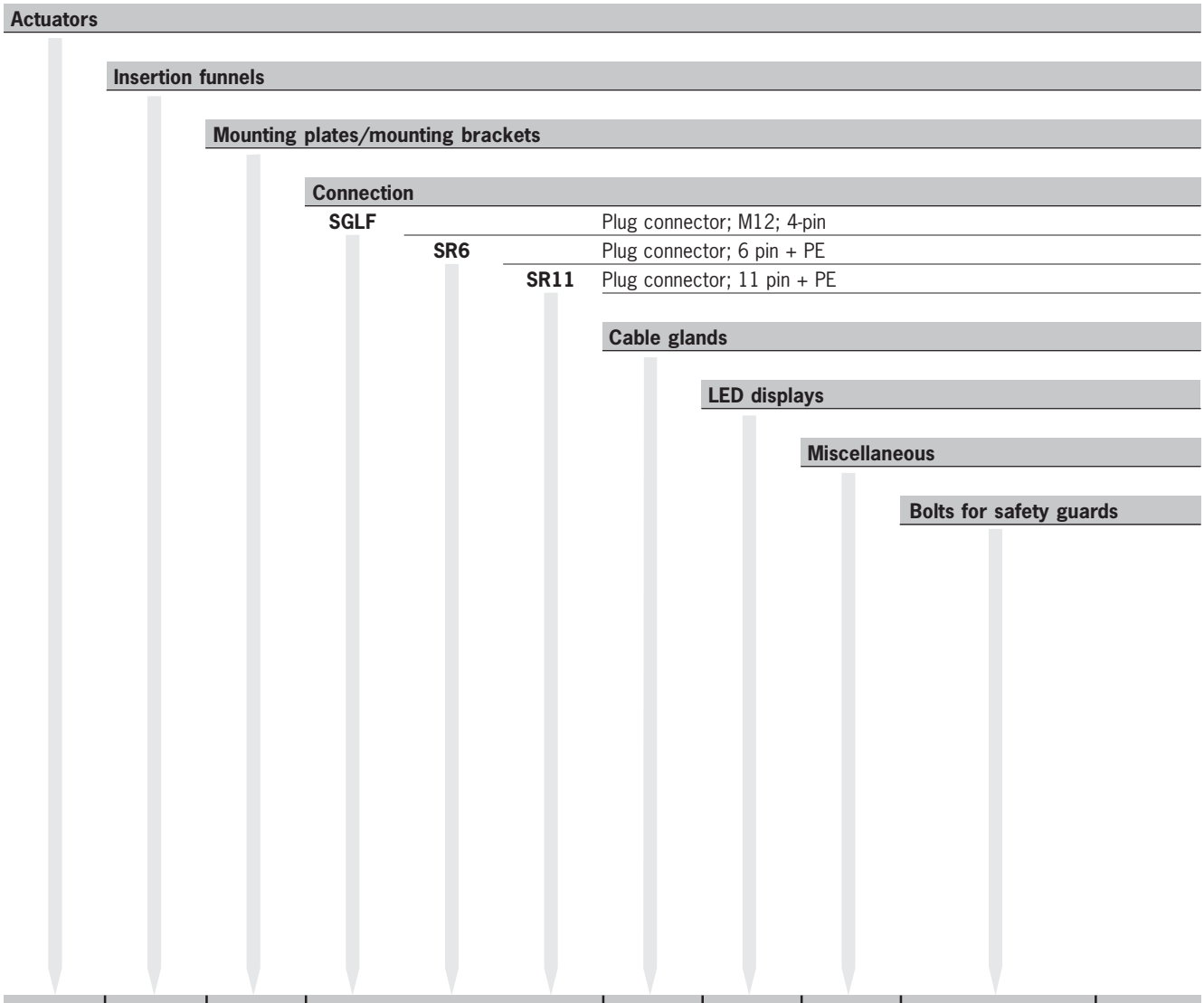
For switching functions see technical data on page 119

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage		
					AC/DC 24 V	AC 110 V	AC 230 V
TK	**M** Cable entry **3 x M20 x 1.5**	**1** Mechanical	**528** 1 NC ⊖ + 1 NO	**C** Guard locking pin left	**094 192** TK1-528CB024M	-	-
			4131 2 NC ⊖ + 2 NO	**C** Guard locking pin left	**099 687** TK1-4131CB024M	-	-
		2 Electrical	**4131** 2 NC ⊖ + 2 NO	**C** Guard locking pin left	**099 691** TK2-4131CB024M	-	-

For safety precautions see page 132
For technical data see page 99

Selection table for accessories



Actuators	Insertion funnels	Mounting plates/ mounting brackets	Plug connectors			Cable glands	LED displays	Miscella-neous	Bolts		Page
			SGLF	SR6	SR11				Metal	Plastic	
●											76 - 84
	●										85
		●									86 - 87
			●								87
				●							88
					●						88
						●					89
							●				89
								●			90 / 91
									●		92 - 95
										●	96

Actuators for safety switches NM.VZ

- **Actuators made of stainless steel**
- **Two stainless safety screws per actuator**
- **Actuators with optional rubber bushings**
- **Narrow design optional**

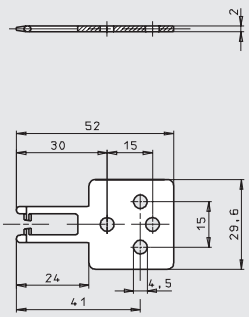
Straight actuator
The straight actuator is used on sliding doors or hinged doors with door radii greater than 150 mm. Safety screws prevent unscrewing of the actuator.

Actuator with rubber bush
For flexible mounting of the actuator.

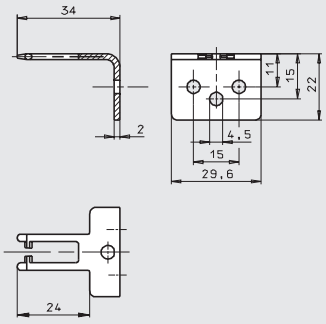
Screws made of stainless steel
The safety screws included can be inserted with a normal tool, but cannot be removed again.

Actuator M-G straight
Overtravel 4 mm

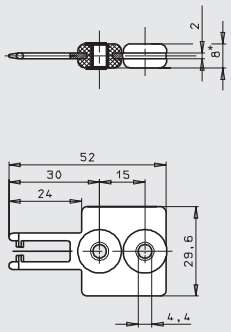
Dimension drawings



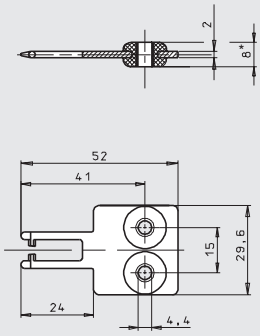
Actuator M-W bent
Overtravel 4 mm



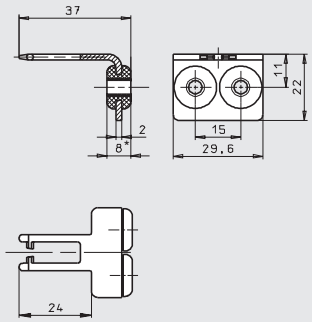
Actuator M-GT straight
Longitudinal rubber bush, overtravel 4 mm



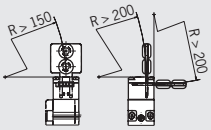
Actuator M-GQ straight
Transverse rubber bush, overtravel 4 mm



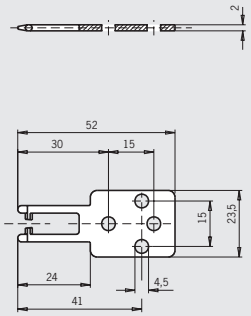
Actuator M-WT bent
Rubber bush, overtravel 4 mm



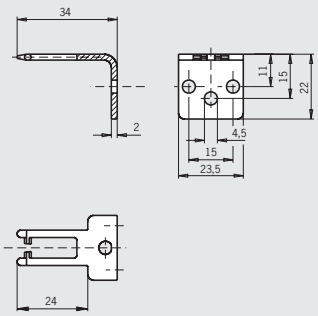
Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Actuator straight	**M-G** 4 mm overtravel incl. 2 safety screws M4 x 14		1 ea.	**074 076** ACTUATOR-M-G
Actuator bent	**M-W** 4 mm overtravel incl. 2 safety screws M5x10		1 ea.	**074 077** ACTUATOR-M-W
Actuator straight longitudinal rubber bush	**M-GT** 4 mm overtravel incl. 2 safety screws M4 x 14		1 ea.	**074 078** ACTUATOR-M-GT
Actuator straight transverse rubber bush	**M-GQ** 4 mm overtravel incl. 2 safety screws M4 x 14		1 ea.	**074 079** ACTUATOR-M-GQ
Actuator bent rubber bush	**M-WT** 4 mm overtravel incl. 2 safety screws M4 x 14		1 ea.	**074 080** ACTUATOR-M-WT

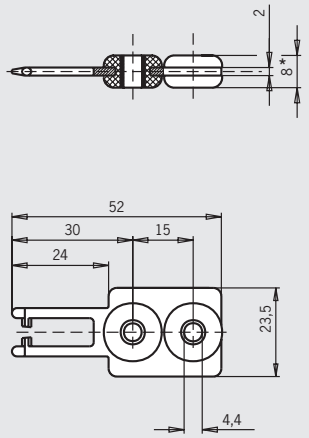
Actuator M-GS straight
Narrow, overtravel 4 mm



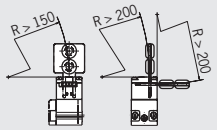
Actuator M-WS bent
Narrow, overtravel 4 mm



Actuator M-GTS straight
Rubber bush, narrow, overtravel 4 mm



Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Actuator straight narrow	**M-GS** 4 mm overtravel incl. 2 safety screws M4 x 14		1 ea.	**074 128** ACTUATOR-M-GS
Actuator bent narrow	**M-WS** 4 mm overtravel incl. 2 safety screws M5x10		1 ea.	**074 129** ACTUATOR-M-WS
Actuator straight, narrow rubber bush	**M-GTS** 4 mm overtravel incl. 2 safety screws M4 x 14		1 ea.	**074 130** ACTUATOR-M-GTS

For safety precautions see page 132
For technical data see page 99

Actuators for safety switches NP/GP/TP

- **Actuators made of stainless steel**
- **Two stainless safety screws per actuator**
- **Actuators with optional rubber bushings**

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.

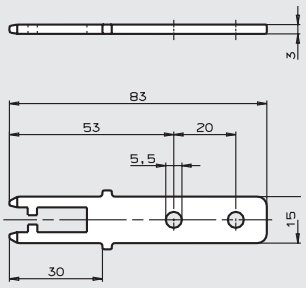
Actuator with overtravel
- **2 mm** for doors with normal play
- **7 mm** for doors with large play (optional)

Actuator with rubber bush
For flexible mounting of the actuator.

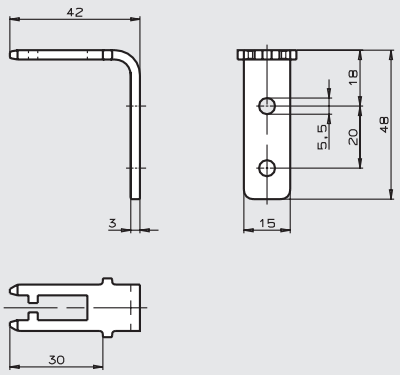
Screws made of stainless steel
The safety screws included can be inserted with a normal tool, but cannot be removed again.

Actuator P-G straight
Overtravel 2 mm

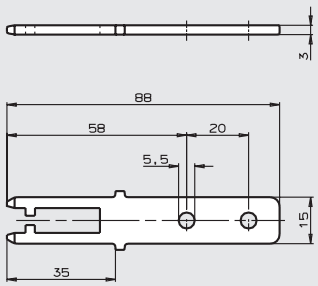
Dimension drawings



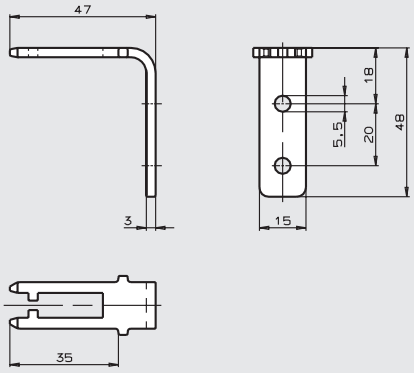
Actuator P-W bent
Overtravel 2 mm



Actuator P-GN straight
Overtravel 7 mm



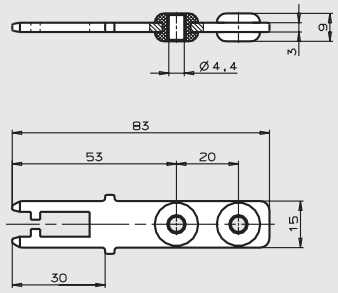
Actuator P-WN bent
Overtravel 7 mm



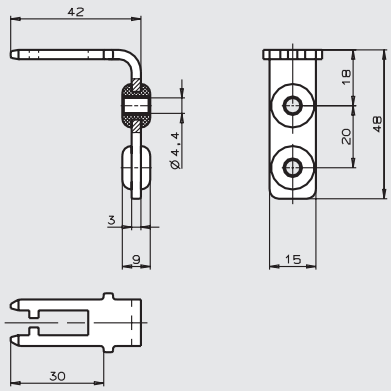
Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Actuator straight	**P-G** Overtravel 2 mm incl. 2 safety screws M5 x 10	1000	1 ea.	**059 226** ACTUATOR-P-G
Actuator bent	**P-W** Overtravel 2 mm incl. 2 safety screws M5 x 10	1000	1 ea.	**059 227** ACTUATOR-P-W
Actuator straight overtravel	**P-GN** Overtravel 7 mm incl. 2 safety screws M5 x 10	1000	1 ea.	**074 570** ACTUATOR-P-GN
Actuator bent overtravel	**P-WN** Overtravel 7 mm incl. 2 safety screws M5 x 10	1000	1 ea.	**074 571** ACTUATOR-P-WN

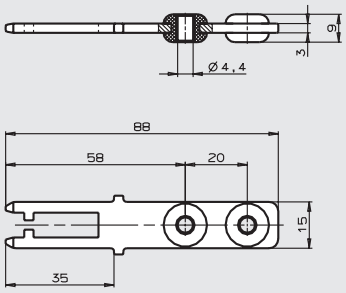
Actuator P-GT straight
Rubber bush, overtravel 2 mm



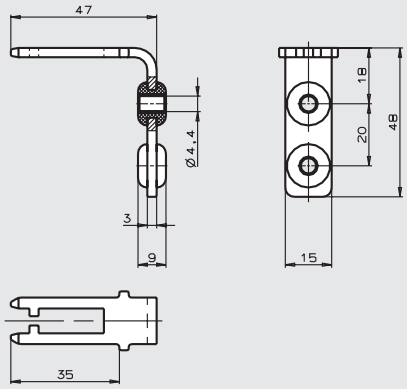
Actuator P-WT bent
Rubber bush, overtravel 2 mm



Actuator P-GNT straight
Rubber bush, overtravel 7 mm



Actuator P-WNT bent
Rubber bush, overtravel 7 mm



Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Actuator straight rubber bush	**P-GT** Overtravel 2 mm incl. 2 safety screws M4 x 14	1000	1 ea.	**070 046** ACTUATOR-P-GT
Actuator bent rubber bush	**P-WT** Overtravel 2 mm incl. 2 safety screws M4 x 14	1000	1 ea.	**070 038** ACTUATOR-P-WT
Actuator straight rubber bush, overtravel	**P-GNT** Overtravel 7 mm incl. 2 safety screws M4 x 14	1000	1 ea.	**074 576** ACTUATOR-P-GNT
Actuator bent rubber bush, overtravel	**P-WNT** Overtravel 7 mm incl. 2 safety screws M4 x 14	1000	1 ea.	**074 577** ACTUATOR-P-WNT

For safety precautions see page 132
For technical data see page 99

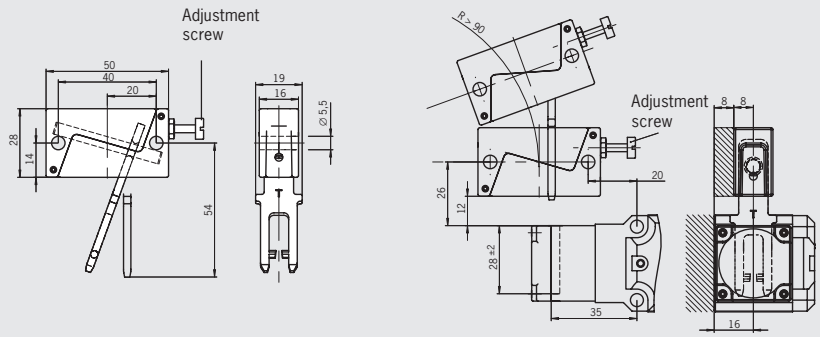
Hinged actuators for safety switches NP/GP/TP

- **Actuators made of stainless steel**
- **Two stainless safety screws per actuator**
- **For top and bottom hinged doors**
- **For right and left hinged doors**

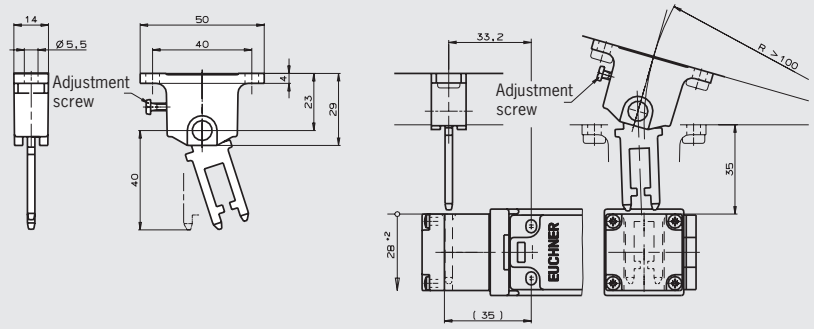
Hinged actuator
For door radii less than 1000 mm a hinged actuator should be used. The spring action movement of the actuator prevents damage due to the actuator jamming in the actuating head. Depending on the movement of the safety guard, the actuator must be selected for left/right or top/bottom.

Hinged actuator P-OU
Safety guard hinged at top/bottom, overtravel 2 mm

Dimension drawings



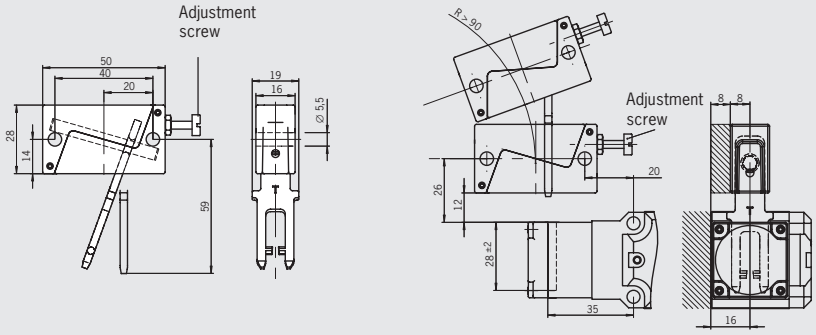
Hinged actuator P-LR
Safety guard hinged on left/right, overtravel 2 mm



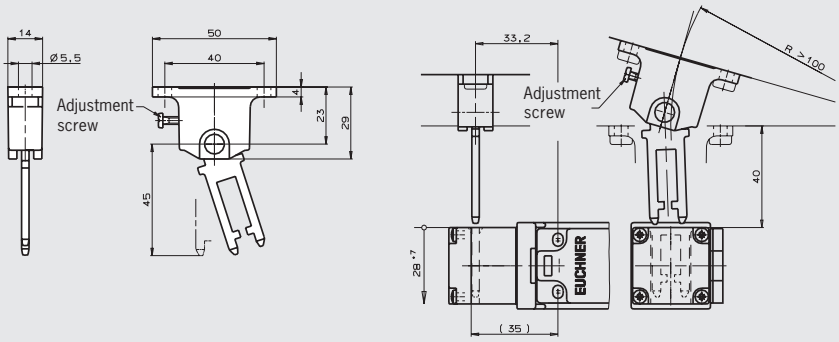
Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Hinged actuator	**P-OU** For top and bottom hinged doors overtravel 2 mm incl. 2 safety screws M5 x 25	90	1 ea.	**070 050** HINGED ACTUATOR P-OU
	P-LR For left and right hinged doors overtravel 2 mm incl. 2 safety screws M5 x 10	100	1 ea.	**059 440** HINGED ACTUATOR P-LR

Hinged actuator P-OUN
Safety guard hinged at top/bottom, overtravel 7 mm



Hinged actuator P-LRN
Safety guard hinged on left/right, overtravel 7 mm



Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Hinged actuator	**P-OUN** For top and bottom hinged doors overtravel 7 mm incl. 2 safety screws M5 x 25	90	1 ea.	**074 572** HINGED ACTUATOR P-OUN
	P-LRN For left and right hinged doors overtravel 7 mm incl. 2 safety screws M5 x 10	100	1 ea.	**074 573** HINGED ACTUATOR P-LRN

For safety precautions see page 132
For technical data see page 99

Actuators for safety switches SGP/STA/STF/STP/STM

- **Two stainless safety screws per actuator**
- **Actuators with rubber bushings**

Note
Type S actuators must not be used in conjunction with insertion funnels.
L actuators must be used for insertion funnels.

