

Safety Switches with Plastic Housing



EUCHNER

More than safety.

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More than safety.



Headquarters in Leinfelden-Echterdingen



Logistics center in Leinfelden-Echterdingen



Production location in Unterböhringen

Internationally successful – the EUCHNER company

EUCHNER GmbH + Co. KG is a world-leading company in the area of industrial safety technology. EUCHNER has been developing and producing high-quality switching systems for mechanical and systems engineering for more than 50 years.

The medium-sized family-operated company based in Leinfelden, Germany, employs more than 500 people around the world, 400 in Germany alone.

In addition to the production locations in Unterböhringen and Shanghai/China, 14 subsidiaries and other sales partners in Germany and abroad work for our international success on the market.

Quality and innovation – the EUCHNER products

A look into the past shows EUCHNER to be a company with a great inventive spirit. We take the technological and ecological challenges of the future as an incentive for extraordinary product developments.

EUCHNER safety switches monitor safety doors on machines and installations, help to minimize dangers and risks and thereby reliably protect people and processes. Today, our products range from electromechanical and electronic components to intelligent integrated safety solutions. Safety for people, machines and products is one of our dominant themes.

We define future safety technology with the highest quality standards and reliable technology. Extraordinary solutions ensure the great satisfaction of our customers. The product ranges are subdivided as follows:

- ▶ Transponder-coded Safety Switches (CES)
- ▶ Transponder-coded Safety Switches with guard locking (CET)
- ▶ Interlocking and guard locking systems (Multifunctional Gate Box MGB)
- ▶ Access management systems (Electronic-Key-System EKS)
- ▶ Electromechanical Safety Switches
- ▶ Magnetically coded Safety Switches (CMS)
- ▶ Enabling Switches
- ▶ Safety Relays
- ▶ Emergency Stop Devices
- ▶ Hand-Held Pendant Stations and Handwheels
- ▶ Safety Switches with AS-Interface
- ▶ Joystick Switches
- ▶ Position Switches



Safety Switches with Plastic Housing














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About this catalog

The catalog *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										TK	Accessories	
With safety function	With separate actuator											
NM	Without guard locking					With guard locking and guard lock monitoring			TK	Accessories		
	NM..VZ	NP	GP	SGP	SGA ¹⁾	TP	STP	STA ²⁾			STM	
												
see page 13	See page 21	See page 25	See page 31	See page 35	See page 39	See page 43	See page 61	See page 75	See page 81	See page 83	See page 87	

1) Switch interchangeable with the SGP; in metal housing

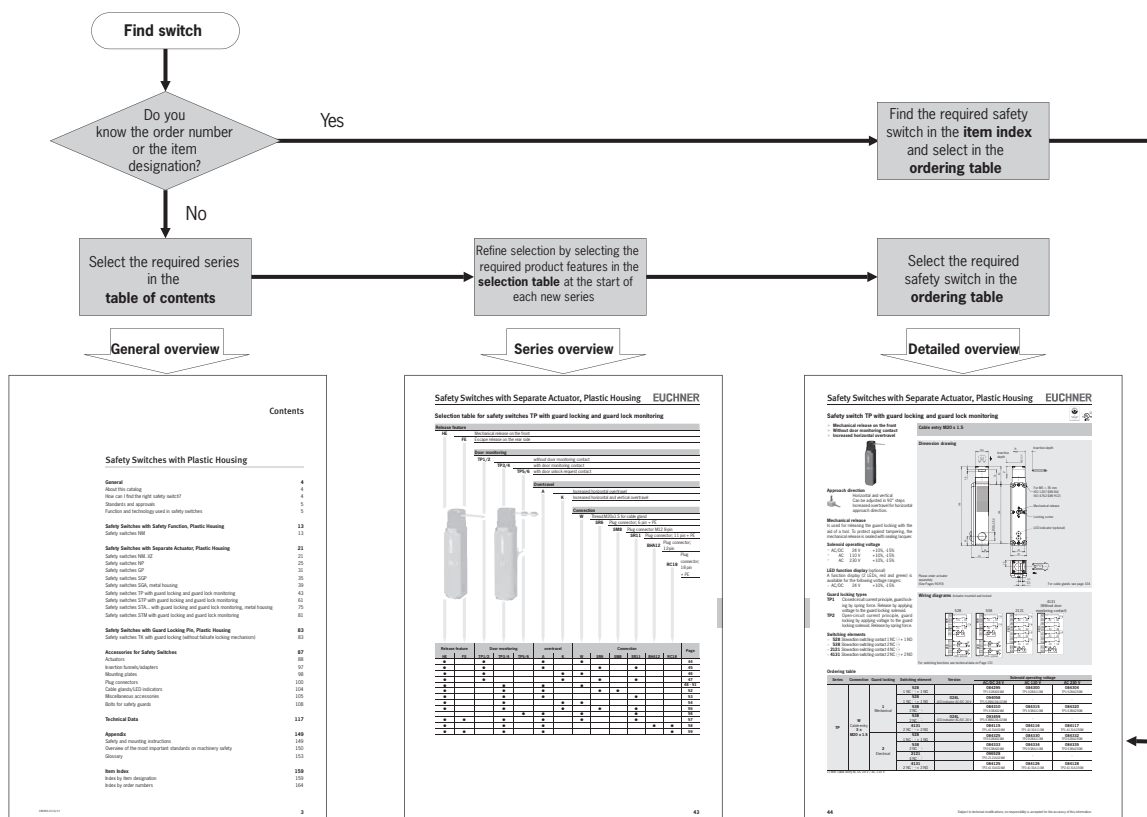
2) Switch interchangeable with the STP; in metal housing

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 159 or page 164).

2) If you have specific requirements, refine the selection step-by-step with the aid of the table of contents and the selection tables.



Standards and approvals

Standards

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

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

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

Approvals

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

Many of the safety switches listed in this catalog have been tested by the German Social Accident Insurance association (DGUV), formerly the employers' liability insurance association (BG), and are given in the lists from the DGUV.

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:



Switches with this symbol have the approval of the German Social Accident Insurance association (DGUV) – formerly the employers' liability insurance association (BG)



Switches with this symbol are approved by Underwriters Laboratories (UL, Canada and USA)

Function and technology used in safety switches

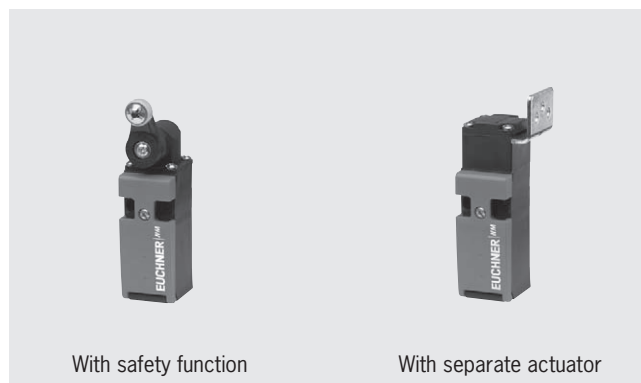
The task of safety switches

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 interlock device.

In this context an interlock 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.



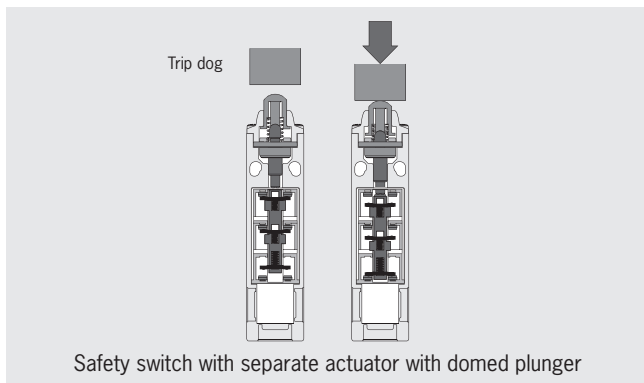
EUCHNER has safety switches with safety function and safety switches with separate actuator in its range.

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.

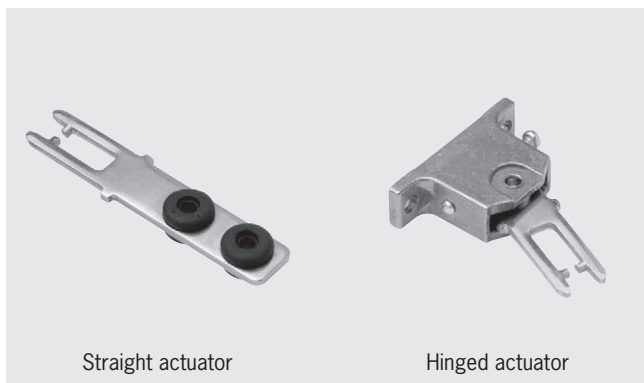


Safety switches with separate actuator

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 type of actuation, identical to the switches with safety function.

Actuating elements for switches with separate actuator

The safety switches NM.VZ, NP, GP, TP, STA, SGP, 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.



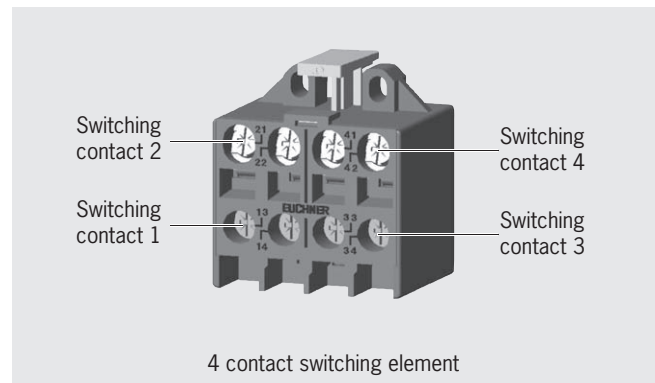
The positively driven contact in the switching element is closed by inserting the actuating element in the switch head. The positively driven contact is reliably opened by the positive application of force when the actuating element is removed – even if the contacts are welded together. In the open state, 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:

- ▶ Single switching element
- ▶ Double switching element with two independent switching contacts
- ▶ Triple switching element with three independent switching contacts
- ▶ Quadruple switching element with four independent switching contacts



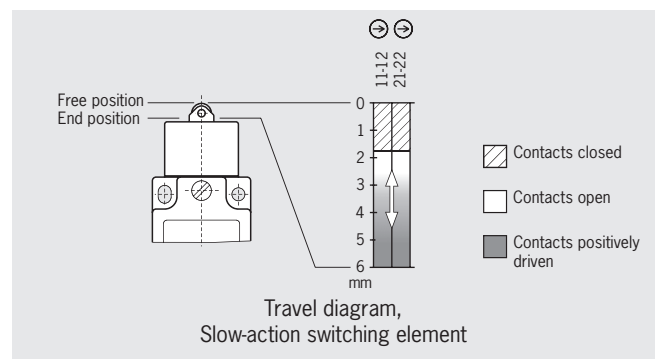
Only one switching element is fitted in each case in switches of the series NM, NP, GP, TP, STA, SGP, STP and TK. Two switching elements are fitted to all series STM safety switches. In this case one of the switching elements is used to monitor the door position (SK) and the other is used to monitor the position of the guard locking solenoid (ÜK).

Switching elements are divided into two types as a function of their switching characteristics:

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

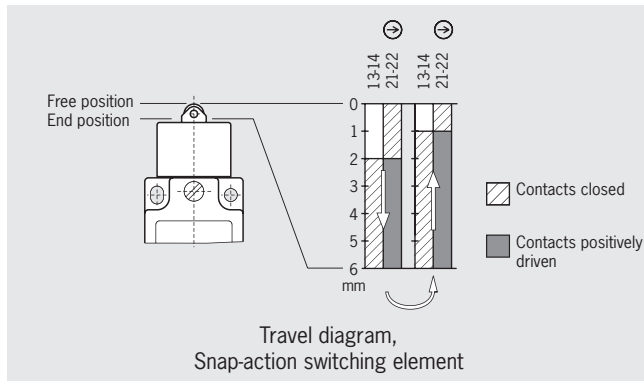
Slow-action switching element

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



Snap-action switching element

On snap-action contact elements, the change from the completely closed state to the completely open state is made at a defined point. As a result the operating 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 contacts 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 contact 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 contact 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 NC 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.

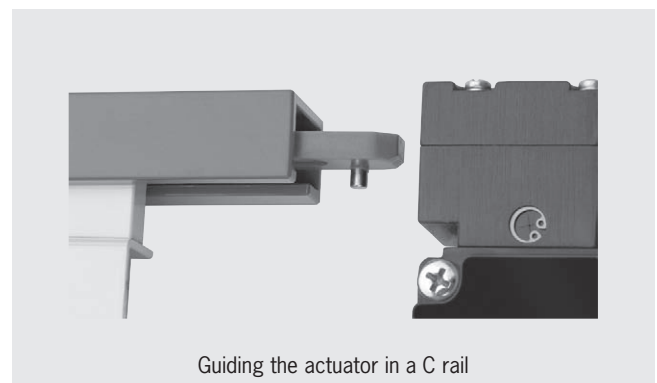
Door unlock request contact

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 of safety switches 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.

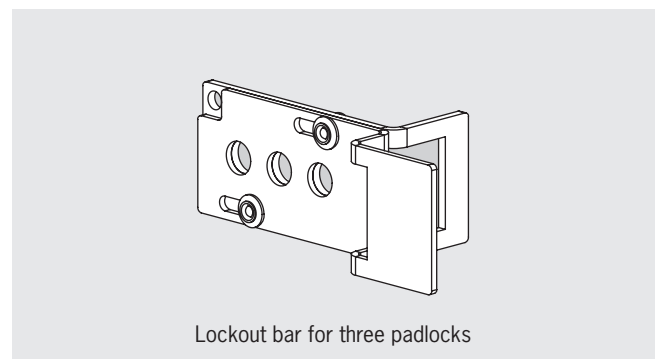
Switches with safety function can be installed covered so that the actuating element cannot be reached.



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 three locks) to protect against removal.



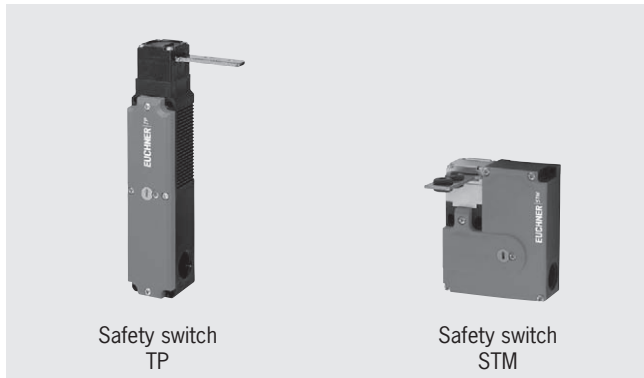
Lockout bar for three padlocks

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 a *failsafe locking mechanism*. It can therefore not be classified as a classic switch with safety function or separate actuator.



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 guard locking solenoid is required. This requirement can, for instance, be achieved by a safe standstill monitor or a safe 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 guard locking 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 fiber glass 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.

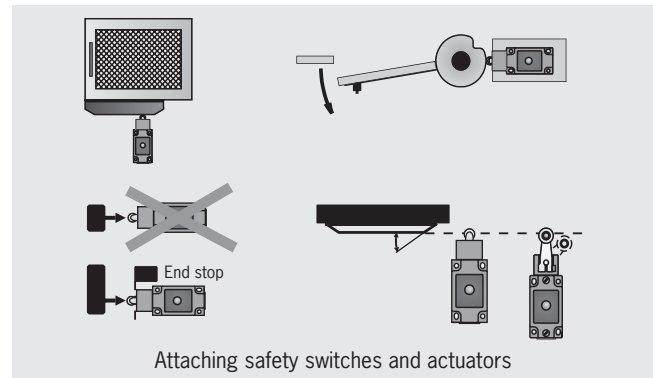
If there are increased demands on the load capability of the actuating head in operation, it is possible to choose an actuating head made of metal in the STM series. Alternatively, you can choose the STP series, which is equipped with a metal head as standard. This allows you to combine the economy of 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 safety switches must be attached such that their position cannot be changed in operation. On the other hand, if necessary it must be possible to replace the switches at any time without renewed adjustment.

These requirements are achieved by using reliable fixings that can only be undone using tools. To prevent a change to the position, there must also be no movement in the joint (e.g. by using dowel pins).

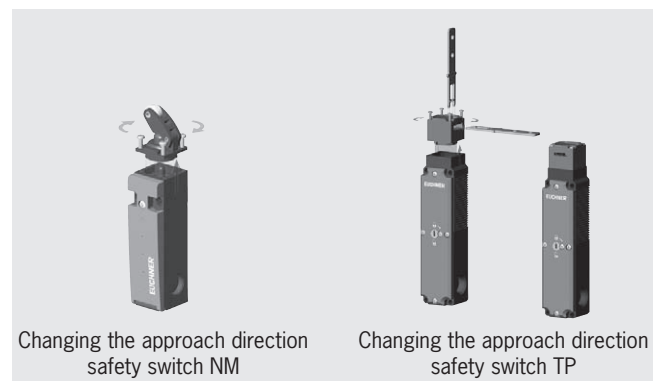


The same applies to the trip dogs for switches with safety function. A joint without movement is also required here. Above all else, loosening must be prevented. In addition, it must be ensured that cams and trip dogs can only be mounted in the correct position.

To prevent tampering, safety screws can also be used for the attachment of safety switches and trip dogs.

Changing the approach direction

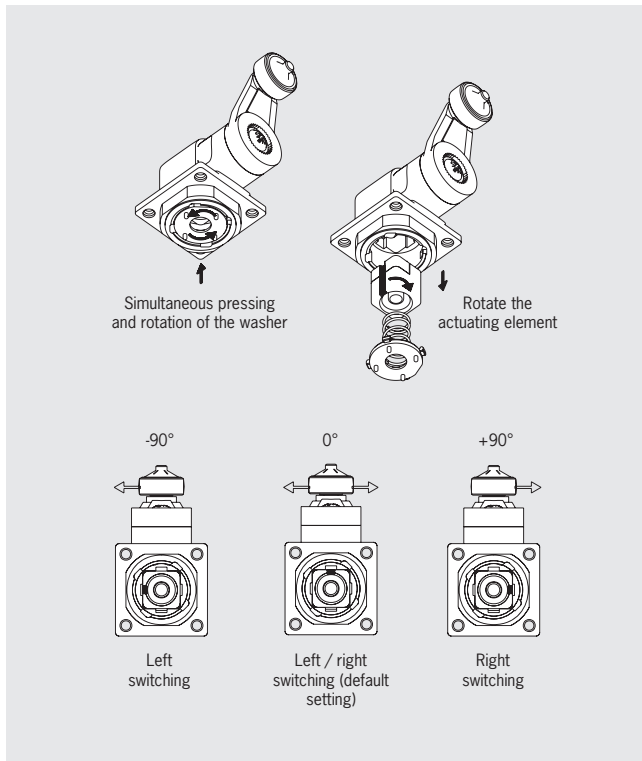
Often the actuator approach direction does not match the standard alignment of the actuating head as delivered. For this reason, the actuating heads on the safety switches NM, NP, GP, TP, STA, SGP and STP can be very easily adjusted to the required direction.



After undoing the four fixing 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 fixing material 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.



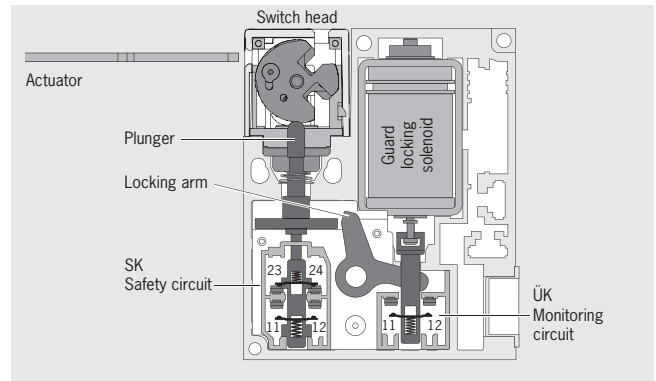
Mounting plates are available to ease the attachment of switches with separate actuator and also actuators. Bolts attached to the safety door are extremely helpful. All requirements, e.g. the mechanical end stop for the door and the exact guidance of the actuator, are optimally met by using bolts.

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

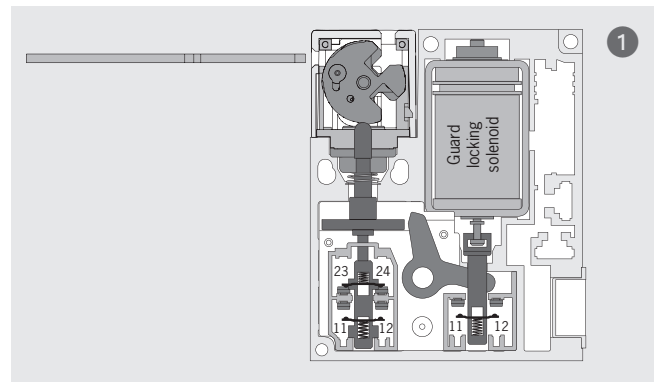
- ▶ Locking arm
The locking arm ensures that the switch is guard locked by the solenoid. It acts directly on the switching element ÜK; the positively driven contact can only be closed in the locked state (see *Failsafe locking mechanism*, page 11).
- ▶ SK
The position of the switching contacts of the SK switching element is dependent on the position of the actuator or the safety guard. This situation means that the positively driven contacts on the SK switching element are only closed if the actuator is in the switch head.
- ▶ ÜK
The position of the switching contacts 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.



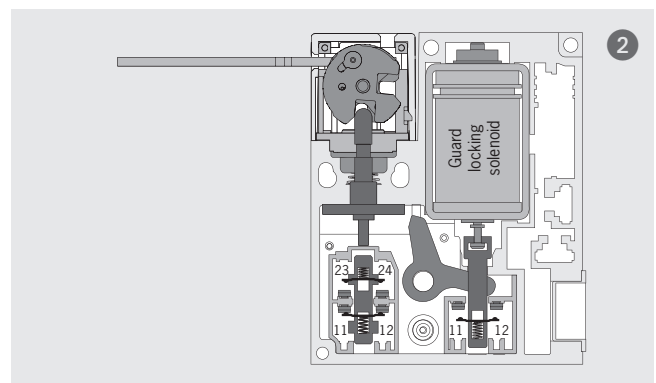
Principle of operation of STM

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 *Failsafe locking mechanism*, page 11).

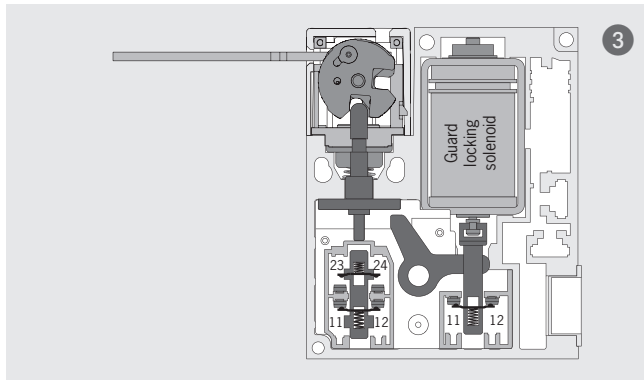


- 2 Door closed and not locked
The plunger is released by inserting the actuator into the switch head. The contacts 11-12 on switching element SK are closed, the contacts 23-24 are opened. The contacts 11-12 of the switching element ÜK remain open as before.



3 Door closed and locked

After the actuator has been inserted, it is possible to activate the switch's guard locking. If the guard locking 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.

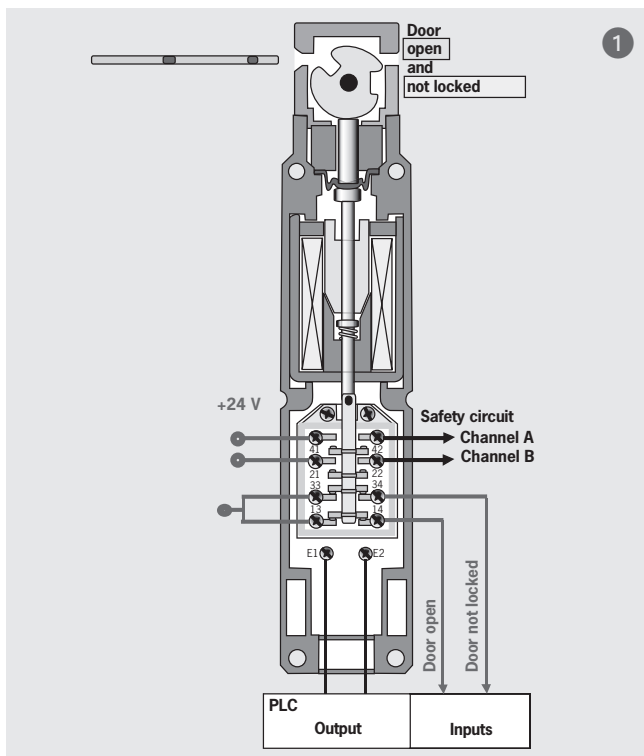


Principle of operation of TP/STA/STP

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

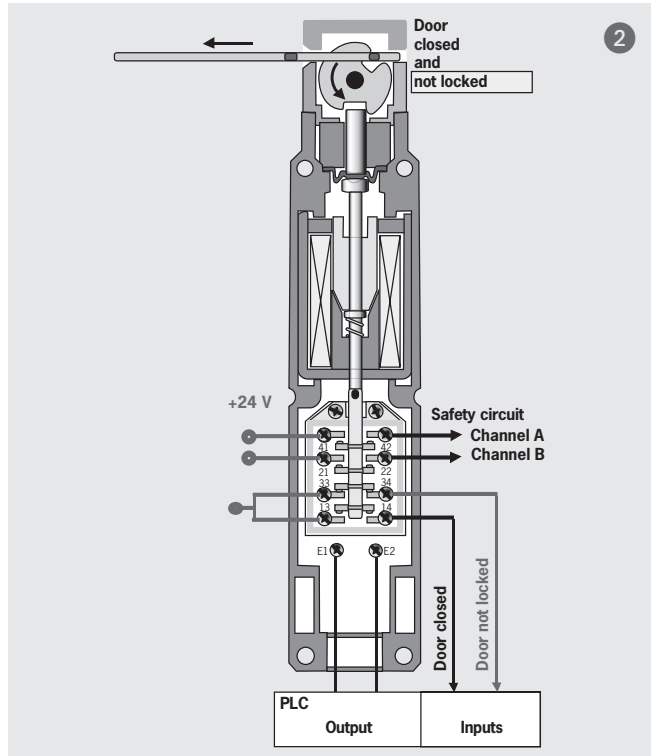
1 Door open and not locked

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 *Failsafe locking mechanism*, page 11).



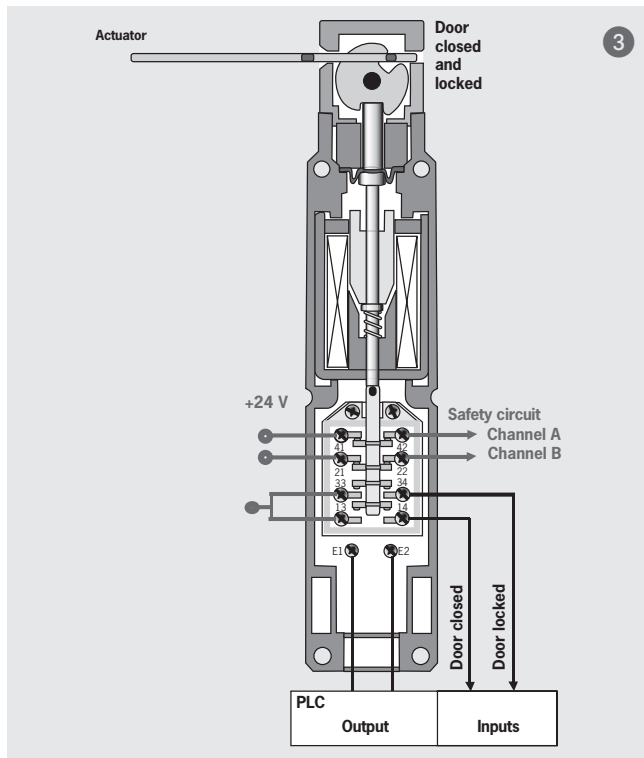
2 Door closed and not locked

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



Principle of operation BiState version

The switch has, in addition to the mechanical/electrical guard locking, fixing for the guard locking pin. The guard locking pin is held in its current position if the operating voltage is not present. The guard locking pin can only be moved by applying the operating voltage.

In case of interruption of the power supply (operating voltage) for the switch or if the machine, e.g., is switched off for servicing, the guard locking pin is held in its last position. As a result the safety door is either completely locked or it can be closed and opened as often as required without activating the guard locking.

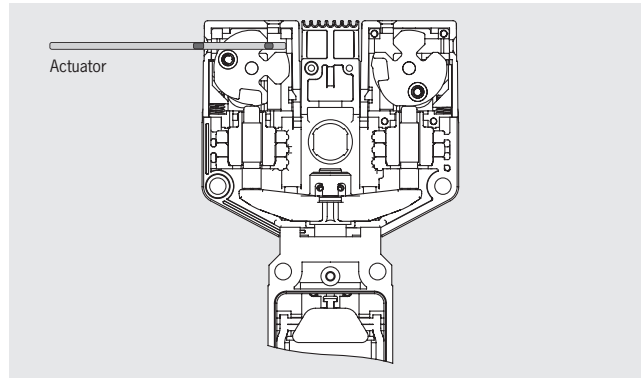
In this case (the guard locking is inactive and the power supply fails), BiState switches therefore ensure that there is no risk of persons being unintentionally trapped in the danger area if the safety guard closes. In other words, there is no chance of getting locked in.

Principle of operation Twin version

The switch has two actuating heads. They permit, depending on the series, the simultaneous monitoring, locking or unlocking of two movable safety guards.

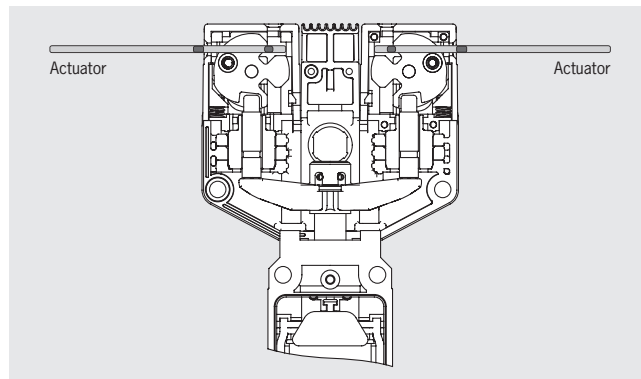
The sectional drawings show the function of the *Twin* version:

1 One door closed



The first guard locking pin is released by inserting the actuator into the actuating head. Due to the rigid connection between the two plungers, a switching operation is not triggered by this action.

2 Both doors closed



The second guard locking pin is released by inserting the actuator into the actuating head. The switching operation is triggered and the safety doors, depending on the version, monitored or locked.

Failsafe locking mechanism

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

Selection table for safety switches NM with safety function

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	
												1 NC ⊖			14
												1 NC ⊖ +			14
												1 NO,			15
												2 NC ⊖			15
												2 NC ⊖ +			16
												1 NO,			16
												3 NC ⊖			17
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Safety switch NM..WO with domed plunger



Approach direction



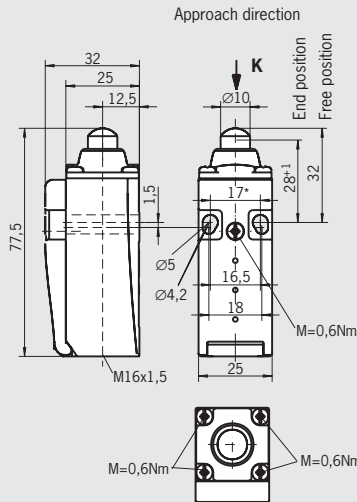
Vertical

Switching elements

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

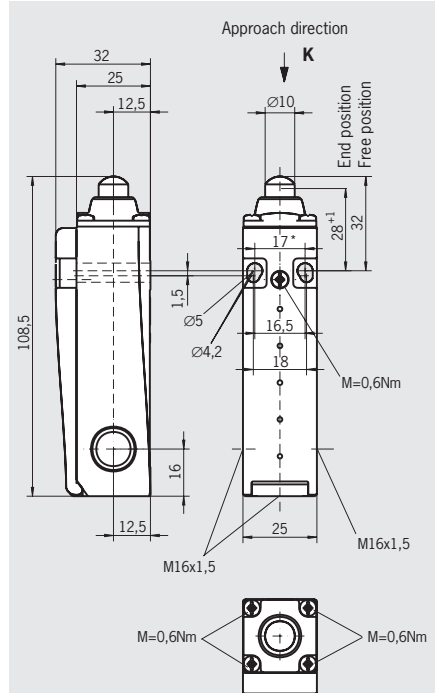
Cable entry M16 x 1.5 Short housing

Dimension drawing



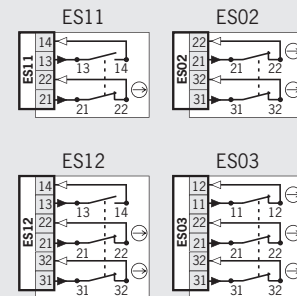
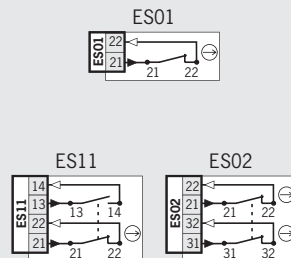
For cable glands see page 104

Cable entry M16 x 1.5 Long housing



For cable glands see page 104

Wiring diagrams Switch not activated



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 ⊖	084495 NM01WOK-M
				11 1 NC ⊕ + 1 NO	095375 NM11WOK-MC2069
				02 2 NC ⊖	095374 NM02WOK-MC2069
		Cable entry 3 x M16 x 1.5	Long 	11 1 NC ⊕ + 1 NO	084496 NM11WOK-M
				02 2 NC ⊖	084497 NM02WOK-M
				12 2 NC ⊕ + 1 NO	084498 NM12WOK-M
			03 3 NC ⊖	084499 NM03WOK-M	

Safety switch NM..RB with roller plunger



Approach direction



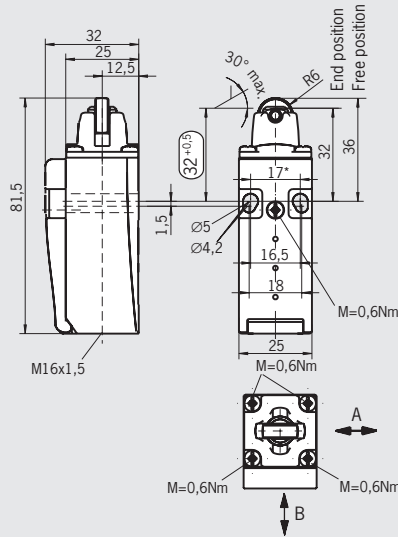
Horizontal
Adjustable in 90° steps.

Switching elements

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

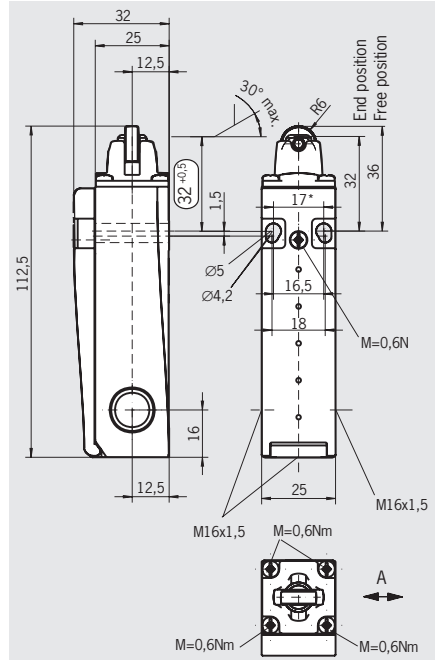
Cable entry M16 x 1.5
Short housing

Dimension drawing



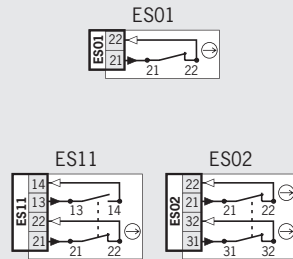
For cable glands see page 104

Cable entry M16 x 1.5
Long housing



For cable glands see page 104

Wiring diagrams Switch not activated



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 ⊖	084515 NM01RBA-M
				11 1 NC ⊖ + 1 NO	095373 NM11RBA-MC2069
				02 2 NC ⊖	095372 NM02RBA-MC2069
		Cable entry 3 x M16 x 1.5	Long 	11 1 NC ⊖ + 1 NO	084516 NM11RBA-M
				02 2 NC ⊖	084517 NM02RBA-M
				12 2 NC ⊖ + 1 NO	084518 NM12RBA-M
03 3 NC ⊖	084519 NM03RBA-M				

For safety precautions see page 149
For technical data see page 117

Safety switch NM..KB with roller arm



Approach direction



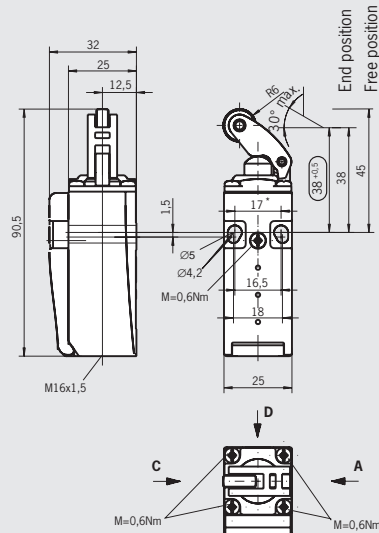
Horizontal
Adjustable in 90° steps.