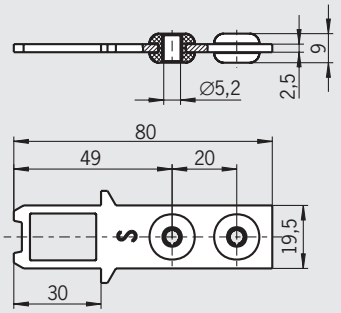
Straight actuator
Suitable for a maximum tensile force of 2500 N for STP, or 3000 B for STA
The straight actuator is used on sliding doors or hinged doors with door radii greater than 300 mm. Safety screws prevent unscrewing of the actuator.

Bent actuator
Suitable for a maximum tensile force of 1500 N.

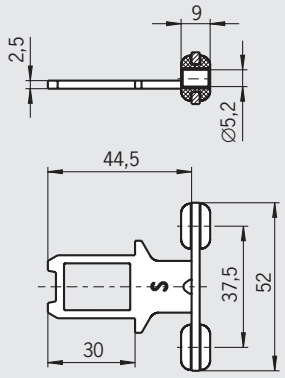
Screws made of stainless steel
The safety screws included can be inserted with a normal tool, but cannot be removed again.

Standard actuator S, straight
Rubber bush, overtravel 5 mm

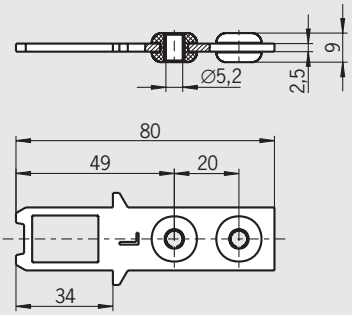
Dimension drawings



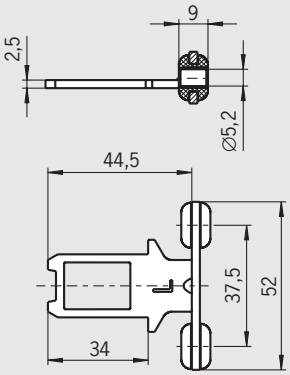
Standard actuator S, bent
Rubber bush, overtravel 5 mm



Actuator L, straight, for insertion funnel
Rubber bush, overtravel 5 mm



Actuator L, bent, for insertion funnel
Rubber bush, overtravel 5 mm



Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Actuator S straight	**S-GT-SN** Overtravel 5 mm incl. 2 safety screws M4 x 14	300	1 ea.	**095 738** ACTUATOR S-GT-SN
Actuator S bent	**S-WQ-SN** Overtravel 5 mm incl. 2 safety screws M4 x 14	300	1 ea.	**095 740** ACTUATOR S-WQ-SN
Actuator L straight	**S-GT-LN** Overtravel 5 mm incl. 2 safety screws M4 x 14	300	1 ea.	**095 739** ACTUATOR S-GT-LN
Actuator L bent	**S-WQ-LN** Overtravel 5 mm incl. 2 safety screws M4 x 14	300	1 ea.	**095 741** ACTUATOR S-WQ-LN

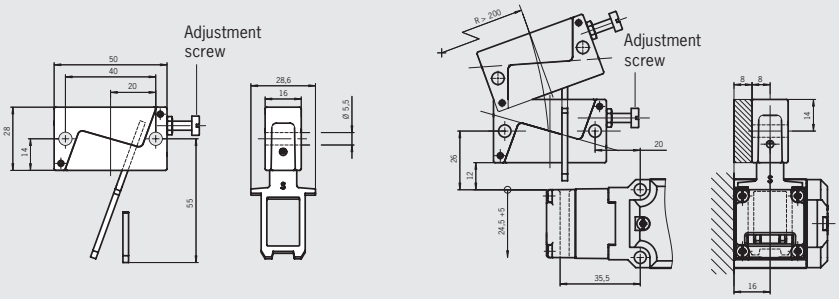
Hinged actuators for safety switches SGP/STA/STF/STP/STM

- **Actuators made of stainless steel**
- **Two stainless safety screws per actuator**
- **For top and bottom hinged doors**
- **For right and left hinged doors**

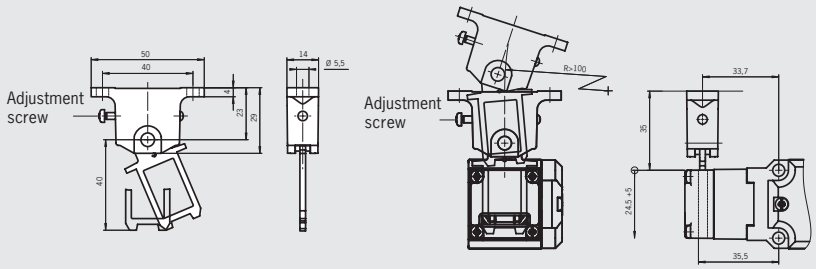
Hinged actuator
For door radii less than 1000 mm a hinged actuator should be used. The spring action movement of the actuator prevents damage due to the actuator jamming in the actuating head. Depending on the movement of the safety guard, the actuator must be selected for left/right or top/bottom.

Hinged actuator S-OU-SN
Safety guard hinged at top/bottom, overtravel 5 mm

Dimension drawings



Hinged actuator S-LR-SN
Safety guard hinged on left/right, overtravel 5 mm



Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Hinged actuator	**S-OU-SN** For top and bottom hinged doors overtravel 5 mm incl. 2 safety screws M5 x 25	200	1 ea.	**095 315** HINGED ACTUATOR-S-OU-SN
	S-LR-SN For left and right hinged doors overtravel 5 mm incl. 2 safety screws M5 x 10	100	1 ea.	**096 838** HINGED ACTUATOR-S-LR-SN

For safety precautions see page 132
For technical data see page 99

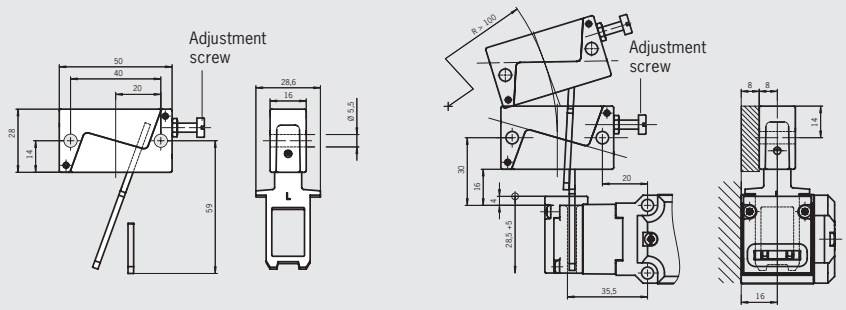
Hinged actuators for safety switches SGP/STA/STF/STP/STM

- **Actuators made of stainless steel**
- **Two stainless safety screws per actuator**
- **For top and bottom hinged doors**
- **For right and left hinged doors**

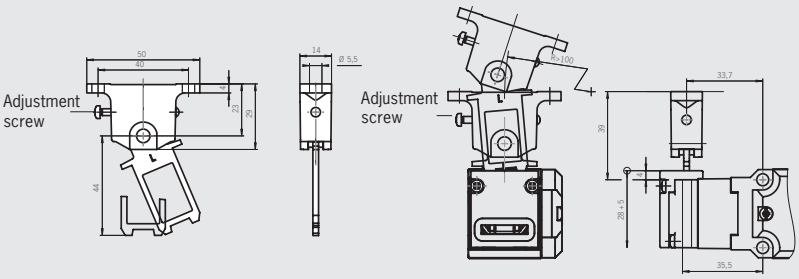
Hinged actuator
For door radii less than 1000 mm a hinged actuator should be used. The spring action movement of the actuator prevents damage due to the actuator jamming in the actuating head. Depending on the movement of the safety guard, the actuator must be selected for left/right or top/bottom.

Hinged actuator S-OU-LN for insertion funnel
Safety guard hinged at top/bottom, overtravel 5 mm

Dimension drawings



Hinged actuator S-LR-LN for insertion funnel
Safety guard hinged on left/right, overtravel 5 mm



Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order No.
Hinged actuator	**S-OU-LN** For top and bottom hinged doors overtravel 5 mm incl. 2 safety screws M5 x 25	200	1 ea.	**096 697** HINGED ACTUATOR-S-OU-LN
	S-LR-LN For left and right hinged doors overtravel 5 mm incl. 2 safety screws M5 x 10	100	1 ea.	**096 844** HINGED ACTUATOR-S-LR-LN

Insertion funnels/adapters

- **Insertion funnel**
- **Adapter NP-K**

Insertion funnel
If an insertion funnel is used, even inexactly positioned actuators are inserted reliably in the actuating head due to the large opening aperture, thus protecting the safety switch against mechanical influences.

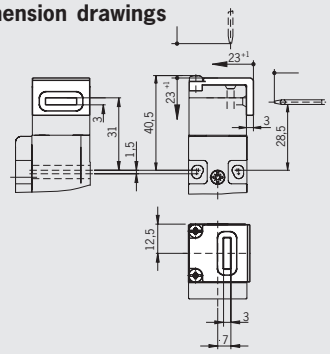
- Cannot be used in conjunction with TP safety switches with increased overtravel from top
- The insertion funnel for TP can only be used in conjunction with an actuator with long overtravel
- The insertion funnel for STP can only be used in conjunction with an actuator for insertion funnel

Adapter NP-K
The adapter NP-K is used for top entry overtravel applications for the NP series.

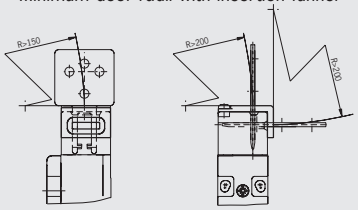
- The adapter **cannot** be used for safety switches of the GP/TP series
- 4 screws 3 x 38 (not safety screws) are supplied

Insertion funnel
For safety switches NM..VZ

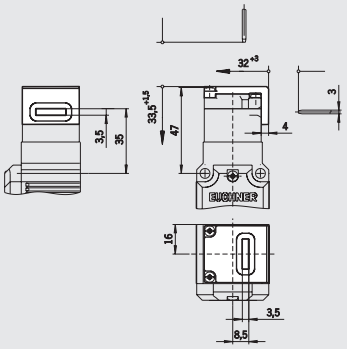
Dimension drawings



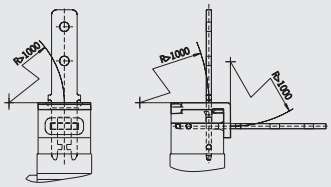
Minimum door radii with insertion funnel



Insertion funnel
For safety switches NP..A/GP/TP..A

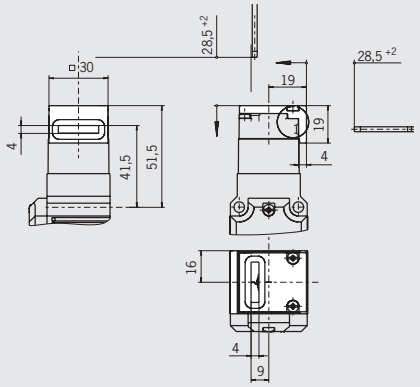


Minimum door radii with insertion funnel



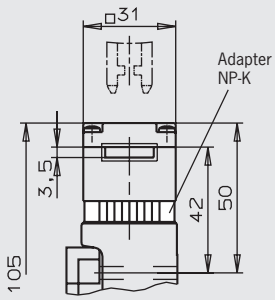
Insertion funnel
For safety switches SGP/STA/STF/STP/STM

Dimension drawings



Minimum door radius with insertion funnel
R > 300 mm

Adapter NP-K
For safety switches NP



Ordering table

Designation	Version	Use	Order No.
Insertion funnel	Incl. 2 fastening screws	For safety switches NM..VZ	**083 565** Insertion funnel M
		For safety switches NP..A/GP/TP..A without adapter	**086 237** Insertion funnel NP/GP/TP
		For safety switches SGP/STA/STF/STP/STM	**093 157** Insertion funnel STP/STM
Adapter NP-K	Incl. 4 fastening screws	For safety switches NP	**074 578** Adapter NP-K

For safety precautions see page 132
For technical data see page 99

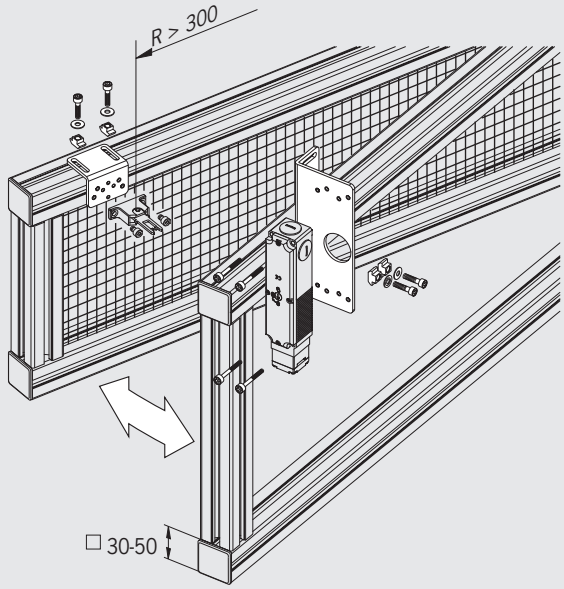
Mounting plates EMP for safety switches TP...A, STA, STF and STP

- **For vertical and horizontal mounting of safety switches TP...A, STA, STF and STP**

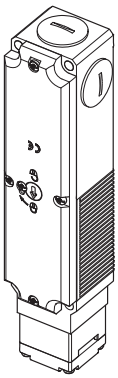
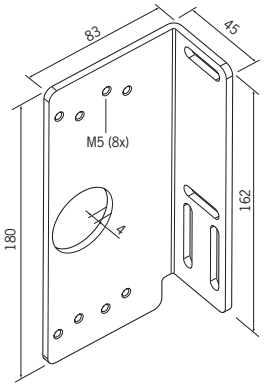
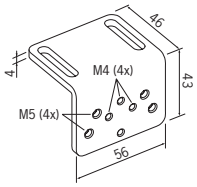
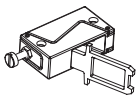
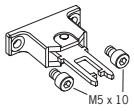
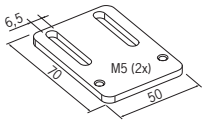
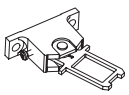
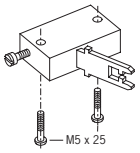
The mounting plates are used for fastening safety switches TP...A, STA, STF and STP and actuators to safety guards. The safety switches can be attached vertically and horizontally.

Note
- Mounting plate material: St37 galvanized

Mounting example, safety switch vertical



Ordering table

Switch	Installation method switch	Mounting plate switch	Mounting plate actuator	Actuator ST...	Actuator TP...A	Minimum distance hinged axis to switch ST...	Minimum distance hinged axis to switch TP...A
TP...A... **STA...** **STF...** **STP...** 	**A** Vertical	**093 456** EMP-SB 	**093 457** EMP-B1 	**095 740**  page 82	**070 038** **074 577**  page 79	> 300 mm	> 1000 mm
				095 315 **096 697**  page 83/84	**059 440** **074 573**  page 80/81	> 200 mm	> 100 mm
	B Horizontal		**093 458** EMP-B2 	**096 838** **096 844**  page 83/84	**070 050** **074 572**  page 80/81	> 100 mm	> 90 mm

Mounting bracket for safety switches NM and NP

- **For vertical and horizontal mounting of safety switches NM and NP**

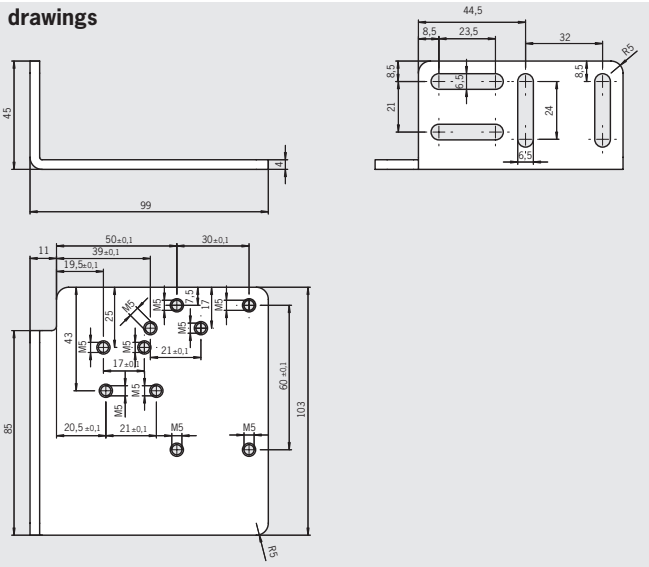
The mounting bracket is used for fastening safety switches NM and NP to safety guards. The safety switches can be attached horizontally or vertically.

Notes

- Mounting plate material: St37 galvanized

Mounting bracket
For safety switches series NM and NP

Dimension drawings



Ordering table

Designation	Use	
Mounting bracket NM, NP	For safety switches series NM and NP horizontal and vertical mounting	**085 753** Mounting bracket NM, NP

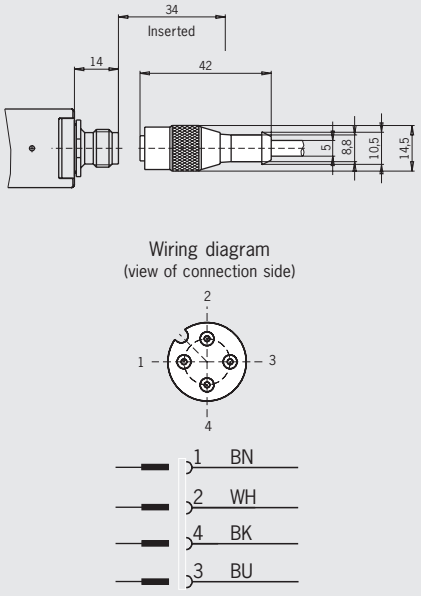
Plug connector M12

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

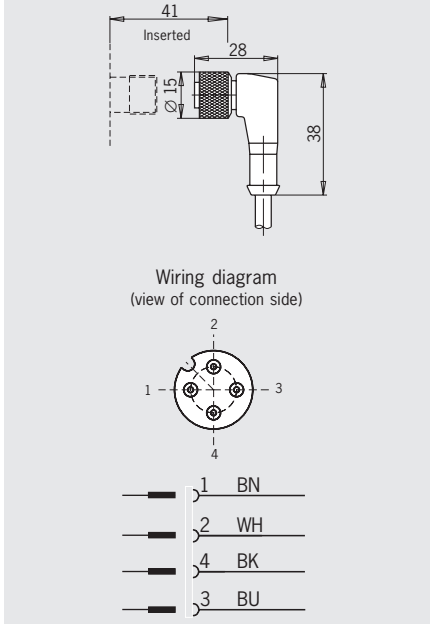
Cable
Cable sleeve PUR, color black, halogen-free, flame retardant. Reduction of toxic gases and smoke in case of fire. Wire cross-section 0.25 mm².

Plug connector SGLF with cable
M12 plug, 4-pin

Dimension drawings



Plug connector SWLF with cable
M12 plug, 4-pin



Ordering table

Designation	Number of pins	Version	Cable length 5 m
SGLF	**4**	Female plug M12 for male plug SM4	**035 613** SGLF4-5000P
SWLF	**4**	Female plug M12 bent for male plug SM4	**041 091** SWLF4-5000P

For safety precautions see page 132
For technical data see page 99

Plug connectors SR6 and SR11

- **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.

Male socket
For fitting in safety switches.

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

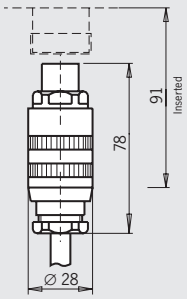
Cable (optional)
Cable sleeve PUR, color gray, wire cross-section 1.0 mm² (individual lines numbered).

Pin assignment for 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

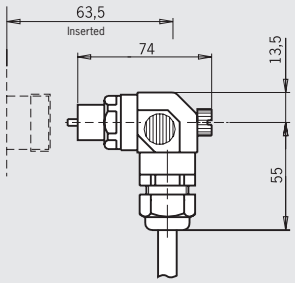
Female plug SR6 EF
6-pin + PE

Dimension drawings



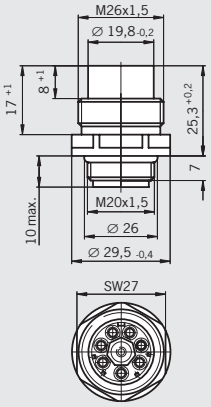
View of connection side, socket

Female plug SR6 WF angled
6-pin + PE



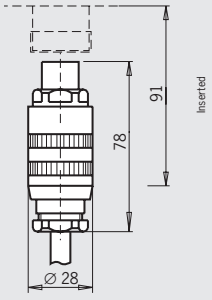
View of connection side, socket

Male socket SR6 AM
6-pin + PE



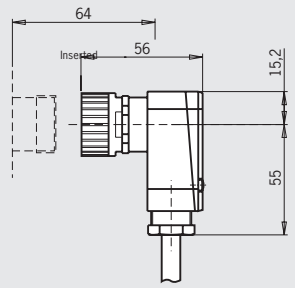
View of connection side, plug

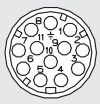
Female plug SR11 EF
11-pin + PE



View of connection side, socket

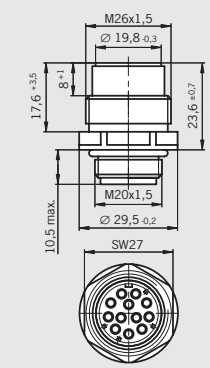
Female plug SR11 WF angled
11-pin + PE





View of connection side, socket

Male socket SR11 AM
11-pin + PE



View of connection side, plug

Ordering table

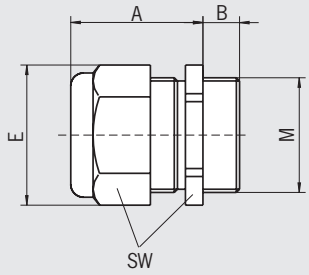
Designation	Version	Cable				
		None	5 m	10 m	15 m	25 m
SR6 [1] 6-pin + PE	**EF** Female plug	**013 176** SR6EF	**077 632** SR6EF-5000	**077 633** SR6EF-10000	**077 634** SR6EF-15000	–
	WF Female plug angled	**024 999** SR6WF	**077 638** SR6WF-5000	**077 639** SR6WF-10000	**077 640** SR6WF-15000	–
	K Coding shells	**013 178** SR6K	–	–	–	–
	AM Male socket, connection M20 x 1.5	**087 180** SR6AM2-M20	–	–	–	–
SR11 [1] 11-pin + PE	**EF** Female plug	**070 859** SR11EF	**077 629** SR11EF-5000	**077 630** SR11EF-10000	**077 631** SR11EF-15000	**094 749** SR11EF-25000
	WF Female plug angled	**054 773** SR11WF	**077 635** SR11WF-5000	**077 636** SR11WF-10000	**077 637** SR11WF-15000	–
	AM Male socket, connection M20 x 1.5	**091 296** SR11AM2-M20	–	–	–	–
SR6 and SR11	**Socket crimp contacts** 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	–	–	–	–

1) Crimp contacts supplied. For information on crimp contacts see page 95.

Cable glands

- **M16 x 1.5**
- **M20 x 1.5**

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



Item	Thread	Cable-Ø [mm]	A [mm]	B [mm]	E [mm]	SW [mm]
EKP.16/05	M16 x 1.5	5 - 10	28	8	22	20
EKP.16/05	M20 x 1.5	6 - 12	28	11	27	24

Ordering table

Thread	Version	Material	
		Metal	Plastic
M16 x 1.5	Cable diameter 5 – 10 mm	–	084 572 EKPM16/05
M20 x 1.5	Cable diameter 6 – 12 mm	–	086 233 EKPM20/06

LED displays for safety switches GP/ TP and STP

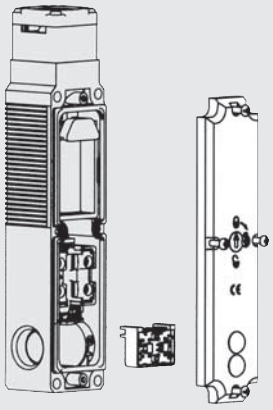
- **LED set**
- **Built-in LED**

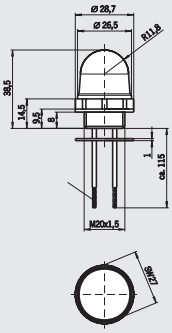
LED set
For safety switches TP/STP

Built-in LED
For safety switches GP/TP/STP

LED set
Consisting of cover with lamp caps, LED module with rectifier and two LEDs (green/red). For retrofitting safety switches TP and STP with an LED display.
Operating voltage AC/DC 24 V +10%, -15%.

Built-in LED
The built-in LED is suitable for direct installation in one of the M20 x 1.5 threads of the three cable entries of the safety switches GP/TP/STP. The built-in LED indicates to the user whether the switch is locked or whether the door is open/ closed.
The switching element can be wired individually.
Operating voltage DC 24 V +10%, -15%.





Ordering table

Designation	Version	Use	Packaging unit	Order No.
LED set	Incl. cover with lamp caps and LED module with rectifier and 2 LEDs (red/green)	For safety switches TP	1 ea.	**093 752** LED set TP
		For safety switches STP	1 ea.	**098 035** LED set STP
Built-in LED (IP65)	Color red for cable entry M20 x 1.5, with seal light radiation to side	For safety switches GP/TP/STA/STP	1 ea.	**087 423** LED M20x1.5
	Color red for cable entry M20 x 1.5, with seal light radiation to front	For safety switches GP/TP/STA/STP	1 ea.	**095 510** LED-F M20x1.5

For safety precautions see page 132
For technical data see page 99

Miscellaneous accessories

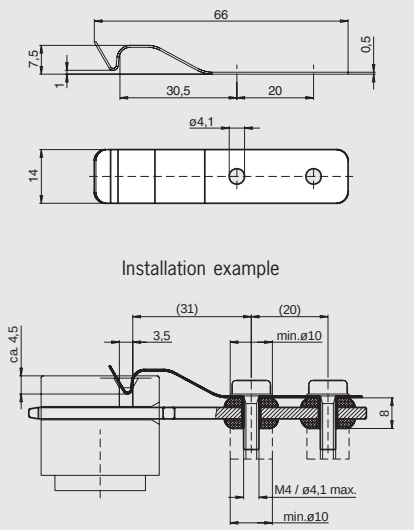
- **Latch spring for increased retention force**
- **Lockout bar**
- **Lock for mechanical release**

Latch spring
Provides an increased retention force of approx. 30N for the safety switches NP and GP or TP in unlocked condition.
May only be used in conjunction with the straight actuator with rubber bush (Order No. 070 046).

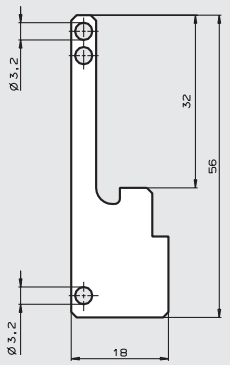
Lockout bar
With the safety door open, can be slid into the actuating head on a switch with separate actuator (NP/GP/TP) instead of an actuator. Removal can be prevented using a commercially available padlock (max. 2 ea.). For the protection of people in areas with a possible hazard.

Latch spring for increased retention force
For safety switches NP/GP/TP

Dimension drawings

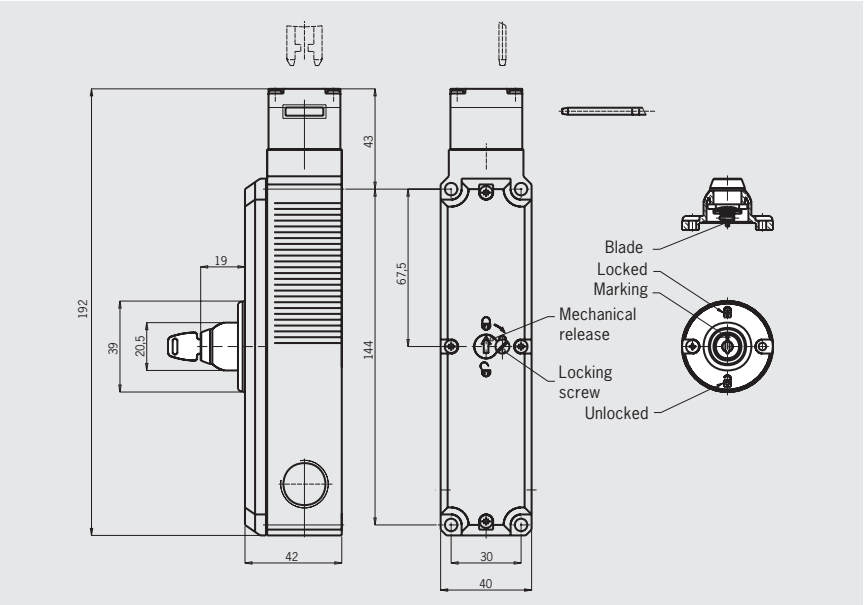


Lockout bar
For safety switches NP/GP/TP



Lock
The lock is used in combination with safety switch TP/STP. The mechanical key release enables authorized personnel to actuate the mechanical release using the related key in certain situations. The unlocking mechanism holds the solenoid in the “unlocked” position.
Two screws are used to fix the lock to the cover of the safety switch TP/STP (above the mechanical release).
- Order safety switch TP/STP separately
- 2 keys are included
- Every safety switch of the series TP/STP can be upgraded to include a lock

Lock
For safety switches TP/STP



Ordering table

Designation	Version	Use	Order No.
Lockout bar	2 holes	For safety switches NP/GP/TP	**070 651** Lockout bar P
Latch spring		For safety switches NP/GP/TP	**076 501** Latch spring NP/TP
Lock	Unique locking (unique key needed to open)	For safety switches TP/STP	**084 177** Lock TP
	Identical locking (identical locks)	For safety switches TP/STP	**086 236** Lock TP
	Replacement key (2 ea.) for identical locking	For safety switches TP/STP	**099 434** Replacement key for identical TP

Miscellaneous accessories

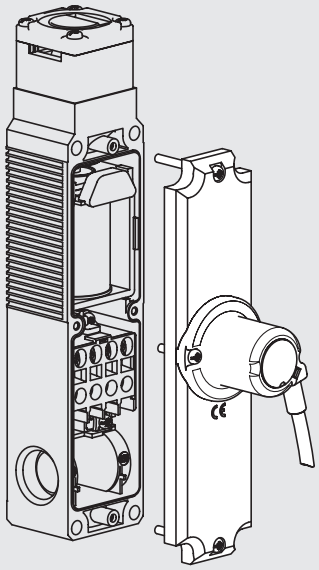
- **Wire front release (bowden)**
- **Safety screws**
- **Replacement screws**

Wire front release (bowden)
As escape release or emergency unlocking facility in the case of inaccessible installation.

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

Replacementscrews
For mounting actuating heads (not safety screws).

Front wire release (bowden)
for safety switches TP/STP



Ordering table

Designation	Version	Use	Order No.
Wire front release (bowden)	Pre-assembled incl. cover and pull wire with 3 m length (2 m sheathed)	For safety switches TP	**096 230** BW-TP-C-2000
		For safety switches STP	**097 952** BW-STP-C-2000
Safety screws VPE: 100 ea.	**M5 x 25**	For hinged actuators for top and bottom hinged doors of series NM..VZ, NP..., GP... and TP...	**073 457** M5x25/V100
	M5 x 10 Material: stainless steel	For actuators straight/bent/hinged actuators for right and left hung doors of series NM..VZ, NP..., GP... and TP...	**073 455** M5x10/V100
	M4 x 14	For all actuators in series NM..VZ	**074 063** M4x14/V100
	M4 x 14 Material: stainless steel	For actuators straight/bent/hinged with bush of series NP..., GP... and TP...	**086 232** M4x14/V100
	PL3x30	Cap screws for series NP...A, GP... and TP...A	**075 532** PL3x30/V100
	PL3x26	Cap screws for series NM..AL, NM..AG, NM..AK, NM..AV and NM..VZ	**085 576** PL3x26/V100
	PL3x8	Cap screws for series NM..HB, NM..KB, NM..RB and NM..WO	**085 577** PL3x8/V100
Replacement screws VPE: 100 ea. (not safety screws)	**PL3x30** Material: stainless steel	Cap screws for series NP...A, GP... and TP...A	**082 237** PL3x30/V100
	PL3x38	Cap screws for series NP...K and TP...K	**076 755** PL3x38/V100

For safety precautions see page 132
For technical data see page 99

Bolts for safety guards for safety switches NM

- **For left or right hinged doors**

Features

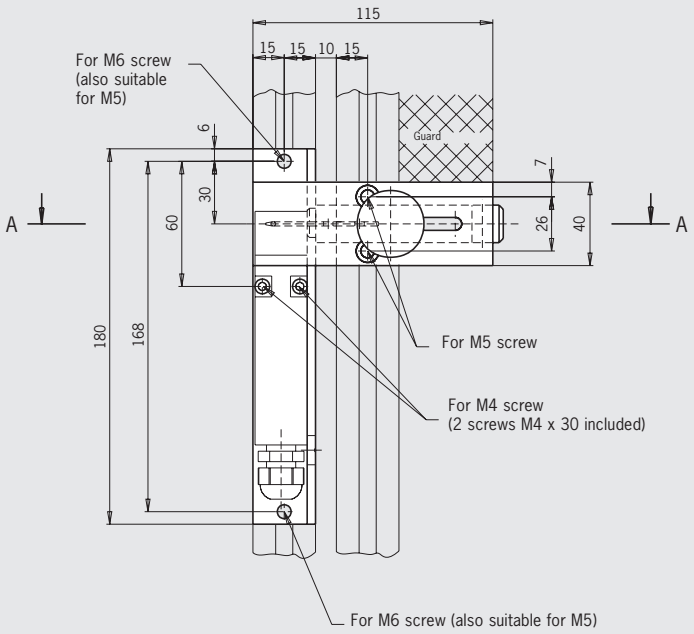
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Symmetrical design for doors hinged on the right or left
- No additional door handle necessary
- Bolt with detent mechanism in opened position
- Through hole on the bolt permits attachment of padlocks

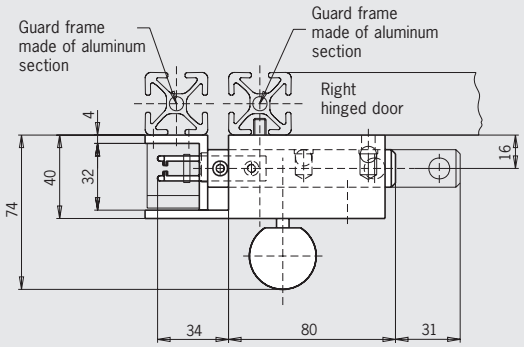
Notes

- Actuator and switch bracket included
- Please order safety switch separately

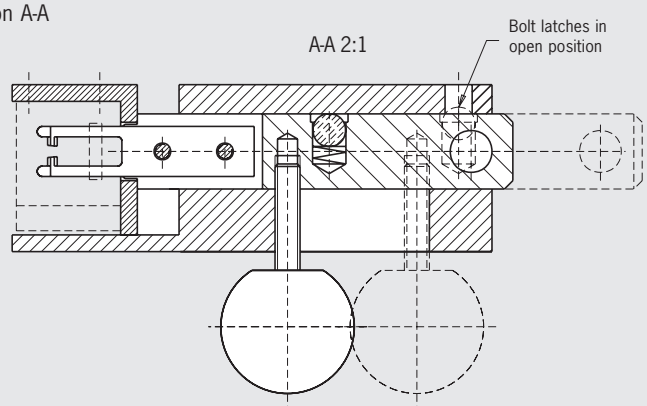
Bolt for safety switches NM..VZ

Dimension drawings





Section A-A



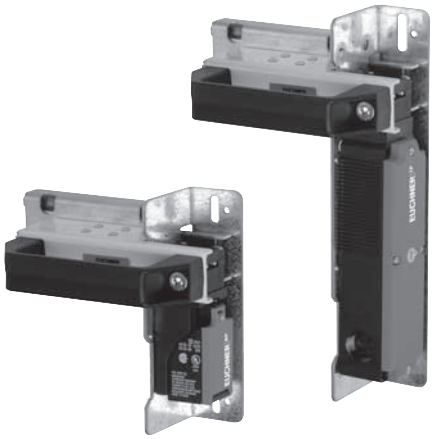
Ordering table

Designation	Detent mechanism	Version	Order No.
Bolt NM	**None**	For right or left hinged doors Actuator and switch bracket included	**077 233** Bolt NM
Switch bracket NM		Separate	**077 245** Switch bracket NM

Bolt for safety guards for safety switches NP, GP and TP

- **For left or right hinged doors**

Bolt for safety switches NP..AS/GP.../TP...A



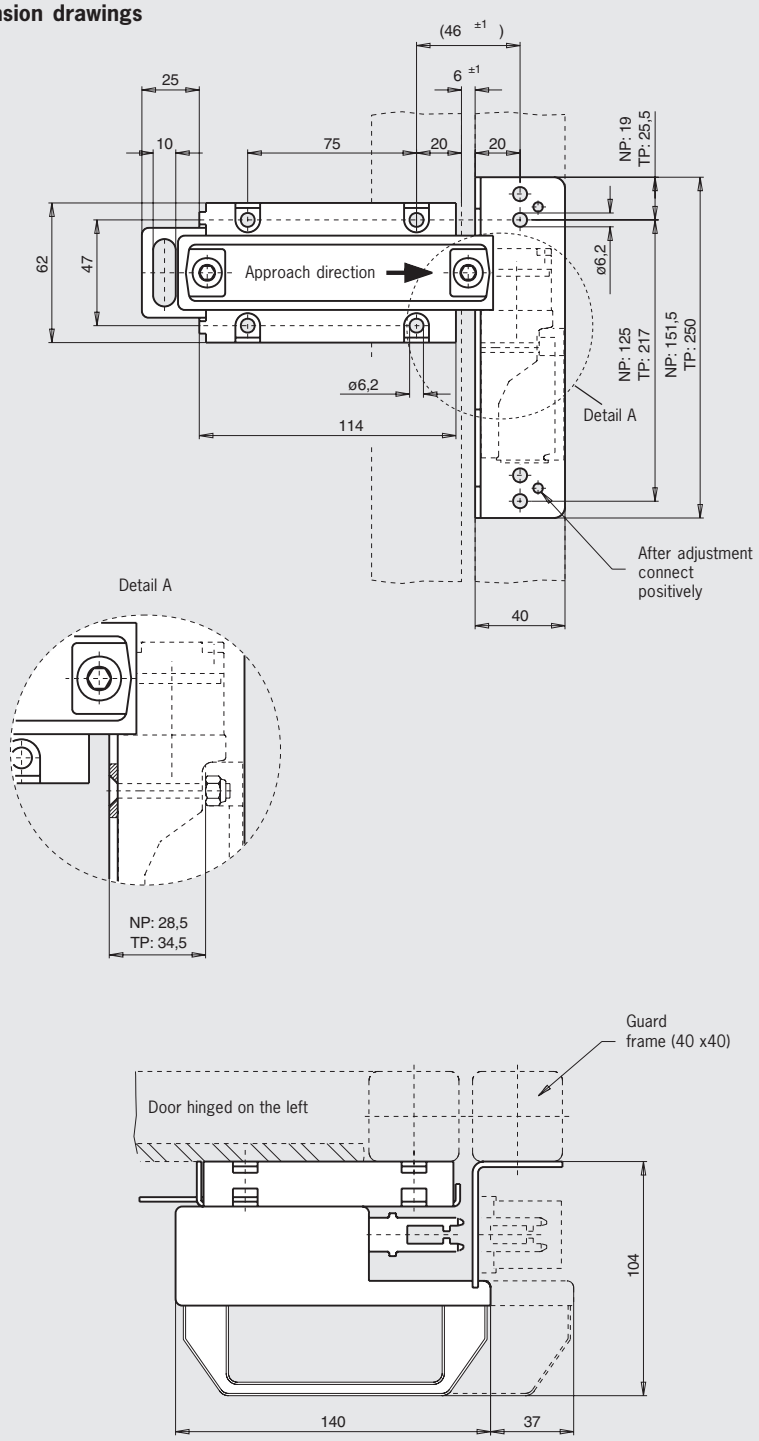
Features

- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Symmetrical design for doors hinged on the right or left
- No additional door handle necessary
- Automatic detent mechanism when bolt is moved to the locked position (only available on **bolt 1 NP/TP** version)
- Detent mechanism prevents unintentional opening of the hinged door
- Slot on the bolt permits attachment of padlocks
- Identical bolt for safety switches series **NP...AS** and **TP...A**