Switching elements

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

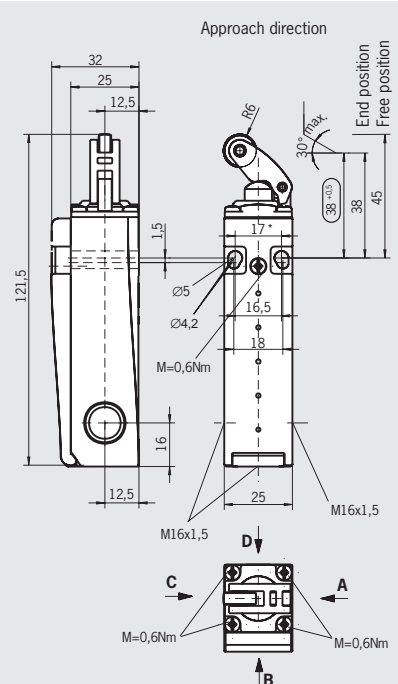
Cable entry M16 x 1.5 Short housing

Dimension drawing



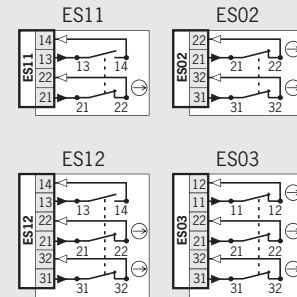
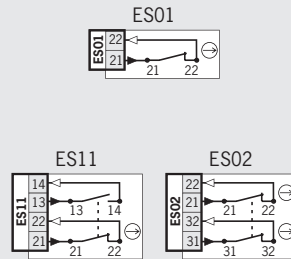
For cable glands see page 104

Cable entry M16 x 1.5 Long housing



For cable glands see page 104

Wiring diagrams Switch not activated



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order no./item
NM	KB Roller arm	Cable entry 1 x M16 x 1.5		01 1 NC ⊖	084522 NM01KBA-M
				11 1 NC ⊕ + 1 NO	095371 NM11KBA-MC2069
				02 2 NC ⊖	095370 NM02KBA-MC2069
		Cable entry 3 x M16 x 1.5		11 1 NC ⊕ + 1 NO	084523 NM11KBA-M
				02 2 NC ⊖	084524 NM02KBA-M
				12 2 NC ⊕ + 1 NO	084525 NM12KBA-M
			03 3 NC ⊖	084526 NM03KBA-M	

Safety switch NM..HB with lever arm



Approach direction

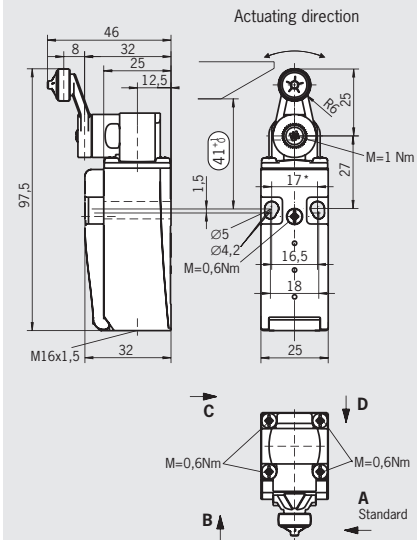
Horizontal
Adjustable in 90° steps.

Switching elements

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

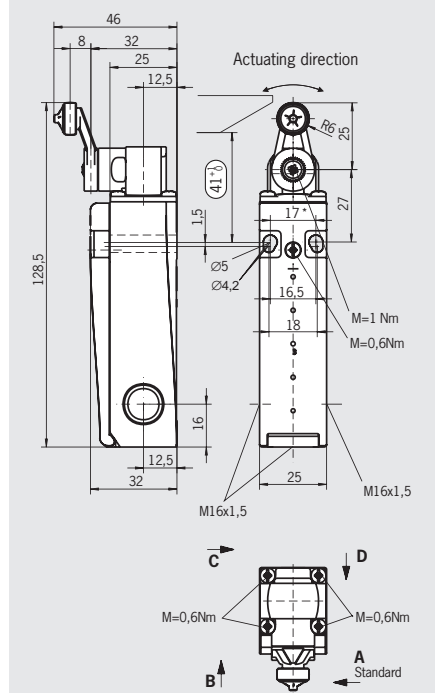
Cable entry M16 x 1.5
Short housing

Dimension drawing



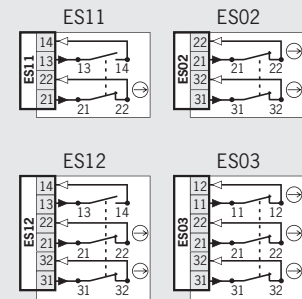
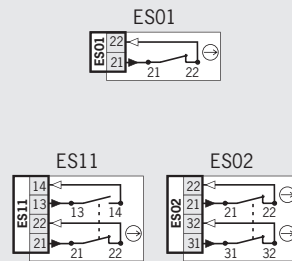
For cable glands see page 104

Cable entry M16 x 1.5
Long housing



For cable glands see page 104

Wiring diagrams Switch not activated



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order no./item
NM	HB Lever arm	Cable entry 1 x M16 x 1.5		01 1 NC ⊖	084527 NM01HBA-M
				11 1 NC ⊖ + 1 NO	095369 NM11HBA-MC2069
				02 2 NC ⊖	095368 NM02HBA-MC2069
		Cable entry 3 x M16 x 1.5		11 1 NC ⊖ + 1 NO	084528 NM11HBA-M
				02 2 NC ⊖	084529 NM02HBA-M
				12 2 NC ⊖ + 1 NO	084530 NM12HBA-M
			03 3 NC ⊖	084531 NM03HBA-M	

For safety precautions see page 149
For technical data see page 117

Safety switch NM..AV / NM..AL



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

Cable entry M16 x 1.5
Short housing

Cable entry M16 x 1.5
Long housing

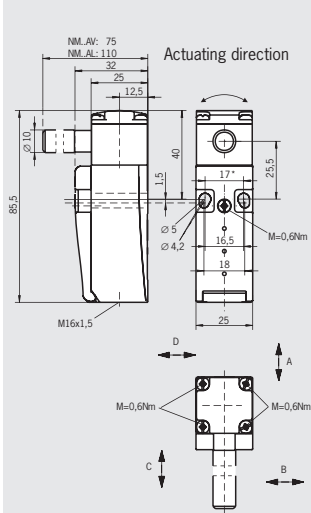
Plug connector M12
4-pin, long housing



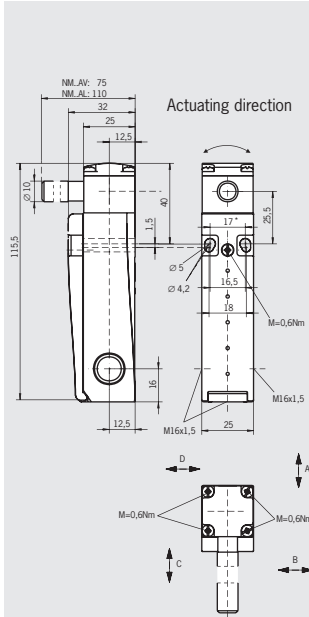
Switching elements

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

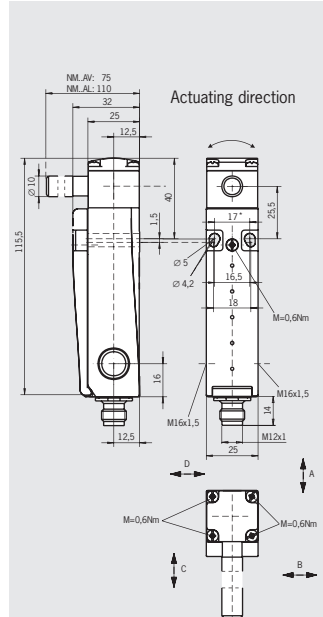
Dimension drawing



For cable glands see page 104

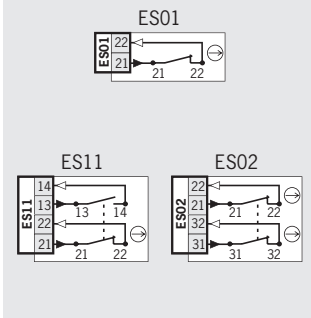


For cable glands see page 104



For plug connectors see page 99

Wiring diagrams Switch not activated



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order no./item
NM	AV Hinged axis Solid shaft Length 75 mm	Cable entry 1 x M16 x 1.5	Short	01 1 NC ⊖	084545 NM01AV-M
				11 1 NC ⊖ + 1 NO	095367 NM11AV-MC2069
				02 2 NC ⊖	095366 NM02AV-MC2069
		Cable entry 3 x M16 x 1.5	Long	11 1 NC ⊖ + 1 NO	084546 NM11AV-M
				02 2 NC ⊖	084547 NM02AV-M
				12 2 NC ⊖ + 1 NO	084548 NM12AV-M
	AL Hinged axis Solid shaft Length 110 mm	Cable entry 3 x M16 x 1.5	Long	03 3 NC ⊖	084549 NM03AV-M
			Short	01 1 NC ⊖	079117 NM01AL-M
				11 1 NC ⊖ + 1 NO	095365 NM11AL-MC2069
		02 2 NC ⊖		095364 NM02AL-MC2069	
Plug connector M12	Long	11 1 NC ⊖ + 1 NO	079118 NM11AL-M		
		02 2 NC ⊖	079119 NM02AL-M		
		12 2 NC ⊖ + 1 NO	079120 NM12AL-M		
		03 3 NC ⊖	079121 NM03AL-M		
			02 2 NC ⊖	093246 NM02AL-SM4	

Safety switch NM..AG

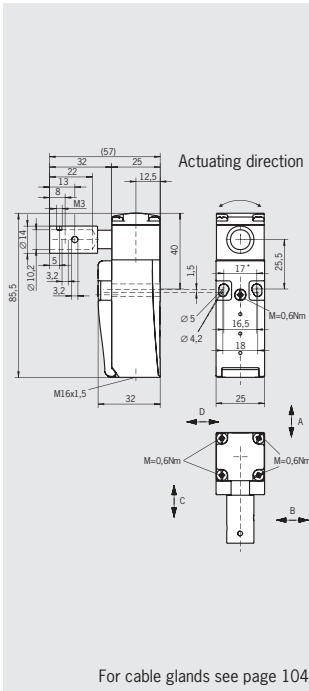
- ▶ Hinged actuator as hollow shaft
- ▶ Internal diameter 10.2 mm



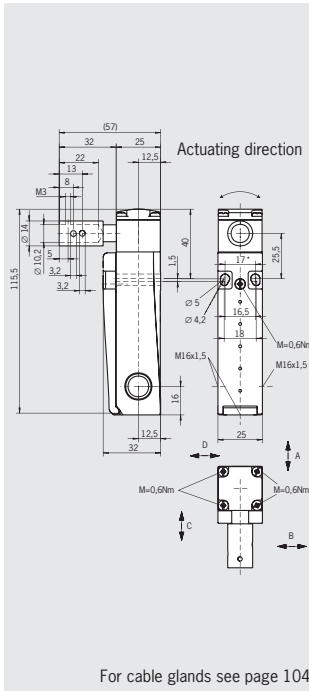
Switching elements

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

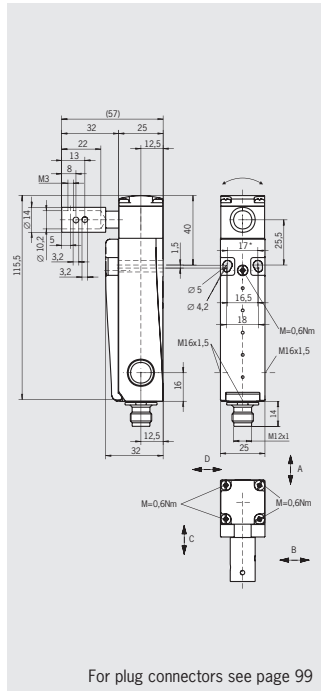
Cable entry M16 x 1.5 Short housing



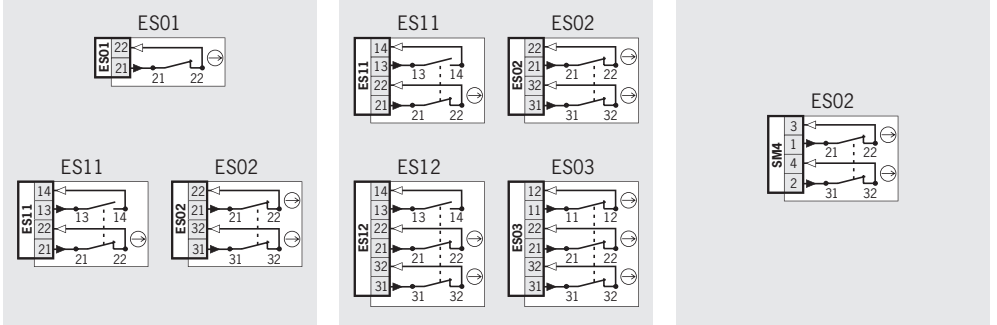
Cable entry M16 x 1.5 Long housing



Plug connector M12 4-pin, long housing



Wiring diagrams Switch not activated



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order no./item
NM	AG Hinged axis Hollow shaft ∅ 10.2 mm	Cable entry 1 x M16 x 1.5	Short	01 1 NC ⊖	084553 NMO1AG-M
				11 1 NC ⊕ + 1 NO	095361 NM11AG-MC2069
				02 2 NC ⊖	095360 NMO2AG-MC2069
		Cable entry 3 x M16 x 1.5	Long	11 1 NC ⊕ + 1 NO	084554 NM11AG-M
				02 2 NC ⊖	084555 NMO2AG-M
				12 2 NC ⊕ + 1 NO	084556 NM12AG-M
				03 3 NC ⊖	084557 NMO3AG-M
Plug connector M12	Long	02 2 NC ⊖	084565 NMO2AG-SM4		

For safety precautions see page 149
For technical data see page 117

Safety switch NM..AK

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

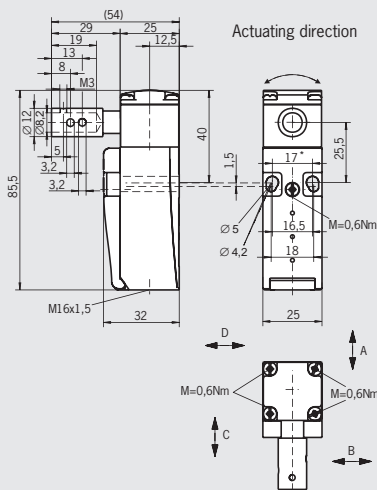


Switching elements

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

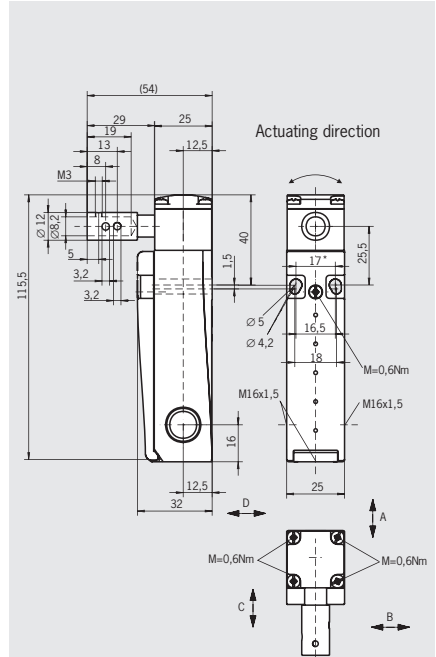
Cable entry M16 x 1.5 Short housing

Dimension drawing



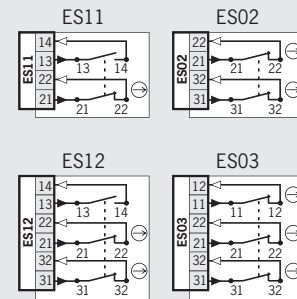
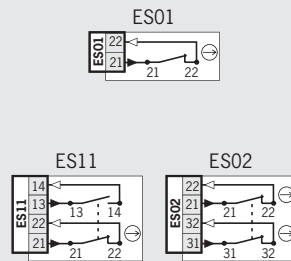
For cable glands see page 104

Cable entry M16 x 1.5 Long housing





For cable glands see page 104

Wiring diagrams Switch not activated



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order no./item
NM	AK Hinged axis Hollow shaft ∅ 8.2 mm	Cable entry 1 x M16 x 1.5	Short 	01 1 NC ⊖	084559 NM01AK-M
				11 1 NC ⊕ + 1 NO	095363 NM11AK-MC2069
				02 2 NC ⊖	095362 NM02AK-MC2069
		Cable entry 3 x M16 x 1.5	Long 	11 1 NC ⊕ + 1 NO	084560 NM11AK-M
				02 2 NC ⊖	084561 NM02AK-M
				12 2 NC ⊕ + 1 NO	084562 NM12AK-M
			03 3 NC ⊖	084563 NM03AK-M	

Selection table for safety switches NM with separate actuator

Connection		Housing		Switching element			Page
M	SM4	Short	Long	One contact	Two contacts	Three contacts	
				1 NC ⊖	1 NC ⊖ + 1 NO, 2 NC ⊖	2 NC ⊖ + 1 NO, 3 NC ⊖	22
							23

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
- ▶ Plug connector M12 optional



Approach direction



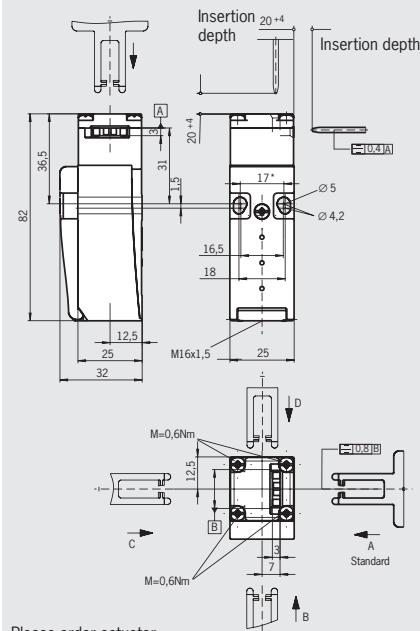
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

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

Cable entry M16 x 1.5 Short housing

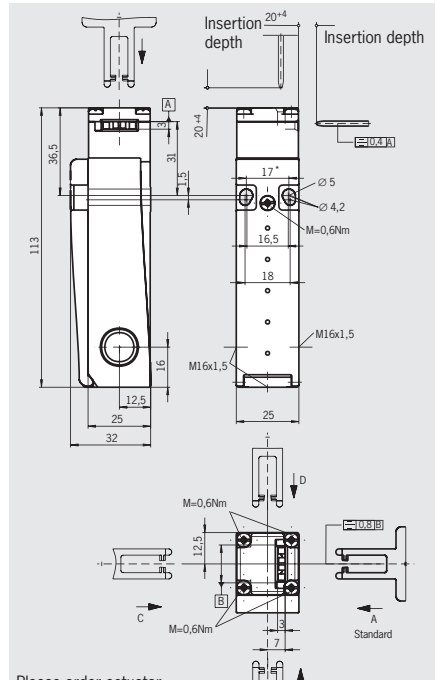
Dimension drawing



Please order actuator separately
(See pages 88-89)

For cable glands see page 104

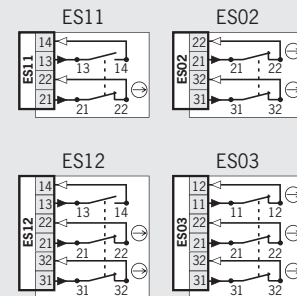
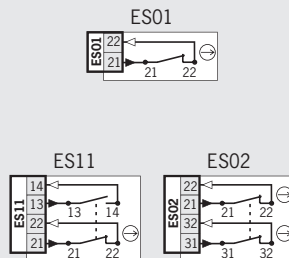
Cable entry M16 x 1.5 Long housing



Please order actuator separately
(See pages 88-89)

For cable glands see page 104

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 ⊖	084451 NM01VZA-M
				11 1 NC ⊕ + 1 NO	094471 NM11VZA-MC2069
				02 2 NC ⊖	094470 NM02VZA-MC2069
		Cable entry 3 x M16 x 1.5	Long	11 1 NC ⊕ + 1 NO	084452 NM11VZA-M
				02 2 NC ⊖	084453 NM02VZA-M
				12 2 NC ⊕ + 1 NO	084454 NM12VZA-M
03 3 NC ⊖	084455 NM03VZA-M				



Safety switch NP

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



Approach direction



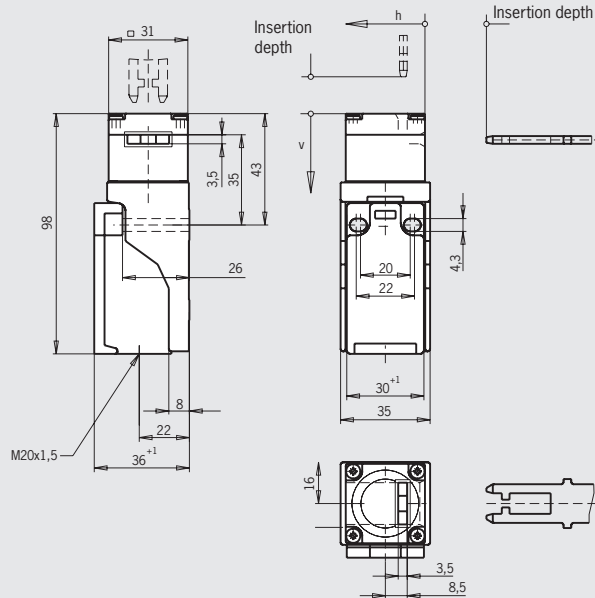
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- ▶ **618** Slow-action switching contact
1 NC ⊖
- ▶ **628** Slow-action switching contact
1 NC ⊕ + 1 NO
- ▶ **638** Slow-action switching contact
2 NC ⊖
- ▶ **648** Slow-action switching contact
2 NC ⊕ + 1 NO

Cable entry M20 x 1.5

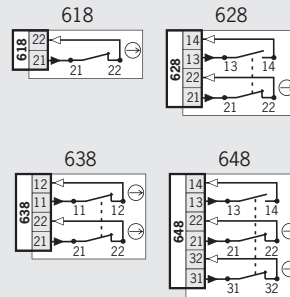
Dimension drawing



Please order actuator separately
(See pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted



Ordering table

Series	Mounting	Connection	Switching element	Order no./item
NP	AS To DIN EN 50047	1 Cable entry 1 x M20 x 1.5	618 1 NC ⊖	083685 NP1-618AS-M
			628 1 NC ⊕ + 1 NO	083688 NP1-628AS-M
			638 2 NC ⊖	083691 NP1-638AS-M
			648 ¹⁾ 2 NC ⊕ + 2 NO	082280 ¹⁾ NP1-648AS-M

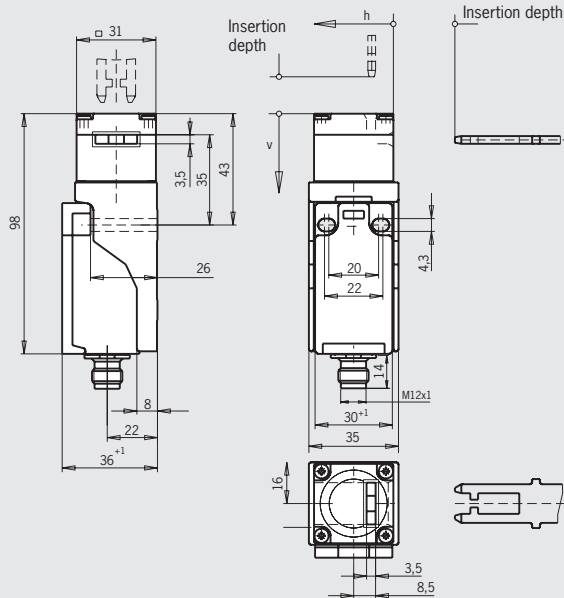
1) No ⊕ Approval



Plug connector SM4 Plug M12, 4-pin

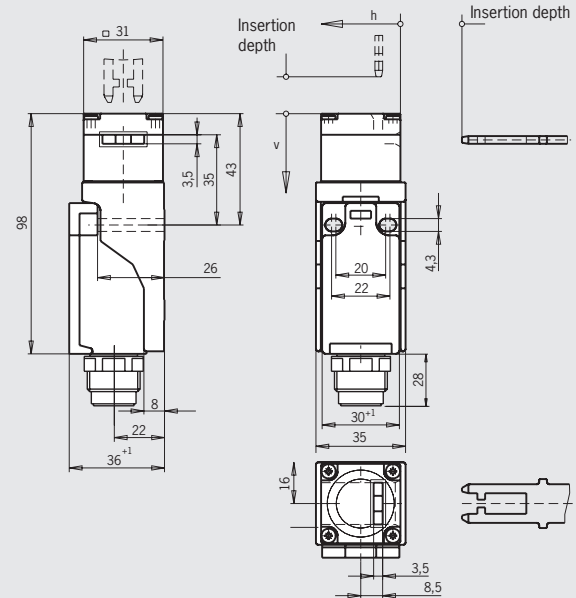
Plug connector SR6 6-pin + PE

Dimension drawing



Please order actuator separately
(See pages 90-93)

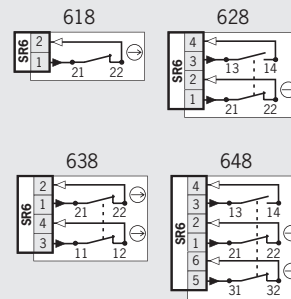
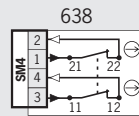
For plug connectors see page 99



Please order actuator separately
(See pages 90-93)

For plug connectors see page 100

Wiring diagrams Actuator inserted



Ordering table

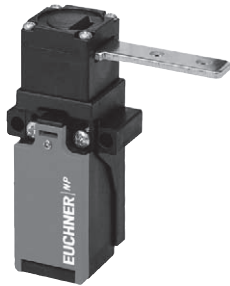
Series	Mounting	Connection	Switching element	Order no./item
NP	AS To DIN EN 50047	3 Plug connector SM4	638 2 NC \rightarrow	084400 NP3-638AS
		2 Plug connector SR6	618 1 NC \rightarrow	059445 NP2-618AS
			628 1 NC \rightarrow + 1 NO	059447 NP2-628AS
			638 2 NC \rightarrow	059449 NP2-638AS
			648 2 NC \rightarrow + 2 NO	088924 NP2-648AS

For safety precautions see page 149
For technical data see page 117



Safety switch NP

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



Approach direction



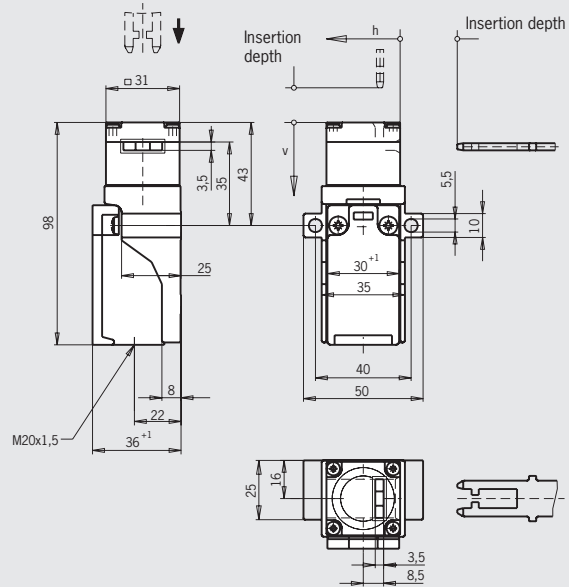
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- ▶ **618** Slow-action switching contact
1 NC ⊖
- ▶ **628** Slow-action switching contact
1 NC ⊕ + 1 NO
- ▶ **638** Slow-action switching contact
2 NC ⊖
- ▶ **648** Slow-action switching contact
2 NC ⊕ + 1 NO

Cable entry M20 x 1.5

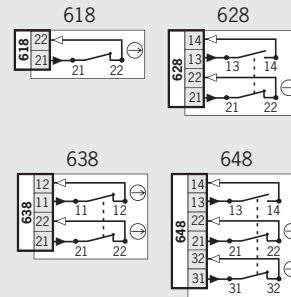
Dimension drawing



Please order actuator separately
(See pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted



Ordering table

Series	Mounting	Connection	Switching element	Order no./item
NP	AB with 40 mm spacing	1 Cable entry 1 x M20 x 1.5	618 1 NC ⊖	083680 NP1-618AB-M
			628 1 NC ⊕ + 1 NO	083686 NP1-628AB-M
			638 2 NC ⊖	083690 NP1-638AB-M
			648 ¹⁾ 2 NC ⊕ + 2 NO	082276 ¹⁾ NP1-648AB-M

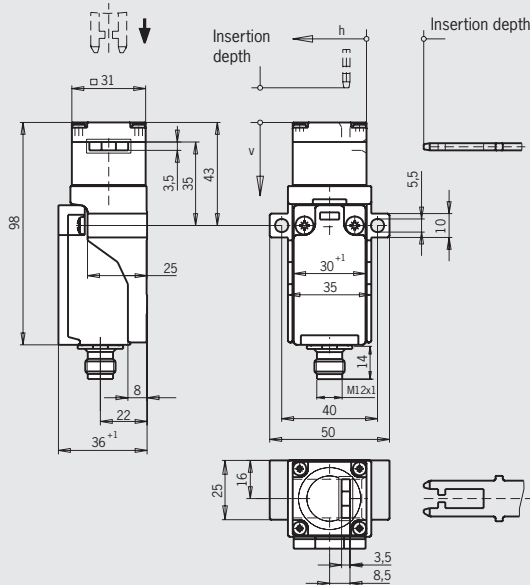
1) No ⊕ Approval



Plug connector SM4 Plug M12, 4-pin

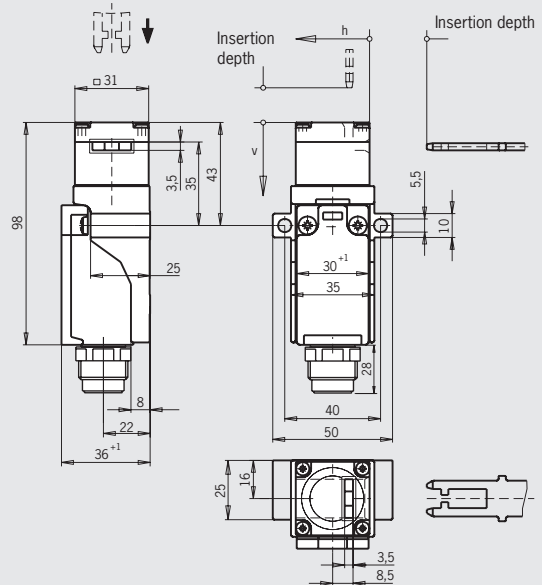
Plug connector SR6 6-pin + PE

Dimension drawing



Please order actuator separately (See pages 90-93)

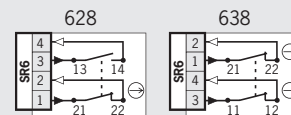
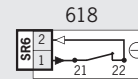
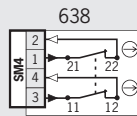
For plug connectors see page 99



Please order actuator separately (See pages 90-93)

For plug connectors see page 100

Wiring diagrams Actuator inserted




Ordering table

Series	Mounting	Connection	Switching element	Order no./item
NP	AB with 40 mm spacing	3 Plug connector SM4	638 2 NC \rightarrow	094509 NP3-638AB
		2 Plug connector SR6	618 1 NC \rightarrow	059446 NP2-618AB
			628 1 NC \rightarrow + 1 NO	059448 NP2-628AB
			638 2 NC \rightarrow	059450 NP2-638AB

For safety precautions see page 149
For technical data see page 117

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



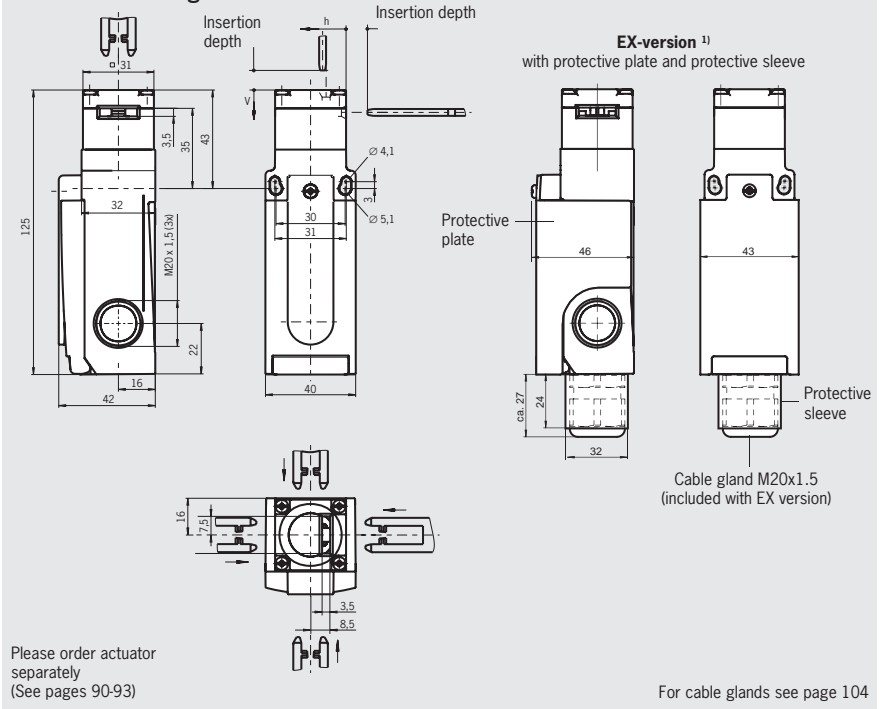
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

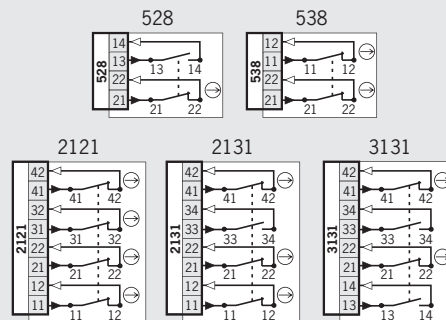
- ▶ **528** Slow-action switching contact
1 NC ⊕ + 1 NO
- ▶ **538** Slow-action switching contact
2 NC ⊕
- ▶ **2121** Slow-action switching contact
4 NC ⊕
- ▶ **2131** Slow-action switching contact
3 NC ⊕ + 1 NO
- ▶ **3131** Slow-action switching contact
2 NC ⊕ + 2 NO

Cable entry M20 x 1.5

Dimension drawing



Wiring diagrams Actuator inserted



Ordering table

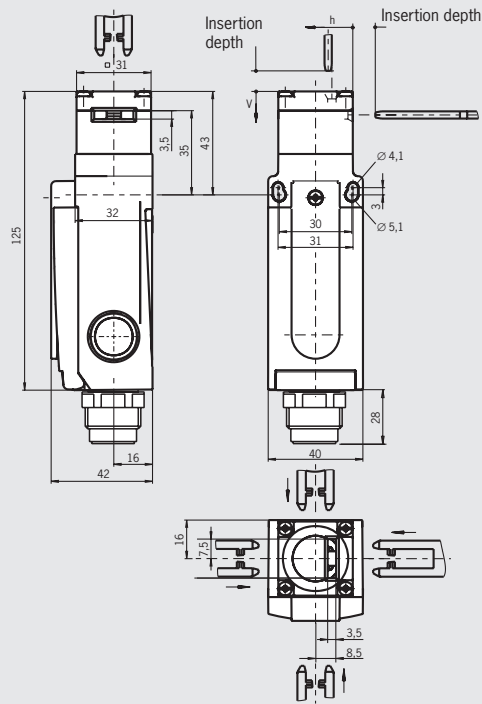
Series	Connection	Switching element	Version	Order no./item
GP	1 Cable entry 3 x M20 x 1.5	528 1 NC ⊕ + 1 NO		089725 GP1-528A-M
		538 2 NC ⊕		090250 GP1-538A-M
		2121 4 NC ⊕		090252 GP1-2121A-M
		2131 3 NC ⊕ + 1 NO		090255 GP1-2131A-M
		2131 3 NC ⊕ + 1 NO	ATEX incl. cable gland	095702 ¹⁾ GP1-2131A-M-EX
		3131 2 NC ⊕ + 2 NO		090258 GP1-3131A-M

1) ⊕ II 3 G Ex nC IIB T5 Gc X
⊕ II 3 D Ex tc IIIC T90°C Dc X



Plug connector SR11 11-pin + PE

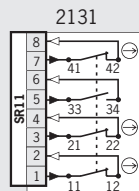
Dimension drawing



Please order actuator separately
(See pages 90-93)

For plug connectors see page 100

Wiring diagrams Actuator inserted



Ordering table

Series	Connection	Switching element	Order no./item
GP	2 Plug connector SR11	2131 3 NC \ominus + 1 NO	096227 GP2-2131ASR11

For safety precautions see page 149
For technical data see page 117

Safety Switches with Separate Actuator, Plastic Housing EUCHNER

Selection table for safety switches SGP

Version		Connection			Switching element		Page
Standard	TW	M	SR6	SR11	Two contacts	Four contacts	
		Mounting to DIN EN 50047			2 NC ☺		36
		Mounting with 40 mm spacing			2 NC ☺ + 2 NO,		
					3 NC ☺ + 1 NO,		
					4 NC ☺		38

Version		Connection			Switching element		Page
Standard	TW	M	SR6	SR11	Two contacts	Four contacts	
●		●				●	36
●			●	●	●	●	
	●	●				●	