Notes

- Switch bracket **NP** is suitable only for the series **NP...AS**
- Switch bracket **TP** is suitable only for the series **TP...A** and GP
- Actuator included
- Please order safety switch and switch bracket separately

Dimension drawings



Ordering table

Designation	Detent mechanism	Version	Order No.
Bolt 0 NP/TP	**None**	For right or left hinged doors (also for GP)	**073 535** Bolt 0 NP/TP
Bolt 1 NP/TP	**1 x detent mechanism closed**	For right or left hinged doors (also for GP)	**073 536** Bolt 1 NP/TP
Switch bracket NP		Separate	**073 538** Switch bracket NP
Switch bracket TP		Separate (also for GP)	**073 539** Switch bracket TP

For safety precautions see page 132
For technical data see page 99

Bolt for safety guards for safety switches GP and TP

- **Lever for escape release from the danger area (optional)**

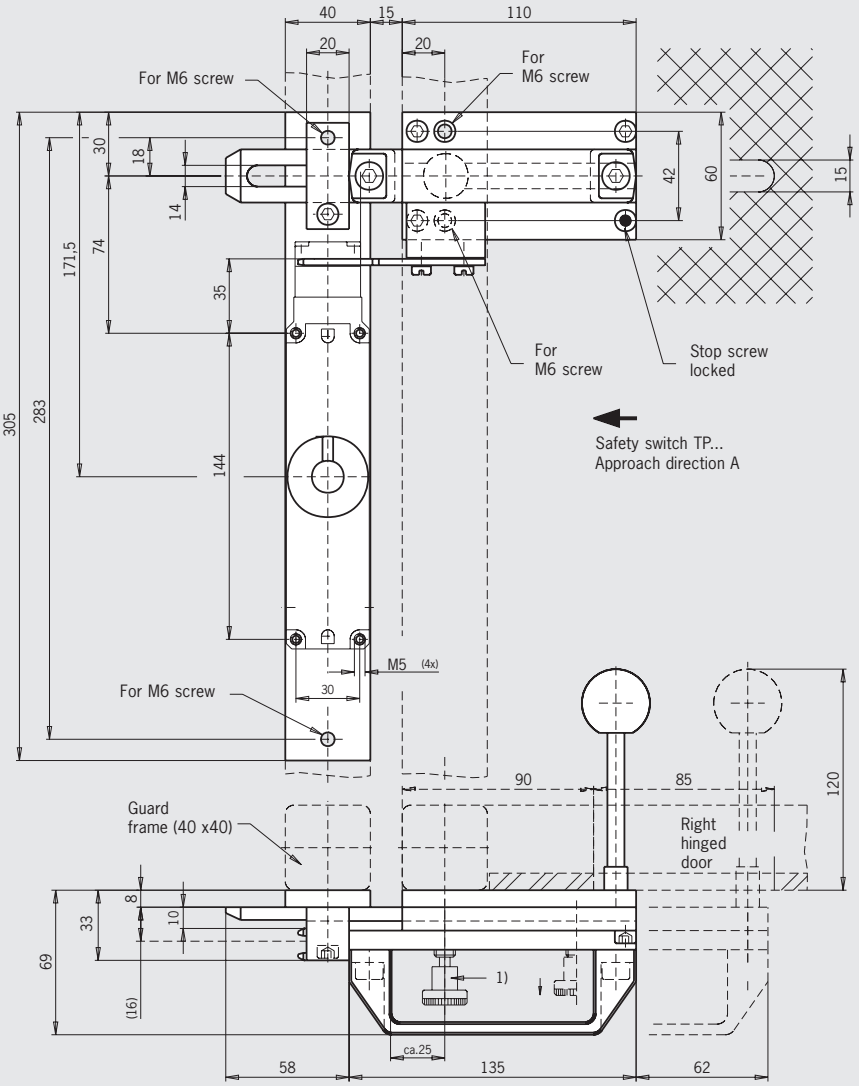
Special features
(only for bolt TP-AF and TP-CF with escape release)
- Bolt with detent mechanism
  The bolt latches in open position to prevent unintended closing
- Lever for escape release from the danger area

Features
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Robust version for heavy doors
- No additional door handle necessary
- Slot on the bolt permits attachment of padlocks

Notes
- The bolts are suitable only for the series **TP...A** and **GP**
- Actuator included
- Please order safety switch separately

Bolt for safety switches GP.../TP...A/TP..A.-C1743/TP...A.-C1993

Dimension drawings (here: shown with escape release)



1) Bolt with detent mechanism (only for bolt TP-AF and TP-CF with escape release):
Latches in open position and prevents unintended closing of the bolt.
Unlocked by pulling the detent knob upward.

Ordering table

Designation	Detent mechanism	Version	Order No.
Bolt TP-AF	**Detent knob**	For right hinged doors with escape release	**086 186** Bolt TP-AF
Bolt TP-CF	**Detent knob**	For left hinged doors with escape release	**086 188** Bolt TP-CF
Bolt TP-A	**None**	For right hinged doors without escape release (also for GP)	**084 430** Bolt TP-A
Bolt TP-C	**None**	For left hinged doors without escape release (also for GP)	**084 432** Bolt TP-C

Bolts for safety guards for safety switches STP/STA/SGP

- **Lever for escape release from the danger area (optional)**

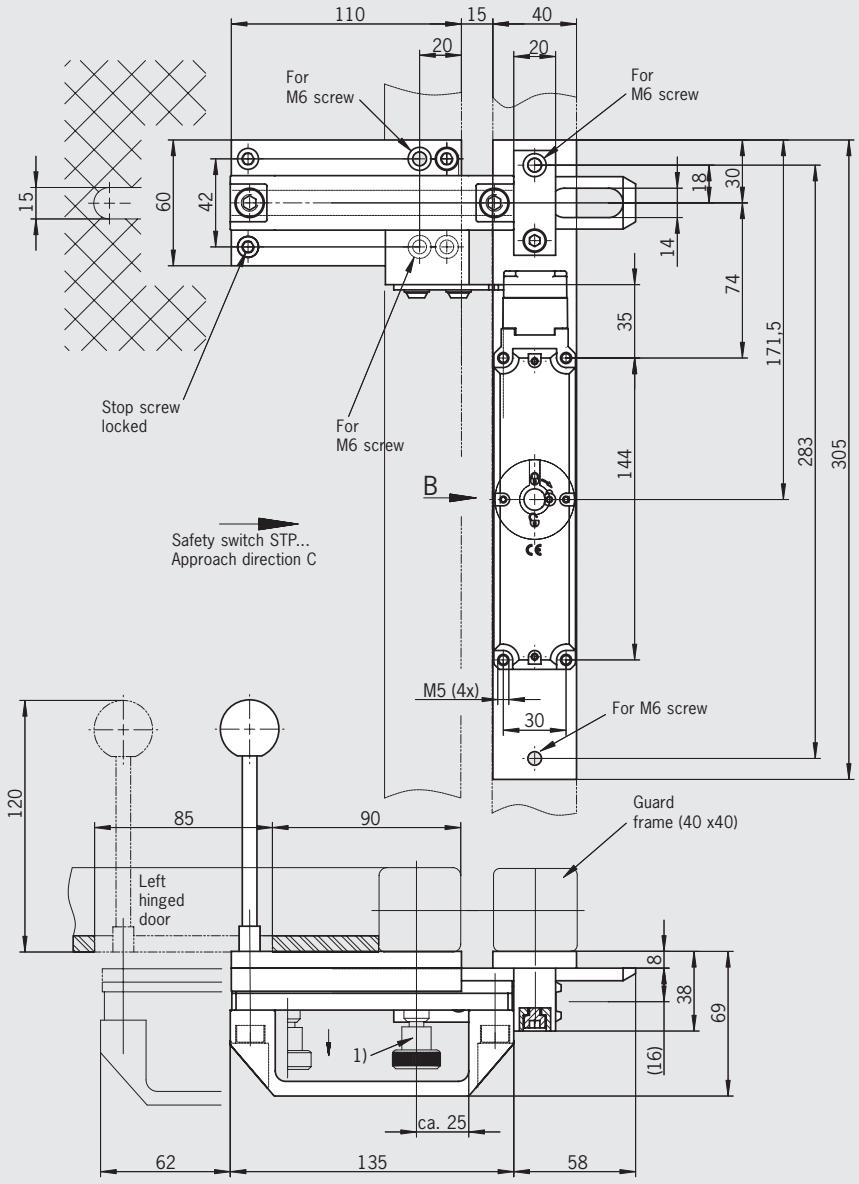
Special features
(only for bolt STP-AF and STP-CF with escape release)
- Bolt with detent mechanism
  The bolt latches in open position to prevent unintended closing
- Lever for escape release from the danger area (optional)

Features
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Robust version for heavy doors
- No additional door handle necessary
- Slot on the bolt permits attachment of padlocks

Notes
- The bolts are only suitable for series **STP.../STA.../SGP...**
- Actuator included
- Please order safety switch separately

Bolts for safety switches series STP.../STA.../SGP...

Dimension drawings (here: shown with escape release)



1) Bolt with detent mechanism (only for bolt STP-AF and STP-CF with escape release):
Latches in open position and prevents unintended closing of the bolt.
Unlocked by pulling the detent knob upward.

Ordering table

Designation	Detent mechanism	Version	Order No.
Bolt STP-AF	**Detent knob**	For right hinged doors with escape release	**096 390** Bolt STP-AF
Bolt STP-CF	**Detent knob**	For left hinged doors with escape release	**096 391** Bolt STP-CF
Bolt STP-A	**None**	For right hinged doors without escape release	**096 384** Bolt STP-A
Bolt STP-C	**None**	For left hinged doors without escape release	**096 385** Bolt STP-C

For safety precautions see page 132
For technical data see page 99

Bolt for safety guards for safety switches GP, SGP, TP, STA and STP

- **Material: reinforced plastic**
- **Lever for escape release from the danger area**
- **For left or right hinged doors**

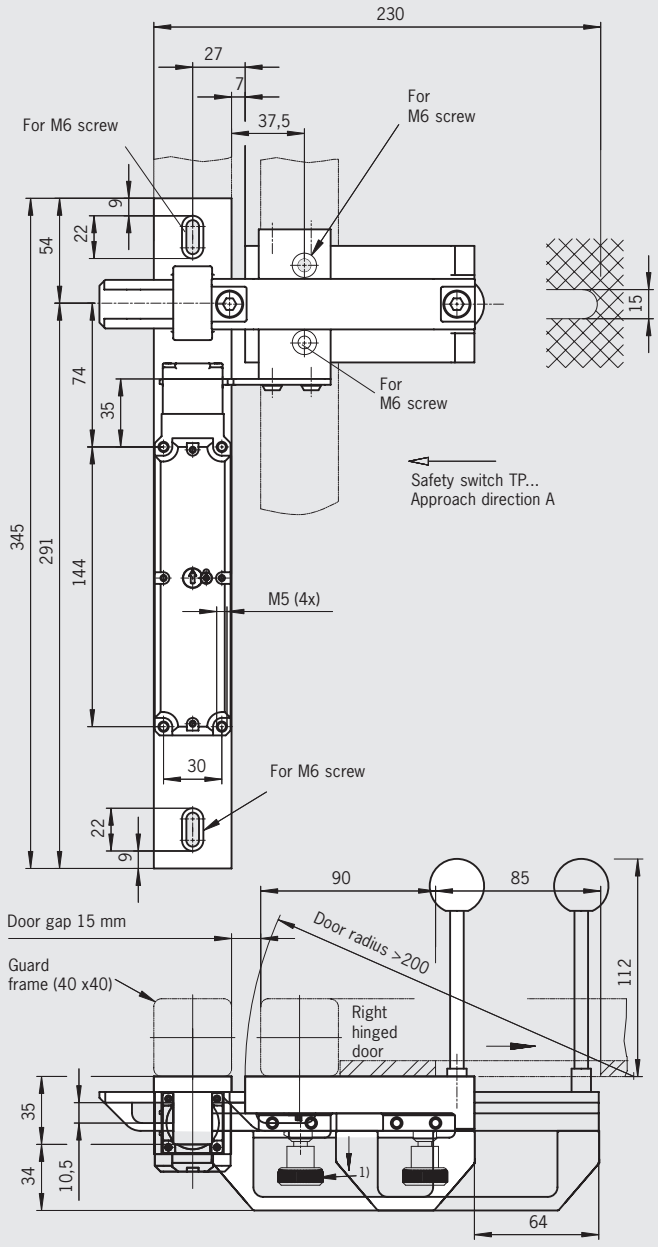
Special features
- Bolt with detent mechanism (only for bolts with escape release)
  The bolt latches in open position to prevent unintended closing

Features
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Robust version for heavy doors
- No additional door handle necessary
- Slot on the bolt permits attachment of padlocks

Notes
- Functions only in conjunction with switch bracket **TP-GFK**
- Actuator included
- Please order safety switch separately
- Order switch bracket separately

Bolt for safety switches GP.../TP...A/TP..A.-C1743/TP...A.-C1993

Dimension drawings (here: shown with escape release)



1) Bolt with detent mechanism (only for bolts with escape release:
Latches in open position and prevents unintended closing of the bolt.
Unlocked by pulling the detent knob upward.

Ordering table

Designation	Detent mechanism	Version	Order No.
Bolt TP-GFK-F	**Detent knob**	For right or left hinged doors with escape release (also for GP)	**097 602** Bolt TP-GFK-F
Bolt TP-GFK	**Detent knob**	For right or left hinged doors without escape release (also for GP)	**096 616** Bolt TP-GFK
Bolt STP-GFK	**Detent knob**	For right or left hinged doors without escape release (also for SGP/STA)	**098 121** Bolt STP-GFK
Switch bracket TP-GFK		Separate (also for GP/SGP/STP/STA)	**096 613** Switch bracket TP-GFK

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

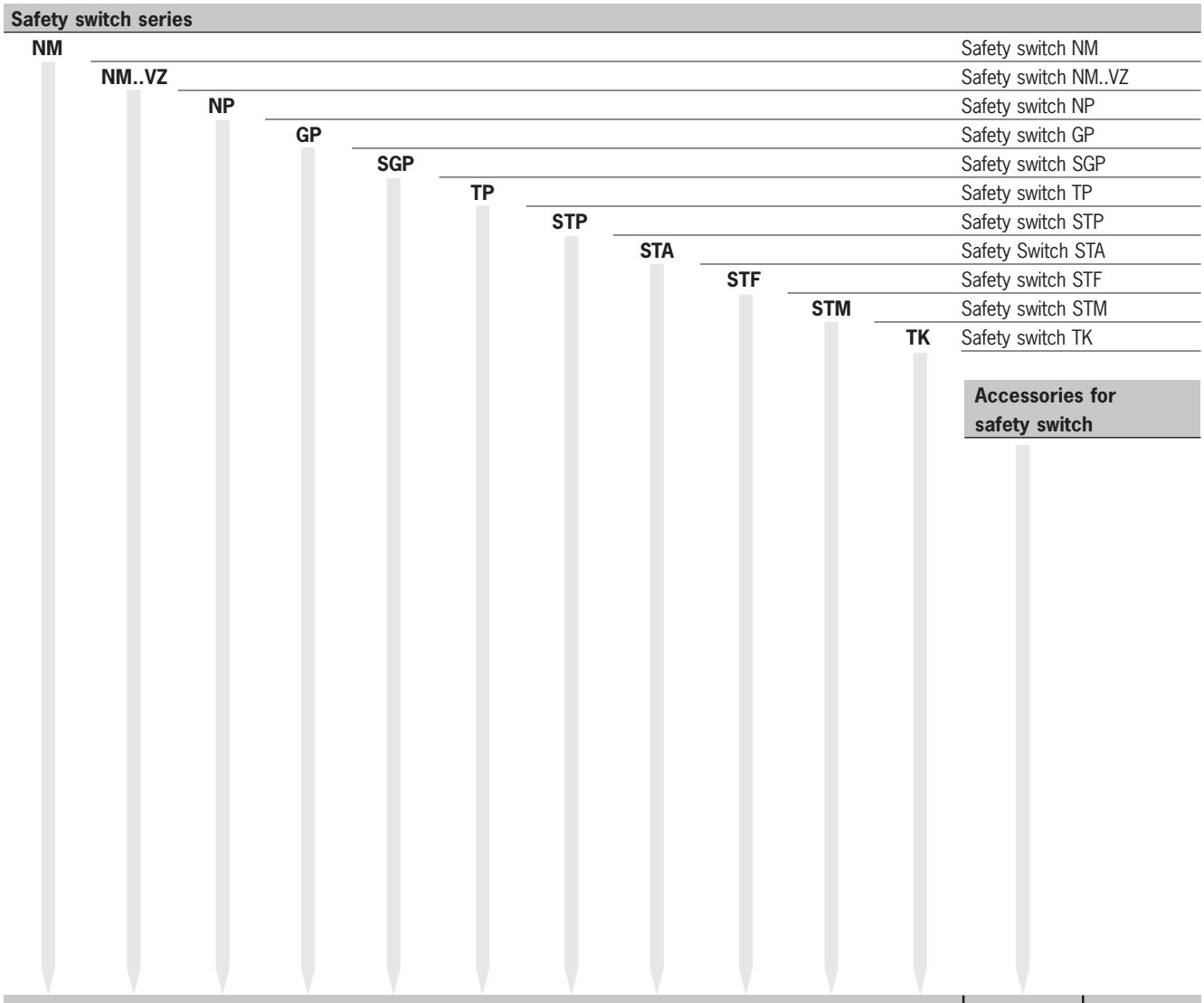
Type	Version	Manufacturer's designation	
SVM5 5 pins	Female plug M12	**99-0436-57-05** Cable socket	**Binder** www.binder-connector.de
	Female flange connector M12	**09-3442-700-05** Flange connector with wires	
	Dummy plug M12	**08-2425-000-000** Protective cap for socket with retaining strap	
CE5 3 pins + N + PE	Mating connector (socket)	**CEE plug as per CEE standard**	
C16-1 6 pins + PE	Female flange connector	**T3107 500** Female receptacle	**Amphenol-Tuchel** www.amphenol-tuchel.com
	Female crimp contacts for C16-1, VPE 100 pcs.	**VN02 016 0002 (1)** Single contact, silver, 0.5-1.5 mm²	
	Dummy plug	**T6483 000** Protective cap for female receptacle	
MR 7, 8, 9, 10 and 12 pins	Straight female plug (7-pin), pre-assembled for built-in connector MR7	**MIN-7FPX-..** Female plugs with cable	**MENCOM** www.mencomcorp.com
	Straight female plug (8-pin), pre-assembled for built-in connector MR8	**MIN-8FPX-..** Female plugs with cable	
	Straight female plug (9-pin), pre-assembled for built-in connector MR9	**MIN-9FP-..** Female plugs with cable	
	Straight female plug (10-pin), pre-assembled for built-in connector MR10	**MIN-10FP-..** Female plugs with cable	
	Straight female plug (12-pin), pre-assembled for built-in connector MR12	**MIN-12FP-..** Female plugs with cable	
HAN10 10 pins + PE	Flange connector 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** Socket crimp contacts 0.5 mm²	
	Dummy plug	**09 20 010 5425** Cover	
RC17-Y coded 17-pin	Female flange connector, solder for male plug RC17Y)	**RC-17S1Y122000** Flange plug connector 17-pin	**Coninvers** www.coninvers.com
	Blanking plug	**RC-17P1N8A83NN** Protective cap for socket with retaining strap	