Safety Switches with Separate Actuator, Plastic Housing **EUCHNER**



Safety switch SGP

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



Approach direction



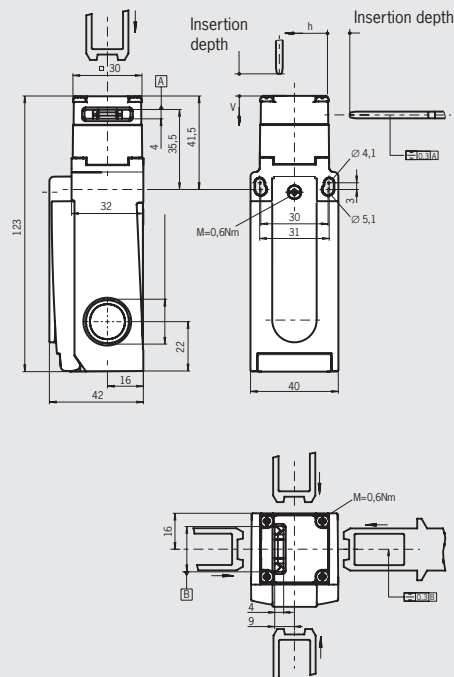
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

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

Cable entry M20 x 1.5

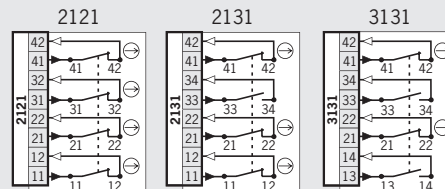
Dimension drawing



Please order actuator
separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted



Ordering table

Series	Connection	Switching element	Order no./item
SGP	1 Cable entry 3 x M20 x 1.5	2121 4 NC ⊖	097705 SGP1E-2121A-M
		2131 3 NC ⊖ + 1 NO	097706 SGP1E-2131A-M
		3131 2 NC ⊖ + 2 NO	097707 SGP1E-3131A-M

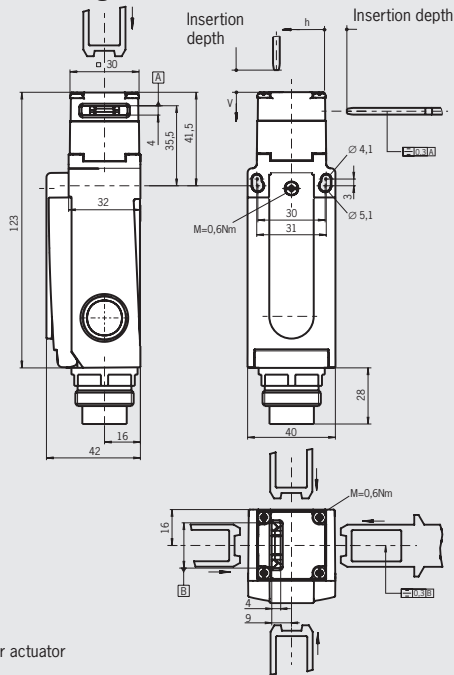
Safety Switches with Separate Actuator, Plastic Housing **EUCHNER**



Plug connector SR6 6-pin + PE

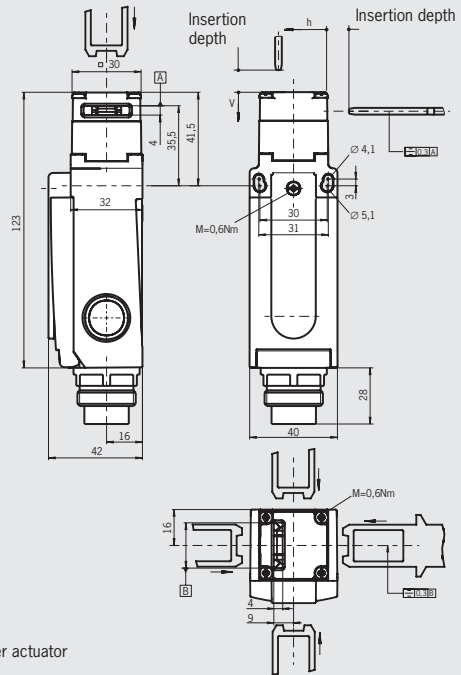
Plug connector SR11 11-pin + PE

Dimension drawing



Please order actuator separately
(See pages 94-96)

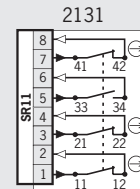
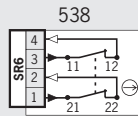
For plug connectors see page 100



Please order actuator separately
(See pages 94-96)

For plug connectors see page 100

Wiring diagrams Actuator inserted



Ordering table

Series	Connection	Switching element	Order no./item
SGP	2 Plug connector SR6	538 2 NC ⊖	104022 SGP2E-538ASR6
	2 Plug connector SR11	2131 3 NC ⊕ + 1 NO	099084 SGP2E-2131ASR11

For safety precautions see page 149
For technical data see page 117

Safety Switches with Separate Actuator, Plastic Housing **EUCHNER**



Safety switch SGP-TW

- ▶ Actuating heads made of metal
- ▶ Simultaneous monitoring of two safety doors
- ▶ Cable entry M20 x 1.5



Approach direction



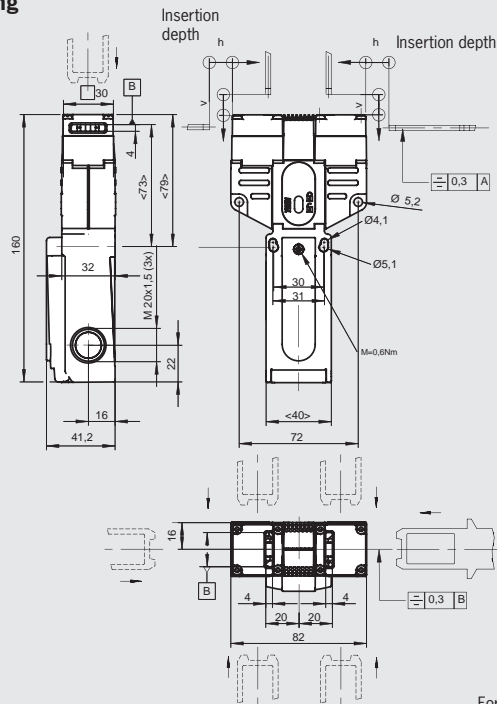
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- ▶ **2131** Slow-action switching contact
3 NC \ominus + 1 NO

Cable entry M20 x 1.5

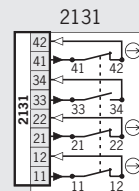
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104


Wiring diagrams Actuator inserted



Ordering table

Series	Connection	Switching element	Order no./item
SGP-TW	1 Cable entry 3 x M20 x 1.5	2131 3 NC \ominus + 1 NO	100809 SGP-TW-1E-2131AC-M

Selection table for safety switches SGA

Version						
Standard	One actuating head made of metal					
Connection						
M	Thread M20x1.5 for cable glands					
SR11	Plug connector 11-pin + PE					
RC18	Plug connector 18-pin + PE					
Switching element						
Two contacts	2 NC ⊖					
Four contacts	3 NC ⊖ + 1 NO, 4 NC ⊖					
						
Version Standard	M	Connection		Switching element		Page
		SR11	RC18	Two contacts	Four contacts	
●	●				●	40
●		●			●	41
●			●		●	42



Safety switch SGA

- ▶ Metal housing with metal actuating head
- ▶ Cable entry M20 x 1.5
- ▶ Plug connector optional



Approach direction



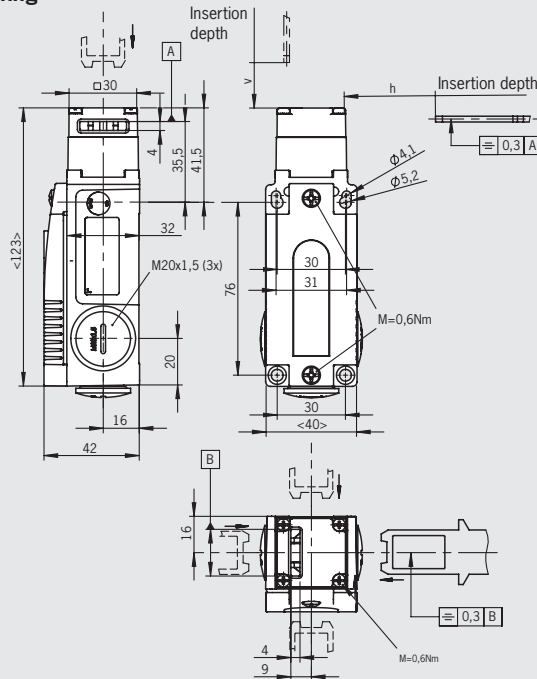
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- ▶ **2121** Slow-action switching contact
4 NC \ominus
- ▶ **2131** Slow-action switching contact
3 NC \ominus + 1 NO

Cable entry M20 x 1.5

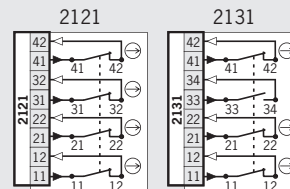
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted



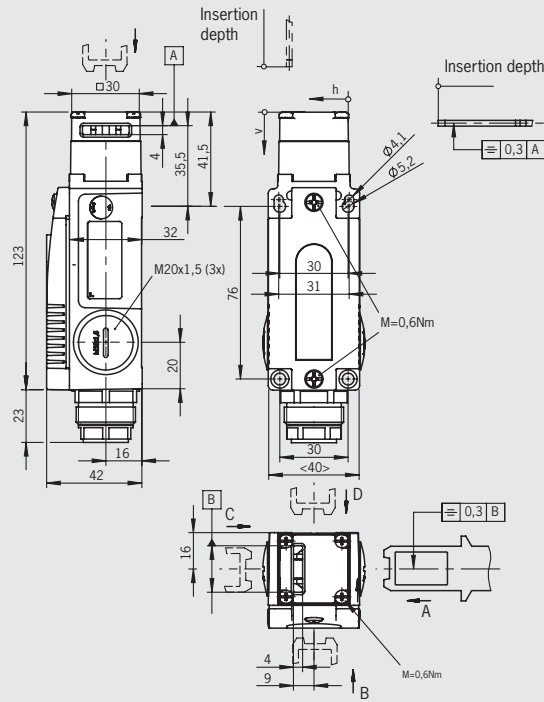
Ordering table

Series	Connection	Switching element	Order no./item
SGA	1 Cable entry 3 x M20 x 1.5	2121 4 NC \ominus	103725 SGA1A-2121A-M
		2131 3 NC \ominus + 1 NO	106307 SGA1A-2131A-M



Plug connector SR11 11-pin + PE

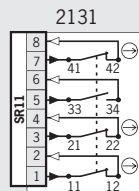
Dimension drawing



Please order actuator separately
(See pages 94-96)

For plug connectors see page 100

Wiring diagrams Actuator inserted



Ordering table

Series	Connection	Switching element	Order no./item
SGA	2 Plug connector SR11	2131 3 NC \ominus + 1 NO	106736 SGA2E-2131ASR11

For safety precautions see page 149
For technical data see page 117



Safety switch SGA

- ▶ Metal housing with metal actuating head
- ▶ 2 illuminated pushbuttons
- ▶ Plug connector RC18



Approach direction



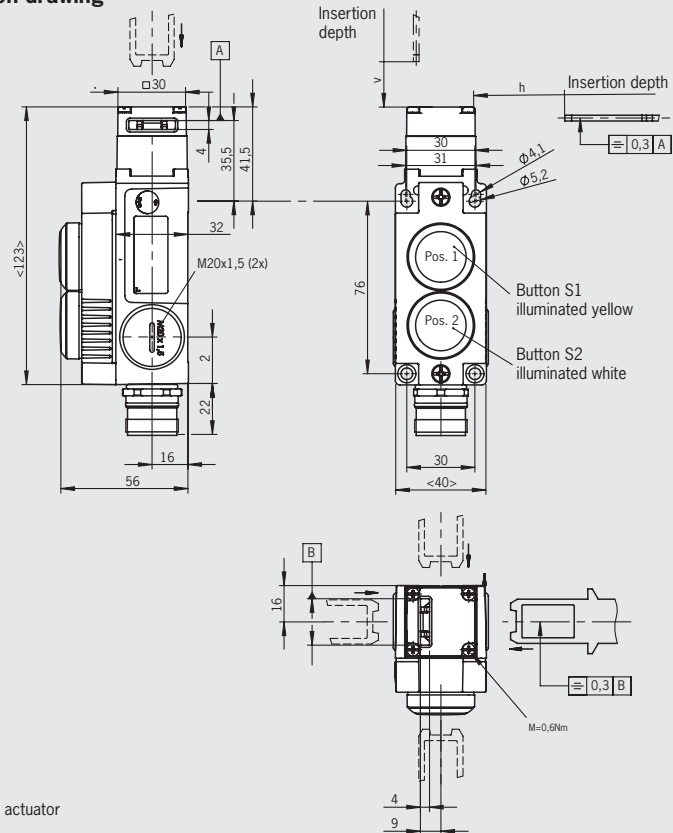
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- ▶ **2121** Slow-action switching contact
4 NC

Plug connector RC18 18-pin + PE

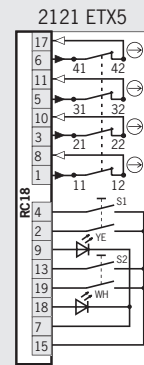
Dimension drawing



Please order actuator
separately
(See pages 94-96)

For plug connectors see page 101-102

Wiring diagrams Actuator inserted



Ordering table

Series	Connection	Switching element	Version	Order no./item
SGA	2 Plug connector RC18	2121 4 NC	Pos. 1: yellow push button Pos. 2: white push button	104012 SGA2A-2121ARC18-ETX5

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 gland											
SR6		Plug connector; 6 pin + PE											
SM8		Plug connector M12 8-pin											
SR11		Plug connector; 11 pin + PE											
BHA12		Plug connector; 12-pin											
RC18		Plug connector; 18 pin + PE											
Release feature		Door monitoring			overtravel		Connection						Page
HE	FE	TP1/2	TP3/4	TP5/6	A	K	M	SR6	SM8	SR11	BHA12	RC18	
•		•			•		•						44
•		•			•		•	•		•			45
•		•				•	•						46
•		•				•	•	•		•			47
•			•		•		•						48 - 51
•			•		•			•	•				52
•			•		•					•			53
•			•			•	•						54
•			•			•		•		•			55
				•	•		•			•			56
•	•		•		•		•			•			57
•			•		•						•	•	58
•	•		•		•							•	59



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. To protect against tampering, the mechanical release is sealed 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

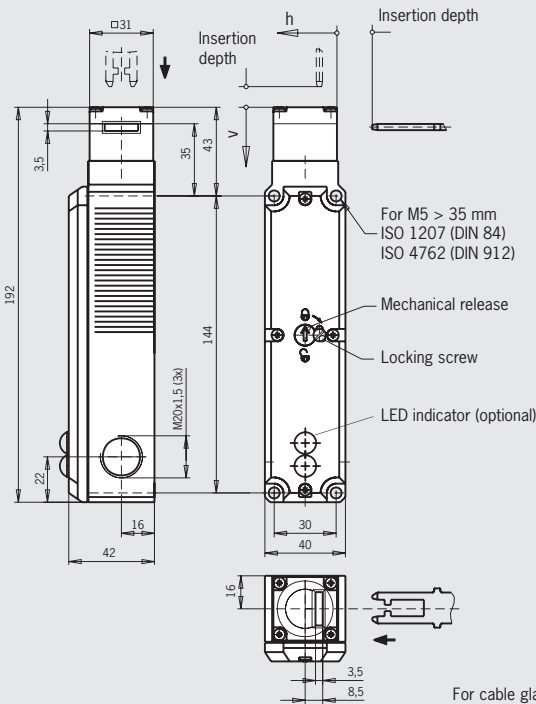
- TP1** Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.
- TP2** Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

- ▶ **528** Slow-action switching contact 1 NC ⊕ + 1 NO
- ▶ **538** Slow-action switching contact 2 NC ⊕
- ▶ **2121** Slow-action switching contact 4 NC ⊕
- ▶ **4131** Slow-action switching contact 2 NC ⊕ + 2 NO

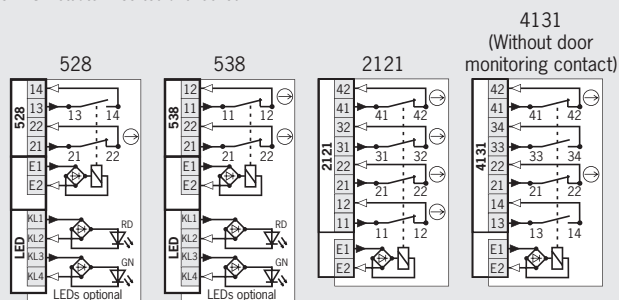
Cable entry M20 x 1.5

Dimension drawing



Please order actuator separately (See Pages 90-93)

Wiring diagrams Actuator inserted and locked



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		084295 TP1-528A024M	084300 TP1-528A110M	084304 TP1-528A230M
			528 1 NC ⊕ + 1 NO	024L LED indicator AC/DC 24 V	094058 TP1-528A024L024M	-	-
			538 2 NC ⊕		084310 TP1-538A024M	084315 TP1-538A110M	084320 TP1-538A230M
			538 2 NC ⊕	024L LED indicator AC/DC 24 V	093459 TP1-538A024L024M	-	-
			4131 2 NC ⊕ + 2 NO		084115 TP1-4131A024M	084116 TP1-4131A110M	084117 TP1-4131A230M
			528 1 NC ⊕ + 1 NO		084325 TP2-528A024M	084330 TP2-528A110M	084332 TP2-528A230M
		2 Electrical	538 2 NC ⊕		084333 TP2-538A024M	084334 TP2-538A110M	084335 TP2-538A230M
			2121 4 NC ⊕		096528 TP2-2121A024M	-	-
			4131 2 NC ⊕ + 2 NO		084125 TP2-4131A024M	084126 TP2-4131A110M	084128 TP2-4131A230M

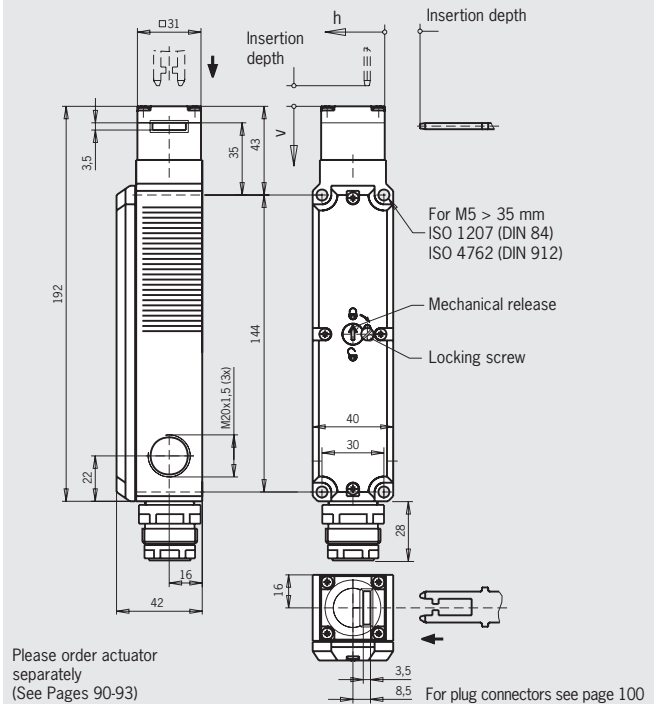
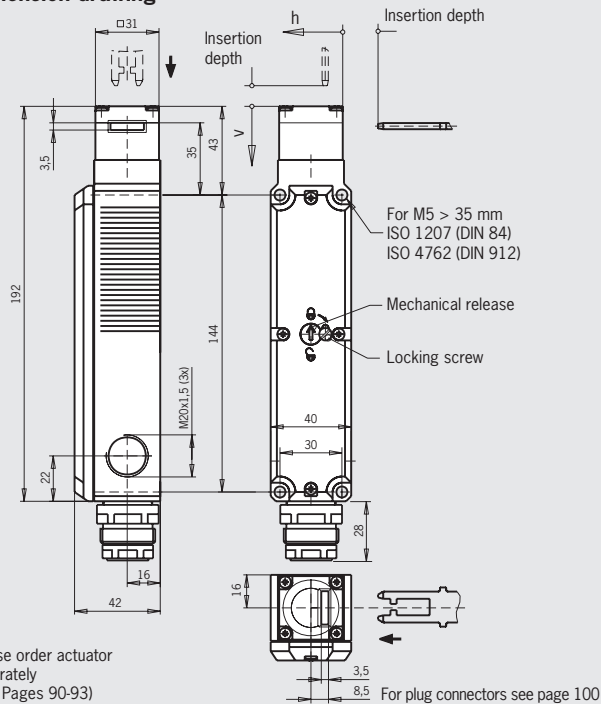
1) With cable entry M, DC 24 V / AC 110 V



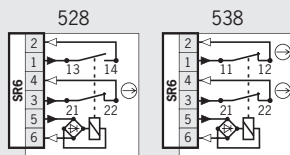
Plug connector SR6 6-pin + PE

Plug connector SR11 11-pin + PE

Dimension drawing

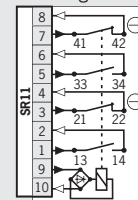


Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 131

4131 (Without door monitoring contact)



For switching functions see technical data on Page 131

Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage		
				AC/DC 24 V	AC 110 V	AC 230 V
TP	SR6 Plug connectors	1 Mechanical	528 1 NC ⊖ + 1 NO	087431 TP1-528A024SR6	087435 TP1-528A110SR6	087438 TP1-528A230SR6
			538 2 NC ⊖	087433 TP1-538A024SR6	087436 TP1-538A110SR6	087439 TP1-538A230SR6
		2 Electrical	528 1 NC ⊖ + 1 NO	087441 TP2-528A024SR6	087444 TP2-528A110SR6	087448 TP2-528A230SR6
			538 2 NC ⊖	087442 TP2-538A024SR6	087446 TP2-538A110SR6	087449 TP2-538A230SR6
	SR11 Plug connectors	1 Mechanical	4131 2 NC ⊖ + 2 NO	088202 TP1-4131A024SR11	-	-
		2 Electrical	4131 2 NC ⊖ + 2 NO	088203 TP2-4131A024SR11	-	-

2) Only with solenoid voltage AC/DC 24 V

For safety precautions see page 149
 For technical data see page 117



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. To protect against tampering, the mechanical release is sealed 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 guard locking solenoid.

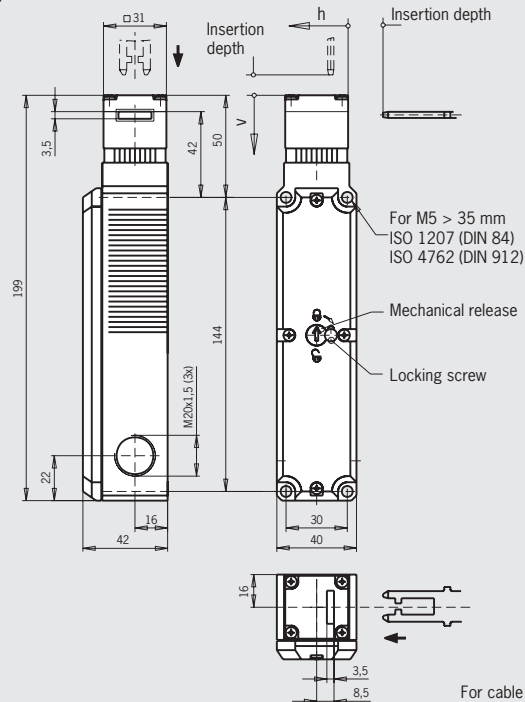
TP2 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

- ▶ **528** Slow-action switching contact 1 NC ⊕ + 1 NO
- ▶ **538** Slow-action switching contact 2 NC ⊕
- ▶ **4131** Slow-action switching contact 2 NC ⊕ + 2 NO

Cable entry M20 x 1.5

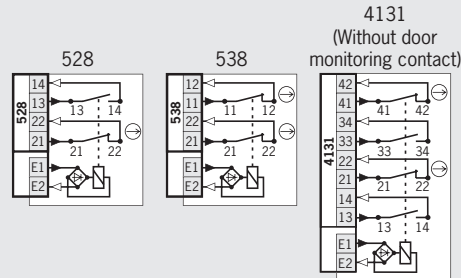
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 131

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	084342 TP1-528K024M	On request	On request
			538 2 NC ⊕	084343 TP1-538K024M	On request	On request
			4131 2 NC ⊕ + 2 NO	084150 TP1-4131K024M	084254 TP1-4131K110M	084255 TP1-4131K230M
		2 Electrical	528 1 NC ⊕ + 1 NO	084344 TP2-528K024M	On request	On request
			538 2 NC ⊕	084346 TP2-538K024M	On request	On request
			4131 2 NC ⊕ + 2 NO	084253 TP2-4131K024M	On request	On request

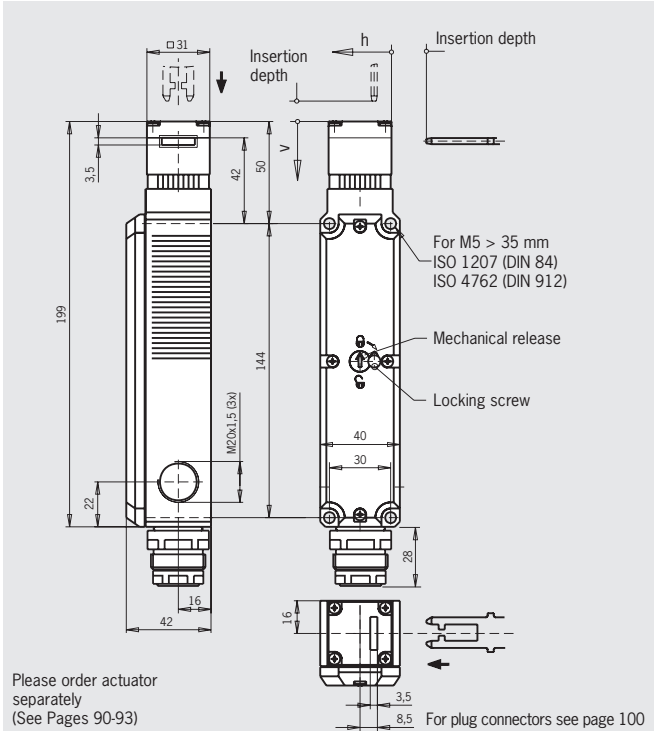
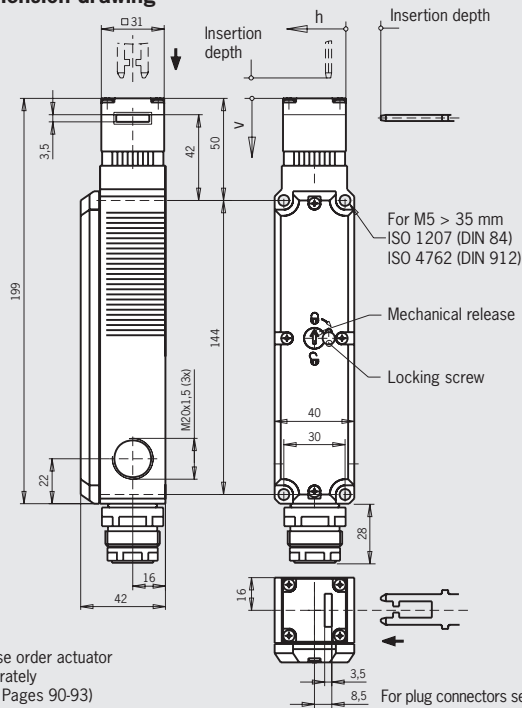
1) With cable entry M, DC 24 V / AC 110 V



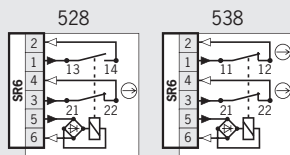
Plug connector SR6 6-pin + PE

Plug connector SR11 11-pin + PE

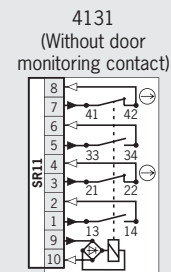
Dimension drawing



Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 131



For switching functions see technical data on Page 131

Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage		
				AC/DC 24 V	AC 110 V	AC 230 V
TP	SR6 Plug connectors	1 Mechanical	528 1 NC ⊖ + 1 NO	088210 TP1-528K024SR6	On request	On request
			538 2 NC ⊖	088212 TP1-538K024SR6	On request	On request
		2 Electrical	528 1 NC ⊖ + 1 NO	088214 TP2-528K024SR6	On request	On request
			538 2 NC ⊖	088215 TP2-538K024SR6	On request	On request
	SR11 Plug connectors	1 Mechanical	4131 2 NC ⊖ + 2 NO	088217 TP1-4131K024SR11	-	-
		2 Electrical	4131 2 NC ⊖ + 2 NO	088218 TP2-4131K024SR11	-	-

2) Only with solenoid voltage AC/DC 24 V

For safety precautions see page 149
For technical data see page 117

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. To protect against tampering, the mechanical release is sealed 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 guard locking solenoid.

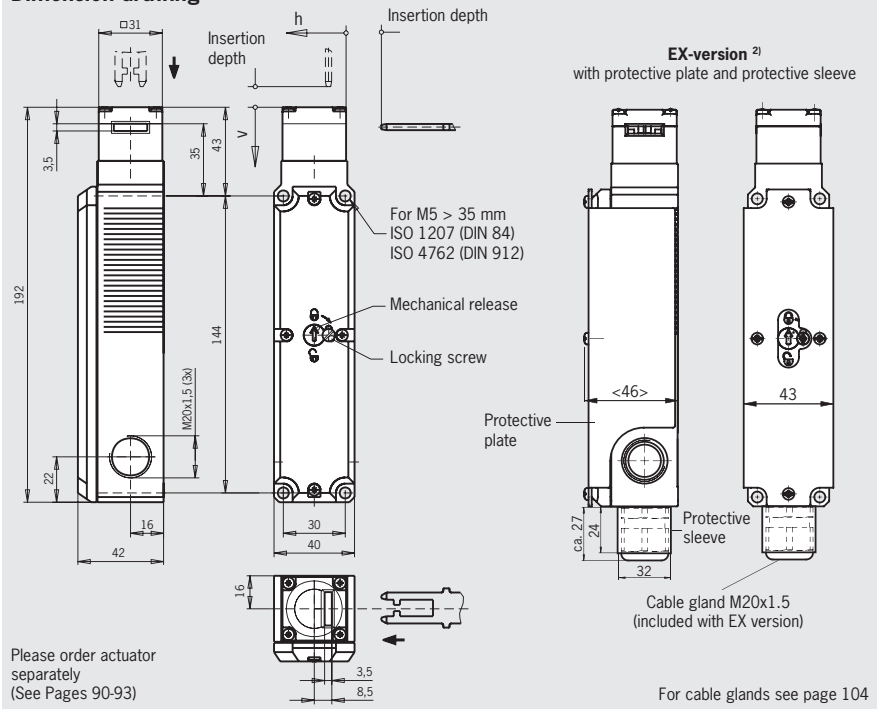
TP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

- ▶ **537** Slow-action switching contact
1 NC ⊕ + 1 NC (door monitoring contact)
- ▶ **2131** Slow-action switching contact
2 NC ⊕ + 1 NO + 1 NC (door monitoring contact)
- ▶ **4121** Slow-action switching contact
2 NC ⊕ + 1 NC / 1 NO (door monitoring contact)
- ▶ **4131** Slow-action switching contact
2 NC ⊕ + 1 NO + 1 NO (door monitoring contact)
- ▶ **4141** Slow-action switching contact
2 NC ⊕ + 2 NC ⊕ (door monitoring contact)

Cable entry M20 x 1.5

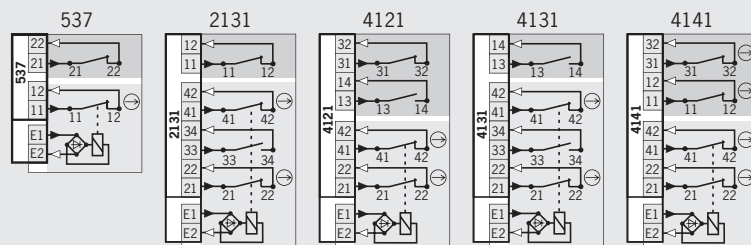
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 132

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		084336 TP3-537A024M	084337 TP3-537A110M	084338 TP3-537A230M
			2131 2 NC ⊕ + 1 NO + 1 NC		084142 TP3-2131A024M	084143 TP3-2131A110M	084144 TP3-2131A230M
			2131 2 NC ⊕ + 1 NO + 1 NC	ATEX incl. cable gland	093791 2) TP3-2131A024M-EX	-	-
			2131 2 NC ⊕ + 1 NO + 1 NC	C1761 Cable gland in rear of housing	084290 3) TP3-2131A024MC1761	-	-
			4121 2 NC ⊕ + 1 NC / 1 NO		084135 TP3-4121A024M	084137 TP3-4121A110M	084138 TP3-4121A230M
			4131 2 NC ⊕ + 1 NO + 1 NO		084129 TP3-4131A024M	084130 TP3-4131A110M	084131 TP3-4131A230M
			4141 2 NC ⊕ + 2 NC ⊕		084270 TP3-4141A024M	088264 TP3-4141A110M	-

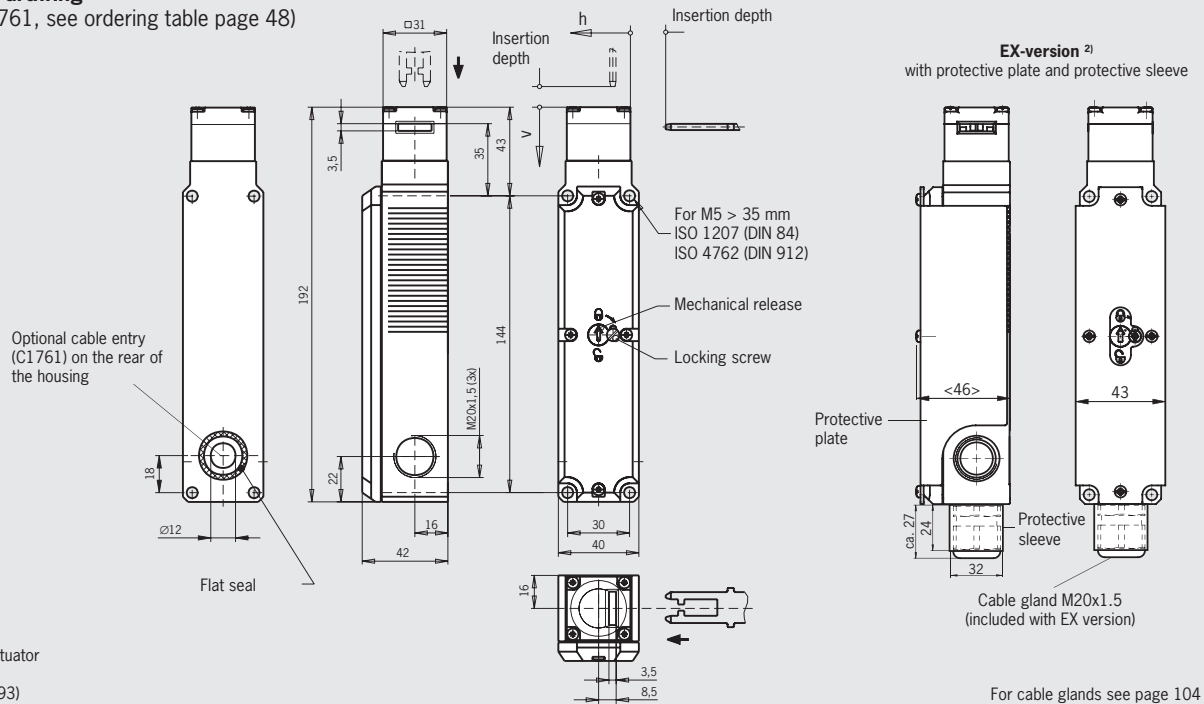
1) With cable entry M, DC 24 V / AC 110 V 2) 3 G Ex nC IIB T4 Gc X / 3) No approvals



Cable entry M20 x 1.5

Dimension drawing

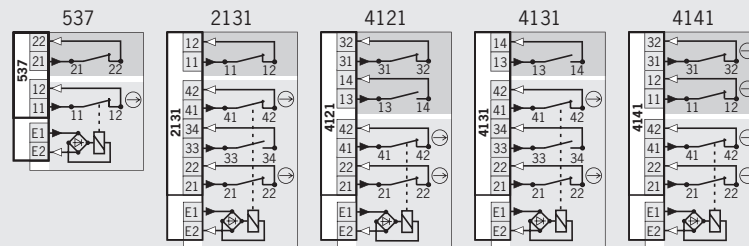
(Version C1761, see ordering table page 48)



Please order actuator separately (See Pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



□ Solenoid monitoring
■ Door monitoring

For switching functions see technical data on Page 132

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		084339 TP4-537A024M	084340 TP4-537A110M	084341 TP4-537A230M
			2131 2 NC ⊖ + 1 NO + 1 NC		084145 TP4-2131A024M	084147 TP4-2131A110M	084148 TP4-2131A230M
			2131 2 NC ⊖ + 1 NO + 1 NC	ATEX incl. cable gland	093793 ²⁾ TP4-2131A024M-EX	-	-
			4121 2 NC ⊖ + 1 NC / 1 NO		084139 TP4-4121A024M	084140 TP4-4121A110M	084141 TP4-4121A230M
			4131 2 NC ⊖ + 1 NO + 1 NO		084132 TP4-4131A024M	084133 TP4-4131A110M	084134 TP4-4131A230M
			4141 2 NC ⊖ + 2 NC ⊖		084275 TP4-4141A024M	-	-

1) With cable entry M, DC 24 V / AC 110 V 2) Ⓢ II 3 G Ex nC IIB T4 Gc X / Ⓢ II 3 D Ex tc IIIC T110°C Dc X

For safety precautions see page 149
For technical data see page 117



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. To protect against tampering, the mechanical release is sealed 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 guard locking solenoid.

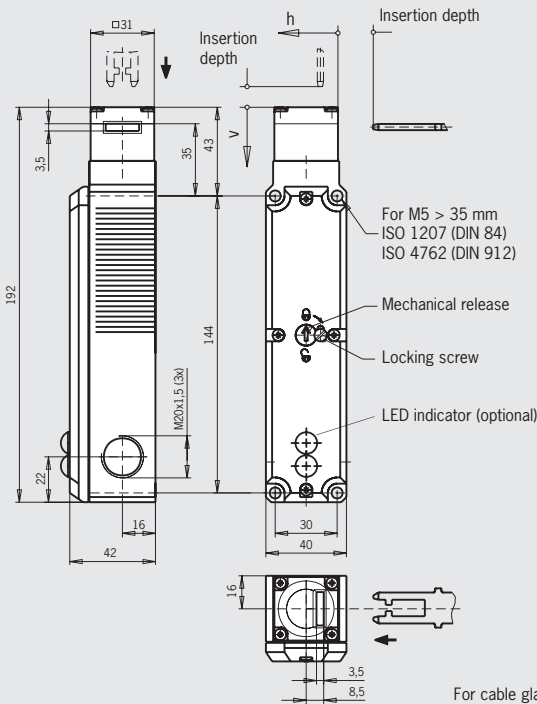
TP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

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

Cable entry M20 x 1.5

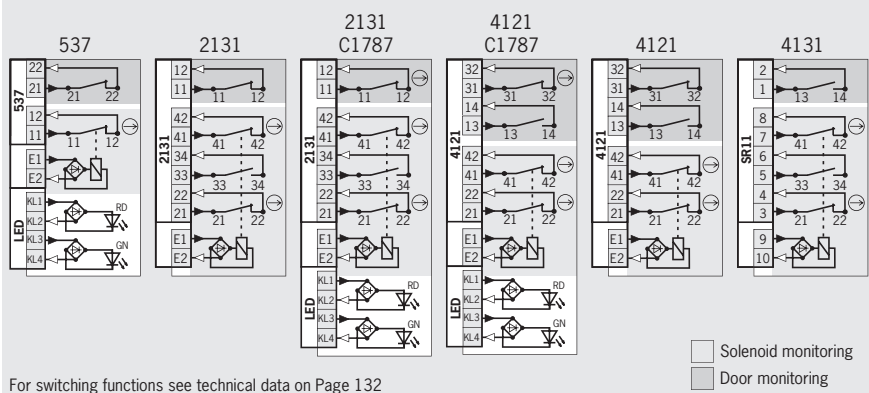
Dimension drawing



Please order actuator separately (See Pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 132

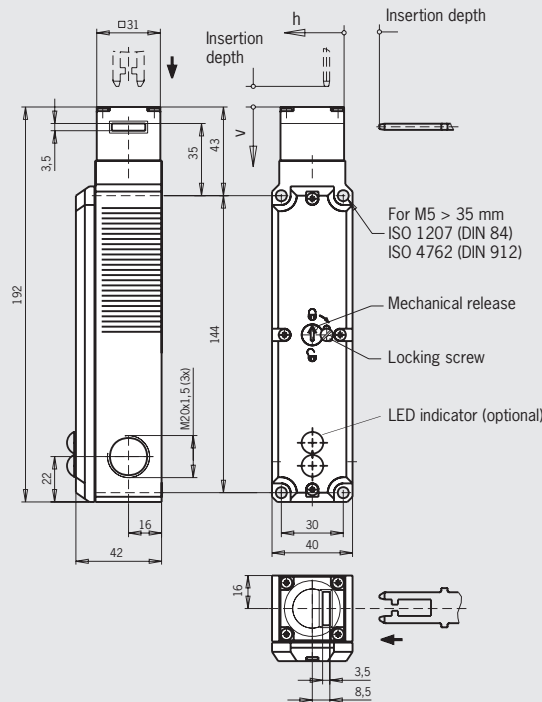
Ordering table

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 indicator AC/DC 24 V	093460 TP3-537A024L024M	
			2131 2 NC ⊖ + 1 NO + 1 NC	024L LED indicator AC/DC 24 V	093634 TP3-2131A024L024M	
			2131 2 NC ⊖ + 1 NO + 1 NC ⊖	C1787 3 positively driven contacts	084289 TP3-2131A024MC1787	
			4121 2 NC ⊖ + 1 NC / 1 NO	024L LED indicator AC/DC 24 V	093636 TP3-4121A024L024M	
			4121 2 NC ⊖ + 1 NC ⊖ + 1 NO	C1787 3 positively driven contacts	084158 TP3-4121A024MC1787	
			4131 2 NC ⊖ + 1 NO + 1 NO	024L LED indicator AC/DC 24 V	098403 TP3-4131A024L024M	



Cable entry M20 x 1.5

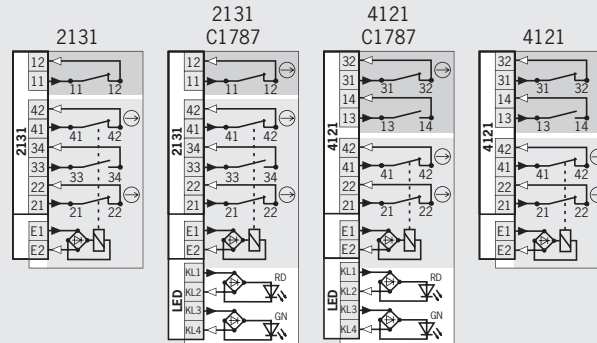
Dimension drawing



Please order actuator separately (See Pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 132

Solenoid monitoring
 Door monitoring

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 + 1 NC	024L LED indicator AC/DC 24 V	093635 TP4-2131A024L024M
			2131 2 NC ⊖ + 1 NO + 1 NC ⊖	C1787 3 positively driven contacts	084159 TP4-2131A024MC1787
			4121 2 NC ⊖ + 1 NC / 1 NO	024L LED indicator AC/DC 24 V	093637 TP4-4121A024L024M
			4121 2 NC ⊖ + 1 NC ⊖ + 1 NO	C1787 3 positively driven contacts	084160 TP4-4121A024MC1787

For safety precautions see page 149
 For technical data see page 117

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. To protect against tampering, the mechanical release is sealed 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 guard locking solenoid.

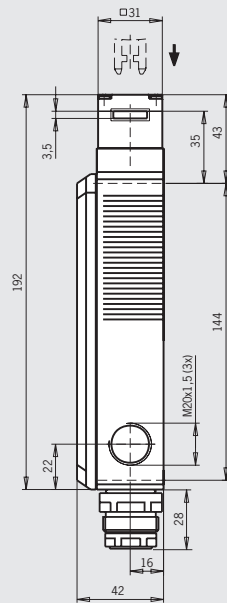
TP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

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

Plug connector SR6 6-pin + PE

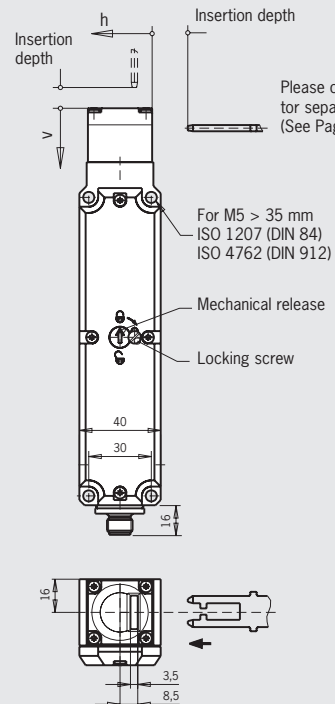
Dimension drawing



Please order actuator separately (See Pages 90-93)

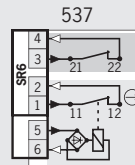
For plug connectors see page 100

Plug connector SM8 Plug M12, 8-pin



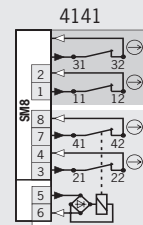
Please order actuator separately (See Pages 90-93)

Wiring diagrams Actuator inserted and locked



□ Solenoid monitoring
■ Door monitoring

For switching functions see technical data on Page 132



□ Solenoid monitoring
■ Door monitoring

For switching functions see technical data on Page 132

Ordering table

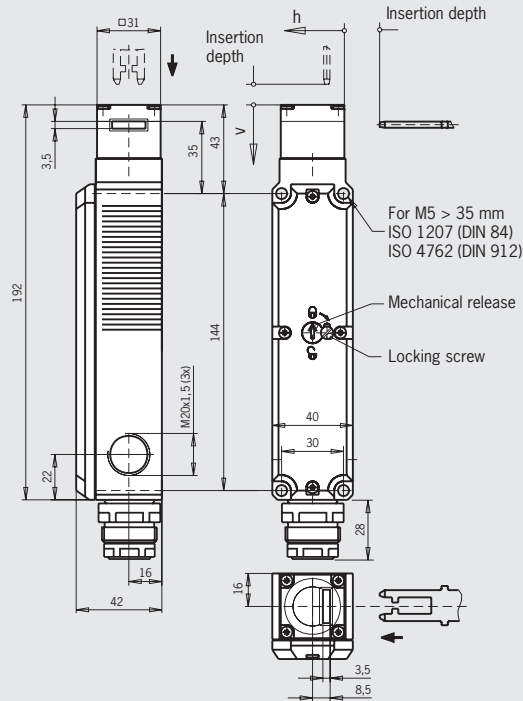
Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage		
					AC/DC 24 V	AC 110 V	AC 230 V
TP	SR6 Plug connectors	3 Mechanical	537 1 NC ⊖ + 1 NC		087434 TP3-537A024SR6	087437 TP3-537A110SR6	087440 TP3-537A230SR6
		4 Electrical	537 1 NC ⊖ + 1 NC		087443 TP4-537A024SR6	087447 TP4-537A110SR6	087450 TP4-537A230SR6
	SM8 Plug connectors M12	3 Mechanical	4141 2 NC ⊖ + 2 NC ⊖	C1992 Direct connection to safe bus module	087377 ¹⁾ TP3-4141A024SM8C1992	-	-
		4 Electrical	4141 2 NC ⊖ + 2 NC ⊖	C1992 Direct connection to safe bus module	087378 ¹⁾ TP4-4141A024SM8C1992	-	-

1) No BG approval 2) Only with solenoid operating voltage AC/DC 24 V



Plug connector SR11 11-pin + PE

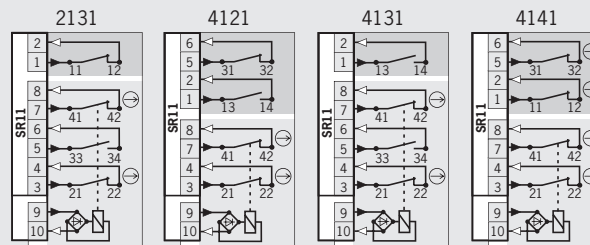
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For plug connectors see page 100

Wiring diagrams Actuator inserted and locked



□ Solenoid monitoring
□ Door monitoring

For switching functions see technical data on Page 132

Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage	
				AC/DC 24 V	
TP	SR11 Plug connectors	3 Mechanical	2131 2 NC ⊕ + 1 NO + 1 NC	088205	TP3-2131A024SR11
			4121 2 NC ⊕ + 1 NC / 1 NO	088206	TP3-4121A024SR11
			4131 2 NC ⊕ + 1 NO + 1 NO	088204	TP3-4131A024SR11
			4141 2 NC ⊕ + 2 NC ⊕	088922	TP3-4141A024SR11
		4 Electrical	2131 2 NC ⊕ + 1 NO + 1 NC	088208	TP4-2131A024SR11
			4121 2 NC ⊕ + 1 NC / 1 NO	088209	TP4-4121A024SR11
			4131 2 NC ⊕ + 1 NO + 1 NO	088207	TP4-4131A024SR11
			4141 2 NC ⊕ + 2 NC ⊕	088923	TP4-4141A024SR11

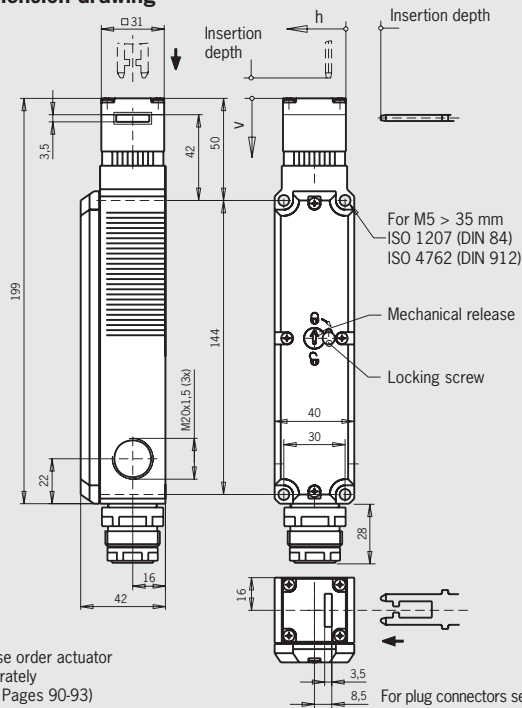
2) Only with solenoid voltage AC/DC 24 V

For safety precautions see page 149
For technical data see page 117



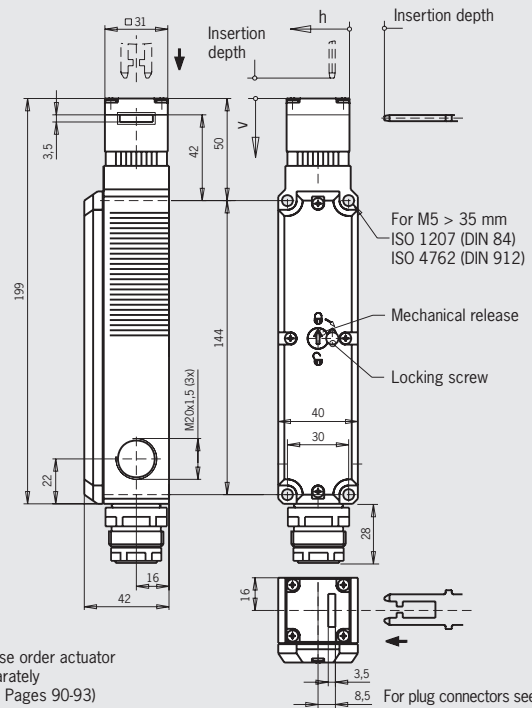
Plug connector SR6 6-pin + PE

Dimension drawing

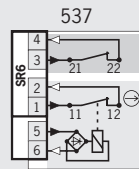


Plug connector SR11 11-pin + PE

Dimension drawing

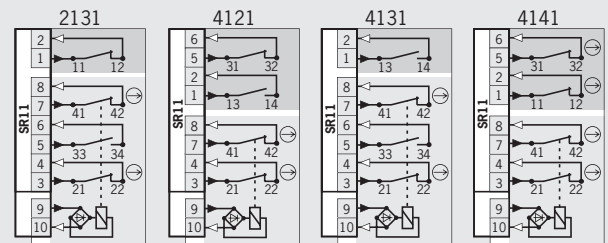


Wiring diagrams Actuator inserted and locked



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 132



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 132

Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage	
				AC/DC 24 V	
TP	SR6 Plug connectors	3 Mechanical	537 1 NC ⊕ + 1 NC	088213	TP3-537K024SR6
		4 Electrical	537 1 NC ⊕ + 1 NC	088216	TP4-537K024SR6
	SR11 Plug connectors	3 Mechanical	2131 2 NC ⊕ + 1 NO + 1 NC	088220	TP3-2131K024SR11
			4121 2 NC ⊕ + 1 NC / 1 NO	088221	TP3-4121K024SR11
			4131 2 NC ⊕ + 1 NO + 1 NO	088219	TP3-4131K024SR11
			2131 2 NC ⊕ + 1 NO + 1 NC	088223	TP4-2131K024SR11
		4 Electrical	4121 2 NC ⊕ + 1 NC / 1 NO	088224	TP4-4121K024SR11
			4131 2 NC ⊕ + 1 NO + 1 NO	088222	TP4-4131K024SR11
			4141 2 NC ⊕ + 2 NC ⊕	088230	TP4-4141K024SR11

For safety precautions see page 149
For technical data see page 117

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 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).

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 guard locking solenoid.

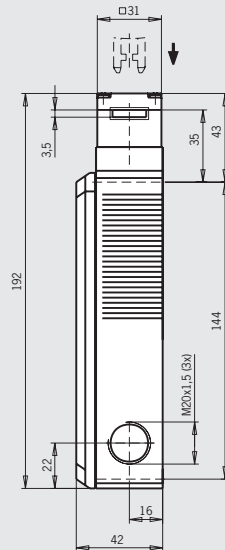
TP6 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

- ▶ **4120** Slow-action switching contact
1 NC ⊖ (Door unlock request contact) +
1 NC ⊖ + 1 NO (solenoid monitoring contact)

Cable entry M20 x 1.5

Dimension drawing

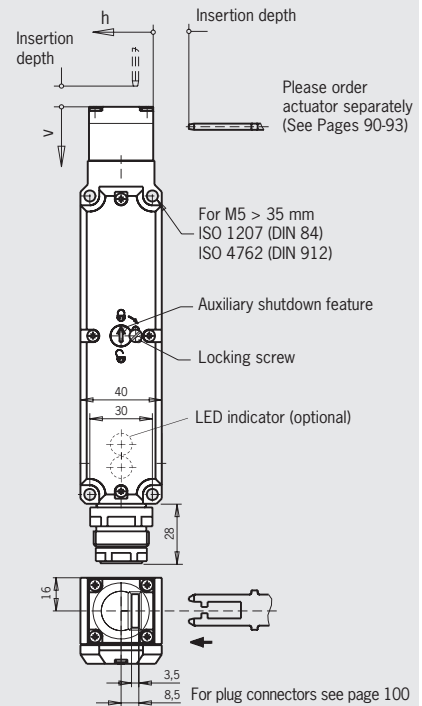


Please order actuator separately (See Pages 90-93)

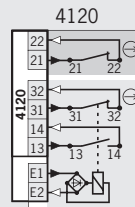
For cable glands see page 104

Plug connector SR11

11-pin + PE

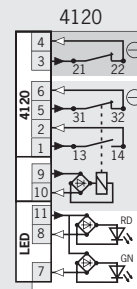


Wiring diagrams Actuator inserted and locked



- Solenoid monitoring
- Door unlock request contact

For switching functions see technical data on Page 132



- Solenoid monitoring
- Door unlock request contact

For switching functions see technical data on Page 132

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		084279 TP5-4120A024M	On request	088241 TP5-4120A230M
		6 Electrical	4120 1 NC ⊖ + 1 NC ⊖ + 1 NO		084280 TP6-4120A024M	On request	On request
	SR11 Plug connectors	5 Mechanical	4120 1 NC ⊖ + 1 NC ⊖ + 1 NO		094895 ²⁾ TP5-4120A024SR11	-	-
		5 Mechanical	4120 1 NC ⊖ + 1 NC ⊖ + 1 NO	LED indicator AC/DC 24 V	094902 ²⁾ TP5-4120A024L024SR11	-	-
		6 Electrical	4120 1 NC ⊖ + 1 NC ⊖ + 1 NO		096204 ²⁾ TP5-4120A024L024SR11	-	-
		6 Electrical	4120 1 NC ⊖ + 1 NC ⊖ + 1 NO			-	-

1) With cable entry M, DC 24 V/AC 110 V 2) Only solenoid operating voltage AC/DC 24 V

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

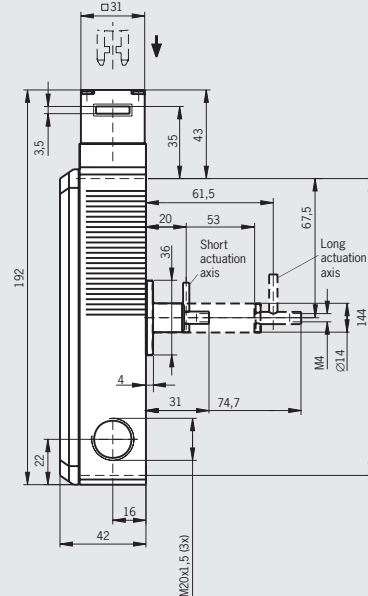
TP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

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

Cable entry M20 x 1.5

Dimension drawing

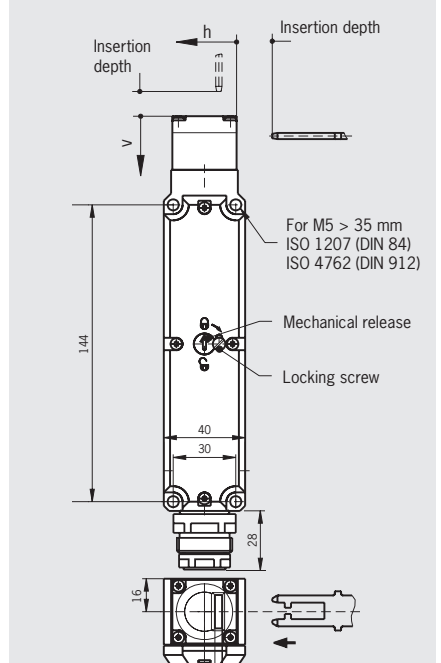


Please order actuator separately (See Pages 90-93)

For cable glands see page 104

Plug connector SR11

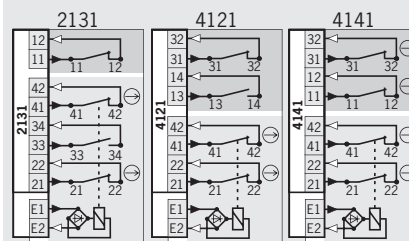
11-pin + PE



Please order actuator separately (See Pages 90-93)

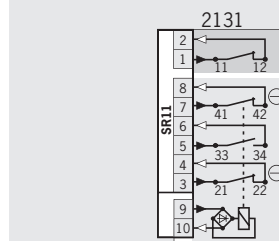
For plug connectors see page 104

Wiring diagrams Actuator inserted and locked



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 132



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 132

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 + 1 NC	C1743 Short actuator shaft	084285 TP3-2131A024MC1743	
				C1993 Long actuator shaft	087400 TP3-2131A024MC1993	
			4121 2 NC ⊖ + 1 NC / 1 NO	C1743 Short actuator shaft	087427 TP3-4121A024MC1743	
				C1993 Long actuator shaft	106155 TP3-4131A024MC1993	
			4141 2 NC ⊖ + 2 NC ⊖	C1743 Short actuator shaft	086165 TP3-4141A024MC1743	
	SR11 Plug connectors	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	C1993 Long actuator shaft	097897 TP3-2131A024SR11C1743	

Safety switch TP with guard locking and guard lock monitoring

- ▶ Mechanical release on the front
- ▶ Pushbutton and cover for indicators
- ▶ 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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Solenoid operating voltage

- ▶ AC/DC 24 V +10%, -15%

Cover for indicators

A cover for indicators (1 LED, green) is available for the following voltage ranges:

- ▶ DC 24 V +10%, -15%

Guard locking types

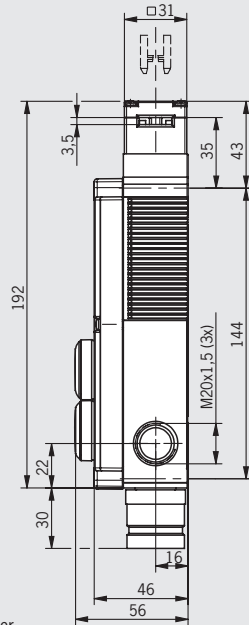
TP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

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

Plug connector BHA12 12-pin

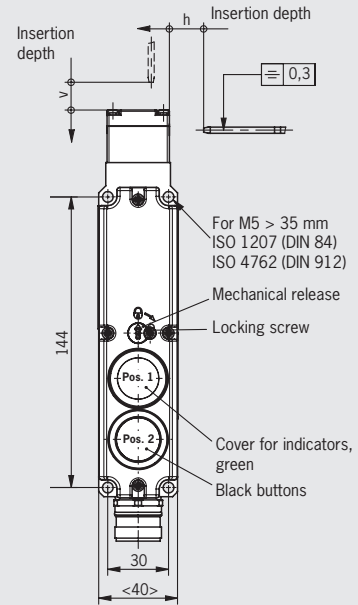
Dimension drawing



Please order actuator separately (See Pages 90-93)

For plug connectors see page 103

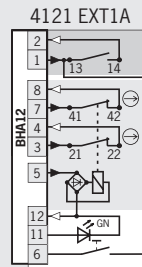
Plug connector RC18 18-pin + PE



Please order actuator separately (See Pages 90-93)

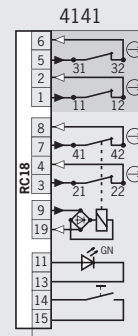
For plug connectors see page 101/102

Wiring diagrams Actuator inserted and locked



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 132



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 132

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage
					AC/DC 24 V
TP	BHA12 Plug connectors	3 Mechanical	4121 2 NC ⊖ + 1 NC / 1 NO	Pos. 1 Cover for indicators, green Pos. 2 Black buttons	105388 TP3-4121A024BHA12EXT1A
	RC18 Plug connectors	3 Mechanical	4141 2 NC ⊖ + 2 NC ⊖	Pos. 1 Cover for indicators, green Pos. 2 Black buttons	103339 TP3-4141A024RC18EXT1



Safety switch TP with guard locking and guard lock monitoring

- ▶ Escape release from the rear
- ▶ 2 illuminated pushbuttons
- ▶ 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%

Button LED

A cover for indicators (1 LED, green) is available for the following voltage ranges:

- ▶ DC 24 V +10%, -15%

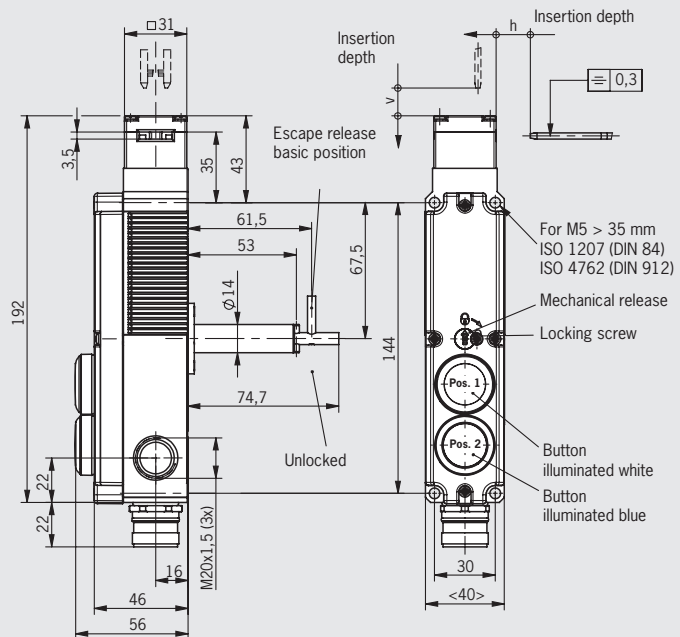
Guard locking types

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

Switching elements

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

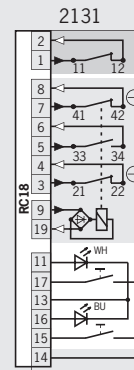
Plug connector RC18 18-pin + PE



Please order actuator separately (See Pages 90-93)

For plug connectors see page 101/102

Wiring diagrams Actuator inserted and locked



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 132

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage
					AC/DC 24 V
TP	RC18 Plug connectors	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	C1993 Long actuator shaft Pos. 1 White button Pos. 2 Blue button	105546 TP3-2131A024RC18C1993EXT2

For safety precautions see page 149
For technical data see page 117

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

Version										
Standard		One actuating head made of metal								
BI		BiState, with additional safety function								
TW		TWIN, 2 actuating heads made of metal								
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 gland								
SR11		Plug connector 11-pin + PE								
RC18		Plug connector 18-pin + PE								

Version			Release feature		Door monitoring		Connection			Page
Standard	BI	TW	HE	FE	STP3/4	STP1/2	M	SR11	RC18	
●			●		●		●	●	●	62 - 65
●			●			●	●			66
●			●	●	●		●	●		67
●			●	●	●	●			●	68 - 69
	●		●		●			●		71
		●	●		●		●	●		72 - 73



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. To protect against tampering, the mechanical release is sealed 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 guard locking solenoid.

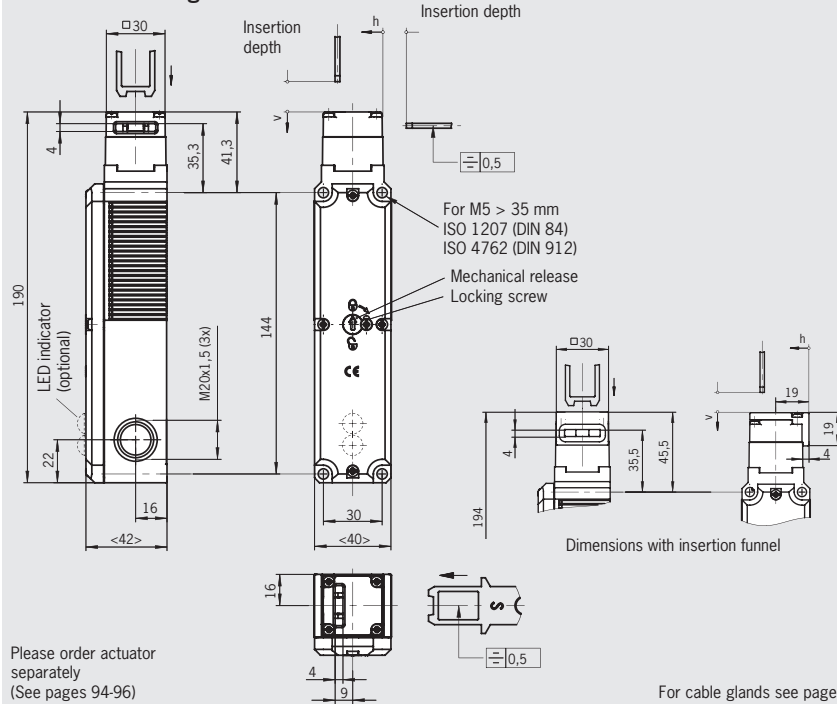
STP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

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

Cable entry M20 x 1.5

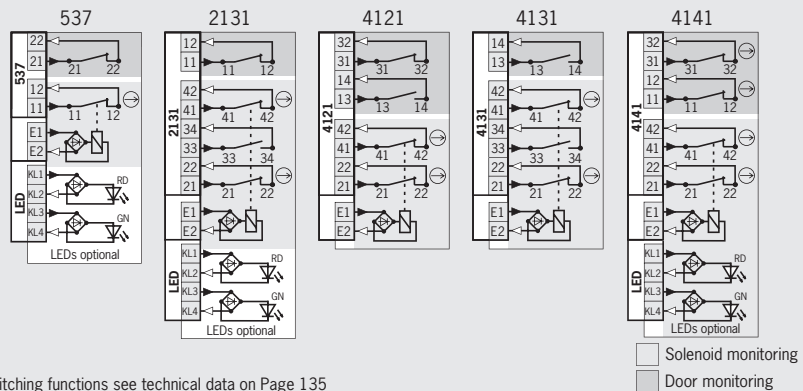
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 135

Ordering table

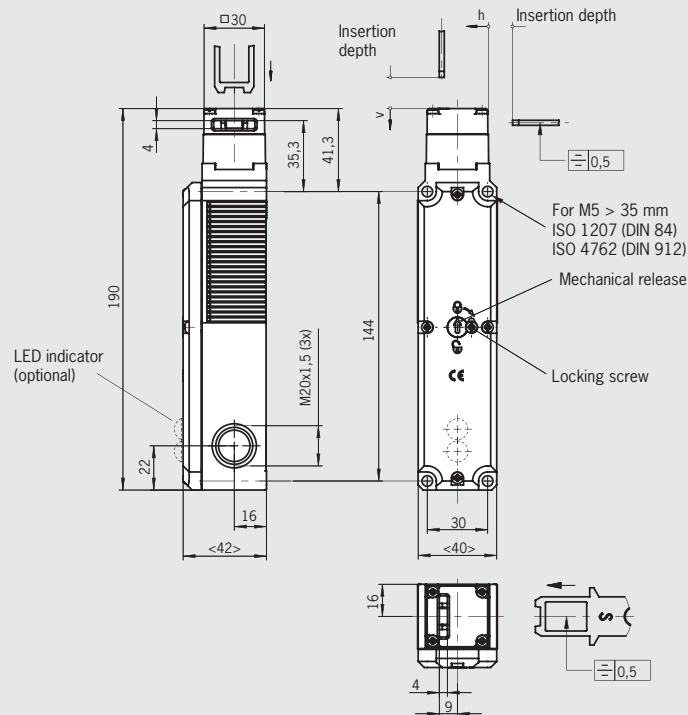
Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage		
					AC/DC 24 V	AC 110 V	AC 230 V
STP	M Cable entry 3 x M20 x 1.5	3 Mechanical	537 1 NC ⊖ + 1 NC	O24L LED indicator AC/DC 24 V D With insertion funnel	097210 STP3D-537A024L024M	On request	On request
					091493 STP3A-2131A024M	099326 STP3A-2131A110M	105972 STP3A-2131A230M
			2131 2 NC ⊖ + 1 NO + 1 NC	O24L LED indicator AC/DC 24 V	091748 STP3A-2131A024L024M	On request	On request
					096890 STP3A-4121A024M	On request	094792 STP3A-4121A230M
			4121 2 NC ⊖ + 1 NC / 1 NO		091776 STP3A-4131A024M	On request	On request
					099272 STP3A-4141A024M	On request	On request
			4131 2 NC ⊖ + 1 NO + 1 NO		097891 STP3D-4141A024M	On request	On request
					099412 STP3D-4141A024L024M	On request	On request
			4141 2 NC ⊖ + 2 NC ⊖				

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



Cable entry M20 x 1.5

Dimension drawing

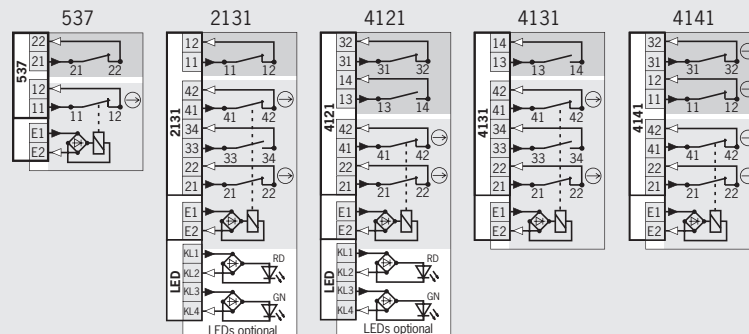


Please order actuator separately (See pages 94-96)

For cable glands see page 104

Please turn over

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
 Door monitoring

For switching functions see technical data on Page 135

Ordering table

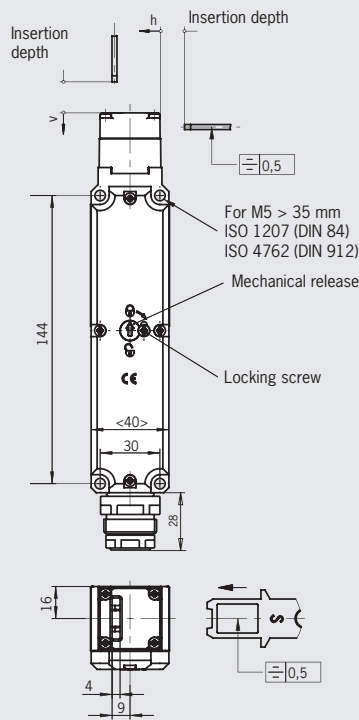
Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage		
					AC/DC 24 V	AC 110 V	AC 230 V
STP	M Cable entry 3 x M20 x 1.5	4 Electrical	537 1 NC ⊖ + 1 NC		092259 STP4A-537A024M	On request	On request
			2131 2 NC ⊖ + 1 NO + 1 NC		091494 STP4A-2131A024M	097754 STP4A-2131A110M	On request
				024L LED indicator AC/DC 24 V	091749 STP4A-2131A024L024M	On request	On request
			4121 2 NC ⊖ + 1 NC / 1 NO		093159 STP4A-4121A024M	094793 STP4A-4121A110M	094794 STP4A-4121A230M
				024L LED indicator AC/DC 24 V	100026 STP4A-4121A024L024M	-	-
4131 2 NC ⊖ + 1 NO + 1 NO		093158 STP4A-4131A024M	On request	104153 STP4A-4131A230M			
4141 2 NC ⊖ + 2 NC ⊖		099314 STP4A-4141A024M	On request	On request			

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

For safety precautions see page 149
For technical data see page 117

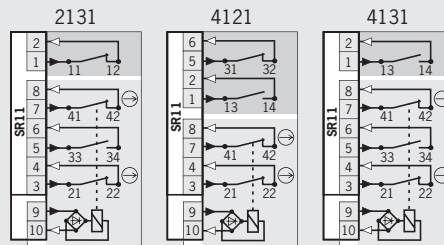


Plug connector SR11 11-pin + PE



Please order actuator separately
(See pages 94-96)