▸ Crimp and extraction tools

For plug connectors	Function	Manufacturer's designation	
SR6 and SR11	Crimp tool	**932 507-002** XCZ 0701	**Hirschmann** www.hirschmann.com
	Extraction tool	**931 812-001** XWA 164	
C16-1	Crimp tool	**TA0500 + TA0000163 + TA0002016001** Crimp pliers, jaws and contact receptacle	**Amphenol-Tuchel** www.amphenol-tuchel.com
	Extraction tool	**FG 0300 1461** Extraction tool	
RC12	Crimp tool	**RC-Z 2378** Crimp pliers for machined contacts	**Coninvers** www.coninvers.com
	Extraction tool	**RC-Z 2097** Extraction tool/insertion tool	
RC18	Crimp tool	**RC-Z 2378** Crimp pliers for machined contacts	
	Extraction tool	**RC-Z 2274** Extraction tool	
VP19	Crimp tool	**T98143 DAK 83S-30 / 11-7576T3** Insertion tool	**Litton/ Veam** www.littonveam.com
	Extraction tool	**46592-MT50 / 11-7576T3** Removal tool	
UT23	Crimp tool	**Y16RCM** Crimping tool for machined contacts	**Burndy** www.burndy.com
	Extraction tool	**RX2025GE1** Extraction tool	
TB24	Crimp tool	**WT10-04** Crimp tool	**Thomas & Betts** www.tnb.com
	Extraction tool	**TRT16** Contact removal tool	

For safety precautions see page 132
For technical data see page 99

Overview



Safety switch series											Accessories	Page
NM	NM..VZ	NP	GP	SGP	TP	STP	STA	STF	STM	TK		
●												100
	●											102
		●										103
			●									105
				●								106
					●							107
						●						110
							●					112
								●				114
									●			116
										●		118
											●	120

Safety switch NM...

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

Switch

Parameter	Value			Unit
Housing material	Reinforced thermoplastic			
Mechanical life	**WO/RB**	**KB/HB**	**AV/AL/AG/AK**	
	30 x 10^6	20 x 10^6	> 4 x 10^6	Operating cycles
Weight	approx. 0.1			kg
Actuator material	Plastic; hinged actuators steel (stainless)			
Approach speed, max.	60			m/min
Actuating force	15			N

Switching element

Parameter	Value				Unit
Switching principle	Slow-action switching element				
Switching elements with 1 switching element	**ES01** 1 NC ⊖				
Switching elements with 2 switching elements	**ES11** 1 NC ⊖ + 1 NO	**ES02** 2 NC ⊖	**ES12** 2 NC ⊖ + 1 NO	**ES03** 3 NC ⊖	
Switching current, min., at 24 V DC	1				mA
Switching voltage, min.	12				V
Contact material	Silver alloy, gold flashed				

Connection, cable entry M16 x 1.5

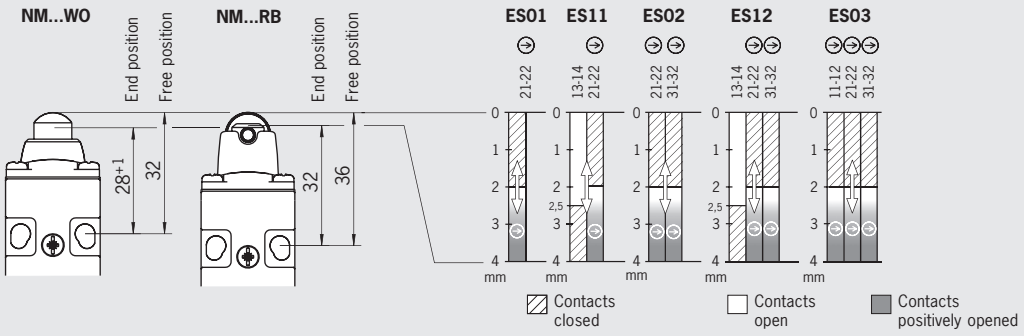
Parameter		Value	Unit
Ambient temperature		- 20 ... + 80	°C
Connection		Screw terminal	
Version		M16 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm^2
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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 SM 4 (M12)

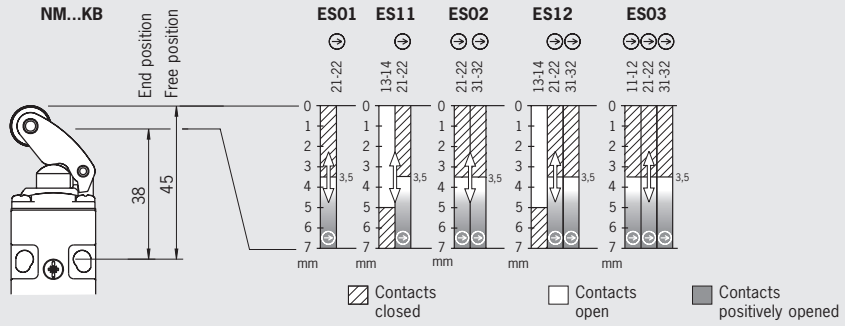
Parameter		Value	Unit
Ambient temperature		- 20 ... + 60	°C
Connection		Plug connector	
Version		M12 (4-pin)	
Degree of protection according to IEC 60529		IP 67 [1)]	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.3	kV
Conventional thermal current I_{th}		1.5	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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	

1) Screwed tight with the related plug connector (see page 87-88)

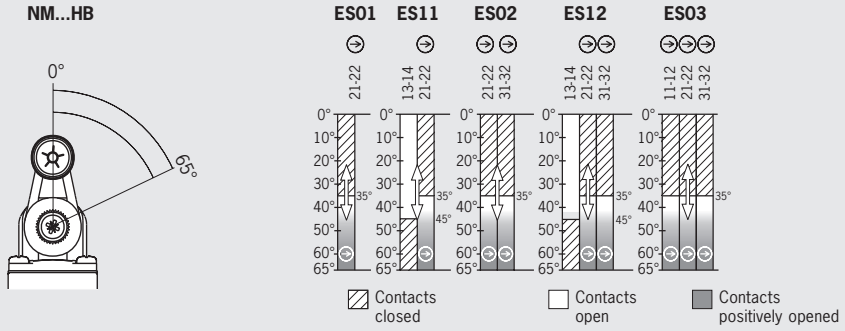
Travel diagram NM.WO/NM.RB



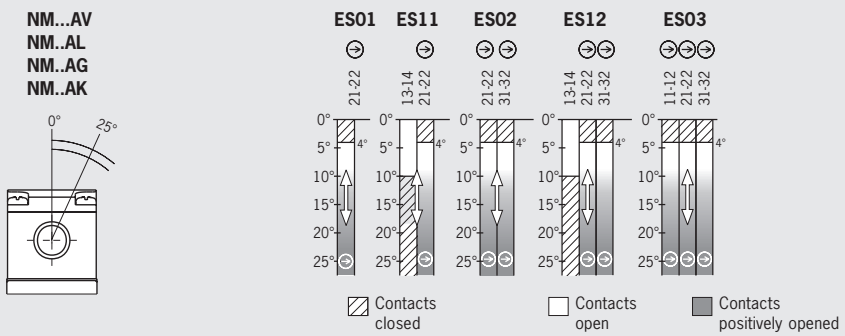
Travel diagram NM.KB



Travel diagram NM.HB



Travel diagram NM.AV/NM.AL/NM.AG/NM.AK



Safety switch NM..VZ

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

Switch

Parameter		Value	Unit
Housing material		Reinforced thermoplastic	
Mechanical life		10^6 operating cycles	
Weight		approx. 0.1	kg
Max. approach speed		20	m/min
Actuating force		10	N
Extraction force		10	N
Retention force		2	N
Insertion depth	necessary minimum travel	20	mm
	permissible overtravel	4	mm

Switching element

Parameter	Value				Unit
Switching principle	Slow-action switching element				
Switching elements with 1 switching element	**ES01** 1 NC ⊖				
Switching elements with 2 switching elements	**ES11** 1 NC ⊖ + 1 NO	**ES02** 2 NC ⊖	**ES12** 2 NC ⊖ + 1 NO	**ES03** 2 NC ⊖	
Switching current, min., at 24 V DC	1				mA
Switching voltage, min., at 10 mA	12				V
Contact material	Silver alloy, gold flashed				

Connection, cable entry M16 x 1.5

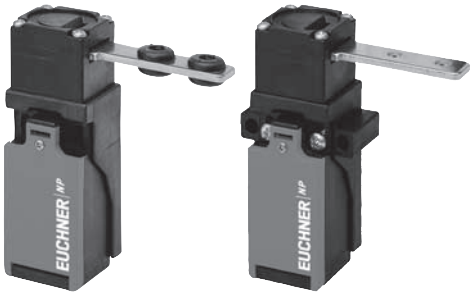
Parameter		Value	Unit
Ambient temperature		- 20 ... + 80	°C
Connection		Screw terminal	
Version		M16 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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 SM 4 (M12)

Parameter		Value	Unit
Ambient temperature		- 20 ... + 60	°C
Connection		Plug connector	
Version		M12 (4-pin)	
Degree of protection according to IEC 60529		IP 67 [1)]	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		1.5	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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	

1) Screwed tight with the related plug connector (see page 87-88)

Safety switch NP



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

Switch

Parameter	Value		Unit
Housing material	Reinforced thermoplastic		
Mechanical life	10^6 operating cycles		
Ambient temperature	- 20 ... + 80		°C
Weight	approx. 0.11		kg
Max. approach speed	20		m/min
Actuating force	5		N
Extraction force	15		N
Retention force	2		N
Insertion depth (minimum required travel + permissible overtravel)	Standard actuators	Overtravel actuator	
Approach direction side (h)	28 + 2	28 + 7	mm
Approach direction from top (v)	29.5 + 1.5	29.5 + 7 Only with adapter NP-K Order No. 074 578 / page 83	mm

Switching element

Parameter	Value		Unit
Switching principle	Slow-action switching element		
Switching elements with 1 switching element	**618** 1 NC ⊖		
Switching elements with 2 switching elements	**628** 1 NC ⊖ + 1 NO	**638** 2 NC ⊖	
Switching elements with 3 switching elements	**648** 2 NC ⊖ + 1 NO		
Switching current, min., at 24 V DC	30		mA
Switching voltage, min., at 10 mA	24		V
Contact material	Silver alloy		

Connection, cable entry M20 x 1.5

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm^2
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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 SM 4 (M12)

Parameter		Value	Unit
Connection		Plug connector	
Version		M12 (4-pin)	
Degree of protection according to IEC 60529		IP 67 [1)]	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.3	kV
Conventional thermal current I_{th}		1.5	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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	

1) Screwed tight with the related plug connector (see page 87-88)

Plug connector SR6 connection			
Parameter		**Value**	**Unit**
Connection		Plug connector	
Version		6-pin + PE	
Degree of protection according to IEC 60529		IP 65 [1)]	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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	

1) Screwed tight with the related plug connector (see page 87-88)

Safety switch GP

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

Switch

Parameter	Value		Unit
Housing material	Reinforced thermoplastic		
Mechanical life	2 x 10^6 operating cycles		
Ambient temperature	- 20 ... + 80		°C
Weight	approx. 0.16		kg
Max. approach speed	20		m/min
Actuating force	10		N
Extraction force	20		N
Retention force	2		N
Insertion depth (minimum required travel + permissible overtravel)	Standard actuators	Overtravel actuator	
Approach direction side (h)	28 + 2	28 + 7	mm
Approach direction from top (v)	29.5 + 1.5	29.5 + 7	mm

Switching element

Parameter	Value			Unit
Switching principle	Slow-action switching element			
Switching elements with 2 switching elements	**528** 1 NC ⊖ + 1 NO	**538** 2 NC ⊖		
Switching elements with 4 switching elements	**2121** 4 NC ⊖	**2131** 3 NC ⊖ + 1 NO	**3131** 2 NC ⊖ + 2 NO	
Switching current, min., at 24 V DC	1			mA
Switching voltage, min., at 10 mA	12			V
Contact material	Silver alloy, gold flashed			

Connection, cable entry M20 x 1.5

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm^2
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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	

Plug connector SR11 connection

Parameter		Value	Unit
Connection		Plug connector	
Version		11-pin + PE	
Degree of protection according to IEC 60529		IP 65 [1)]	
Rated insulation voltage U_i		50	V AC/DC
Rated impulse withstand voltage U_{imp}		1.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 87-88)

Safety switch SGP

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

Switch

Parameter		Value		Unit
Material	Housing	Reinforced thermoplastic		
	Actuating head	Die-cast aluminum		
	Cam in actuating head	Stainless steel		
Mechanical life		2 x 10^6 operating cycles		
Ambient temperature		- 20 ... + 80		°C
Weight		approx. 0.16		kg
Max. approach speed		20		m/min
Actuating force		25		N
Extraction force		25		N
Retention force		10		N
Insertion depth (minimum required travel + permissible overtravel)		Actuator *S* standard	Actuator *L* for insertion funnel	
Approach direction side (h)		24.5 + 5	28.5 + 5	mm
Approach direction from top (v)		24.5 + 5	28.5 + 5	mm

Switching element

Parameter	Value			Unit
Switching principle	Slow-action switching element			
Switching elements with 4 switching elements	**2121** 4 NC ⊖	**2131** 3 NC ⊖ + 1 NO	**3131** 2 NC ⊖ + 2 NO	
Switching current, min., at 24 V DC	1			mA
Switching voltage, min., at 10 mA	12			V
Contact material	Silver alloy, gold flashed			

Connection, cable entry M20 x 1.5

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm^2
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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	

Plug connector SR11 connection

Parameter		Value	Unit
Connection		Plug connector	
Version		11-pin + PE	
Degree of protection according to IEC 60529		IP 65 [1)]	
Rated insulation voltage U_i		50	V AC/DC
Rated impulse withstand voltage U_{imp}		1.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

Safety switch TP... with guard locking and guard lock monitoring

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

Switch

Parameter	Value		Unit
Housing material	Reinforced thermoplastic		
Mechanical life	1 x 10^6 operating cycles		
Ambient temperature	- 20 ... + 55		°C
Weight	approx. 0.5		kg
Max. approach speed	20		m/min
Actuating force	10		N
Extraction force (not locked)	20		N
Retention force	10		N
Locking force, max.	Approach direction		N
	From top (v)	Side (h)	
	1300 (800 with door unlock request contact)	1300 (800 with door unlock request contact)	
Locking force F_{Zh} in accordance with test principles GS-ET-19	Approach direction		N
	From top (v)	Side (h)	
	1000	1000	
Insertion depth (minimum required travel + permissible overtravel)	Standard actuators	Overtravel actuator	
Approach direction side (h)	28 + 2	28 + 7	mm
Approach direction from top (v)	29.5 + 1.5	-	mm

Switching element

Parameter	Value				Unit
Switching principle	Slow-action switching element				
Switching elements with 2 switching elements	**528** 1 NC ⊖→ + 1 NO	**537** 1 NC ⊖→ + 1NC	**538** 2 NC ⊖→ + 1NC		
Switching elements with door unlock request contact	**4120** 2 NC ⊖→ + 1 NO				
Switching elements with 4 switching elements	**2131** 2 NC ⊖→ + 1 NO + 1 NC	**4121** 2 NC ⊖→ + 1 NC + 1 NO	**4131** 2 NC ⊖→ + 2 NO	**4141** 4 NC ⊖→	
Switching current, min., at 24 V DC	1				mA
Switching voltage, min., at 10 mA	12				V
Contact material	Silver alloy, gold flashed				

Guard locking

Parameter	Value			Unit
Solenoid operating voltage	AC/DC 24 V +10/-15%	AC 110 V +10/-15%	AC 230 V +10/-15%	
Connection	Reverse polarity protected, integrated bridge rectifier			
Duty cycle ED	100			%
Power consumption	8			W

Connection, cable entry M20 x 1.5

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section max.		0.34 ... 1.5	mm^2
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC15	I_e 4 A U_e 230 V	
	DC13	I_e 4 A U_e 24 V	

Plug connector SR6 connection

7-pin

Parameter		Value	Unit
Connection		Plug connector	
Version		6-pin + PE	
Degree of protection according to IEC 60529		IP 65 1)	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category 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	

1) Screwed tight with the related plug connector (see page 88)

Plug connector SM8 connection

8-pin

Parameter		Value	Unit
Connection		Plug connector	
Version		8-pin	
Degree of protection according to IEC 60529		IP 67 1)	
Rated insulation voltage U_i		30	V AC/DC
Rated impulse withstand voltage U_{imp}		1.5	kV
Conventional thermal current I_{th}		1	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		1	A gG
Utilization category to IEC 60947-5-1	AC-15	I_e 1 A U_e 24 V	
	DC-13	I_e 1 A U_e 24 V	

1) Screwed tight with the related plug connector

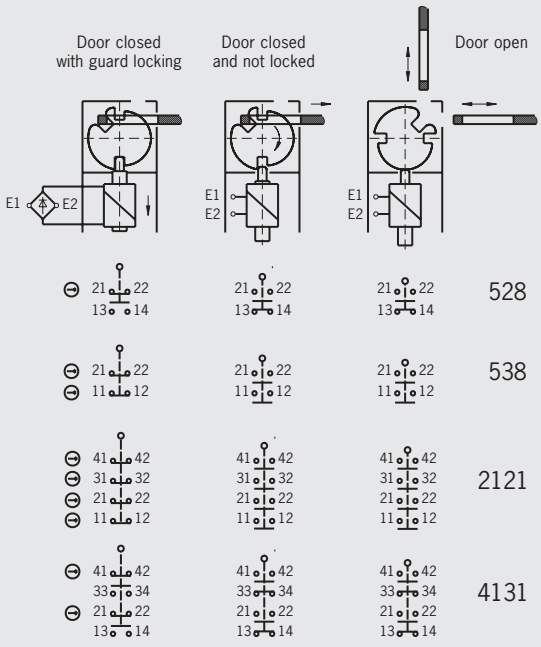
Plug connector SR11 connection

12-pin

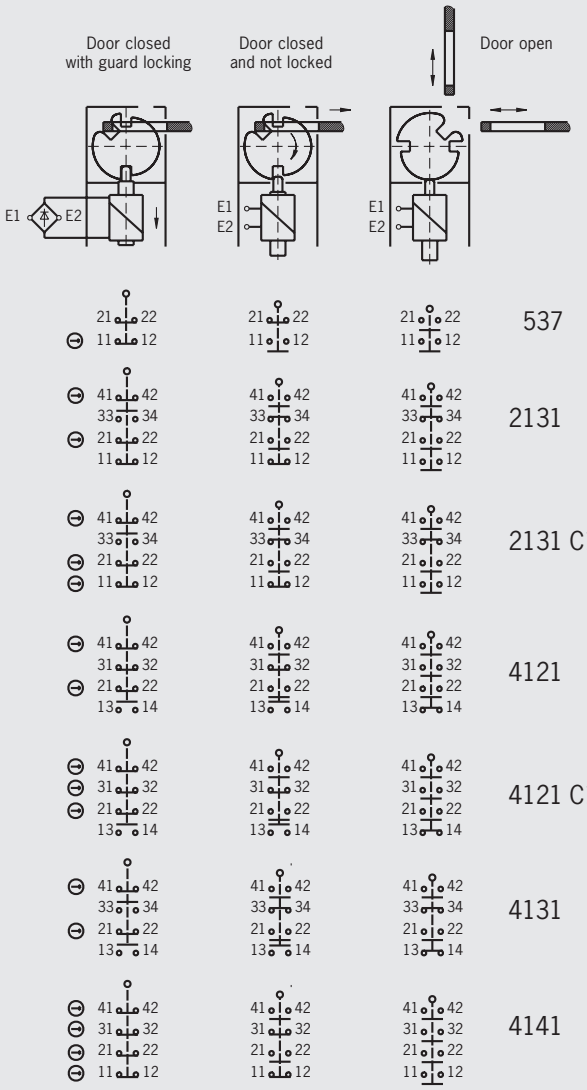
Parameter		Value	Unit
Connection		Plug connector	
Version		11-pin + PE	
Degree of protection according to IEC 60529		IP 65 1)	
Rated insulation voltage U_i		50	V AC/DC
Rated impulse withstand voltage U_{imp}		1.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 88)