For plug connectors see page 100



For switching functions see technical data on Page 135

Solenoid monitoring
 Door monitoring

Ordering table

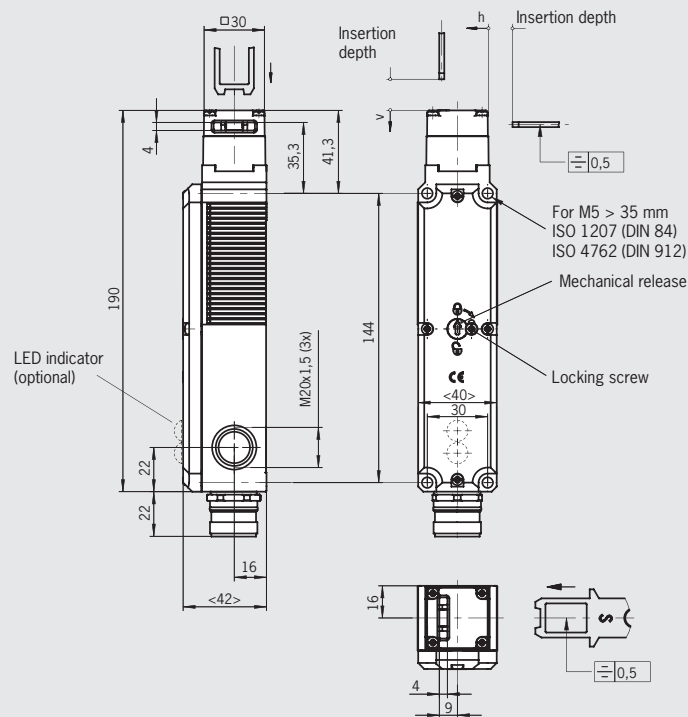
Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage		
					AC/DC 24 V	AC 110 V	AC 230 V
STP	SR11 Plug connector	3 Mechanical	2131 2 NC \rightarrow + 1 NO + 1 NC		099069 STP3A-2131A024SR11	-	-
			4121 2 NC \rightarrow + 1 NC / 1 NO		096318 STP3A-4121A024SR11	-	-
			4131 2 NC \rightarrow + 1 NO + 1 NO		103994 STP3A-4131A024SR11	-	-
		4 Electrical	2131 2 NC \rightarrow + 1 NO + 1 NC		097565 STP4A-2131A024SR11	-	-
			4121 2 NC \rightarrow + 1 NC / 1 NO		099301 STP4A-4121A024SR11	-	-

1) With cable entry M, DC 24 V/AC 110 V 2) Only solenoid operating voltage AC/DC 24 V



Plug connector RC18 18-pin + PE

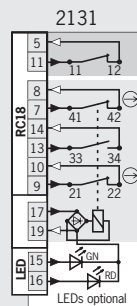
Dimension drawing



Please order actuator separately (See pages 94-96)

For plug connectors see page 101/102

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 135

- Solenoid monitoring
- Door monitoring

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage	
					AC/DC	24 V
STP	RC18 Plug connector	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	024L LED indicator AC/DC 24 V	099644	STP3A-2131A024L024RC18

For safety precautions see page 149
For technical data see page 117



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. To protect against tampering, the mechanical release is sealed 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

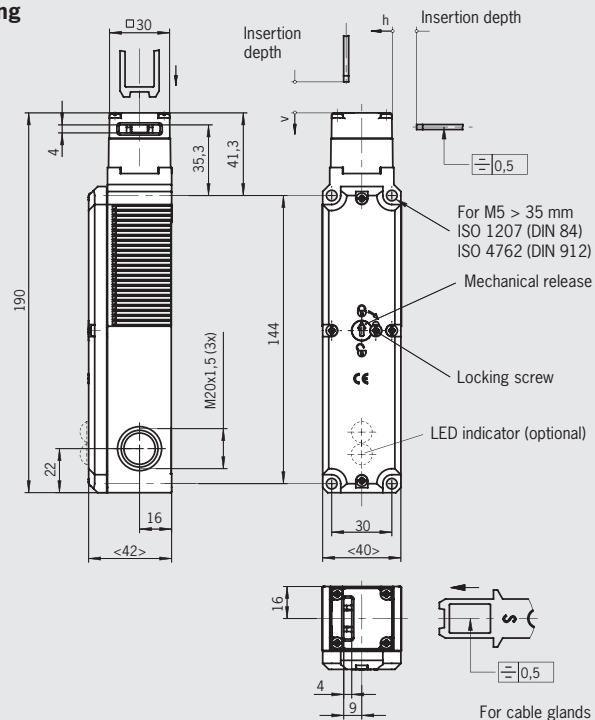
- STP1** Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.
- STP2** Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

- ▶ **528** Slow-action switching contact 1 NC ⊕ + 1 NO
- ▶ **538** Slow-action switching contact 2 NC ⊕
- ▶ **4131** Slow-action switching contact 2 NC ⊕ + 2 NO

Cable entry M20 x 1.5

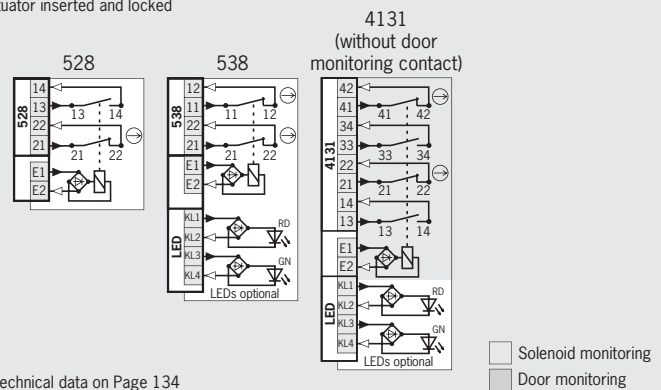
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 134

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		092266 STP1A-528A024M	On request	On request
					092258 STP1A-538A024M	On request	On request
			538 2 NC ⊕	024L LED indicator AC/DC 24 V With pre-assembled insertion funnel	092489 STP1D-538A024L024M	On request	On request
					091491 STP1A-4131A024M	On request	On request
			4131 2 NC ⊕ + 2 NO	024L LED indicator AC/DC 24 V	091746 STP1A-4131A024L024M	On request	On request
					099855 STP2A-528A024M	On request	On request
		2 Electrical	528 1 NC ⊕ + 1 NO		092260 STP2A-538A024M	On request	On request
					092490 STP2A-538A024L024M	On request	On request
			538 2 NC ⊕	024L LED indicator AC/DC 24 V	092490 STP2A-538A024L024M	On request	On request
					091492 STP2A-4131A024M	On request	On request
			4131 2 NC ⊕ + 2 NO	024L LED indicator AC/DC 24 V	091747 STP2A-4131A024L024M	On request	On request

Safety switch STP with guard locking and guard lock monitoring



- ▶ Escape release on the rear
- ▶ With door monitoring contact



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 guard locking solenoid.

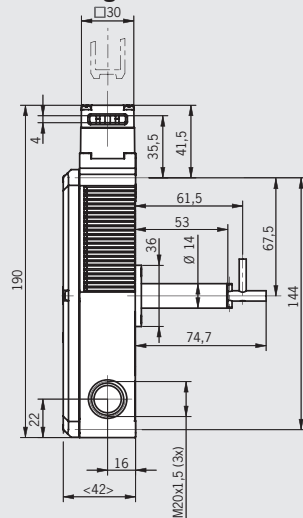
STP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

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

Cable entry M20 x 1.5

Dimension drawing

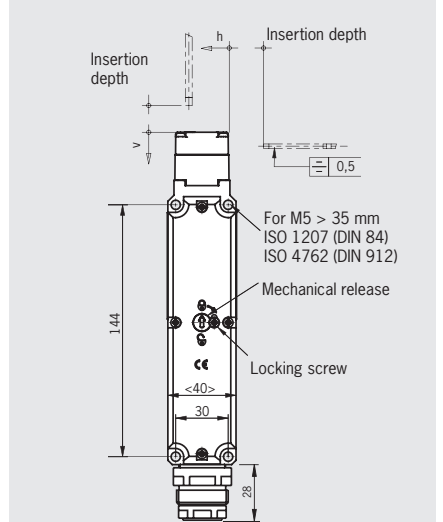


Please order actuator separately (See pages 94-96)

For cable glands see page 104

Plug connector SR11

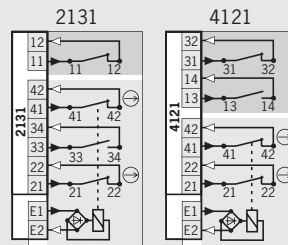
11-pin + PE



Please order actuator separately (See pages 94-96)

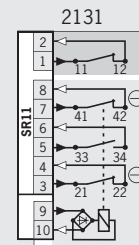
For plug connectors see page 100

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
 Door monitoring

For switching functions see technical data on Page 135



Solenoid monitoring
 Door monitoring

For switching functions see technical data on Page 135

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	2131 2 NC ⊖ + 1 NO + 1 NC	C1993 Long actuator shaft	102267 STP3A-2131A024MC1993	
			4121 2 NC ⊖ + 1 NC / 1 NO	C1993 Long actuator shaft	096885 STP3A-4121A024MC1993	
		4 Electrical	4121 2 NC ⊖ + 1 NC / 1 NO	C1993 Long actuator shaft	100322 STP4A-4121A024MC1993	
	SR11 Plug connector	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	C1993 Long actuator shaft	103223 STP3A-2131A024SR11C1993	

For safety precautions see page 149
For technical data see page 117

Safety switch STP with guard locking and guard lock monitoring



- ▶ Actuating head made of metal
- ▶ Mechanical release on the front
- ▶ Pushbutton and cover for indicators
- ▶ 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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Solenoid operating voltage

- ▶ AC/DC 24 V +10%, -15%

Cover for indicators

A cover for indicators (1 LED, green) is available for the following voltage ranges:

- ▶ DC 24 V +10%, -15%

Guard locking types

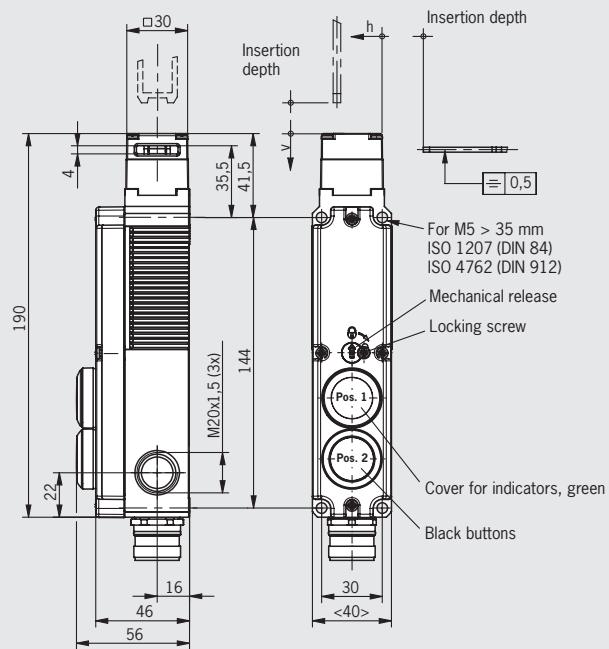
STP1 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

- ▶ **528** Slow-action switching contact 1 NC \ominus + 1 NO

Plug connector RC18
18-pin + PE

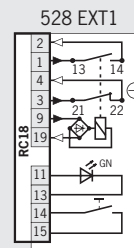
Dimension drawing



Please order actuator separately
(See pages 94-96)

For plug connectors see page 101/102

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 134

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage
					AC/DC 24 V
STP	RC18 Plug connector	1 Mechanical	528 1 NC \ominus + 1 NO	Pos. 1: Cover for indicators, green Pos. 2: Black buttons	106767 STP1A-528A024RC18EXT1



Safety switch STP with guard locking and guard lock monitoring

- ▶ Actuating head made of metal
- ▶ Mechanical release on the front
- ▶ Pushbutton and cover for indicators
- ▶ 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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Solenoid operating voltage

- ▶ AC/DC 24 V +10%, -15%

Cover for indicators

A cover for indicators (1 LED, green) is available for the following voltage ranges:

- ▶ DC 24 V +10%, -15%

Guard locking types

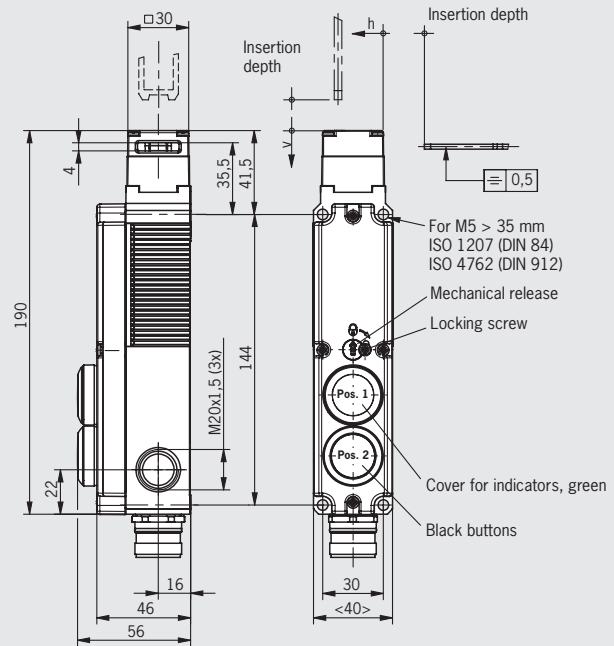
STP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

- ▶ **4141** Slow-action switching contact
2 NC ⊕ + 2 NC ⊖ (door monitoring contact)

Plug connector RC18
18-pin + PE

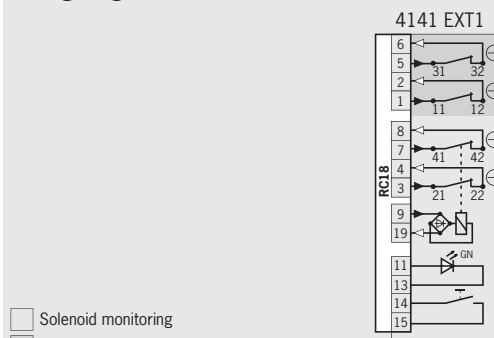
Dimension drawing



Please order actuator separately
(See pages 94-96)

For plug connectors see page 101/102

Wiring diagrams Actuator inserted and locked



- ☐ Solenoid monitoring
- ▣ Door monitoring

For switching functions see technical data on Page 135

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage	
					AC/DC 24 V	
STP	RC18 Plug connector	3 Mechanical	4141 2 NC ⊕ + 2 NC ⊖	Pos. 1: Cover for indicators, green Pos. 2: Black buttons	104995	STP3A-4141A024RC18EXT1

Safety switch STP with guard locking and guard lock monitoring



- ▶ Actuating head made of metal
- ▶ Escape release on the rear
- ▶ 2 illuminated pushbuttons
- ▶ With door monitoring contact



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%

Button LED

A cover for indicators (1 LED, green) is available for the following voltage ranges:

- ▶ DC 24 V +10%, -15%

Guard locking types

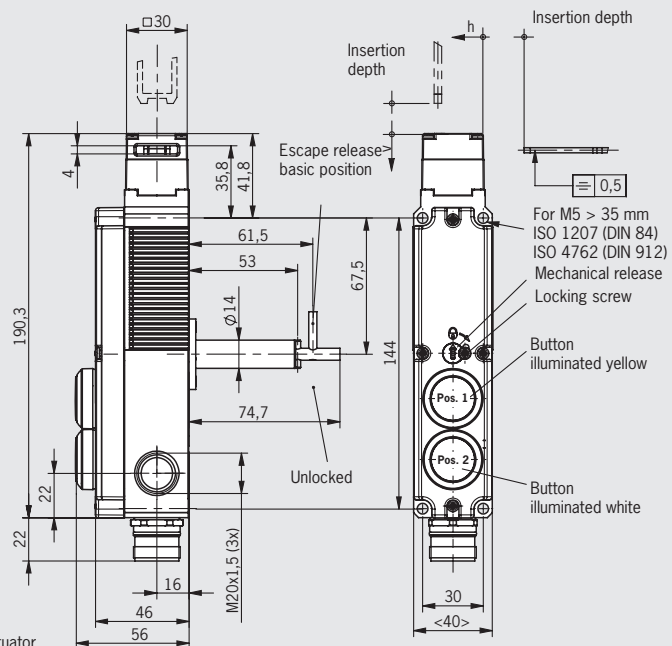
STP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

- ▶ **4141** Slow-action switching contact
2 NC ⊕ + 2 NC ⊖ (door monitoring contact)

Plug connector RC18
18-pin + PE

Dimension drawing

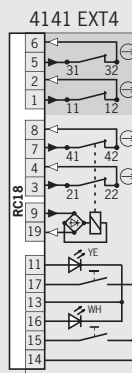


Please order actuator separately
(See pages 94-96)

For plug connectors see page 101/102

Wiring diagrams

Actuator inserted and locked



For switching functions see technical data on Page 135

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage
					AC/DC 24 V
STP	RC18 Plug connector	3 Mechanical	4141 2 NC ⊕ + 2 NC ⊖	C1993 Long actuator shaft Pos. 1: yellow push button Pos. 2: white push button	109399 STP3A-4141A024RC18C1993EXT4



Safety switch STP-BI with guard locking and guard lock monitoring

- ▶ Actuating head made of metal
- ▶ Mechanical release on the front
- ▶ Additional function BI-State
- ▶ 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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Additional function BI-State

In addition, the STP-BI has a function to prevent

- ▶ persons from unintentionally locking themselves inside if the safety door is open in case of a power failure or if the machine is switched off
- ▶ the deactivation of the activated guard locking in case of a power failure.

Solenoid operating voltage

- ▶ AC/DC 24 V +10%, -15%

Guard locking types

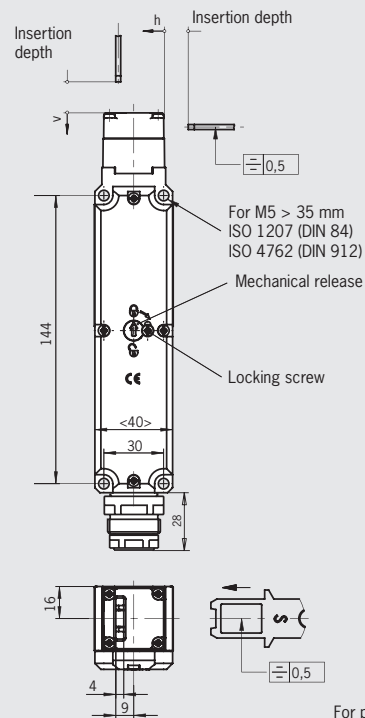
STP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

- ▶ **2131** Slow-action switching contact
2 NC \ominus + 1 NO + 1 NC (door monitoring contact)

Plug connector SR11
11-pin + PE

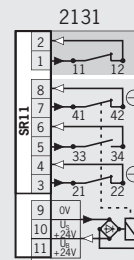
Dimension drawing



Please order actuator separately
(See pages 94-96)

For plug connectors see page 100

Wiring diagrams Actuator inserted and locked



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 135

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage	
					AC/DC 24 V	
STP-BI	SR11 Plug connector	3 Mechanical	2131 2 NC \ominus + 1 NO + 1 NC		100105	STP-BI-3A-2131A024SR11

For safety precautions see page 149
For technical data see page 117



Safety switch STP-TW with guard locking and guard lock monitoring

- ▶ Actuating heads made of metal
- ▶ Simultaneous monitoring of two safety doors
- ▶ Mechanical release on the front
- ▶ Mechanical key release optional
- ▶ 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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Mechanical key release

Additional lock on the switch head. Function as for mechanical release. The mechanical key release setting is indicated in the window. Two keys are included.

Solenoid operating voltage

- ▶ AC/DC 24 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 guard locking solenoid.

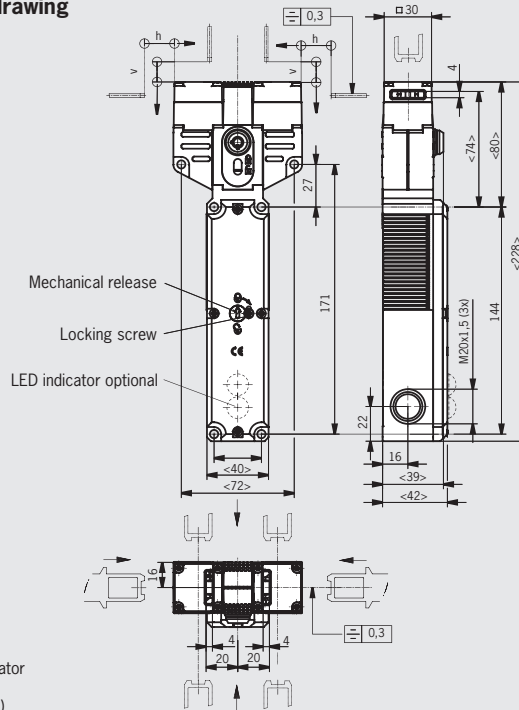
STP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

- ▶ **2131** Slow-action switching contact
2 NC ⊖ + 1 NO + 1 NC (door monitoring contact)
- ▶ **4131** Slow-action switching contact
2 NC ⊖ + 1 NO + 1 NO (door monitoring contact)
- ▶ **4141** Slow-action switching contact
2 NC ⊖ + 2 NC ⊖ (door monitoring contact)

Cable entry M20 x 1.5

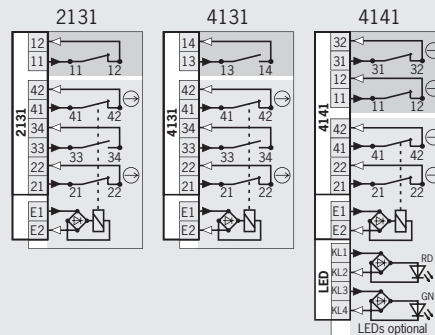
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 137

- Solenoid monitoring
- Door monitoring

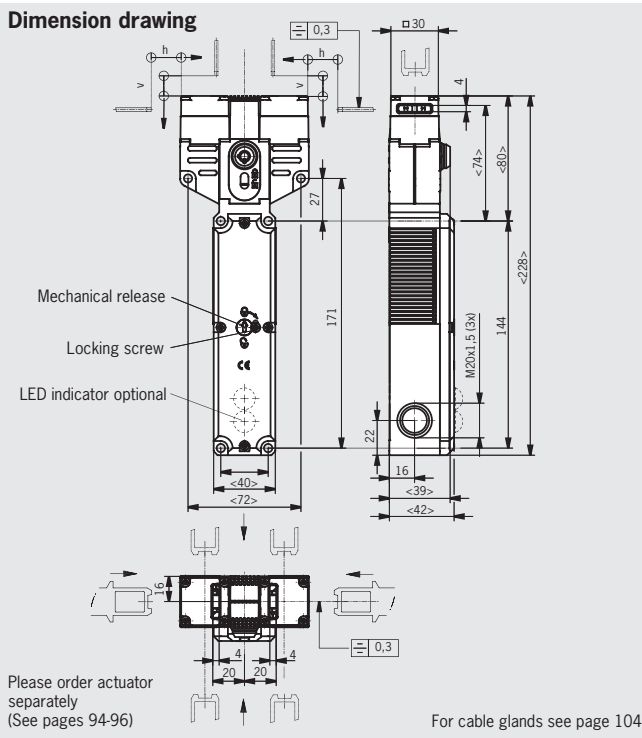
Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage
					AC/DC 24 V
STP-TW	M Cable entry M20 x 1.5	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	With mechanical key release (identical locking)	099973 STP-TW-3A-2131AC024M
					098827 STP-TW-3A-2131AC024M-S1
			4131 2 NC ⊖ + 1 NO + 1 NO	106153 STP-TW-3A-4131AC024M	
				100746 STP-TW-3A-4141AC024M	
			4141 2 NC ⊖ + 2 NC ⊖	024L LED indicator AC/DC 24 V	103048 STP-TW-3A-4141AC024L024M

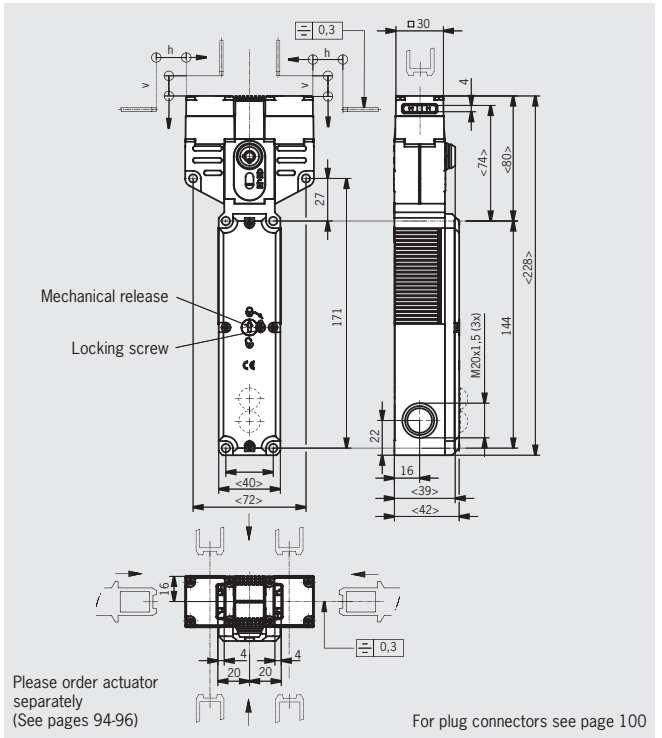


Cable entry M20 x 1.5

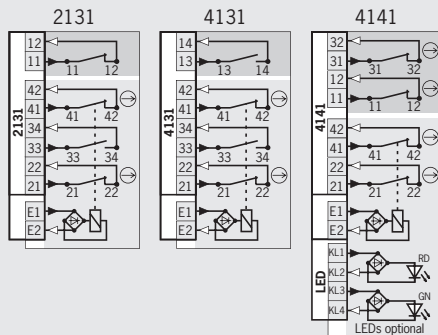
Dimension drawing



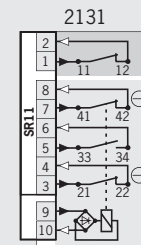
Plug connector SR11 11-pin + PE



Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 137



For switching functions see technical data on Page 137

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage	
					AC/DC	24 V
STP-TW	M Cable entry M20 x 1.5	4 Electrical	2131 2 NC ⊖ + 1 NO + 1 NC	With mechanical key release (identical locking)	100849	STP-TW-4A-2131AC024M
					100850	STP-TW-4A-2131AC024M-S1
			4131 2 NC ⊕ + 1 NO + 1 NO	024L LED indicator AC/DC 24 V	103910	STP-TW-4A-4131AC024M
			4141 2 NC ⊕ + 2 NC ⊖		103636	STP-TW-4A-4141AC024L024M
	SR11 Plug connector	3 Mechanical 4 Electrical	2131 2 NC ⊖ + 1 NO + 1 NC		106547	STP-TW-3A-2131AC024SR11
			2131 2 NC ⊖ + 1 NO + 1 NC		102565	STP-TW-4A-2131AC024SR11

For safety precautions see page 149
For technical data see page 117

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

Version									
Standard		One actuating head made of metal							
TW		TWIN, 2 actuating heads made of metal							
Release feature									
HE		Mechanical release on the front							
FE		Escape release on the rear side							
Door monitoring									
STA3/4					With door monitoring contact				
STA1/2					Without door monitoring contact				
Connection									
M							Thread M20x1.5 for cable gland		
SR11							Plug connector 11-pin + PE		
RC18							Plug connector 18-pin + PE		

Version		Release feature		Door monitoring		Connection			Page
Standard	TW	HE	FE	STA3/4	STA1/2	M	SR11	RC18	
●		●		●		●			76
●		●		●			●	●	77
●		●			●	●			78
●		●	●	●		●			79
	●	●		●		●			80



Safety switch STA with guard locking and guard lock monitoring

- ▶ Mechanical release on the front
- ▶ With door monitoring contact
- ▶ Plug connector optional



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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Solenoid operating voltage

▶ AC/DC 24 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

STA3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

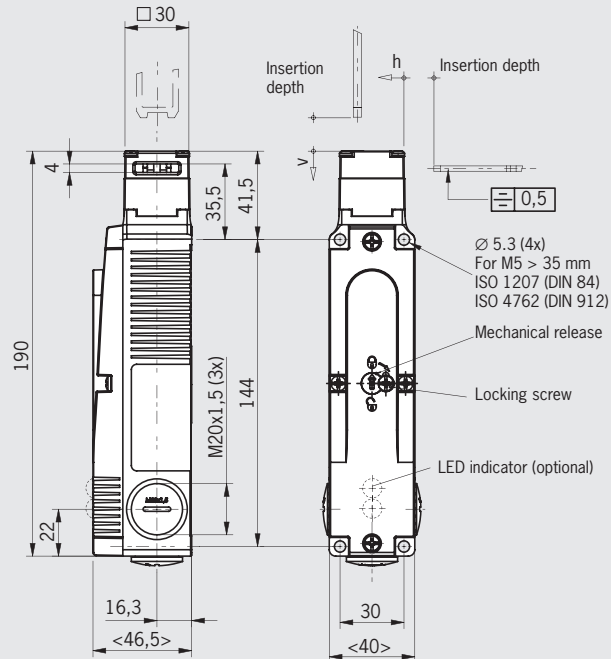
STA4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

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

Cable entry M20 x 1.5

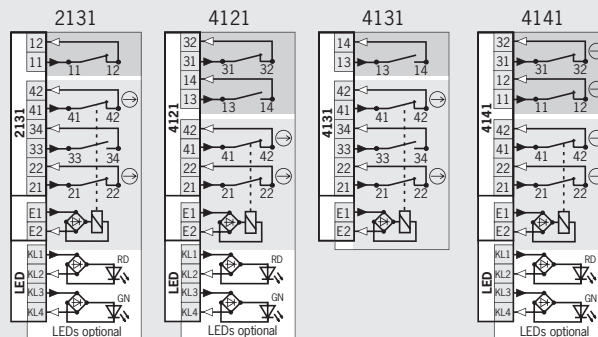
Dimension drawing



Please order actuator separately (See Pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



- ☐ Solenoid monitoring
- ☐ Door monitoring

For switching functions see technical data on Page 139

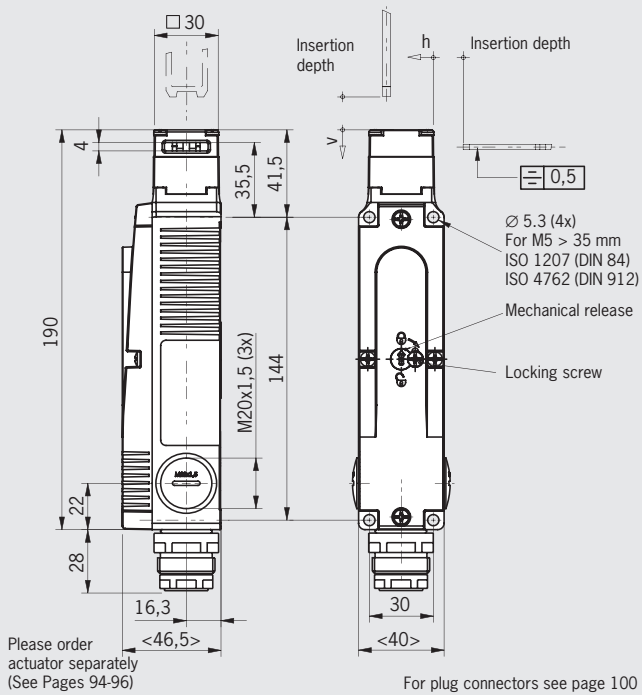
Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage	
					AC/DC 24 V	AC 230 V
STA	M Cable entry 3 x M20 x 1.5	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC		096938 STA3A-2131A024M	104171 STA3A-2131A230M
			4121 2 NC ⊖ + 1 NC / 1 NO	024L LED indicator AC/DC 24 V	096936 STA3A-4121A024M	-
			4131 2 NC ⊖ + 1 NO + 1 NO		106535 STA3A-4121A024L024M	-
			4141 2 NC ⊖ + 2 NC ⊖		099480 STA3A-4131A024M	-
		4 Electrical	2131 2 NC ⊖ + 1 NO + 1 NC	024L LED indicator AC/DC 24 V	099274 STA3A-4141A024M	-
			4121 2 NC ⊖ + 1 NC / 1 NO		100898 STA3A-4141A024L024M	-
			4131 2 NC ⊖ + 1 NO + 1 NO		096939 STA4A-2131A024M	-
			4141 2 NC ⊖ + 2 NC ⊖		103926 STA4A-2131A024L024M	-
			096937 STA4A-4121A024M	-		
			099481 STA4A-4131A024M	-		
			109172 STA4A-4141A024M	-		



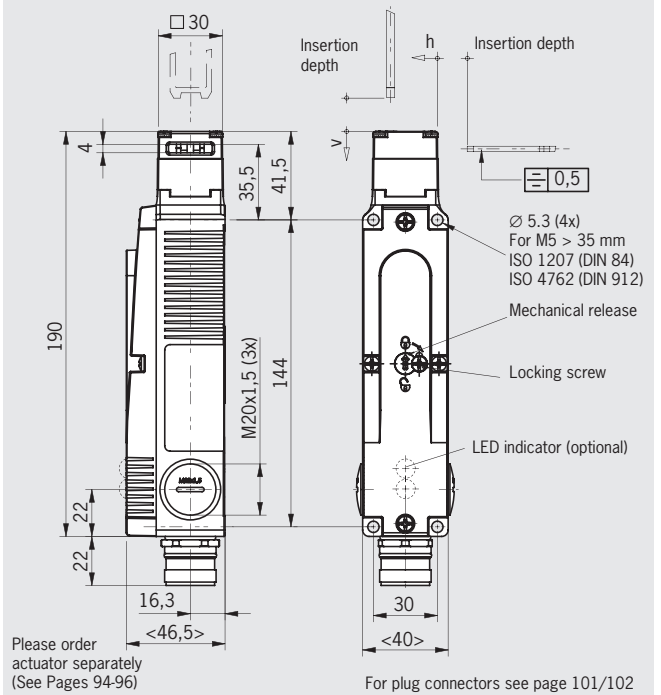
Plug connector SR11 11-pin + PE

Dimension drawing

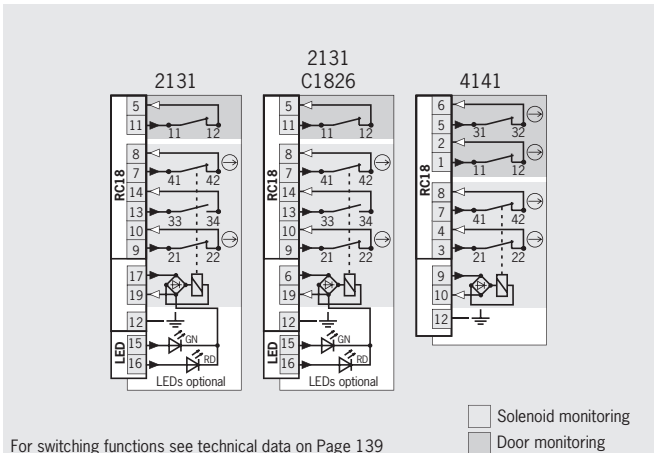
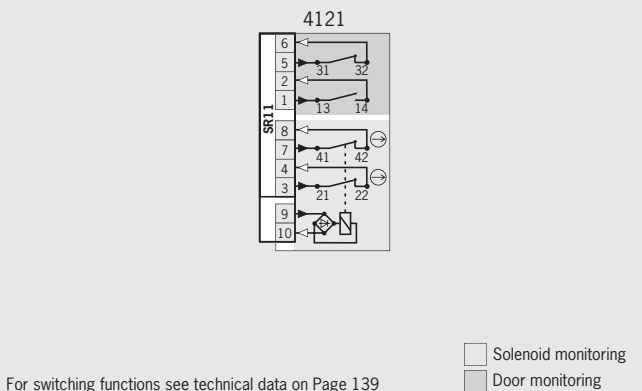


Plug connector RC18 18-pin + PE

Dimension drawing



Wiring diagrams Actuator inserted and locked



Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage	
					AC/DC 24 V	
STA	SR11 Plug connector	3 Mechanical	4121 2 NC ⊖ + 1 NC / 1 NO		105304 STA3A-4121A024SR11	
	RC18 Plug connector	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	024L LED indicator AC/DC 24 V	099658 STA3A-2131A024L024RC18	
				024L LED indicator AC/DC 24 V	106623 STA3A-2131A024L024RC18C1826	
			4141 2 NC ⊖ + 2 NC ⊖		100029 STA3A-4141A024RC18	
				C1826 Special wiring		105303 STA4A-2131A024L024RC18
		4 Electrical	2131 2 NC ⊖ + 1 NO + 1 NC	024L LED indicator AC/DC 24 V	106622 STA4A-2131A024L024RC18C1826	
			024L LED indicator AC/DC 24 V			
			C1826 Special wiring			

For safety precautions see page 149
 For technical data see page 117



Safety switch STA with guard locking and guard lock monitoring

- ▶ 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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Solenoid operating voltage

- ▶ AC/DC 24 V +10%, -15%

Guard locking types

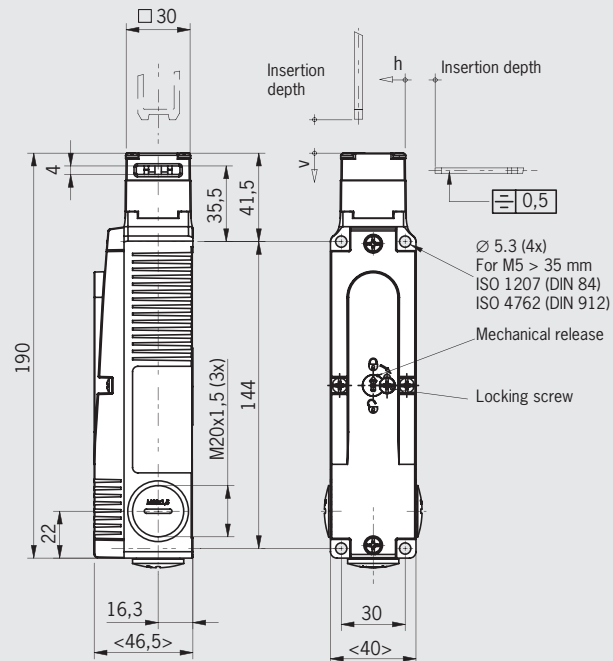
- STA1** Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.
- STA2** Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

- ▶ **4131** Slow-action switching contact 2 NC ⊖ + 2 NO

Cable entry M20 x 1.5

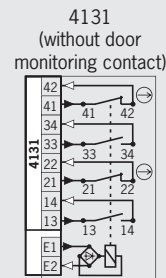
Dimension drawing



Please order actuator separately
(See Pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 139

Ordering table

Series	Connection	Guard locking	Switching element	Solenoid operating voltage	
				AC/DC 24 V	
STA	M Cable entry 3 x M20 x 1.5	1 Mechanical	4131 2 NC ⊖ + 2 NO	096439	STA1A4131A024M
		2 Electrical	4131 2 NC ⊖ + 2 NO	096935	STA2A4131A024M



Safety switch STA with guard locking and guard lock monitoring

- ▶ Escape release from the rear
- ▶ With door monitoring contact



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

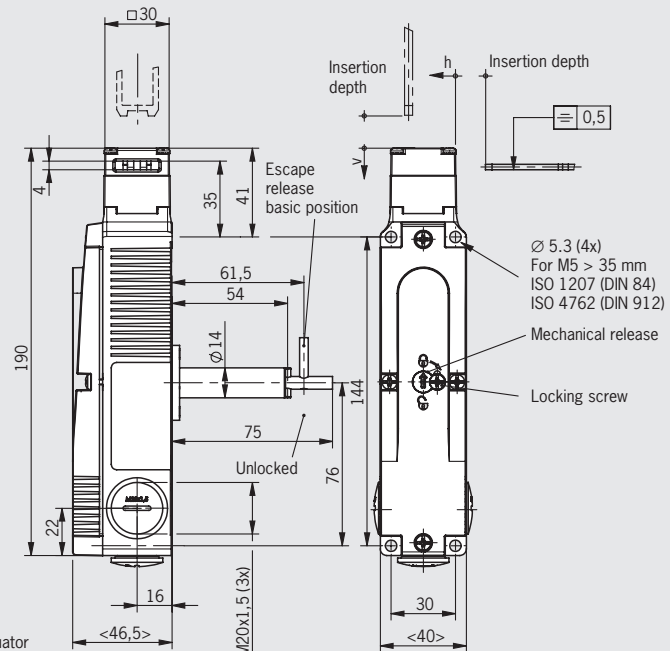
STA3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

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

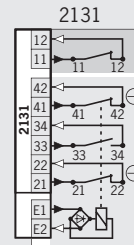
Cable entry M20 x 1.5

Dimension drawing



For cable glands see page 104

Wiring diagrams Actuator inserted and locked



- Solenoid monitoring
- Door monitoring

For switching functions see technical data on Page 139

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage	
					AC/DC	24 V
STA	M Cable entry 3 x M20 x 1.5	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	C1993 Long actuator shaft	103660	STA3A-2131A024MC1993

For safety precautions see page 149
For technical data see page 117

Safety switch STA-TW with guard locking and guard lock monitoring



- ▶ Actuating heads made of metal
- ▶ Simultaneous monitoring of two safety doors
- ▶ Mechanical release on the front
- ▶ Mechanical key release optional
- ▶ 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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Mechanical key release

Additional lock on the switch head. Function as for mechanical release. The mechanical key release setting is indicated in the window. Two keys are included.

Solenoid operating voltage

- ▶ AC/DC 24 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

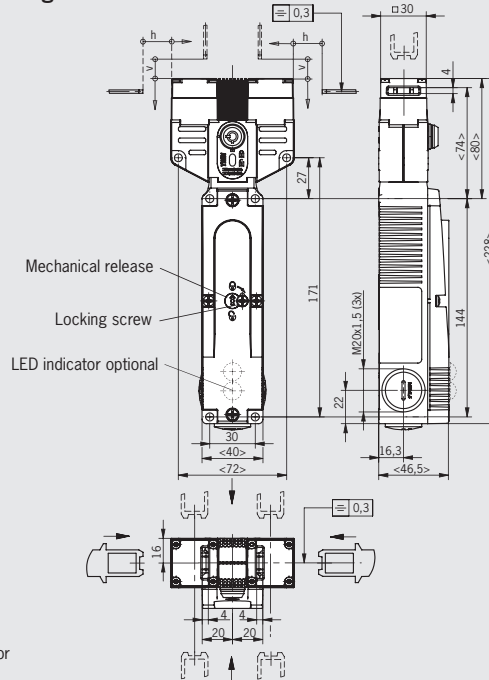
STP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

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

Cable entry M20 x 1.5

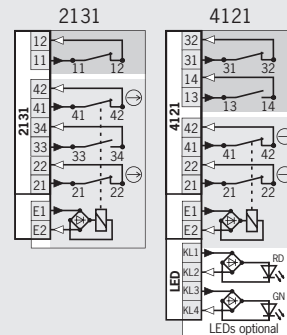
Dimension drawing



Please order actuator separately
(See Pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 141

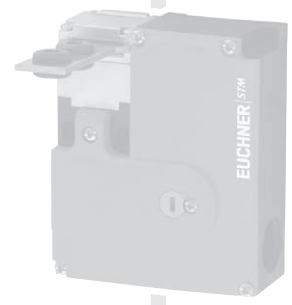
Solenoid monitoring
 Door monitoring

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage	
					AC/DC 24 V	
STA-TW	M Cable entry 3 x M20 x 1.5	3 Mechanical	2131 2 NC ⊖ + 1 NO + 1 NC	With mechanical key release (identical locking)	105617 STA-TW-3A-2131AC024M	
					105888 STA-TW-3A-2131AC024M-S1	
			4121 2 NC ⊖ + 1 NC / 1 NO	106545 STA-TW-3A-4121AC024M		
				106379 STA-TW-3A-4121AC024L024M		
				024L LED indicator AC/DC 24 V		

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

Release feature, front			
HE	Mechanical release on the front		
<hr/>			
Connection			
M	Thread M20x1.5 for cable glands		
<hr/>			
Switching element			
Three contacts	1 NC ⊖ (ÜK) + 2 NC ⊖ (SK) or 1 NC ⊖ (ÜK) + 1 NC ⊖ (SK) + 1 NO (SK)		
<hr/>			
Manual release HE	Connection M	Switching element Three contacts	Page
●	●	●	82





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. To protect against tampering, the mechanical release is sealed with sealing lacquer.

Solenoid operating voltage

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

Guard locking types

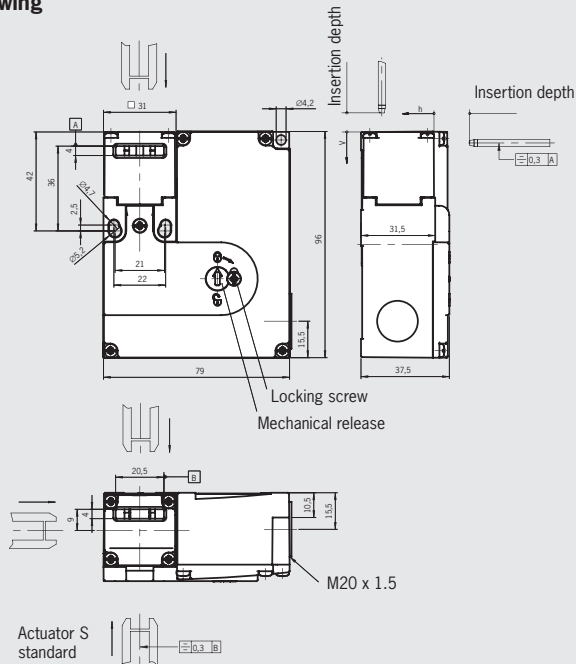
- STM1** Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.
- STM2** Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

- ÜK** For monitoring the guard locking (built-in solenoid)
Slow-action switching contact 1 NC ⊖
- SK** For monitoring the door/actuator position
 - 222** Slow-action switching contact
2 NC ⊖
 - 242** Slow-action switching contact
1 NC ⊖ +1 NO

Cable entry M20 x 1.5

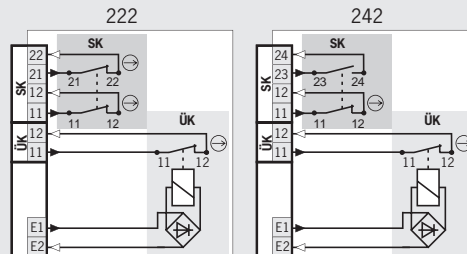
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



□ Solenoid monitoring
■ Door monitoring

For switching functions see technical data on page 143

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 ⊖	091865 STM1N-222B024-M	On request	098714 STM1N-222B230-M
				ÜK: 1 NC ⊖ SK: 242 , 1 NC ⊖ + 1 NO	092031 STM1N-242B024-M	On request	On request
			A Metal	ÜK: 1 NC ⊖ SK: 222 , 2 NC ⊖	095396 STM1A-222B024-M	On request	098036 STM1A-222B230-M
				ÜK: 1 NC ⊖ SK: 242 , 1 NC ⊖ + 1 NO	095397 STM1A-242B024-M	On request	On request
		2 Electrical	N Plastic	ÜK: 1 NC ⊖ SK: 222 , 2 NC ⊖	092048 STM2N-222B024-M	On request	On request
				ÜK: 1 NC ⊖ SK: 242 , 1 NC ⊖ + 1 NO	092050 STM2N-242B024-M	On request	On request
			A Metal	ÜK: 1 NC ⊖ SK: 222 , 2 NC ⊖	095398 STM2A-222B024-M	On request	On request
				ÜK: 1 NC ⊖ SK: 242 , 1 NC ⊖ + 1 NO	095399 STM2A-242B024-M	On request	On request

For safety precautions see page 149
For technical data see page 117

Selection table for safety switch TK with guard locking (without failsafe locking mechanism)

Release feature				
HE	Mechanical release on the switch head			
Guard locking pin				
	A	C	Right	
			Left	
Connection				
			M	Thread M20x1.5 for cable gland
Release feature	Guard locking pin		Connection	Page
HE	A	C	M	
●	●		●	84
●		●	●	85

Safety switch TK with guard locking (without failsafe locking mechanism)



- ▶ 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 shut-down on front
- ▶ Cable entry M20 x 1.5



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). For triangular key see accessories, page 91.

Auxiliary shutdown feature

When actuated, positively driven contacts 21-22 or 41-42 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 guard locking solenoid.

TK2 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

Switching elements

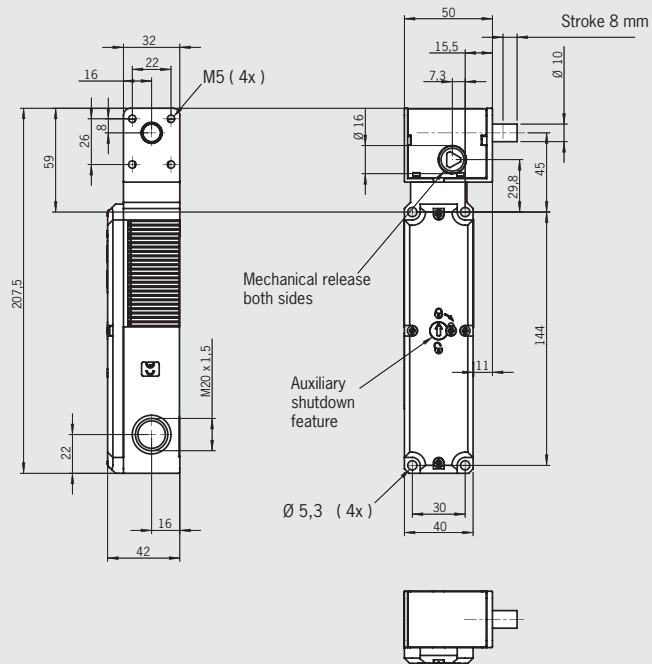
- ▶ **528** Slow-action switching contact 1 NC ⊖ + 1 NO
- ▶ **4131** Slow-action switching contact 2 NC ⊖ + 2 NO

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	094652 TK1-528AB024M	-	-
			4131 2 NC ⊖ + 2 NO	A Guard locking pin right	099686 TK1-4131AB024M	-	-
		2 Electrical	4131 2 NC ⊖ + 2 NO	A Guard locking pin right	099690 TK2-4131AB024M	-	-

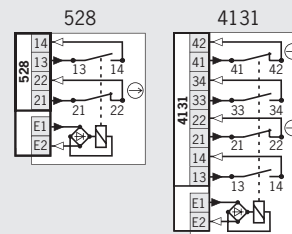
Cable entry M20 x 1.5
Guard locking pin right

Dimension drawing



For cable glands see page 104

Wiring diagrams Switch locked

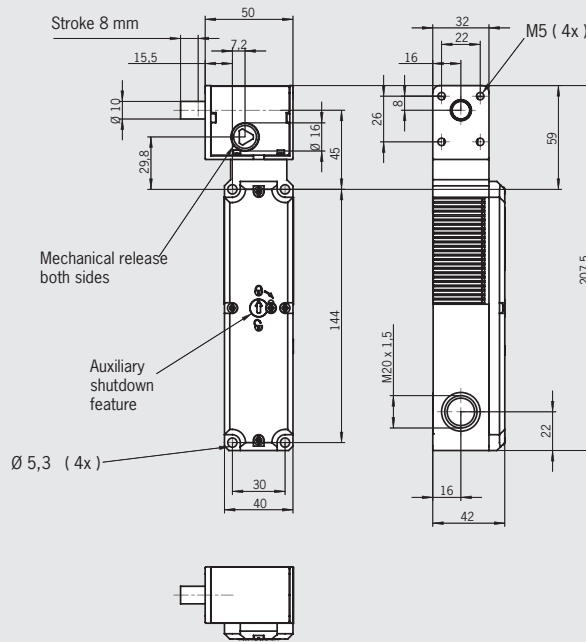


For switching functions see technical data on page 145



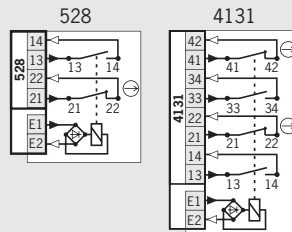
Cable entry M20 x 1.5
Guard locking pin left

Dimension drawing



For cable glands see page 104

Wiring diagrams Switch locked



For switching functions see technical data on page 145

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	094192 TK1-528CB024M	-	100016 TK1-528CB230M
			4131 2 NC ⊕ + 2 NO	C Guard locking pin left	099687 TK1-4131CB024M	-	-
		2 Electrical	4131 2 NC ⊕ + 2 NO	C Guard locking pin left	099691 TK2-4131CB024M	-	-

For safety precautions see page 149
For technical data see page 117

Selection table for accessories

Actuator														
	Insertion funnel													
		Mounting plates/mounting brackets												
			Connection											
			SGLF					Plug connector; M12; 4-pin						
				SR6				Plug connector; 6 pin + PE						
					SR11			Plug connector; 11 pin + PE						
						RC18		Plug connector; 18 pin + PE						
							BHA12	Plug connector 12-pin						
								Cable glands						
										LED indicators				
											Miscellaneous			
												Bolts for safety guards		
Actuator	Insertion funnel	Mounting plates/mounting brackets	Plug connectors					Cable glands	LED indicators	Miscellaneous	Bolt		Page	
SGLF	SR6	SR11	RC18	BHA12						Metal	Plastic			
•													88 - 96	
	•												97	
		•											98 / 99	
			•										99	
				•									100	
					•								100	
						•							101 / 102	
							•						103	
								•					104	
									•				104	
										•			105 - 107	
											•		108 - 113	
												•	114	

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.

Actuators with rubber bushings

For flexible mounting of the actuator.

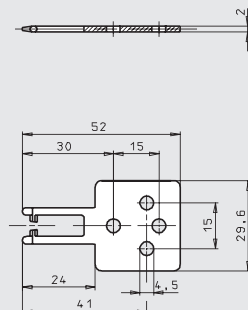
Screws made of stainless steel

The safety screws included can be inserted with a normal tool, but cannot be removed again.

Actuator M-G straight

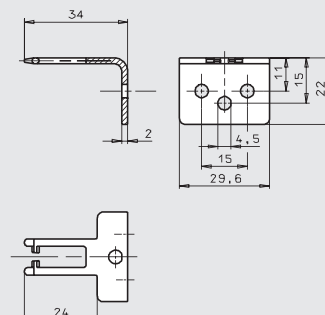
Overtravel 4 mm

Dimension drawings



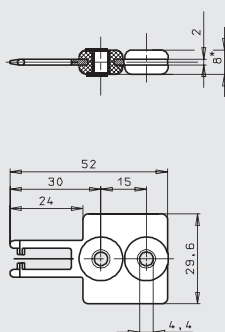
Actuator M-W bent

Overtravel 4 mm



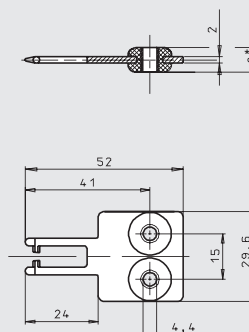
Actuator M-GT straight

Longitudinal rubber bush, overtravel 4 mm



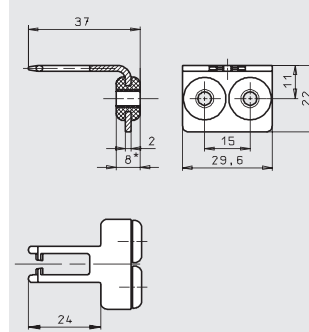
Actuator M-GQ straight

Transverse rubber bush, overtravel 4 mm



Actuator M-WT bent

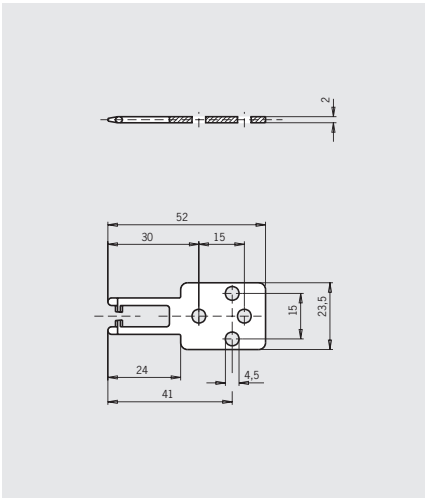
Rubber bush, overtravel 4 mm



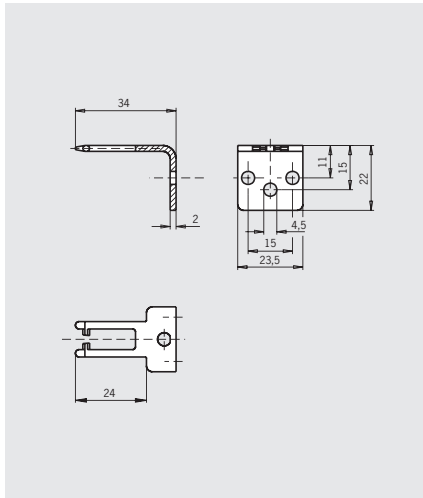
Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order no.
Actuator Straight	M-G Overtravel 4 mm incl. 2 safety screws M4 x 14		1 ea.	074076 ACTUATOR-M-G
Actuator Angled	M-W Overtravel 4 mm incl. 2 safety screws M5 x 10		1 ea.	074077 ACTUATOR-M-W
Actuator Straight longitudinal rubber bush	M-GT Overtravel 4 mm incl. 2 safety screws M4 x 14		1 ea.	074078 ACTUATOR-M-GT
Actuator Straight transverse rubber bush	M-GO Overtravel 4 mm incl. 2 safety screws M4 x 14		1 ea.	074079 ACTUATOR-M-GO
Actuator Angled rubber bush	M-WT Overtravel 4 mm incl. 2 safety screws M4 x 14		1 ea.	074080 ACTUATOR-M-WT

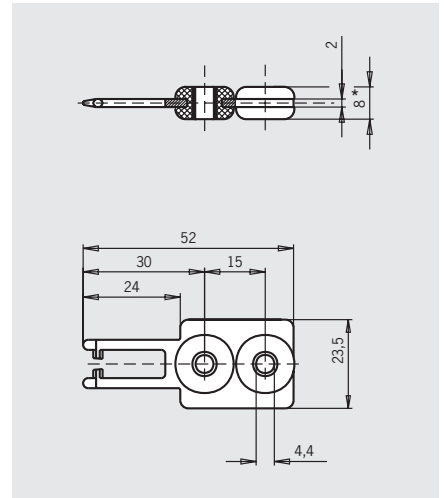
Actuator M-GS straight
Narrow, overtravel 4 mm



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 Overtravel 4 mm incl. 2 safety screws M4 x 14		1 ea.	074128 ACTUATOR-M-GS
Actuator Angled narrow	M-WS 4 mm overtravel incl. 2 safety screws M5 x 10		1 ea.	074129 ACTUATOR-M-WS
Actuator straight, narrow rubber bush	M-GTS Overtravel 4 mm incl. 2 safety screws M4 x 14		1 ea.	074130 ACTUATOR-M-GTS

For safety precautions see page 149
For technical data see page 117

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)

Actuators with rubber bushings

For flexible mounting of the actuator.

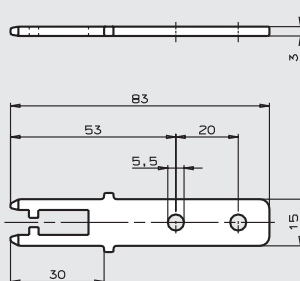
Screws made of stainless steel

The safety screws included can be inserted with a normal tool, but cannot be removed again.

Actuator P-G straight

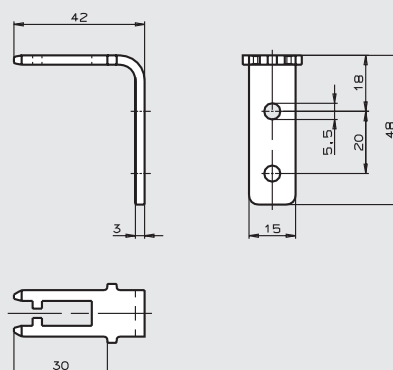
Overtravel 2 mm

Dimension drawings



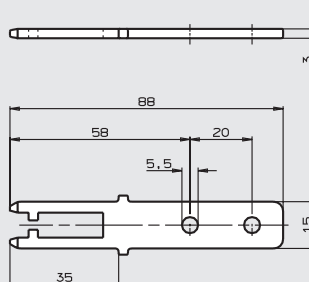
Actuator P-W bent

Overtravel 2 mm



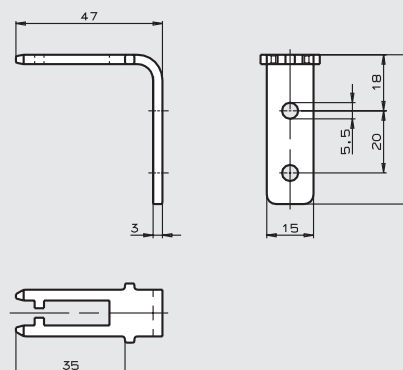
Actuator P-GN straight

Overtravel 7 mm



Actuator P-WN bent

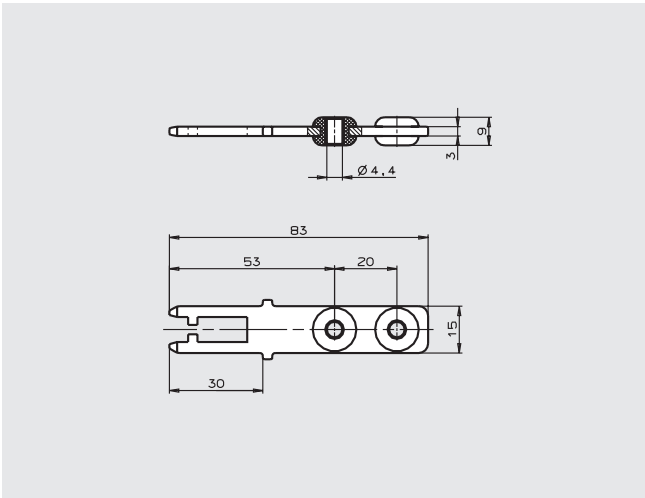
Overtravel 7 mm



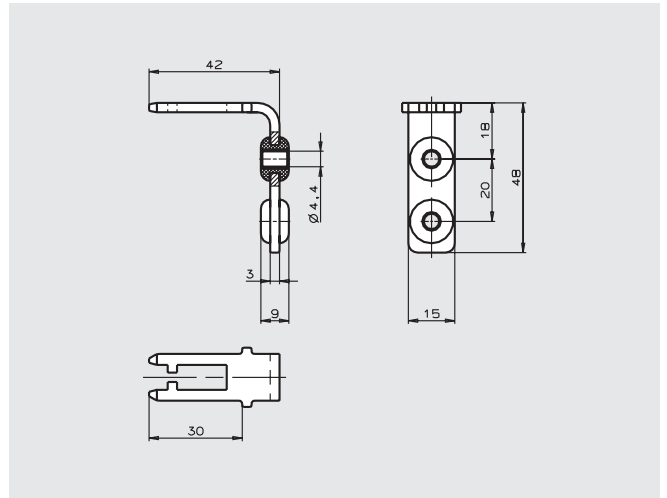
Ordering table

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.	059226 ACTUATOR-P-G
Actuator Angled	P-W Overtravel 2 mm incl. 2 safety screws M5 x 10	1000	1 ea.	059227 ACTUATOR-P-W
Actuator Straight overtravel	P-GN Overtravel 7 mm incl. 2 safety screws M5 x 10	1000	1 ea.	074570 ACTUATOR-P-GN
Actuator Angled overtravel	P-WN Overtravel 7 mm incl. 2 safety screws M5 x 10	1000	1 ea.	074571 ACTUATOR-P-WN

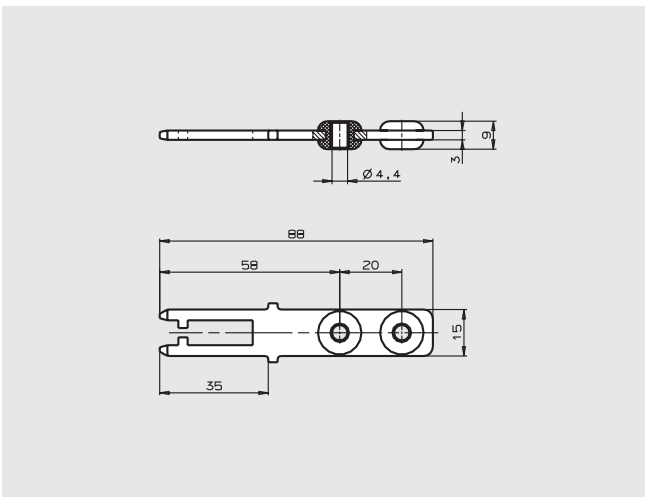
Actuator P-GT straight
Rubber bush, overtravel 2 mm



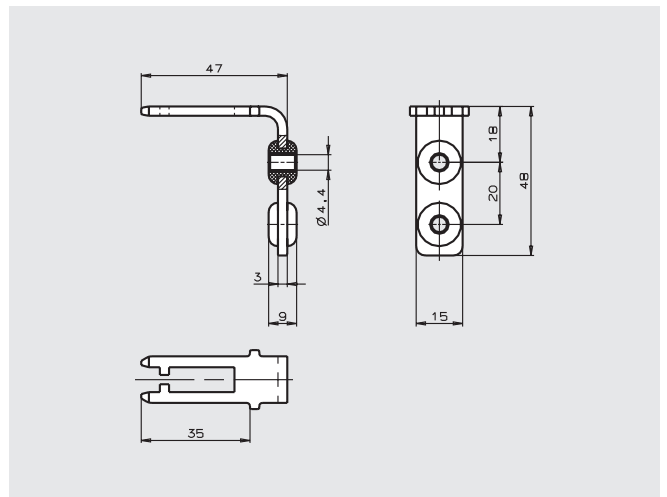
Actuator P-WT bent
Rubber bush, overtravel 2 mm



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.	070046 ACTUATOR-P-GT
Actuator Angled rubber bush	P-WT Overtravel 2 mm incl. 2 safety screws M4 x 14	1000	1 ea.	070038 ACTUATOR-P-WT
Actuator Straight rubber bush, overtravel	P-GNT Overtravel 7 mm incl. 2 safety screws M4 x 14	1000	1 ea.	074576 ACTUATOR-P-GN
Actuator Angled rubber bush, overtravel	P-WNT Overtravel 7 mm incl. 2 safety screws M4 x 14	1000	1 ea.	074577 ACTUATOR-P-WNT

For safety precautions see page 149
For technical data see page 117

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

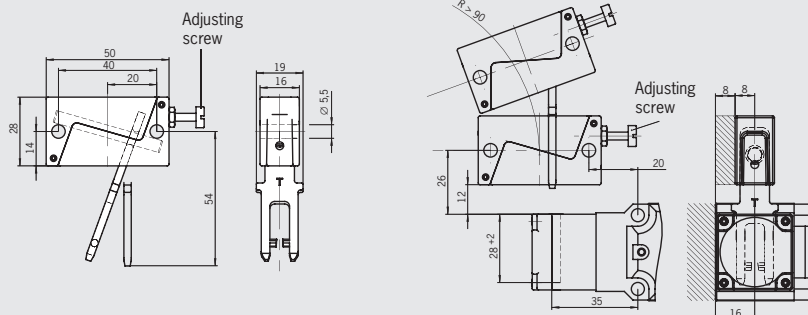
Hinged actuator

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

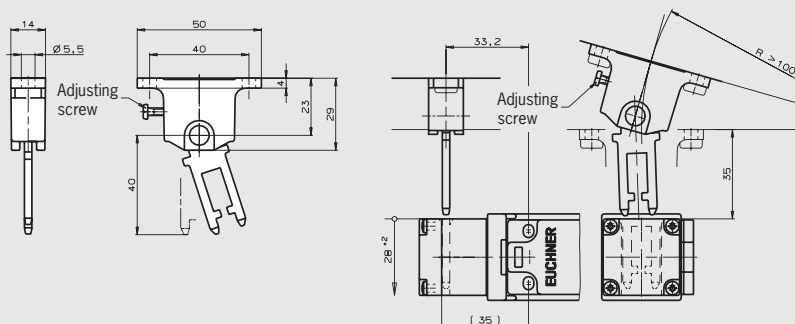
Safety guard hinged at top/bottom, overtravel 2 mm

Dimension drawings



Hinged actuator P-LR

Safety guard hinged on left/right, overtravel 2 mm

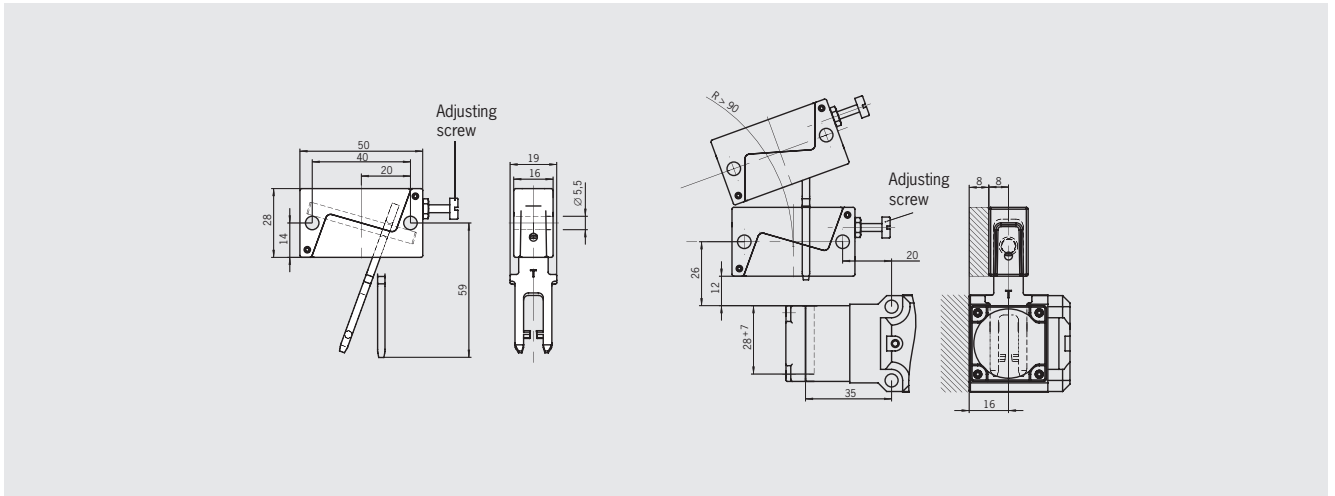


Ordering table

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.	070050 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.	059440 HINGED ACTUATOR P-LR

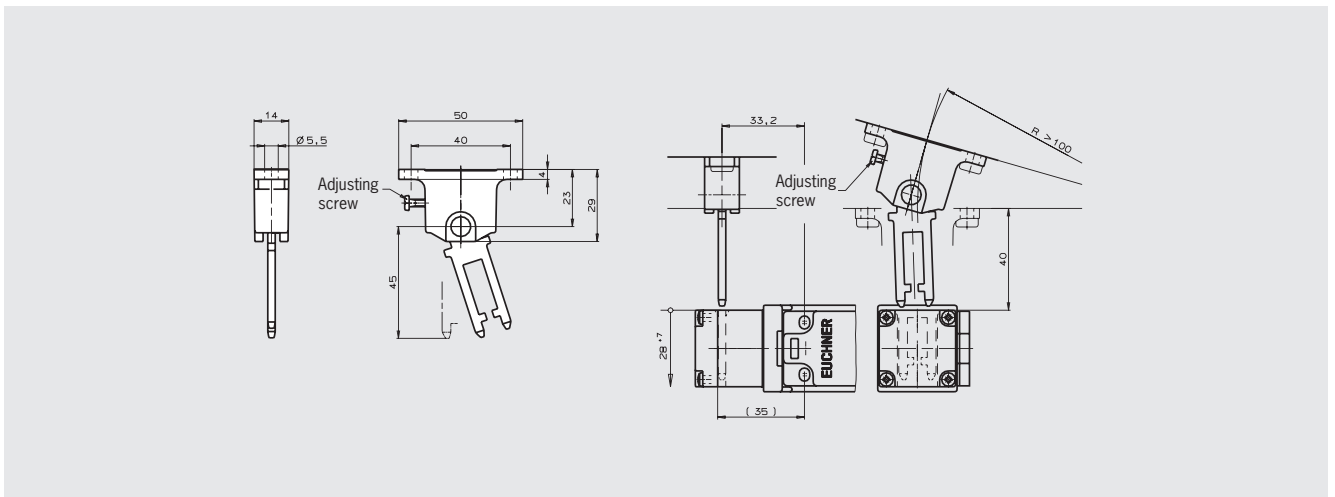
Hinged actuator P-OUN

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.	074572 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.	074573 HINGED ACTUATOR P-LRN

For safety precautions see page 149
 For technical data see page 117

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

- ▶ Two stainless safety screws per actuator
- ▶ Actuators with and without rubber bush

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 N 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

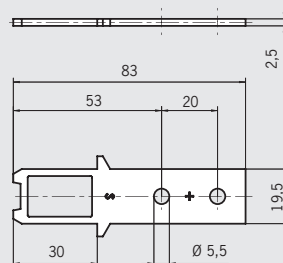
Suitable for a maximum tensile force of 1500 N

Screws made of stainless steel

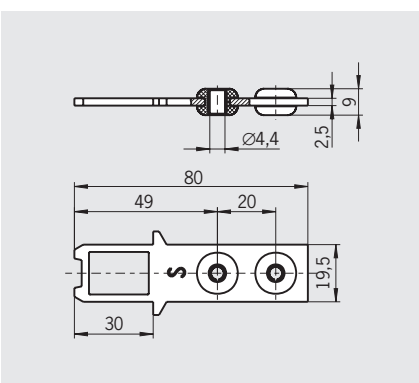
The safety screws included can be inserted with a normal tool, but cannot be removed again.