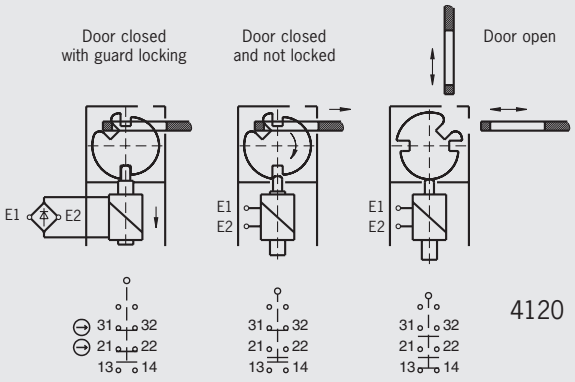
Switching functions TP1/TP2 without door monitoring contact



Switching functions TP3/TP4 with door monitoring contact



Switching functions TP5/TP6 with door unlock request contact



Safety switch STP... with guard locking and guard lock monitoring

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

Switch

Parameter		Value		Unit
Material	Housing	Reinforced thermoplastic		
	Actuating head	Die-cast aluminum		
	Cam in actuating head	Stainless steel		
Mechanical life		1 x 10^6 operating cycles		
Ambient temperature		- 20 ... + 55		°C
Weight		approx. 0.5		kg
Max. approach speed		20		m/min
Actuating force		35		N
Extraction force (not locked)		30		N
Retention force		20		N
Locking force, max.		Approach direction		N
		From top (v)	Side (h)	
		2500	2500	
Locking force F_{Zh} in accordance with test principles GS-ET-19		Approach direction		N
		From top (v)	Side (h)	
	Straight actuator	2000	2000	
Insertion depth (minimum required travel + permissible overtravel)		Actuator *S* standard	Actuator *L* for insertion funnel	
Approach direction side (h)		24.5 + 5	28.5 + 5	mm
Approach direction from top (v)		24.5 + 5	28.5 + 5	mm

Switching element

Parameter	Value			Unit
Switching principle	Slow-action switching element			
Switching elements with 2 switching elements	**528** 1 NC ⊖ + 1 NO	**537** 1 NC ⊖ + 1NC	**538** 1 NC ⊖ + 1NC	
Switching elements with 4 switching elements	**2131** 2 NC ⊖ + 1 NO + 1 NC	**4121** 2 NC ⊖ + 1 NC + 1 NO	**4131** 2 NC ⊖ + 2 NO	
Switching current, min., at 24 V DC	1			mA
Switching voltage, min., at 10 mA	12			V
Contact material	Silver alloy, gold flashed			

Guard locking

Parameter	Value			Unit
Solenoid operating voltage	AC/DC 24 V +10/-15%	AC 110 V +10/-15%	AC 230 V +10/-15%	
Connection	Reverse polarity protected, integrated bridge rectifier			
Duty cycle ED	100			%
Power consumption	8			W

Connection, cable entry M20 x 1.5

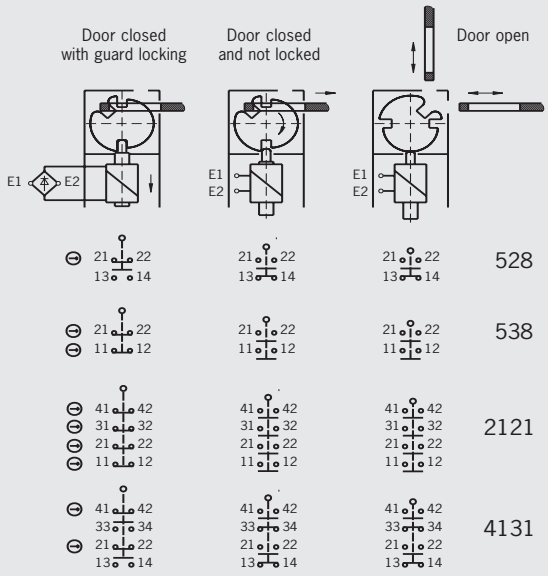
Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section max.		0.34 ... 1.5	mm^2
Degree of protection according to IEC 60529		IP 67	
Rated impulse withstand voltage U_{imp}		2.5	kV
Rated insulation voltage U_i		250	V AC/DC
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC15	I_e 4 A U_e 230 V	
	DC13	I_e 4 A U_e 24 V	

Plug connector SR11 connection

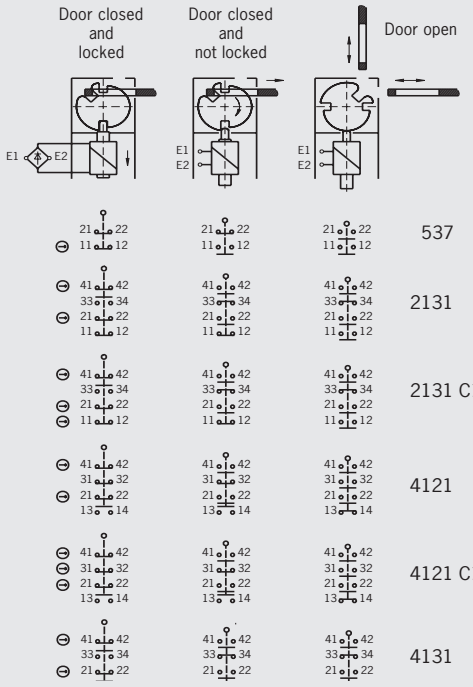
Parameter		12-pin	Unit
Connection		Plug connector	
Version		11-pin + PE	
Degree of protection according to IEC 60529		IP 65 [1)]	
Rated impulse withstand voltage U_{imp}		1.5	kV
Rated insulation voltage U_i		50	V AC/DC
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 88)

Switching functions STP1/STP2 without door monitoring contact



Switching functions STP3/STP4 with door monitoring contact



Safety switch STA... with guard locking and guard lock monitoring

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

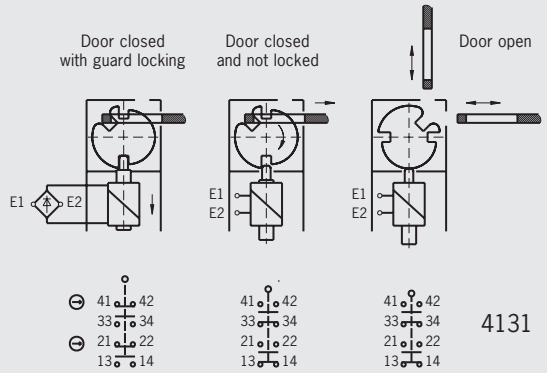
Switch Parameter	Value		Unit
Housing material	Anodized die-cast		
Mechanical life	1 x 10^6 operating cycles		
Ambient temperature	- 20 ... + 80		°C
Weight	approx. 0.6		kg
Max. approach speed	20		m/min
Actuating force	35		N
Extraction force (not locked)	30		N
Retention force	20		N
Locking force, max.	Approach direction		N
	From top (v)	Side (h)	
	3000	3000	
Locking force F_{Zh} in accordance with test principles GS-ET-19	Approach direction		N
	From top (v)	Side (h)	
Straight actuator	2300	2300	
Insertion depth (minimum required travel + permissible overtravel)	Actuator *S* standard	Actuator *L* for insertion funnel	
Approach direction side (h)	24.5 + 5	28.5 + 5	mm
Approach direction from top (v)	24.5 + 5	28.5 + 5	mm

Switching element Parameter	Value				Unit
Switching principle	Slow-action switching element				
Switching elements	**2131**	**4121**	**4131**	**4141**	
with 4 switching elements	2 NC ⊖ + 1 NO + 1 NC	2 NC ⊖ + 1 NC + 1 NO	2 NC ⊖ + 2 NO	2 NC ⊖ + 1NC	
Switching current, min., at 24 V DC	1				mA
Switching voltage, min., at 10 mA	12				V
Contact material	Silver alloy, gold flashed				

Guard locking Parameter	Value	Unit
Solenoid operating voltage	AC/DC 24 V +10/-15%	
Connection	Reverse polarity protected, integrated bridge rectifier	
Duty cycle ED	100	%
Power consumption	8	W

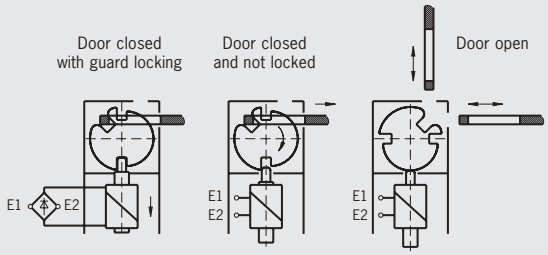
Connection, cable entry M20 x 1.5 Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section max.		0.34 ... 1.5	mm^2
Degree of protection according to IEC 60529		IP 67	
Rated impulse withstand voltage U_{imp}		2.5	kV
Rated insulation voltage U_i		250	V AC/DC
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC15	I_e 4 A U_e 230 V	
	DC13	I_e 4 A U_e 24 V	

Switching functions STA1/STA2 without door monitoring contact

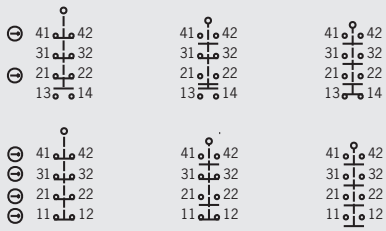


4131

Switching functions STA3/STA4 with door monitoring contact



2131



4121

4141

Safety switch STF... with guard locking, guard lock monitoring and safety latch

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

Switch

Parameter	Value		Unit
Housing material	Reinforced thermoplastic		
Mechanical life	1 x 10^6 operating cycles		
Ambient temperature	- 5 ... + 55		°C
Weight	approx. 0.69		kg
Max. approach speed	20		m/min
Actuating force	18		N
Extraction force (not locked)	26		N
Retention force	26		N
Locking force, max.	Approach direction		N
	From top (v)	Side (h)	
	2500	2000	
Locking force F_{Zh} in accordance with test principles GS-ET-19	Approach direction		N
	From top (v)	Side (h)	
Straight actuator	2000	1500	
Insertion depth (minimum required travel + permissible overtravel)	Actuator *S* standard	Actuator *L* for insertion funnel	
Approach direction side (h)	24.5 + 5	28.5 + 5	mm
Approach direction from top (v)	24.5 + 5	28.5 + 5	mm

Switching element

Parameter	Value	Unit
Switching principle	Slow-action switching element	
Switching elements with 1 switching element	**01** 1 NC ⊖	
Switching elements with 4 switching elements	**2131** 2 NC ⊖ + 1 NO + 1 NC	
Switching current, min., at 24 V DC	1	mA
Switching voltage, min., at 10 mA	12	V
Contact material	Silver alloy, gold flashed	

Guard locking

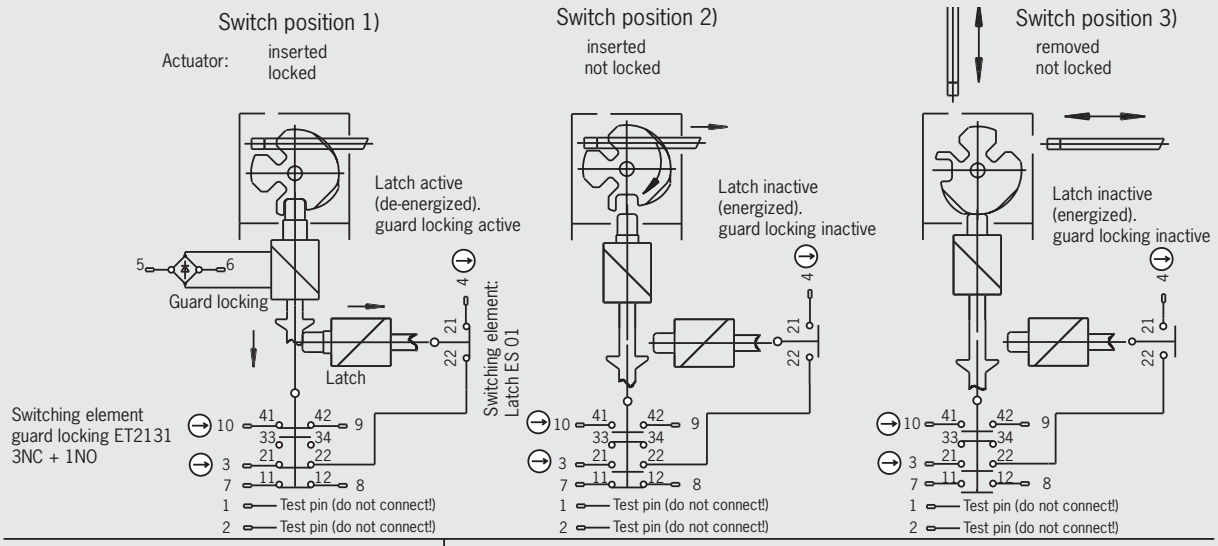
Parameter	Value	Unit
Solenoid operating voltage	AC/DC 24 V +10/-15%	
Connection	Reverse polarity protected, integrated bridge rectifier	
Duty cycle ED	100	%
Guard locking solenoid power consumption	8	W
Latching solenoid power consumption	3.8	W

Plug connector SR11 connection

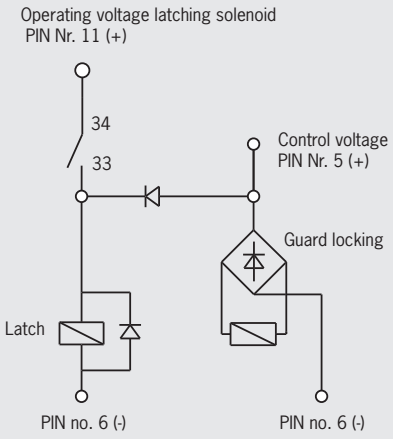
Parameter		Value	Unit
Connection		Plug connector	
Version		11-pin + PE	
Degree of protection according to IEC 60529		IP 65 [1)]	
Rated impulse withstand voltage U_{imp}		15	kV
Rated insulation voltage U_i		50	V AC/DC
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 88)

Switching functions STF3 with door monitoring contact and safety latch

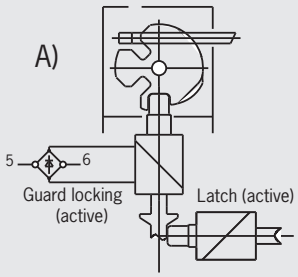


Internal wiring:

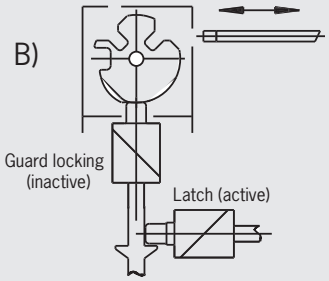


In case of power failure:

A) The switch remains in the locked position



B) The latch secures the unlocked position, i.e. the switch cannot be locked again.



Power failure from switch position 1): situation A)
Power failure from switch position 2): situation A) or B)
Power failure from switch position 3): situation B)

Safety switch STM with guard locking and guard lock monitoring

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

Switch

Parameter	Value		Unit
Housing material	Reinforced thermoplastic		
Mechanical life	2 x 10^6 operating cycles		
Ambient temperature	- 20 ... + 55		°C
Weight	approx. 0.4		kg
Max. approach speed	20		m/min
Actuating force	35		N
Extraction force (not locked)	30		N
Retention force	20		N
Locking force, max.	Approach direction		N
	From top (v)	Side (h)	
STM.A... (metal head)	2000	2000	
STM.N... (plastic head)	1000	1000	
Locking force F_{Zh} in accordance with test principles GS-ET-19	Approach direction		N
	From top (v)	Side (h)	
STM.A... (metal head)	1500	1500	
STM.N... (plastic head)	700	700	
Insertion depth (minimum required travel + permissible overtravel)	Actuator *S* standard		
Approach direction side (h)	24.5 + 5		mm
Approach direction from top (v)	24.5 + 5		mm

Switching element

Parameter	Value		Unit
Switching principle	Slow-action switching element		
Switching elements	ÜK: 1 NC ⊖ SK: **222** 2 NC ⊖	ÜK: 1 NC ⊖ SK: **242** 1 NC ⊖ + 1 NO	
Switching current, min., at 24 V	1		mA
Switching voltage, min., at 10 mA	12		V
Contact material	Silver alloy, gold flashed		

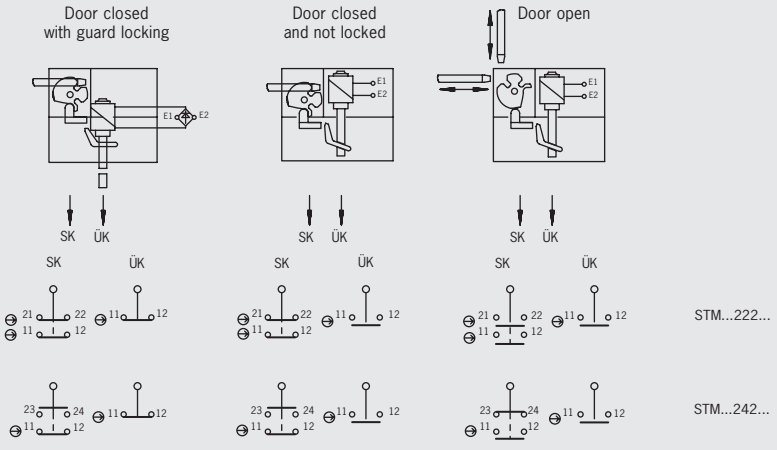
Guard locking

Parameter	Value	Unit
Solenoid operating voltage	AC/DC 24 V +10/-15%	
Connection	Reverse polarity protected, integrated bridge rectifier	
Duty cycle ED	100	%
Power consumption	6	W

Connection, cable entry M20 x 1.5

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section max.		0.34 ... 1.5	mm^2
Degree of protection acc. to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		1.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC15	I_e 4 A U_e 230 V	
	DC13	I_e 4 A U_e 24 V	

Switching functions STM



Safety switch TK... with guard locking (without protection against unintentional closing)

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

Switch

Parameter		Value	Unit
Material	Housing	Reinforced thermoplastic	
	Actuating head	Metal	
	Guard locking pin	Metal	
Mechanical life		1 x 10^6 operating cycles	
Ambient temperature		- 20 ... + 55	°C
Weight		approx. 0.6	kg
Retention force		5	N
Locking force (when fitted on switch head)		5000	N

Switching element

Parameter	Value	Unit
Switching principle	Slow-action switching element	
Switching elements with 2 switching elements	**528** 1 NC ⊖ + 1 NO	
Switching elements with 4 switching elements	**4131** 2 NC ⊖ + 2 NO	
Switching current, min., at 24 V	1	mA
Switching voltage, min., at 10 mA	12	V
Contact material	Silver alloy, gold flashed	

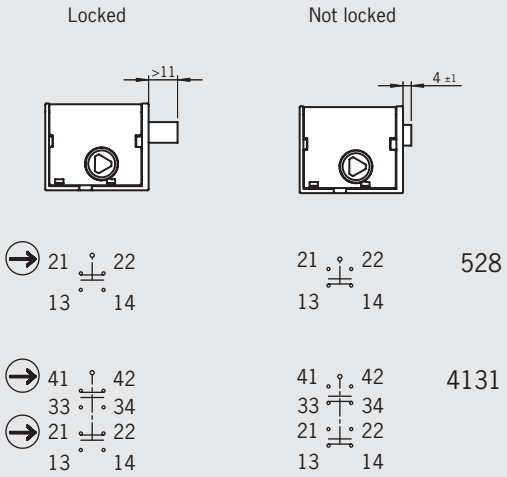
Guard locking

Parameter	Value	Unit
Solenoid operating voltage	AC/DC 24 V +10/-15%	
Connection	Reverse polarity protected, integrated bridge rectifier	
Duty cycle ED	100	%
Power consumption	8	W

Connection, cable entry M20 x 1.5

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section max.		0.34 ... 1.5	mm²
Degree of protection according to IEC 60529		IP 67	
Rated impulse withstand voltage U_{imp}		2.5	kV
Rated insulation voltage U_i		250	V AC/DC
Conventional thermal current I_{th}		4	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category to IEC 60947-5-1	AC15	I_e 4 A U_e 230 V	
	DC13	I_e 4 A U_e 24 V	

Switching functions TK



Accessories for safety switches

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

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

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

Built-in LED		
Parameter	**Value**	**Unit**
Material of housing	ABS/PC blend, black	
Material of cap	Transparent polycarbonate	
Degree of protection (installed)	IP 65	
Ambient temperature	-20 ... +50	°C
Connection	2 wires	
Mounting	M20 x 1.5	
Operating voltage	24	V DC
Switch-on current	< 0.5	A
Current consumption	45	mA

Standards and approvals

Standards

In the field of safety engineering, rope pull switches belong to the category of “EMERGENCY-STOP devices with mechanical latching”. The required EMERGENCY-STOP function must be available and functional at all times irrespective of the operating mode. After operation of the actuating element, the EMERGENCY-STOP device must automatically prevent or reduce the hazard in the best possible way.

The following standards are specifically relevant in relation to rope pull switches:

- EN 60204-1 (Safety of machinery - Electrical equipment of machines – Part 1: General requirements)
- EN 60947-5-5 (Specification for low-voltage switchgear and controlgear. Part 5-5: Control circuit devices and switching elements. Electromechanical control circuit devices. Electrical EMERGENCY--STOP device with mechanical locking function)
- EN 418 (Design, color and arrangement of EMERGENCY-STOP actuating elements)

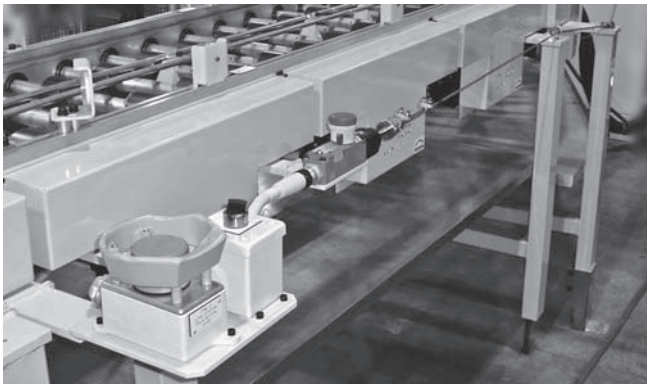
Approvals

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 the employers’ liability insurance association (BG) 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:

BG-PRÜFZERT	Switches with this symbol are approved by the German employers’ liability insurance association (BG)
C SA US	Switches with this symbol are approved by Canadian Standards Association (CSA, Canada and USA)

Task of rope pull switches

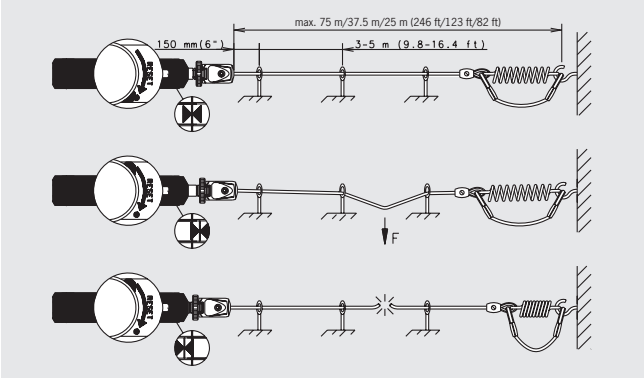
The trip range is much larger than for switches with Emergency-Stop pushbutton, since operation is possible over the whole rope length and is not restricted to the small area within reach of the switch.
Rope pull switches are used whenever it is necessary to protect large danger areas where fitting of a housing or cover is not possible or too complex.



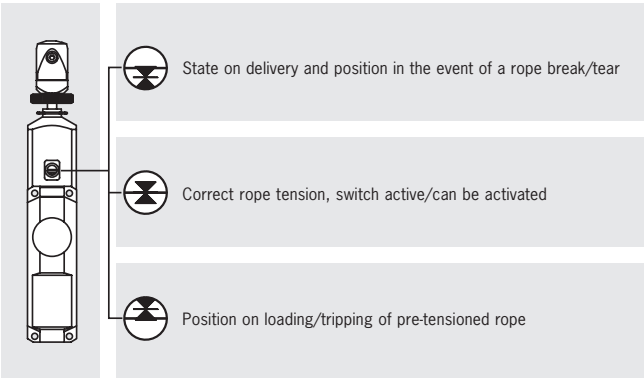
The advantage is that areas of an installation or machine can be shut down immediately from any point in the working area in the event of danger in cases where it would otherwise be necessary to install individual latched Emergency-Stop buttons at short distances apart.

Function and technology used in rope pull switches

The standard EN 60947-5-5 – 6 (Requirements for EMERGENCY-STOP pushbuttons and rope pull switches) specifies certain requirements which must be met by rope pull switches and which therefore also define the mode of operation of such switches.
For example, the latching device (Emergency-Stop switch) must be reset by turning a key, turning the pushbutton in the specified direction or by a pulling movement. Rope pull switches are normally tripped by pulling a plastic-sheathed steel rope (known as the safety rope or pull rope). In addition, EUCHNER rope pull switches feature a latched Emergency-Stop button on the housing which has the same effect.
Upon tripping, the safety contacts are actuated and a stop signal is generated which switches off the machine. The vertical tensile force which acts on the wire or rope to generate the EMERGENCY-STOP signal (contact opening) must be less than 200 N and the vertical deflection of the wire or rope which is necessary for generation of the EMERGENCY--STOP signal must be less than 400 mm. An EMERGENCY-STOP signal must also be generated if the wire or rope breaks or becomes detached. This means that any fault in the safety device is noticed immediately and the safety function is not lost at any time.



In order to achieve this, the rope pull switch has one center position and two switch-off positions. The switch is in center position during machine operation. If the safety rope is pulled or tears, the switch moves from the center position to one of the switch-off positions and the machine is stopped. Rope pull switches from EUCHNER have a sight window which allows the switch position to be seen.



Installation and rope attachment

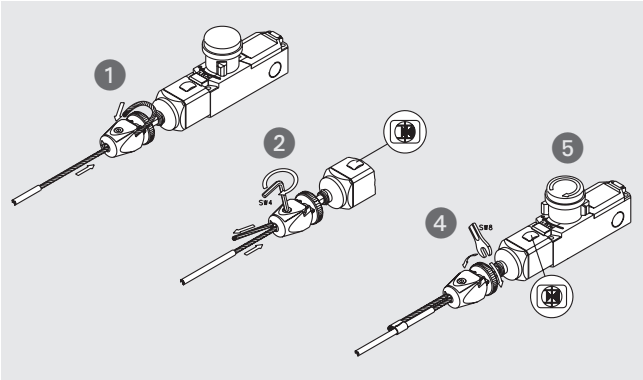
Installation

In accordance with EN 418 – 4.4, EMERGENCY-STOP actuating elements must be installed so that they can be reached easily and operated safely by persons who are at risk. It may be useful to attach marking flags to improve visibility if wires/wire ropes or ropes are used, as is the case with rope pull switches.

Rope attachment

- Version RPS...SC and RPS...PC

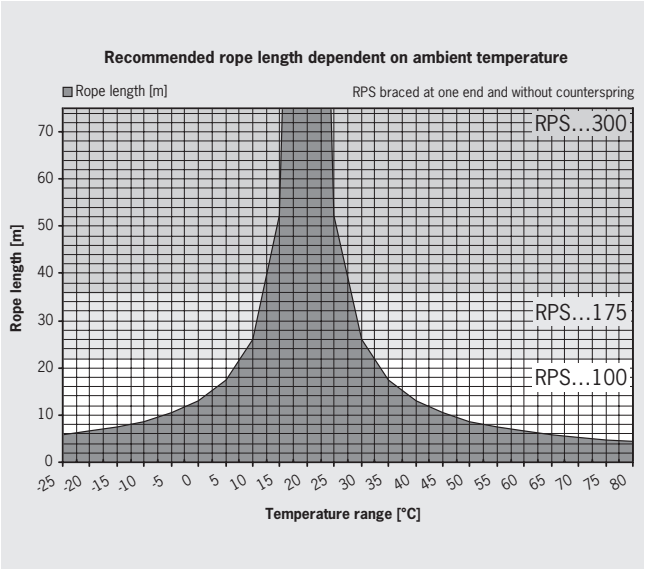
1. Strip the cabling rope and insert into the clamping head. In order to prevent the pull rope from slipping, there must be no rope coating in the clamping head.
2. Set the cabling rope roughly so that the lock marking is in central position and clamp the cabling rope firmly with the hexagon socket head screw.
3. Actuate the cabling rope strongly several times in order to stretch the rope and then reset the rope using the clamping head.
4. Set the lock marking in central position by turning the actuation axis.
5. Activate the rope pull switch by turning the Reset knob in the direction of the arrow (RPS...SC) or by pulling (RPS...PC).



The direction of the safety rope can be changed using rope pulley blocks or eyebolts. Direction changes of up to max. 90° are possible. Rope pulley blocks have the advantage that the frictional forces between the safety rope and deflection points are kept low.

Temperature dependence

When planning safety installations with rope pull switches, it is necessary to take into account the temperature dependence of the installation and the safety rope so that the switch is not tripped as a result of a change in temperature. To do this, the possible rope lengths must be determined and the trip point must be readjusted regularly. The following graph shows the relationship between rope length and temperature. Installation should take place at a temperature of 20°C.



Selection table for rope pull switches RPS

Reset

- **P** Pull-to-reset button
- **S** Turn-to-reset button

Rope attachment

- **R** Pull lug
- **C** Clamping head

Actuating force

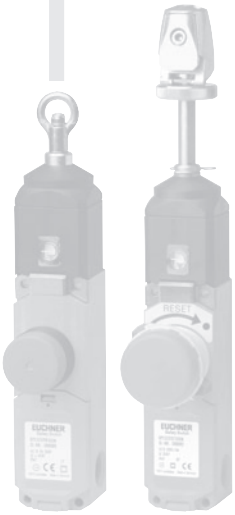
- **100** Actuating force 100 N
- **175** Actuating force 175 N
- **300** Actuating force 300 N

Switching element

- **Four contacts** 3 NC ⊖ + 1 NO or 2 NC ⊖ + 2 NO

Connection

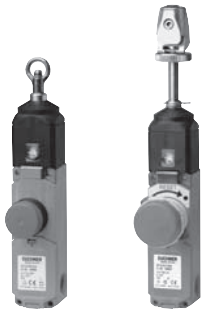
- **M** Thread M20 x 1.5 for cable gland



Reset		Rope attachment		Actuating force			Switching element	Connection	Page
P	S	R	C	100	175	300	four contacts	M	
●		●		●			●	●	126
●		●			●		●	●	126
●		●				●	●	●	126
●			●	●			●	●	127
●			●		●		●	●	127
●			●			●	●	●	127
	●		●	●			●	●	127
	●		●		●		●	●	127
	●		●			●	●	●	127

Rope pull switch with pull- or turn-to-reset button for EMERGENCY-STOP device

- **EMERGENCY-STOP device with detent mechanism in accordance with EN 418 and EN 60204-1**
- **Pull lug or clamping head for pull rope**
- **Indication of correct rope tension**
- **3 cable entries M20 x 1.5**
- **Switching elements with 4 contacts**

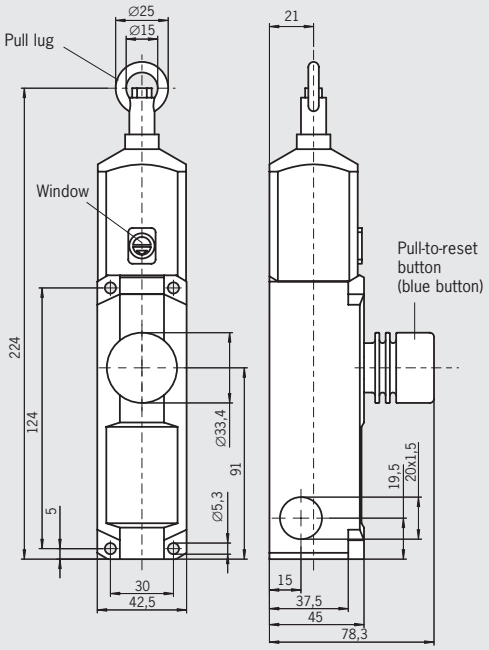


Switching elements

- **2131** Slow-action switching element 3 NC ⊖ + 1 NO
- **3131** Slow-action switching element 2 NC ⊖ + 2 NO

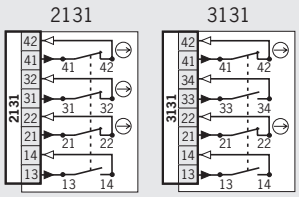
Cable entry M20 x 1.5
Pull-to-reset button for EMERGENCY-STOP, pull lug for tensioning rope

Dimension drawing



For cable glands see page 89

Wiring diagrams switch not actuated



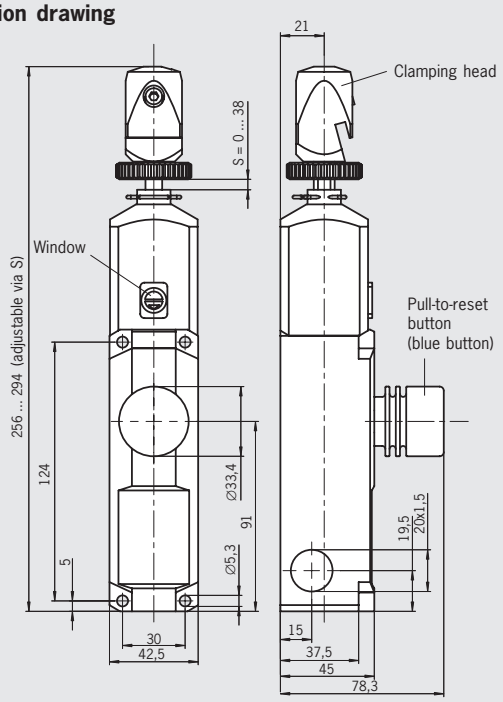
For switching functions see technical data on page 130

Ordering table

Series	Connection	Rope attachment	Reset	Actuating force [N]	Switching element	Order No. / Item
RPS	Cable entry **3 x M20 x 1.5**	**R** Pull lug	**P** Pull-to-reset button	**100**	**2131** 3 NC ⊖ + 1 NO	**094 849** RPS2131PR100M
					3131 2 NC ⊖ + 2 NO	**088 888** RPS3131PR100M
				175	**2131** 3 NC ⊖ + 1 NO	**094 850** RPS2131PR175M
					3131 2 NC ⊖ + 2 NO	**088 889** RPS3131PR175M
				300	**2131** 3 NC ⊖ + 1 NO	**094 851** RPS2131PR300M
					3131 2 NC ⊖ + 2 NO	**088 890** RPS3131PR300M

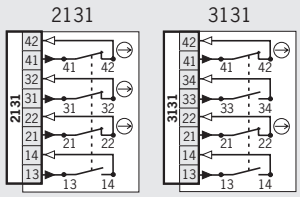
Cable entry M20 x 1.5
Pull-to-reset button for EMERGENCY-STOP, clamping head for tensioning rope

Dimension drawing



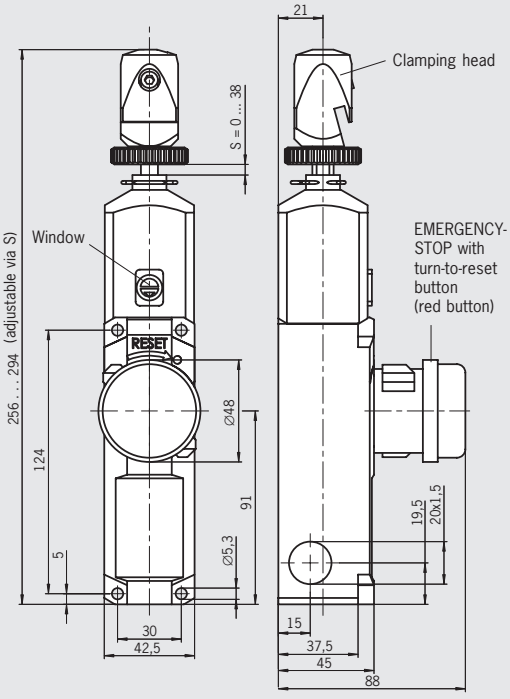
For cable glands see page 89

Wiring diagrams Switch not actuated

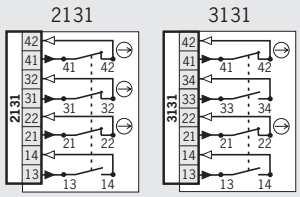


For switching functions see technical data on page 130

Cable entry M20 x 1.5
Turn-to-reset button for EMERGENCY-STOP, clamping head for tensioning rope



For cable glands see page 89



For switching functions see technical data on page 130

Ordering table

Series	Connection	Rope attachment	Reset	Actuating force [N]	Switching element	Order No. / Item
RPS	Cable entry **3 x M20 x 1.5**	**C** Clamping head	**P** Pull-to-reset button	**100**	**2131** 3 NC ⊖ + 1 NO	**094 852** RPS2131PC100M
					3131 2 NC ⊖ + 2 NO	**088 885** RPS3131PC100M
				175	**2131** 3 NC ⊖ + 1 NO	**094 853** RPS2131PC175M
					3131 2 NC ⊖ + 2 NO	**088 886** RPS3131PC175M
				300	**2131** 3 NC ⊖ + 1 NO	**094 854** RPS2131PC300M
					3131 2 NC + 2 NO	**088 887** RPS3131PC300M
			S Turn-to-reset button	**100**	**2131** 3 NC ⊖ + 1 NO	**094 430** RPS2131SC100M
					3131 2 NC ⊖ + 2 NO	**088 882** RPS3131SC100M
				175	**2131** 3 NC ⊖ + 1 NO	**094 431** RPS2131SC175M
					3131 2 NC ⊖ + 2 NO	**088 883** RPS3131SC175M
				300	**2131** 3 NC ⊖ + 1 NO	**094 432** RPS2131SC300M
					3131 2 NC ⊖ + 2 NO	**088 884** RPS3131SC300M

For safety precautions see page 132
For technical data see page 130

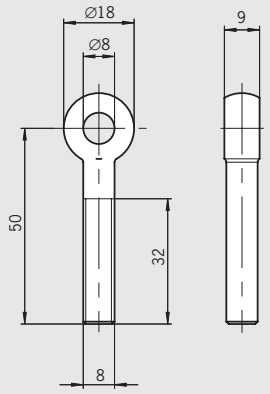
Accessories for rope pull switches

- **Eyebolt**
- **Rope set**
- **Pulley set**
- **Turnbuckle**
- **Tensioner spring**
- **Tensioning rope**
- **Built-in LED**

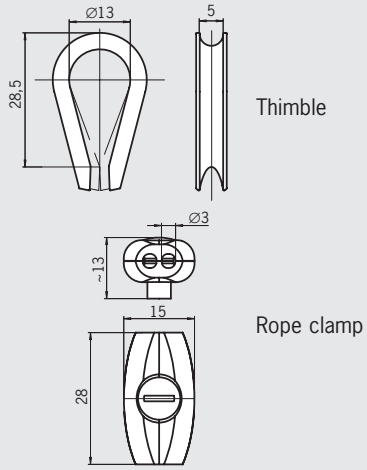
Built-in LED
The built-in LED is suitable for direct installation in one of the M20 x 1.5 threads of the three cable entries in the rope pull switch RPS.
The built-in LED indicates to the operator whether the switch is actuated or not.
The switching element can be wired individually.
Operating voltage DC 24 V +10%, -15%.