Standard actuator S, straight (Physically compatible with TP actuator P-G)
Without rubber bush, overtravel 5 mm

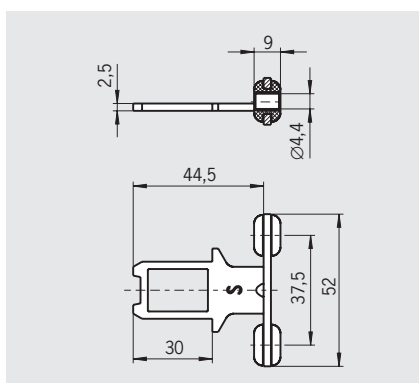
Dimension drawings



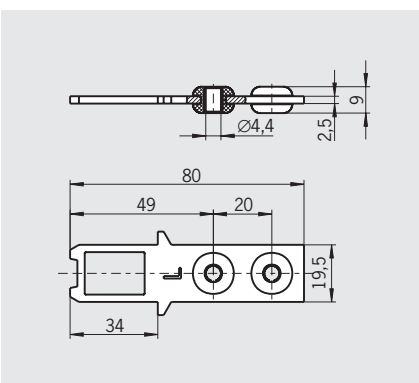
Standard actuator S, straight
With rubber bush, overtravel 5 mm



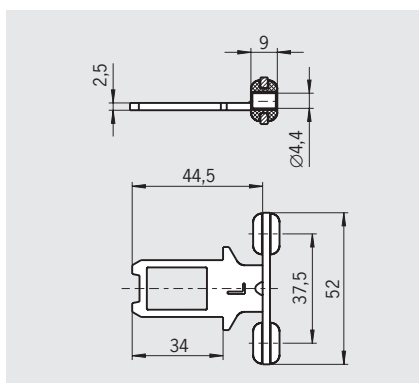
Standard actuator S, bent
With rubber bush, overtravel 5 mm



Actuator L, straight, for insertion funnel
With rubber bush, overtravel 5 mm



Actuator L, bent, for insertion funnel
With rubber bush, overtravel 5 mm



Ordering table

Designation	Version	Min. door radius r [mm]	Packaging unit	Order no.
Actuator S Straight	S-G-SN-C2115 Without rubber bush, overtravel 5 mm incl. 2 safety screws M5 x 10	300	1 ea.	097861 ACTUATOR S-G-SN-C2115
	S-GT-SN With rubber bush, overtravel 5 mm incl. 2 safety screws M4 x 14	300	1 ea.	095738 ACTUATOR S-GT-SN
Actuator S Angled	S-WQ-SN Without rubber bush, overtravel 5 mm incl. 2 safety screws M4 x 14	300	1 ea.	095740 ACTUATOR S-WQ-SN
Actuator L Straight	S-GT-LN With rubber bush, overtravel 5 mm incl. 2 safety screws M4 x 14	300	1 ea.	095739 ACTUATOR S-GT-LN
Actuator L Angled	S-WQ-LN With rubber bush, overtravel 5 mm incl. 2 safety screws M4 x 14	300	1 ea.	095741 ACTUATOR S-WQ-LN

Hinged actuators for safety switches SGA/SGP/STA/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

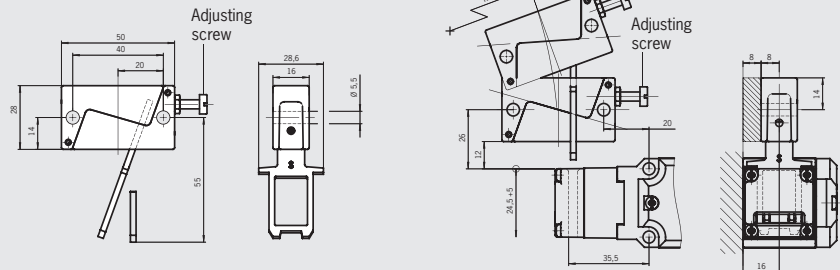
Hinged actuator

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

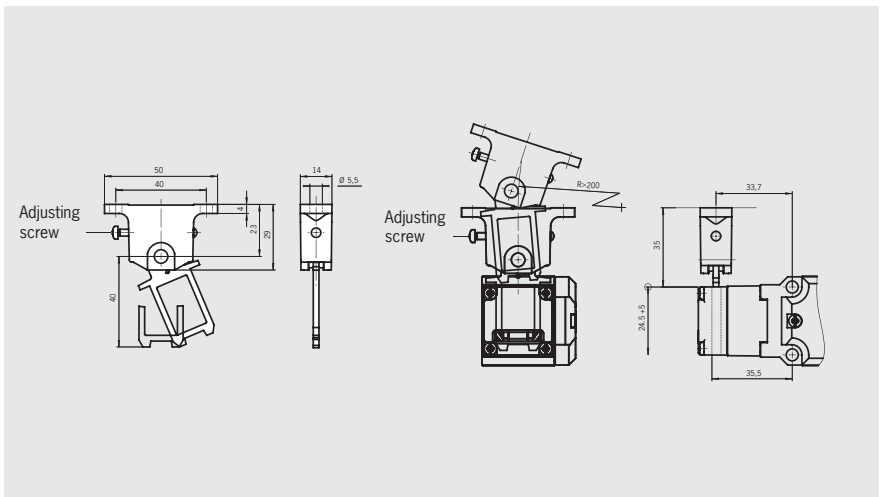
Safety guard hinged at top/bottom, overtravel 5 mm

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.	095315 HINGED ACTUATOR-S-OU-SN
	S-LR-SN For left and right hinged doors overtravel 5 mm incl. 2 safety screws M5 x 10	200	1 ea.	096838 HINGED ACTUATOR-S-LR-SN

For safety precautions see page 149
For technical data see page 117

Hinged actuators for safety switches SGA/SGP/STA/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

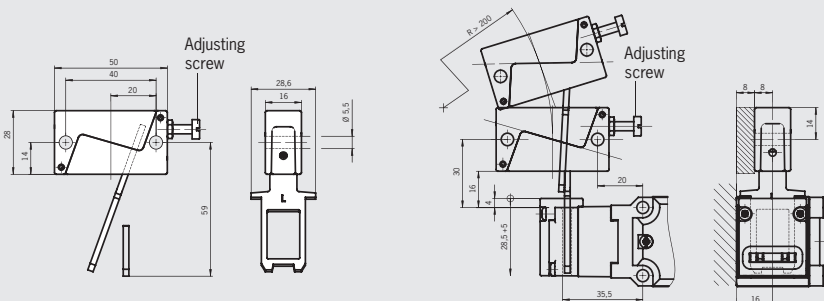
Hinged actuator

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

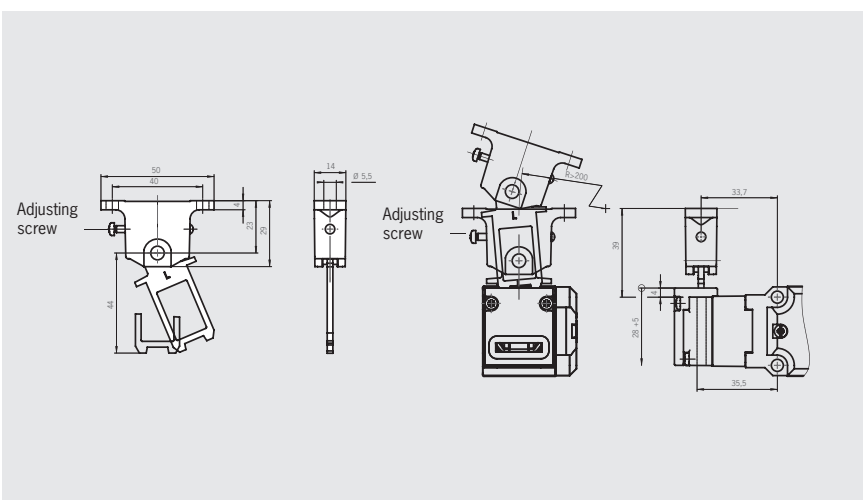
Safety guard hinged at top/bottom, overtravel 5 mm

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.	096697 HINGED ACTUATOR-S-OU-LN
	S-LR-LN For left and right hinged doors overtravel 5 mm incl. 2 safety screws M5 x 10	200	1 ea.	096844 HINGED ACTUATOR-S-LR-LN

Insertion funnels/adapters

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

Insertion funnel

If an insertion funnel is used, even in exactly positioned actuators are inserted reliably in the actuating head due to the large opening funnel, 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

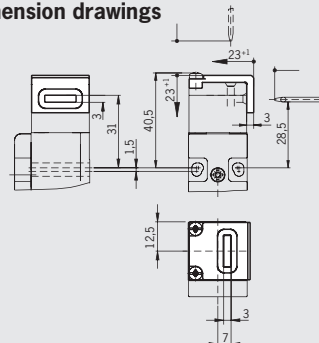
Adapter NP-K

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

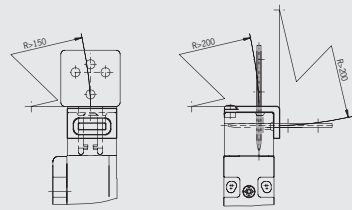
- ▶ The adapter can **not** be used for safety switches of the GP/TP series
- ▶ 4 screws 3 x 38 (not safety screws) are included

Insertion funnel for safety switches NM..VZ

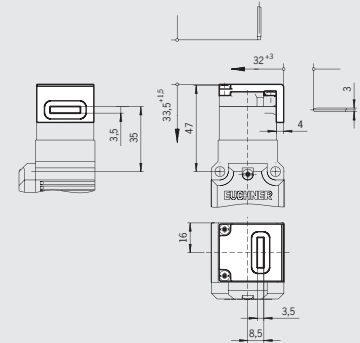
Dimension drawings



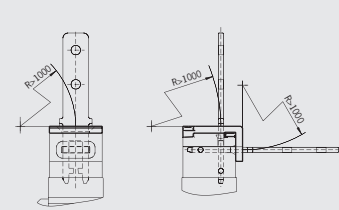
Minimum door radii with insertion funnel



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

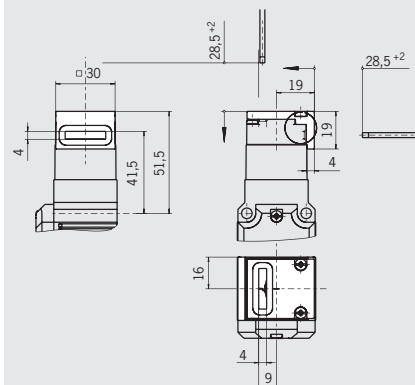


Minimum door radii with insertion funnel



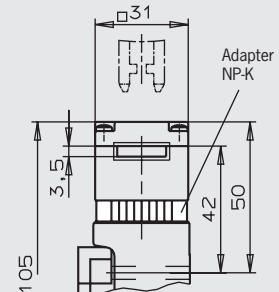
Insertion funnel for safety switches SGP/STA/STP/STM

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 fixing screws	For safety switches NM..VZ	083565 Insertion funnel M
		For safety switches NP..A/GP/TP..A without adapter	086237 Insertion funnel NP/GP/TP
		For safety switches SGP/STA/STP/STM	093157 Insertion funnel STP/STM
Adapter NP-K	Incl. 4 fixing screws	For safety switches NP	074578 Adapter NP-K

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

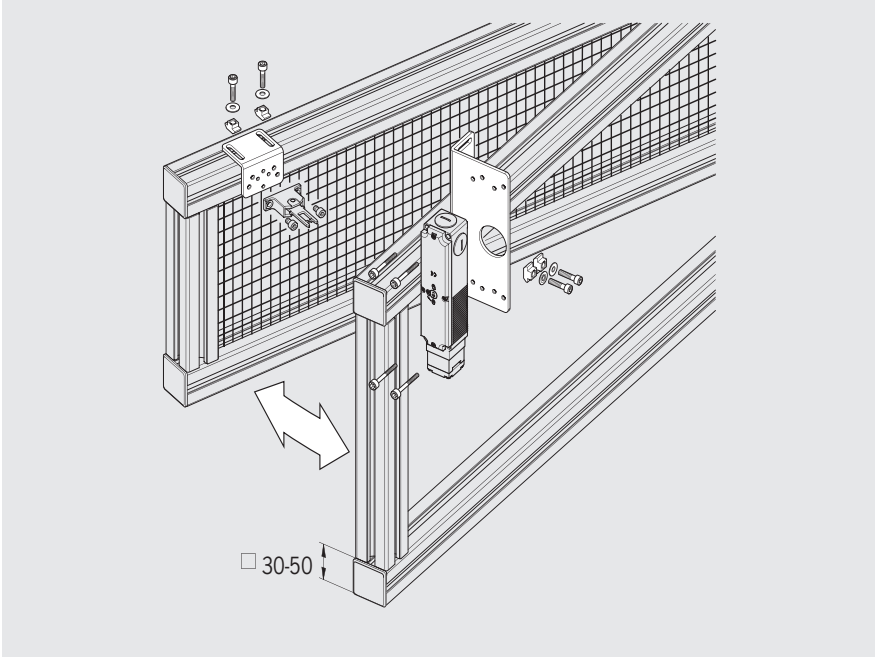
- ▶ For vertical and horizontal mounting of safety switches SGA, SGP, TP...A, STA and STP

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

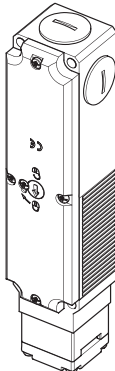
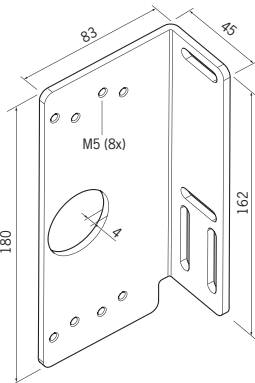
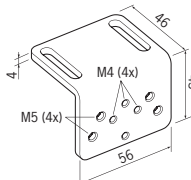
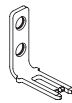
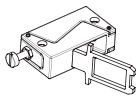
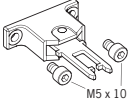
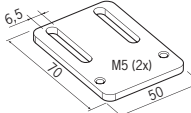
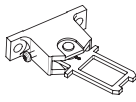
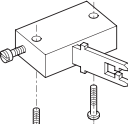
Note

- ▶ Mounting plate material: galvanized St37.

Installation example, safety switch vertical



Ordering table

Switch	Installation method switch	Mounting plate switch	Mounting plate actuator	Actuator		Minimum distance hinged actuator to switch	
				ST...	TP...A	ST...	TP...A
 SGA... SGP... TP...A... STA... STP...	A Vertical	093456 EMP-SB 	093457 EMP-B1 	ST... 	070038 074577 Page 91	> 300 mm	> 1000 mm
				 Page 95/96	 Page 92/93	> 200 mm	> 100 mm
	B Horizontal	093458 EMP-B2 	 Page 95/96	096838 096844  Page 92/93	> 200 mm	> 90 mm	

Mounting bracket for safety switches NM and NP...AS

- For vertical and horizontal mounting of safety switches NM and NP...AS

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

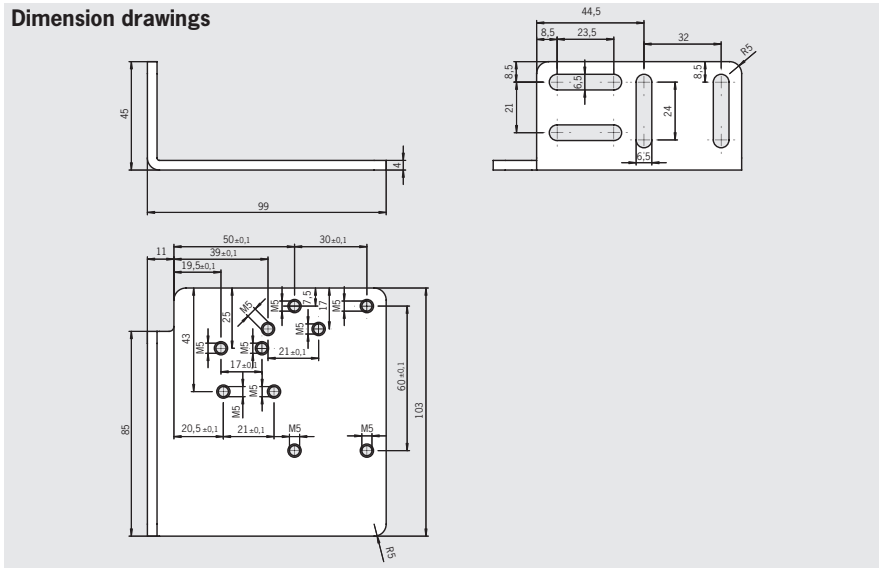
Notes

- Mounting plate material: galvanized St37.

Mounting bracket

For safety switches NM and NP...AS

Dimension drawings



Ordering table

Designation	Use	Order no.
Mounting bracket NM, NP	For safety switches NM and NP...AS horizontal and vertical mounting	085753 EMP-SC

Plug connector M12

- Plug connector M12 with cable
- 90° angled optional

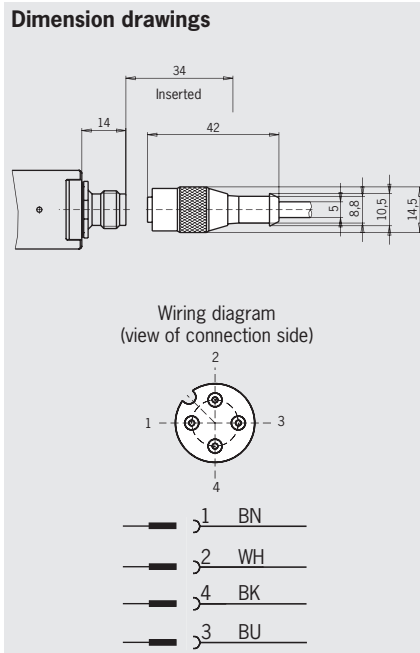
Cable

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

Plug connector SGLF with cable

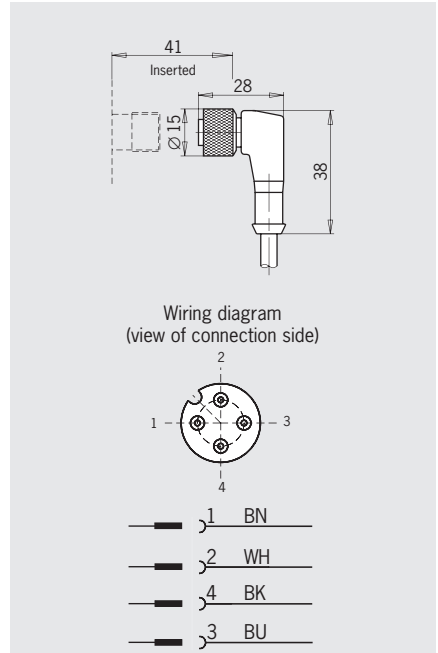
M12 plug, 4-pin

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 connector M12 for male plug SM4	035613 SGLF4-5000P
SWLF	4	Female connector M12 angled for male plug SM4	035618 SWLF4-5000P

Plug connectors SR6 and SR11

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

Angled plug connector

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

Male socket

For fitting in safety switches.

Coding shells

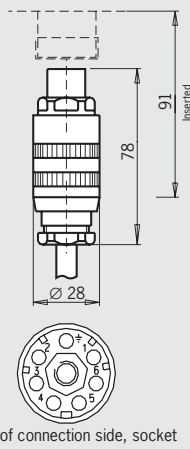
Two coding shells and screws. If used only matching connectors can be mated.

Cable (optional)

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

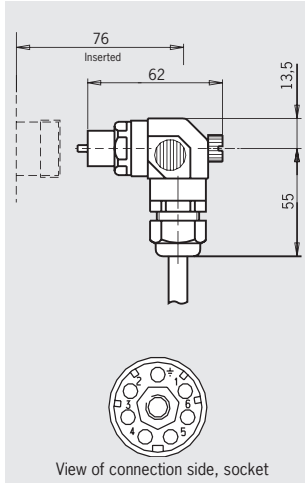
Female connector SR6 EF 6-pin + PE

Dimension drawings



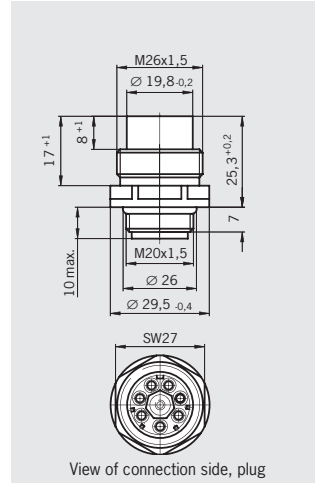
View of connection side, socket

Female connector SR6 WF angled 6-pin + PE



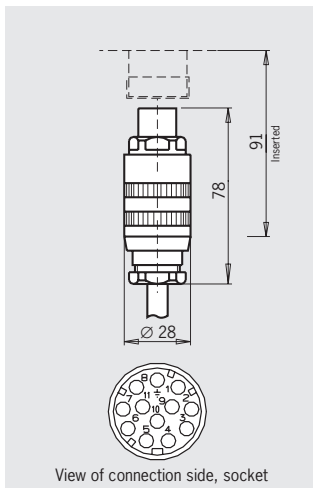
View of connection side, socket

Male socket SR6 AM 6-pin + PE



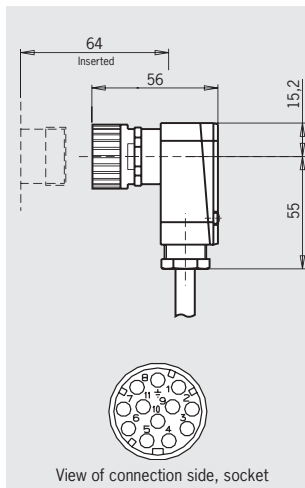
View of connection side, plug

Female connector SR11 EF 11-pin + PE



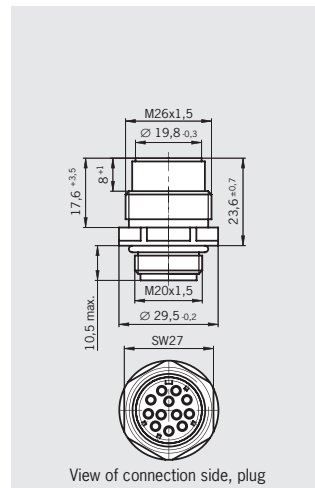
View of connection side, socket

Female connector SR11 WF angled 11-pin + PE



View of connection side, socket

Male socket SR11 AM 11-pin + PE



View of connection side, plug

Connector 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

Ordering table

Designation	Version	Cable					
		Without	5 m	10 m	15 m	20 m	25 m
SR6 ¹⁾ 6-pin + PE	EF Female connector	013176 SR6EF	077632 SR6EF-5000	077633 SR6EF-10000	077634 SR6EF-15000	098128 SR6EF-20000	-
	WF Female connector angled	024999 SR6WF	077638 SR6WF-5000	077639 SR6WF-10000	077640 SR6WF-15000	-	-
	K Coding shells	013178 SR6K	-	-	-	-	-
	AM Male socket, connection M20x1.5	087180 SR6AM2-M20	-	-	-	-	-
SR11 ¹⁾ 11-pin + PE	EF Female connector	070859 SR11EF	077629 SR11EF-5000	077630 SR11EF-10000	077631 SR11EF-15000	096632 SR11EF-20000	094749 SR11EF-25000
	WF Female connector angled	054773 SR11WF	077635 SR11WF-5000	077636 SR11WF-10000	077637 SR11WF-15000	-	-
	AM Male socket, connection M20x1.5	091296 SR11AM2-M20	-	-	-	-	-
SR6 and SR11	Socket crimp contacts Conductor cross-section 0.5 - 1.5 mm ²	071260 SRF	-	-	-	-	-
	Pin crimp contacts Conductor cross-section 0.5 - 1.5 mm ²	071261 SRM	-	-	-	-	-

¹⁾ Crimp contacts are included. For information on crimp contacts see page 115.

Plug connectors RC18 and RC18 with option C1825

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

Crimp contacts

With 19 crimp pins for conductor cross-section 0.75 - 1.00 mm².

Option C1825

With 16 crimp pins for conductor cross-section 0.38 - 0.5 mm² and 3 pins for conductor cross-section 0.75 - 1.0 mm² for control of the guard locking solenoid. This plug is easier to connect.
Important: Only for switch with option C1826.

Angled plug connector (optional)

On plug connectors with cables the direction of the cable exit can be chosen on left/right. On plug connectors without cables the direction can be adjusted in 45° steps.

Cable (optional)

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

Halogen-free cable (optional)

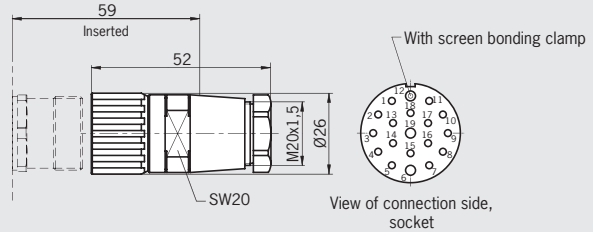
Cable sleeve PUR, color black, halogen-free, silicone-free. Reduction of toxic gases and smoke in case of fire.

Conductor cross-section 0.5 mm² or 1.0 mm².

Female connector RC18 / RC18..C1825

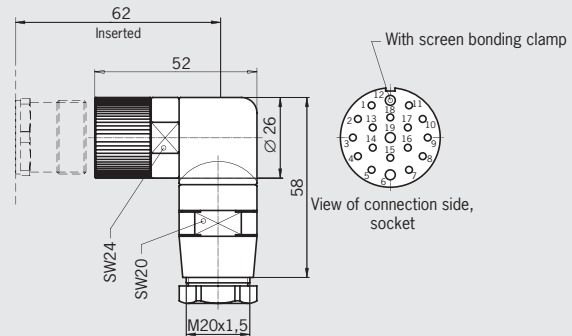
18-pin + PE (for cable diameter 10 ... 14 mm)

Dimension drawings



Female connector RC18 / RC18..C1825

angled 18-pin + PE (for cable diameter 10 ... 14 mm)



Ordering table

Designation	Version	Without cable
RC18 ²⁾ 18-pin + PE	EF Female connector	074616 RC18EF
	WF ¹⁾ Female connector angled	074617 RC18WF
	Replacement pin crimp contacts Conductor cross-section 19 x 0.75 - 1 mm ²	094309 Pin crimp contact RCM
	EF-C1825 Female connector	077025 RC18EF-C1825
	WF-C1825 ¹⁾ Female connector angled	077026 RC18WF-C1825
	Replacement pin crimp contacts Conductor cross-section 16 x 0.38 - 0.5 mm ² 3 x 0.75 - 1 mm ²	094310 Pin crimp contact RCM-C1825

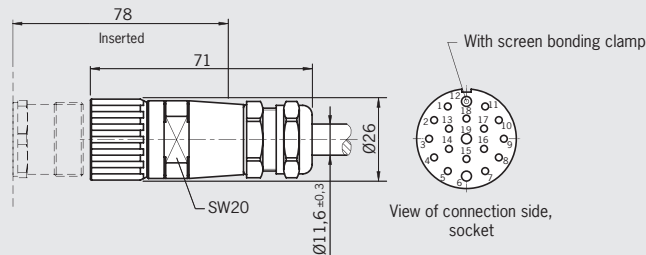
For information on crimp contacts see page 115.

1) Plug connector RC18 on the switches STP/STA not aligned.

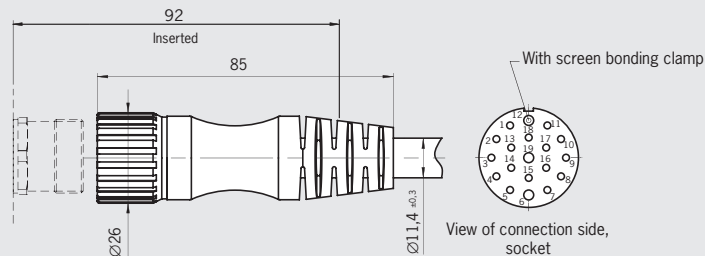
2) Crimp contacts are included.

Female connector RC18..C1825 with cable 18-pin + PE / 19-pin PUR

Dimension drawings



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



Connector assignment plug RC18 with cable and option C1825

Pin	Wire color	Conductor cross-section [mm]			
1	VT	0.5	10	GY/WH	0.5
2	RD	0.5	11	BK	0.5
3	GY	0.5	12	GN/YE	1.0
4	RD/BU	0.5	13	PK	0.5
5	GN	0.5	14	BN/GY	0.5
6	BU	1.0	15	BN/YE	0.5
7	GY/PK	0.5	16	BN/GN	0.5
8	GN/WH	0.5	17	WH	0.5
9	YE/WH	0.5	18	YE	0.5
			19	BN	1.0

Ordering table

De-scrip.	Version	Cable									
		1.5 m	3 m	6 m	8 m	10 m	15 m	20 m	25 m	30 m	40 m
RC18 18-pin + PE with cable	EF-C1825 Female con- nector	092761 RC18EF1.5M- C1825	092816 RC18EF3M- C1825	077014 RC18EF6M- C1825	077015 RC18EF8M- C1825	092898 RC18EF10M- C1825	077016 RC18EF15M- C1825	092726 RC18EF20M- C1825	092727 RC18EF25M- C1825	095993 RC18EF30M- C1825	102490 RC18EF40M- C1825
RC18 18-pin + PE with cable halo- gen- free	EFF-C1825 Female con- nector	092883 RC18EF1.5MF- C1825	092884 RC18EF3MF- C1825	092885 RC18EF6MF- C1825	092886 RC18EF8MF- C1825	092887 RC18EF10MF- C1825	092888 RC18EF15MF- C1825	092889 RC18EF20MF- C1825	092890 RC18EF25MF- C1825	-	-

Ordering table female connector RC18 with cable PUR, 19-pin, separately numbered cores, black (Numbering as per the pin number)

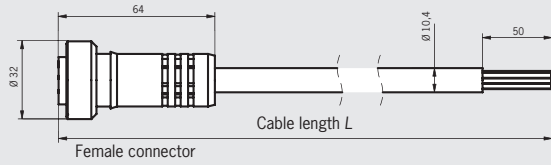
Descrp.	Cable *						
	1.5 m	3 m	6 m	10 m	15 m	20 m	25 m
RC18 Female connector 19-pin with cable PUR	110301 CM23F19-PU01,5MA-110301	110302 CM23F19-PU03,0MA-110302	110303 CM23F19-PU06,0MA-110303	110304 CM23F19-PU10,0MA-110304	110305 CM23F19-PU15,0MA-110305	110306 CM23F19-PU20,0MA-110306	110307 CM23F19-PU25,0MA-110307

* Conductor cross-section as for connection cable above.

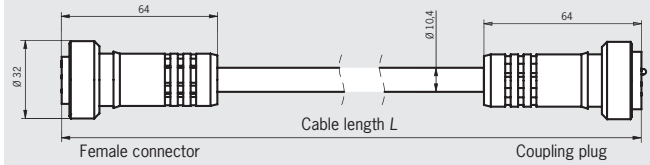
Plug connector BHA12 with cable

Female connector with cable
12-pin

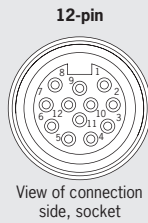
Dimension drawings



Extension cable
12-pin



Connector assignment (Conductor cross-section 0.82 mm² / 18 AWG)



Pin	Wire color
1	OG
2	BU
3	WH/BK
4	RD/BK
5	GN/BK
6	OG/BK
7	BU/BK
8	BK/WH
9	GN/YE
10	RD
11	WH
12	BK

Ordering table

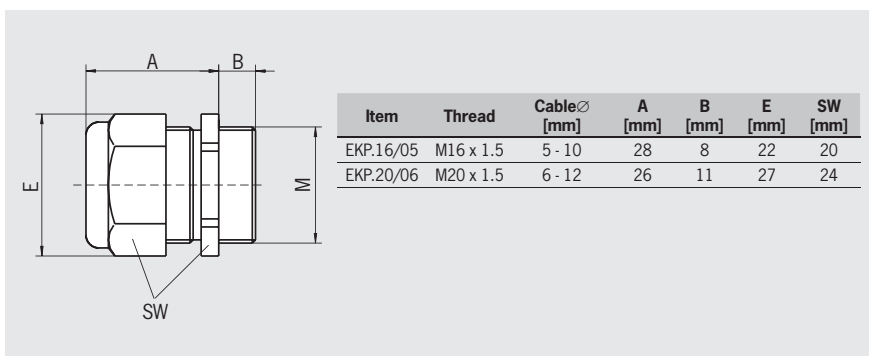
Version	Number of pins	Material	Cable length L [mm]								
			910	1800	3600	6000	9100	12100	15200	18200	24300
Female connector with cable	12	PVC	-	100959	100960	100961	100962	103158	103159	103160	-
		PUR	-	100966	100967	102522	102523	102524	102525	102526	-
Extension cable	12	PVC	-	-	100963	100964	100965	-	-	-	-
		PUR	-	102527	100968	-	-	-	-	-	-

Cable glands

- ▶ M16 x 1.5
- ▶ M20 x 1.5

Cable glands

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



Ordering table

Thread	Version	Material	
		Metal	Plastic
M16 x 1.5	Cable diameter 5 - 10 mm	-	084572 EKPM16/05
M20 x 1.5	Cable diameter 6 - 12 mm	-	086233 EKPM20/06

LED indicators for safety switches GP/ TP and STP

- ▶ LED set
- ▶ Built-in LED

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 indicator.

Operating voltage AC/DC 24 V +10%, -15%.

Built-in LED

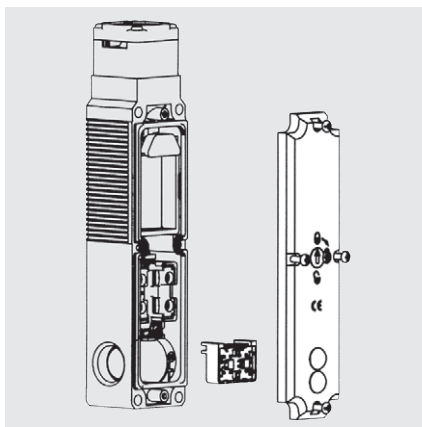
The built-in LED is suitable for direct installation in one of the M20 x 1.5 threads of the three cable entries of the safety switches GP/TP/STP.

The built-in LED indicates to the user whether the switch is locked or whether the safety door is open/closed.

The switching element can be wired individually. Operating voltage DC 24 V +10%, -15%.

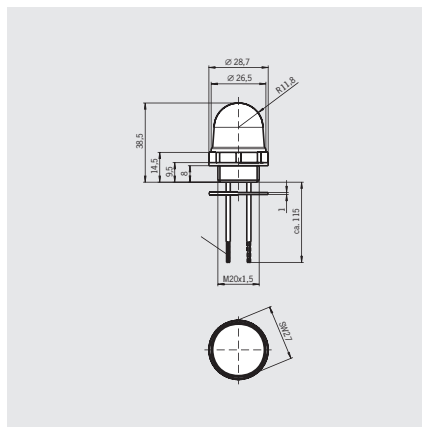
LED set

For safety switches TP/STP



Built-in LED

For safety switches GP/TP/STP/STA



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.	093752 LED set TP
		For safety switches STP	1 ea.	098035 LED set STP
Built-in LED (IP 65)	Color red for cable entry M20 x 1.5, with seal Light radiation to side	For safety switches GP/TP/STA/STP	1 ea.	087423 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.	095510 LED-F M20x1.5

Miscellaneous accessories

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

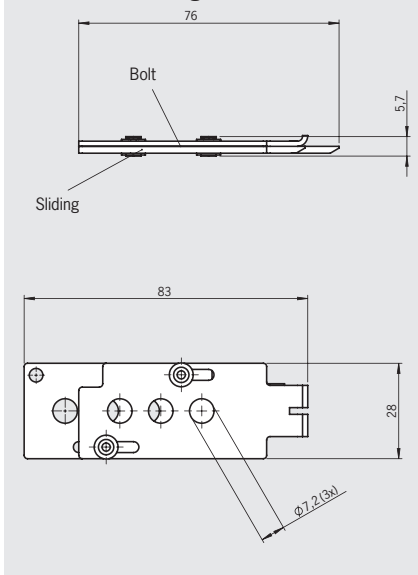
Lockout bar

With the safety door open, it can be slid into the actuating head on a switch with separate actuator (NP/GP/TP/STA/STP) instead of an actuator. Removal can be prevented using a commercially available padlock (max. 3 ea.). For the protection of people in areas with a possible hazard.

Lockout bar

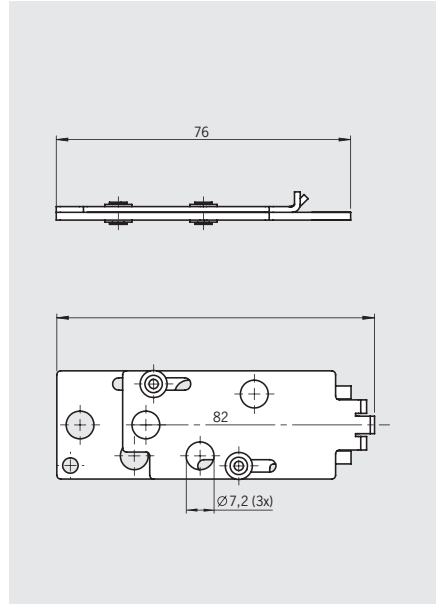
For safety switches NP/GP/TP

Dimension drawings



Lockout bar

For safety switches SGA/SGP/STA/STP



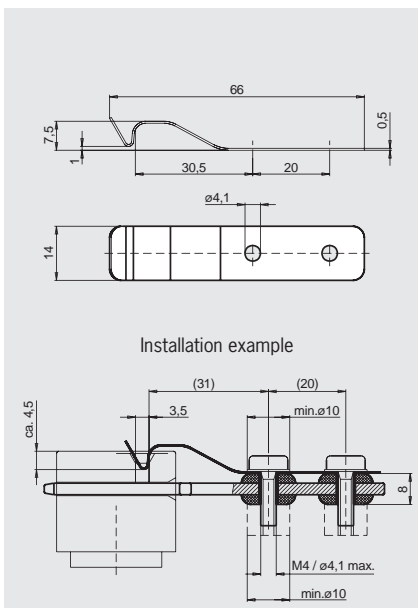
Latch spring

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).