Eyebolt
Thread M8

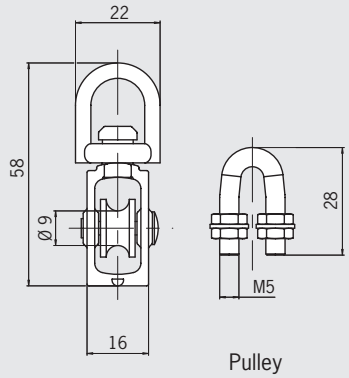
Dimension drawings



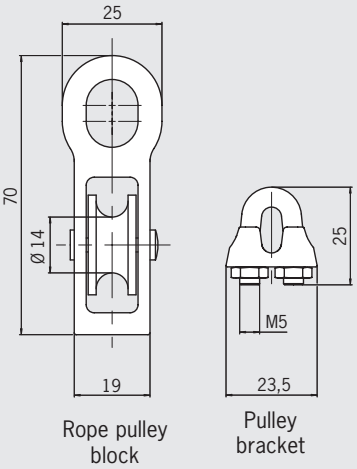
Rope set



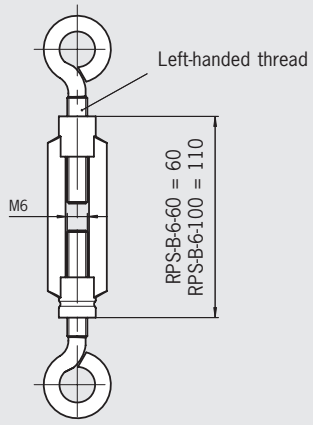
Pulley set RPS-PS/V5



Pulley set RPS-P/V1



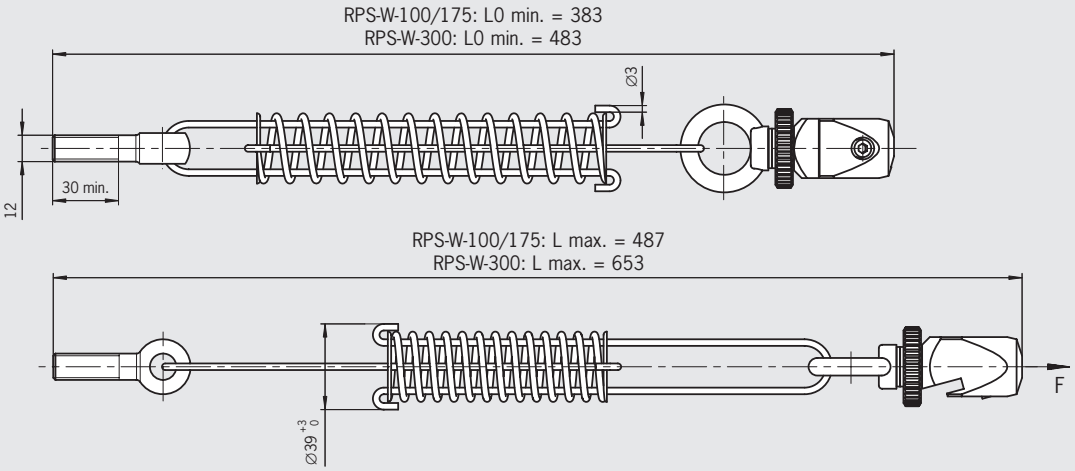
Turnbuckle



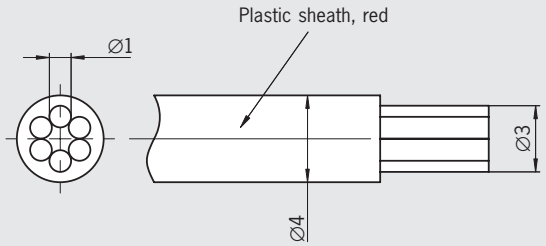
Ordering table

Designation	Version	Packaging unit	Order No./Item
Eyebolt	Thread M8	5 ea.	**092 495** RPS-O-8-50/V5
Rope set	Consisting of thimble and rope clamp	5 ea.	**092 496** RPS-RS/V5
Pulley set RPS-PS/V5	Consisting of rope pulley block and pulley bracket	5 ea.	**092 501** RPS-PS/V5
Pulley set RPS-P/V1	Consisting of rope pulley block and pulley bracket	1 ea.	**096 251** RPS-P/V1
Turnbuckle	M6 x 60	5 ea.	**092 498** RPS-B-6-60/V5
	M6 x 100	1 ea.	**092 500** RPS-B-6-110

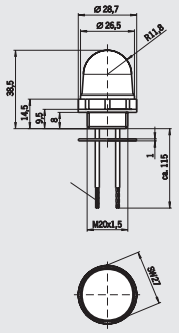
Tensioner spring



Tensioning rope



Built-in LED

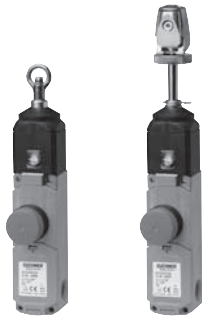


Ordering table

Designation	Version	Packaging unit	Order No./Item
Tensioner spring	For tensile force 110 N / 175 N	1 ea.	**092 136** RPS-W-100/175
	For tensile force 300 N	1 ea.	**092 138** RPS-W-300
Tensioning rope	Length 50 m	1 ea.	**092 813** RPS-I-3-4/50m
	Length 100 m	1 ea.	**092 814** RPS-I-3-4/100m
Built-in LED	Color red for cable entry M20 x 1.5, with seal light radiation to side	1 ea.	**087 423** LED M20x1.5
	Color red for cable entry M20 x 1.5, with seal light radiation to front	1 ea.	**095 510** LED M20x1.5

For safety precautions see page 132
For technical data see page 131

Rope pull switch RPS



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

Switch

Parameter		Value			Unit
Housing material		Reinforced thermoplastic			
Actuation material		Die-cast zinc, steel			
Degree of protection according to IEC 60529		IP 67			
Mechanical life		Acc. to IEC 60947-5-5			
Ambient temperature		- 25 ... + 70			°C
Weight		Approx. 0.48			kg
Latching device		Acc. to EN 418			
		RPS...100	**RPS...175**	**RPS...300**	
Actuating force		100	175	300	N
Rope length max.		25	37.5	75	m
Rope diameter		2 ... 5			mm
Rope attachment	RPS...R...	Via pull lug			
	RPS...C...	Via clamping head			
EMERGENCY-STOP reset	RPS...P...	Pull-to-reset button			
	RPS...S...	Turn-to-reset button			

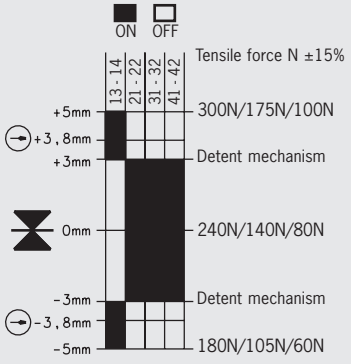
Switching element

Parameter	Value		Unit
Switching principle	Slow-action switching element		
Switching elements with 4 switching elements	**2131** 3 NC ⊖ + 1 NO	**3131** 2 NC ⊖ + 2 NO	
Contact opening gap	> 2 x 2 mm		
Min. switching current at 24 V DC	10		mA

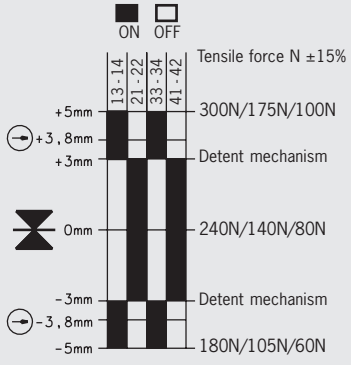
Connection, cable entry M20 x 1.5

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm²
Rated insulation voltage U_i		250	V AC/DC
Conventional thermal current I_{th}		10	A
Short circuit protection according to IEC 60269-1 (control circuit fuse)		10	A gL
Utilization category to IEC 60947-5-1	AC-15	I_e 4 A U_e 230 V	

Travel diagram RPS2131...



Travel diagram RPS3131...



Accessories for rope pull switches RPS

Tensioner spring

Parameter	Value		Unit
Material of rope clamp	Die-cast zinc/steel		
Material of spring	X12CrNi177 (1.4310)		
Eyebolt	DIN 444 M12x50-4.6 Zn		
Ambient temperature	-25 ... +70		°C
Rope diameter	2 ... 5		mm
Rope attachment	Quick-action clamping device		
	RPS-W-100/175	**RPS-W-300**	
Spring rate	2.1	1.9	N/mm
Maximum spring force	218	335	N
Weight	Approx. 0.5	Approx. 0.55	kg

Built-in LED

Parameter	Value	Unit
Material of housing	ABS/PC blend, black	
Material of cap	Transparent polycarbonate	
Degree of protection (fitted in rope pull switch)	IP 65	
Ambient temperature	-20 ... +50	°C
Connection	2 wires	
Mounting	M20 x 1.5	
Operating voltage	24	V DC
Switch-on current	< 0.5	A
Current consumption	45	mA

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.
- If damaged or worn, safety switches must be replaced as a unit.

Assembly instructions

Safety switches with safety function

- To obtain the required isolating distance, the trip dog setting distance shown in the dimension drawing must be observed (see technical data, travel diagrams). Actuating 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	EN 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 and specifications
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 circuits. 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.
EN 62061	IEC 62061	Safety of machinery. Functional safety of safety-related electrical, electronic and programmable electronic control 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

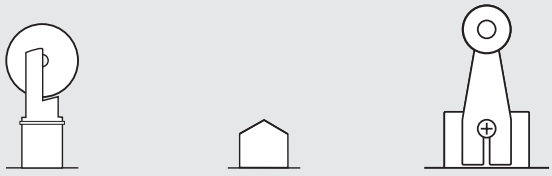
Glossary

Actuating force
Switches with safety function:
The actuating force is the minimum force required to perform a switching operation.

Switches with separate actuator:
The actuating force is the force required to insert the actuator in order to thus perform a switching operation.

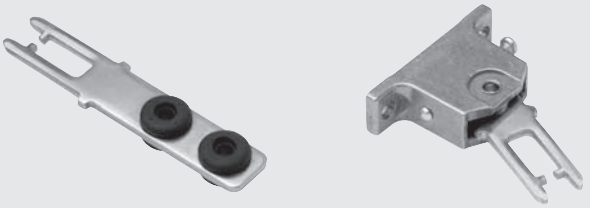
Actuation (electrical / mechanical)
Transition of a moving contact from one switch position to another. This will result in a change to the switch state of an item of switchgear. A differentiation is made between electrical actuation (e.g. switching on – switching off) and mechanical actuation (e. g.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



Roller plunger Chisel plunger Roller arm

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.

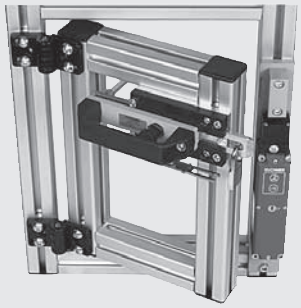


Straight actuator Hinged actuator

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 that 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.



Bolt for safety switch

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 guard locking* is also used.

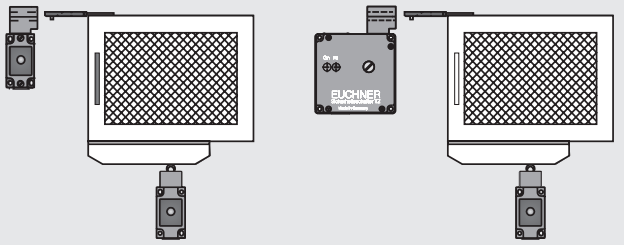
Cyclic mode
An *operating mode* in which the working space on the machine is opened during every operating cycle and the operator therefore frequently needs to work in the *danger area*.

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.).

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.



Movable safety guard without guard locking, with system diversity.

Movable safety guard with guard locking, with system diversity.

Electrical guard locking
Guard locking based on the ▸*open-circuit current principle*.

Enable path
An enable path is used to generate a safety-related output signal. Enable paths act to the exterior like NO contacts.

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*.

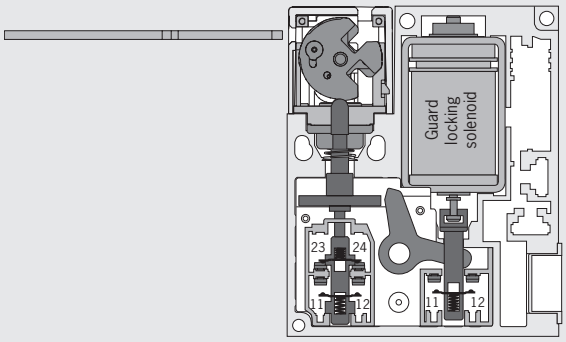
Extraction force
The extraction force is the required minimum force to achieve positively driven opening of all NC contacts.

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

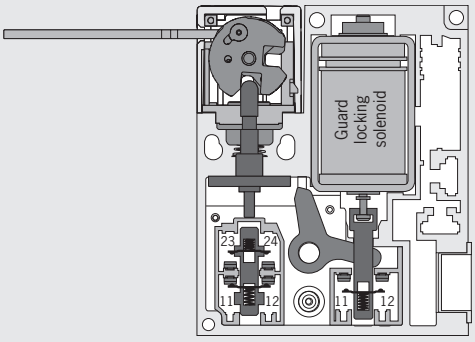
Guard lock monitoring
The guard lock monitoring monitors the position of the interlocking solenoids. This device is positively linked to the switching element ÜK via a locking arm. On intentional or unintentional unlocking of the interlocking solenoid, the positively driven contact in this switching element is actuated and therefore signals the position of the interlocking solenoid.

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

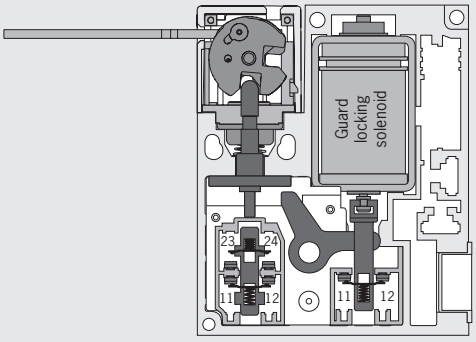
1 Door open and not locked



2 Door closed and not locked

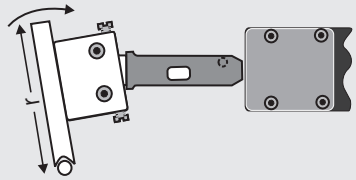


3 Door closed and locked



Hazardous states
Are states that could result in injury. ▸*Safety switches*, if the ▸*safety guard* used correctly, 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.



Hinged actuator

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
The locking force is the force that ▸*guard locking* can withstand on switches ▸*with separate actuator*.
The locking force in accordance with GS-ET 19 includes an additional safety coefficient (S = 1.3) which is prescribed by the employers' liability insurance association in its test principles.
The locking force F_{Zh} in accordance with GS-ET 19 is calculated as follows:

$$F_{Zh} = \frac{\text{Locking force, max.}}{\text{Safety coefficient}}$$

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 guard locking
Guard locking based on 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).

Safety switch with mechanical release

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 guard 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 **P**robability of **D**angerous **F**ailure
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 **P**roximity **D**evices with defined behaviour under **F**ault conditions
Proximity switches with defined behavior under fault conditions (see EN 60947-5-3).

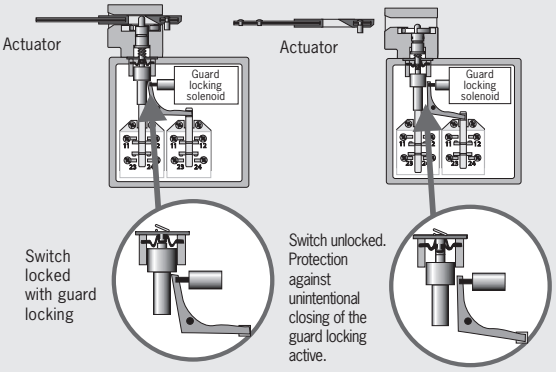
Positive actuation
Positive actuation is the positive movement of a moving mechanical component together with another component – either by direct contact or via rigid parts. The second component is, as a result, moved positively by the first.

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*.

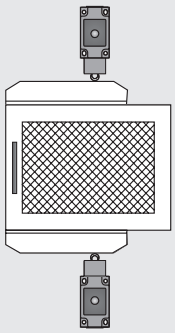
Positively driven, positively driven contact
The achievement of contact separation by a positive movement of the ▸*actuating element* is termed positively driven. ▸*Switching elements* with this switching behavior are termed positively driven contacts. These NC contacts are drawn with the symbol shown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

Symbol for a positively driven contact

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 for the use of a position switch with two positively driven NC contacts, the term redundant (dual-channel) system is often 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

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.
In the case of switches without guard locking, the retention force is the maximum force that may be applied to the actuator in withdrawal direction while still guaranteeing reliable contact.

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*.

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

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 relays
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.

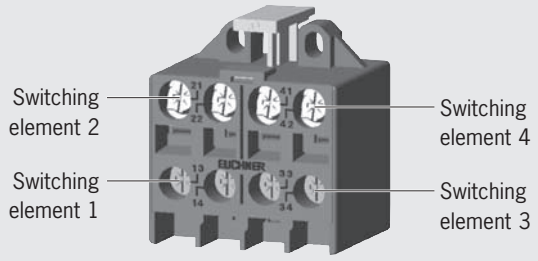
Snap-action contact element
On snap-action contact elements the ▸*switching element jumps* to the other switch state from a defined ▸*actuator* position. The movement of the switching element is independent of the speed at which the actuator is moved. Snap-action contact elements typically have hysteresis.

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*.



4 contact switching element

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:

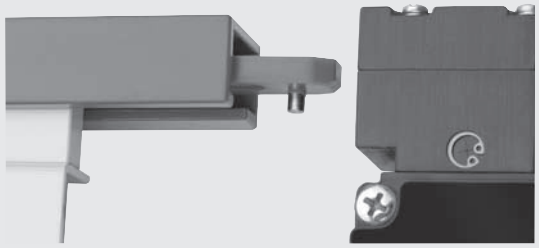
- Screwdrivers
- Ball-point pens
- Nails
- Pieces of wire
- Adhesive tape
- etc.

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.


Guiding the actuator in a C rail

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

Index by item designation

Index by order number

Overview of Range

Automation

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

Precision Multiple Limit Switches

Inductive Limit Switches

Plug Connectors

Trip Rails/Trip Dogs

Inductive Ident Systems

Safety

Safety Switches, Metal Housing
- Safety Switches NZ/TZ
- Safety Switches NX/TX

Safety Switches, Plastic Housing
- Safety Switches NM
- Safety Switches NP/GP/TP
- Safety Switches STM
- Safety Switches STP

Non-Contact Safety Switches
- Non-Contact Safety Switches CES/CEM, Transponder Coding
- Non-Contact Safety Switches CMS, Magnetic Coding

Safety Products with integrated Bus Interface

Bolts for Safety Guards

Enabling Switches

Safety Relays
- Safety Relays ESM
- Modular Safety System ESM-F

Rope Pull Switches

ManMachine

Joystick Switches

Electronic Handwheels

Pendant Stations
- Pendant Stations HBA
- Pendant Stations HBE/HBL

Electronic-Key-System

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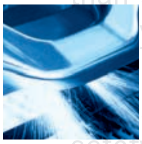
Automation



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