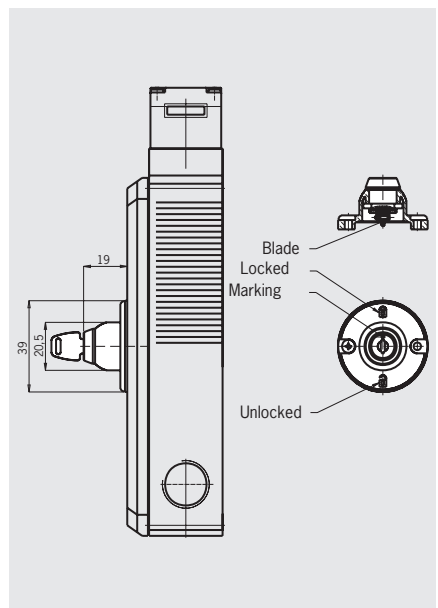
Latch spring for increased retention force

For safety switches NP/GP/TP



Lock

For safety switches TP/STP



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

Ordering table

Designation	Version	Use	Order no.
Lockout bar	3 holes	For safety switches NP/GP/TP	096105 Lockout bar TP
		For safety switches SGA/SGP/STA/STP	105701 Lockout bar STP
Latch spring		For safety switches NP/GP/TP	076501 Latch spring NP/TP
Lock	Unique locking (unique key needed to open)	For safety switches TP/STP	084177 Lock TP
	Identical locking (identical locks)	For safety switches TP/STP	086236 Lock TP
	Identical locking (identical locks) Key can only be removed in locked position	For safety switches TP/STP	109212 Identical lock TP C2293
	Replacement key (2 x) for identical locking	For safety switches TP/STP/SGP-TW	099434 Replacement key for identical TP

Miscellaneous accessories

- ▶ **Emergency unlocking for safety switches TP/STP**
- ▶ **Emergency unlocking for safety switches STA**
- ▶ **Mechanical release with automatic reset for safety switches TP/STP**
- ▶ **Handle for escape release**
- ▶ **Triangular key for safety switch TK**

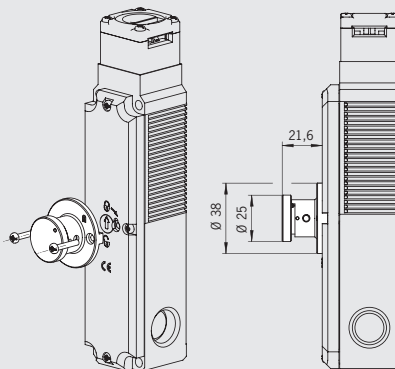
Emergency unlocking

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

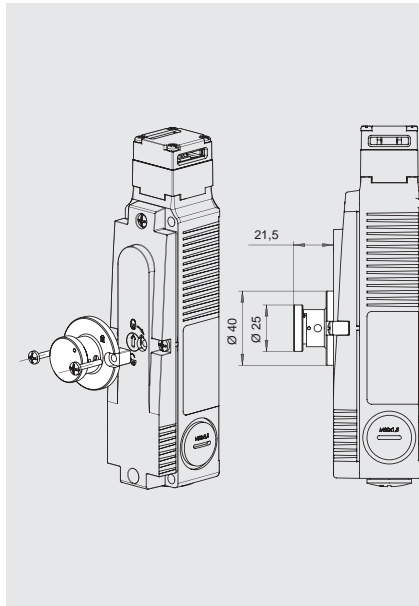
Warning: Prior to mounting, the locking screw for the mechanical release must be removed.

Emergency unlocking For safety switches TP/STP

Dimension drawings



Emergency unlocking For safety switch STA

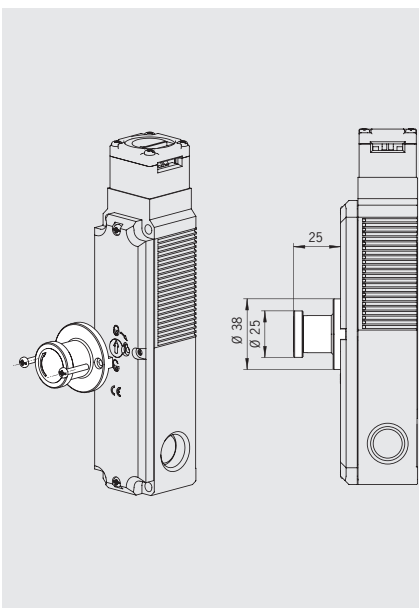


Release

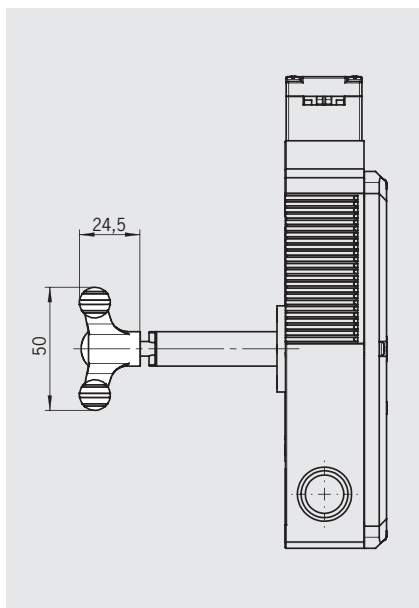
Is used for the manual release of the guard locking. The integrated spring automatically resets the release to the locked state.

Attention: Prior to mounting, the locking screw for the mechanical release must be removed.

Release with automatic reset For safety switches TP/STP



Handle for escape release For safety switches TP/STP/STA



Handle for escape release

Can be mounted on all escape release actuator shafts C1993 for safety switches TP, STP and STA for easier use.

Ordering table

Designation	Version	Use	Order no.
Emergency unlocking	Incl. 2 screws M3 x 17	For safety switches TP/STP	099877 Emergency unlocking TP/STP
	Incl. 2 screws M3.5 x 19	For safety switch STA	099876 Emergency unlocking STA
Release with automatic reset	Incl. 2 screws M3 x 17	For safety switches TP/STP	103110 Release with automatic reset TP/STP
Handle for escape release		For safety switches TP/STP/STA	105329 Escape release handle
Triangular key	DIN 22417 M5 100 mm	For safety switch TK	103057 Triangular key

Miscellaneous accessories

- ▶ **Wire front release (latching)**
- ▶ **Handle for wire front release (Bowden)**
- ▶ **Safety screws**
- ▶ **Replacement screws**

Wire front release (bowden)

Flexible routing of the pull wire permits release of the guard locking in inaccessible installation situations.

- ▶ Usage as emergency unlocking if the safety switch is mounted in an inaccessible position
- ▶ Usage as escape release for unlocking the guard locking from the danger area
- ▶ Can be retrofitted to all series TP/STP safety switches

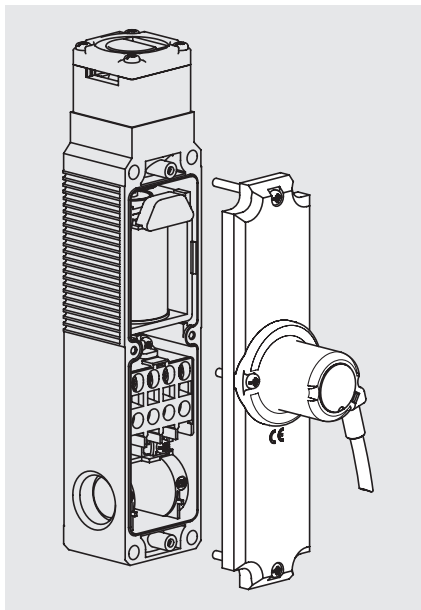
Safety screws

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

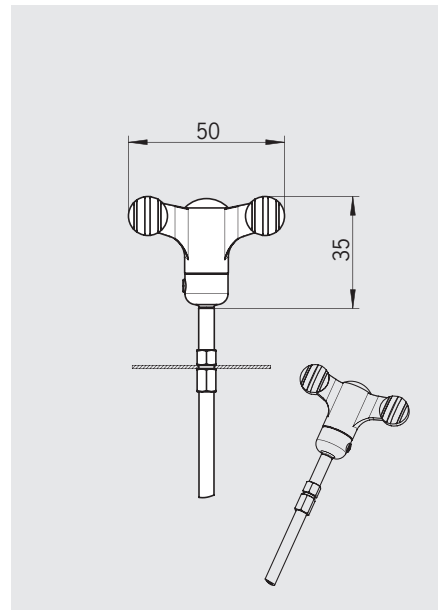
Replacement screws

For mounting actuating heads (not safety screws).

Wire front release (bowden)
for safety switches TP/STP



Handle for wire front release (Bowden)
for safety switches TP/STP



Ordering table

Designation	Version	Use	Order no.
Wire front release (latching) Pre-assembled incl. cover and pull wire	Length 3 m (2 m sheathed)	For safety switches TP	096230 BW-TP-C-2000
	Length 4 m (3 m sheathed)	For safety switches TP	098313 BW-TP-C-3000
	Length 5 m (4 m sheathed)	For safety switches TP	098314 BW-TP-C-4000
	Length 3 m (2 m sheathed)	For safety switches STP	097952 BW-STP-C-2000
Handle for wire front release (Bowden)		For safety switches TP/STP	099795 Handle for wire front release (Bowden)
Safety screws packaging unit: 100 ea.	M5 x 25	For hinged actuator for doors hinged on the top and bottom of series NM..VZ, NP..., GP... and TP...	073457 M5x25/V100
	M5 x 10 Material: stainless steel	For straight/bent actuators/hinged actuators for doors hinged on the right and left of series NM..VZ, NP..., GP... and TP...	073455 M5x10/V100
	M4 x 14	For all actuators of series NM..VZ	074063 M4x14/V100
	M4 x 14 Material: stainless steel	For straight/bent actuators with bush of series NP..., GP... und TP...	086232 M4x14/V100
	PL3x30	Cap screws for series NP...A, GP... and TP...A	075532 PL3x30/V100
	PL3x26	Cap screws for series NM..AL, NM..AG, NM..AK, NM..AV and NM..VZ	085576 PL3x26/V100
	PL3x8	Cap screws for series NM..HB, NM..KB, NM..RB and NM..WO	085577 PL3x8/V100
Replacement screws packaging unit: 100 ea. (not safety screws)	PL3x30 Material: stainless steel	Cap screws for series NP...A, GP... and TP...A	082237 PL3x30/V100
	PL3x38	Cap screws for series NP...K and TP...K	076755 PL3x38/V100

For safety precautions see page 149
For technical data see page 117

Bolts for safety guards for safety switches NM

- ▶ For doors hinged on the right or left



Features

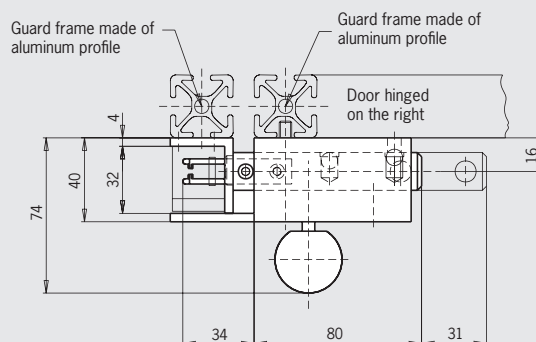
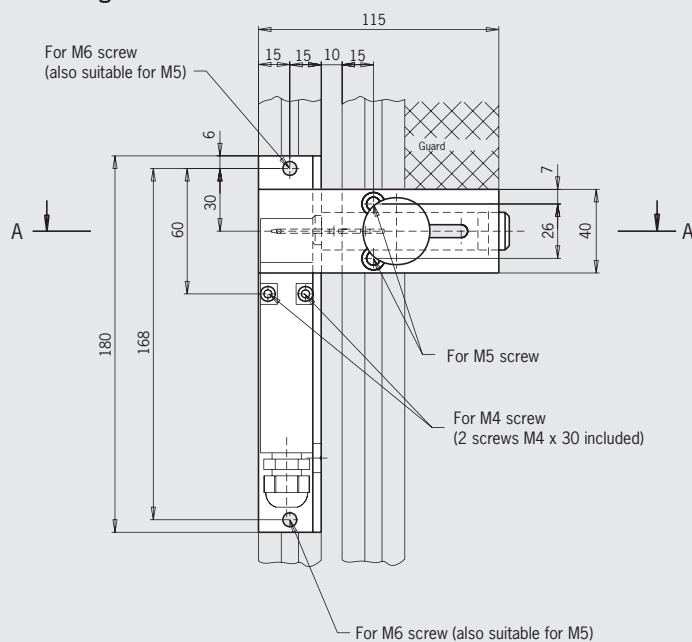
- ▶ Easily fitted to standard aluminum profiles and machine covers by screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Symmetrical design for doors hinged on the right or left
- ▶ No additional door handle necessary
- ▶ Bolt with detent mechanism in opened position
- ▶ Through hole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

Notes

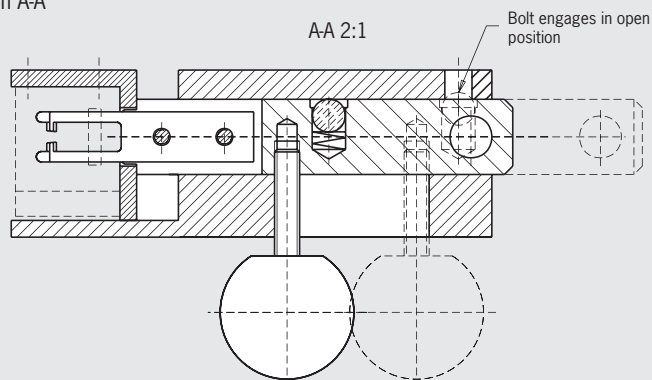
- ▶ Actuator and switch bracket included in bolt scope of delivery
- ▶ Order safety switch separately

Bolt for safety switches NM..VZ

Dimension drawings



Section A-A

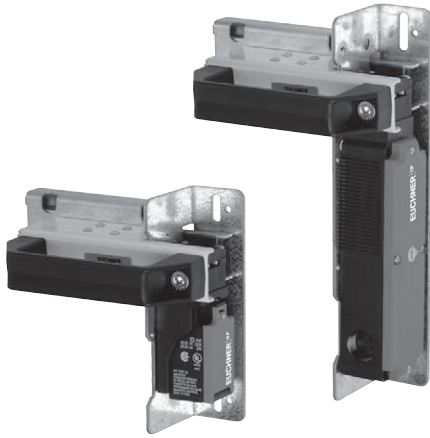


Ordering table

Designation	Detent mechanism	Version	Order no.
Bolt NM	Without	For doors hinged on the right or left actuator and switch bracket included	077233 Bolt NM
Switch bracket NM		Separate	077245 Switch bracket NM

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

- ▶ For doors hinged on the right or left



Features

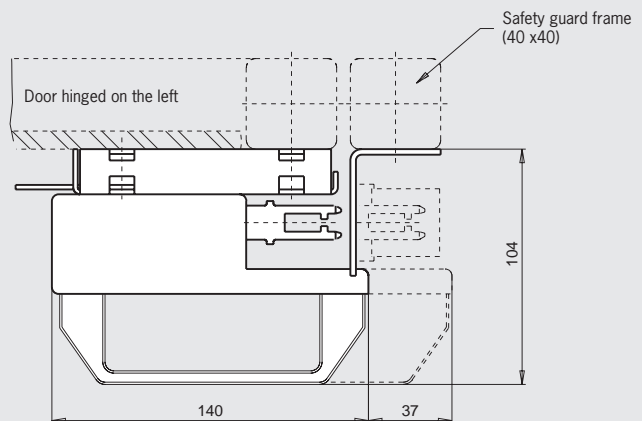
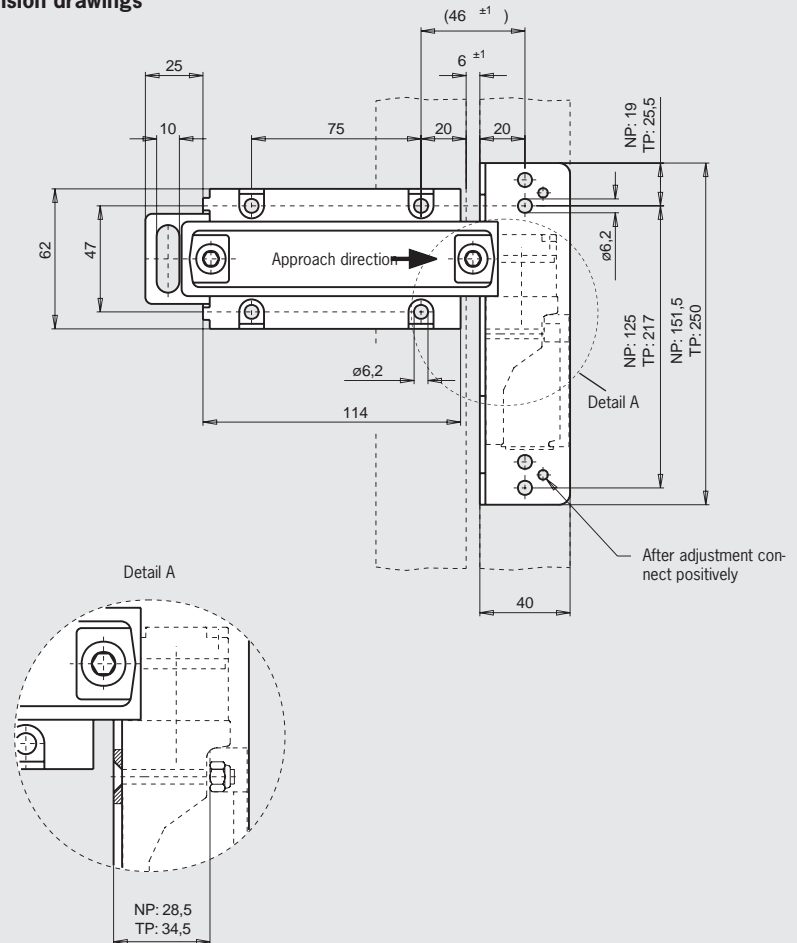
- ▶ Easily fitted to standard aluminum profiles and machine covers by screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Symmetrical design for doors hinged on the right or left
- ▶ No additional door handle necessary
- ▶ Automatic detent mechanism to retain position of the bolt when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

Notes

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

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

Dimension drawings



Ordering table

Designation	Detent mechanism	Version	Order no.
Bolt 0 NP/TP	Without	For doors hinged on the right or left (also for GP)	073535 Bolt 0 NP/TP
Bolt 1 NP/TP	1 x detent mechanism closed	For doors hinged on the right or left (also for GP)	073536 Bolt 1 NP/TP
Switch bracket NP		Separate	073538 Switch bracket NP
Switch bracket TP		Separate (also for GP)	073539 Switch bracket TP

Bolts 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
Latches in open position and prevents unintentional closing of the bolt
- ▶ Lever for escape release from the danger area

Features

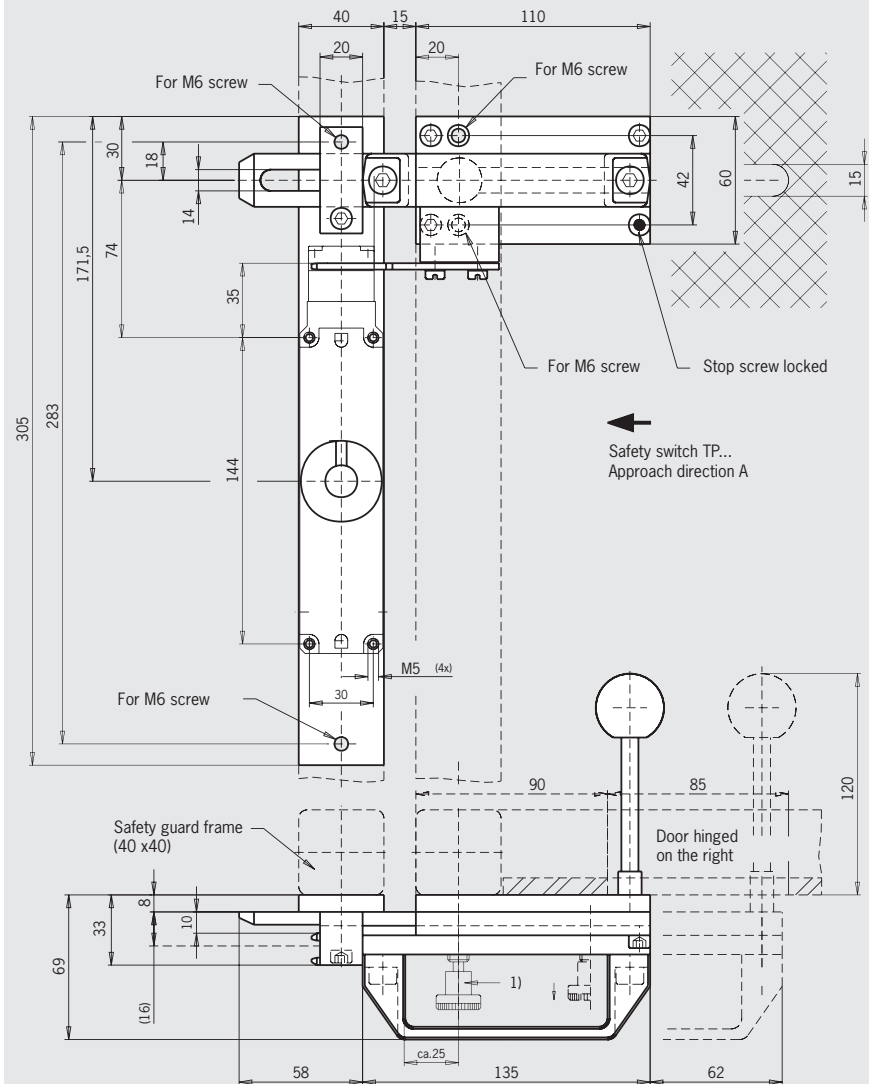
- ▶ Easily fitted to standard aluminum profiles and machine covers by screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Robust construction for heavy doors
- ▶ No additional door handle necessary
- ▶ Slot on the bolt permits attachment of padlocks

Notes

- ▶ The bolts are only suitable for series **TP...A** and **GP**
- ▶ Actuator included
- ▶ Order safety switch separately

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

Dimension drawings (here: shown with escape release)



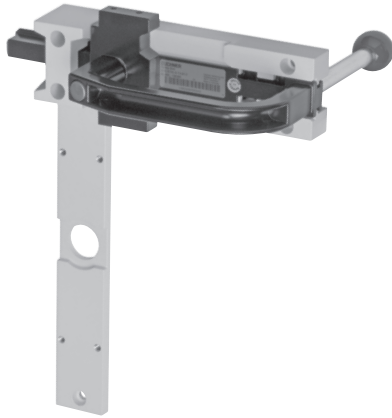
1) Bolt with detent mechanism (only for bolt TP-AF and TP-CF with escape release):
latches in open position and prevents unintentional closing of the bolt.
Unlocked by pulling the detent knob upward.

Ordering table

Designation	Detent mechanism	Version	Order no.
Bolt TP-AF	Detent knob	For doors hinged on the right with escape release	086186 Bolt TP-AF
Bolt TP-CF	Detent knob	For doors hinged on the left with escape release	086188 Bolt TP-CF
Bolt TP-A	Without	For doors hinged on the right without escape release (also for GP)	084430 Bolt TP-A
Bolt TP-C	Without	For doors hinged on the left without escape release (also for GP)	084432 Bolt TP-C

Bolts for safety guards for safety switches GP and TP

- ▶ Material: die-cast aluminum
- ▶ Lever for escape release from the danger area (optional)
- ▶ For doors hinged on the right or left



Special features

(only for bolt BTC-T/GP-S-TH-01-F with escape release)

- ▶ Bolt with detent mechanism
Latches in open position and prevents unintentional closing of the bolt. Unlocked by pressing the knob
- ▶ Lever for escape release from the danger area (optional)

Features

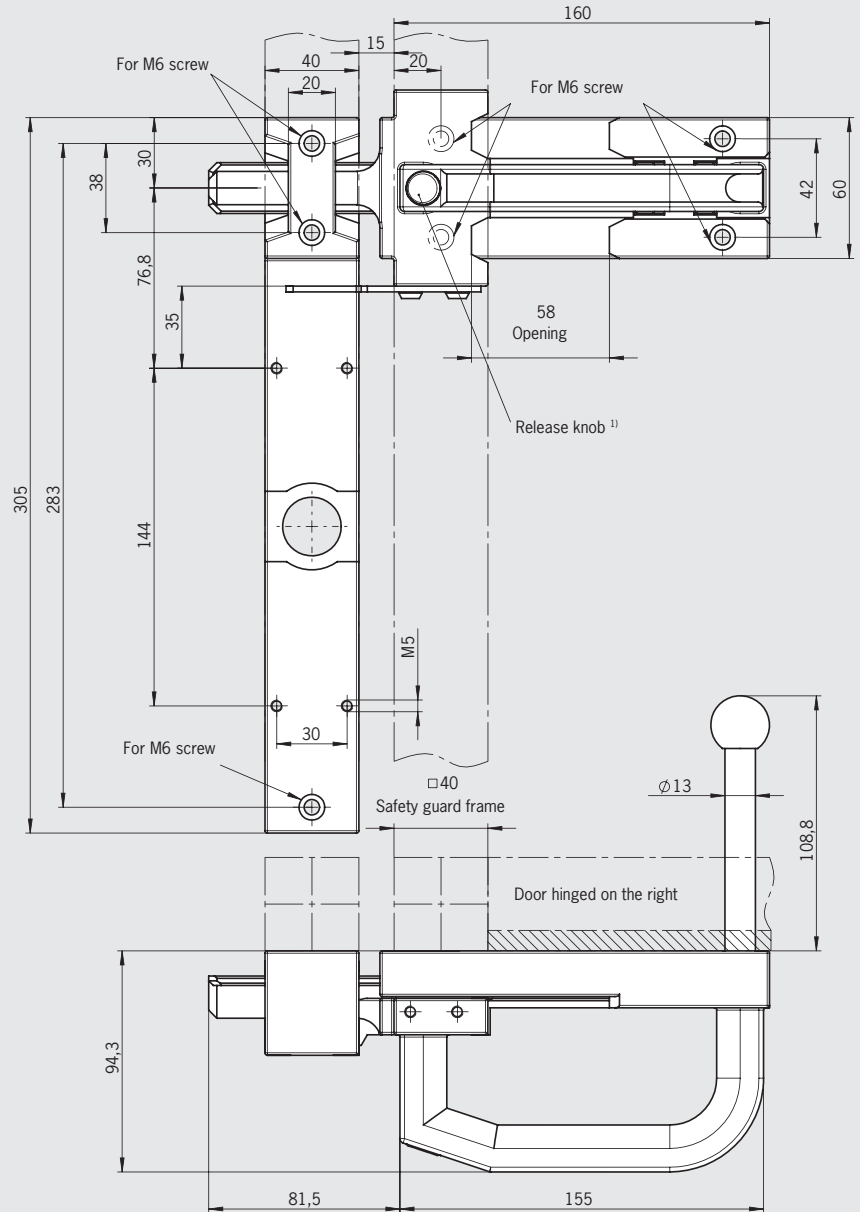
- ▶ Easily fitted to standard aluminum profiles and machine covers by screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Robust construction for heavy doors
- ▶ No additional door handle necessary

Notes

- ▶ The bolts are only suitable for series **TP...A** and **GP**
- ▶ Actuator included
- ▶ 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 bolts BTC-T/GP-S-TH-01-F with escape release):
latches in open position and prevents unintentional closing of the bolt.
Unlocked by pressing the knob

Ordering table

Designation	Detent mechanism	Version	Order no.
Bolt BTC-T/GP-S-TH-01-F	1 x detent mechanism closed	For doors hinged on the right or left with escape release	106302 Bolt BTC-T/GP-S-TH-01-F
Bolt BTC-T/GP-S-TH-00-X	Without	For doors hinged on the right or left without escape release	106301 Bolt BTC-T/GP-S-TH-00-X

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
Latches in open position and prevents unintentional closing of the bolt
- ▶ Lever for escape release from the danger area (optional)

Features

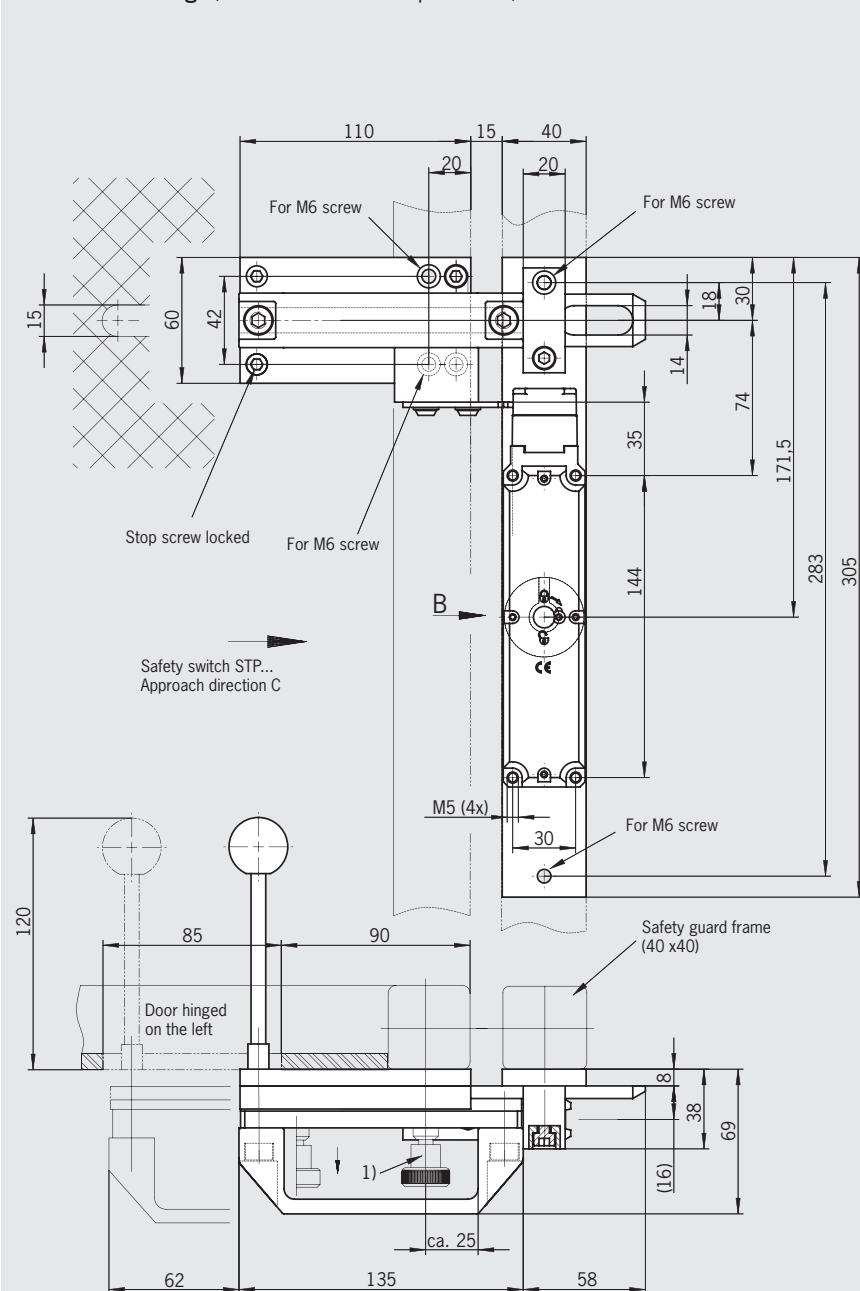
- ▶ Easily fitted to standard aluminum profiles and machine covers by screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Robust construction for heavy doors
- ▶ No additional door handle necessary
- ▶ Slot on the bolt permits attachment of padlocks

Notes

- ▶ The bolts are only suitable for series **STP.../STA.../SGP...**
- ▶ Actuator included
- ▶ Order safety switch separately

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

Dimension drawings (here: shown with escape release)



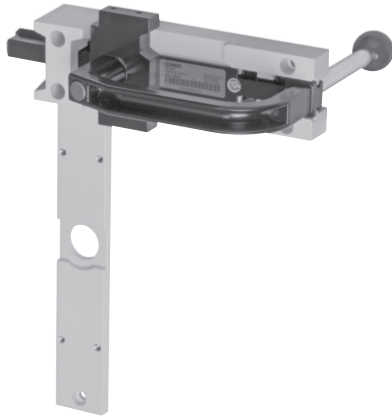
1) Bolt with detent mechanism (only for bolt STP-AF and STP-CF with escape release):
latches in open position and prevents unintentional closing of the bolt.
Unlocked by pulling the detent knob upward.

Ordering table

Designation	Detent mechanism	Version	Order no.
Bolt S-AF	Detent knob	For doors hinged on the right with escape release	096390 Bolt S-AF
Bolt S-CF	Detent knob	For doors hinged on the left with escape release	096391 Bolt S-CF
Bolt S-A	Without	For doors hinged on the right without escape release	096384 Bolt S-A
Bolt S-C	Without	For doors hinged on the left without escape release	096385 Bolt S-C

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

- ▶ Material: die-cast aluminum
- ▶ Lever for escape release from the danger area (optional)
- ▶ For doors hinged on the right or left



Special features

(only for bolt BTC-ST/G-S-TH-01-F with escape release)

- ▶ Bolt with detent mechanism
Latches in open position and prevents unintentional closing of the bolt. Unlocked by pressing the knob
- ▶ Lever for escape release from the danger area (optional)

Features

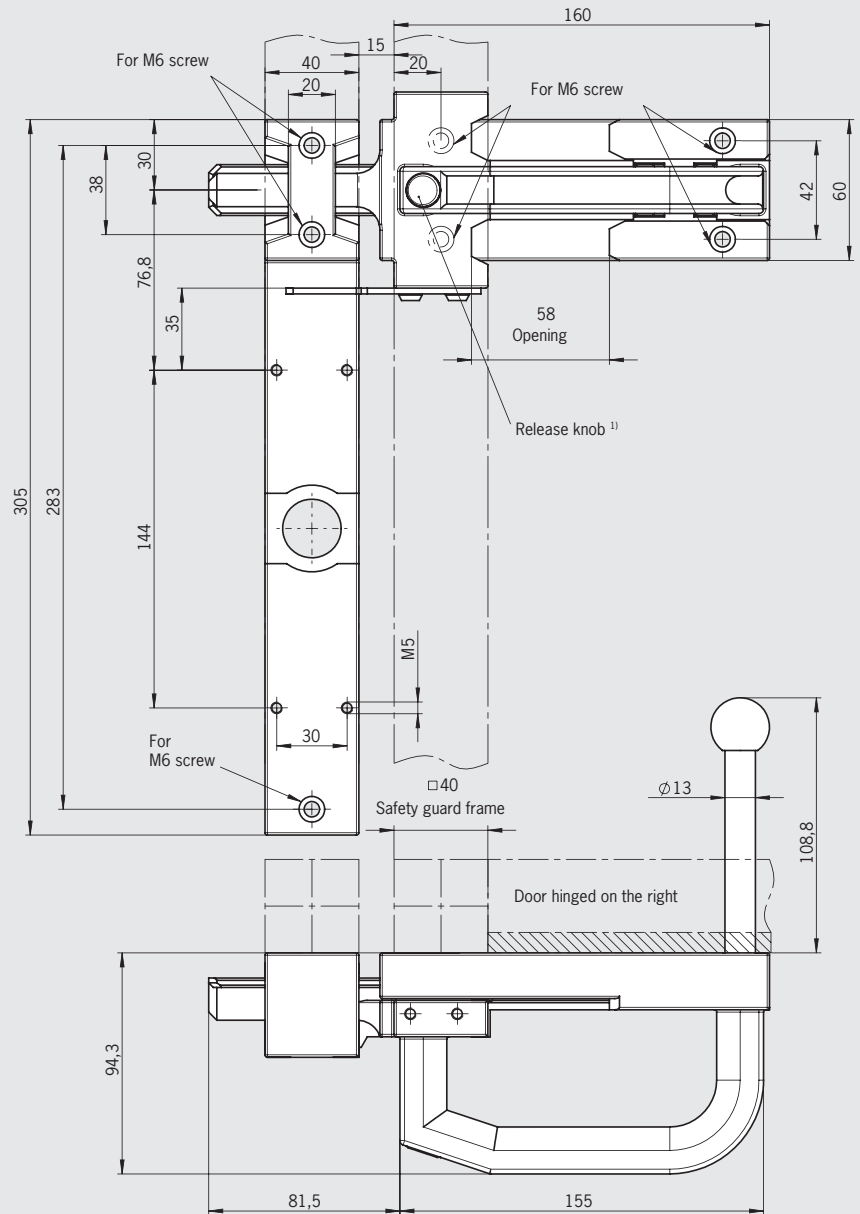
- ▶ Easily fitted to standard aluminum profiles and machine covers by screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Robust construction for heavy doors
- ▶ No additional door handle necessary

Notes

- ▶ The bolts are only suitable for series **STP.../STA.../SGP.../SGA...**
- ▶ Actuator included
- ▶ Order safety switch separately

Bolt for safety switches STP.../STA.../SGP.../SGA...

Dimension drawings (here: shown with escape release)



1) Bolt with detent mechanism (only for bolt BTC-ST/G-S-TH-01-F with escape release):
latches in open position and prevents unintentional closing of the bolt.
Unlocked by pressing the knob

Ordering table

Designation	Detent mechanism	Version	Order no.
Bolt BTC-ST/G-S-TH-01-F	1 x detent mechanism closed	For doors hinged on the right or left with escape release	106285 Bolt BTC-ST/G-S-TH-01-F
Bolt BTC-ST/G-S-TH-00-X	Without	For doors hinged on the right or left without escape release	106284 Bolt BTC-ST/G-S-TH-00-X

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

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



Special features

- ▶ Bolt with detent mechanism (only bolts with escape release) Bolt latches in open position to prevent unintentional closing

Features

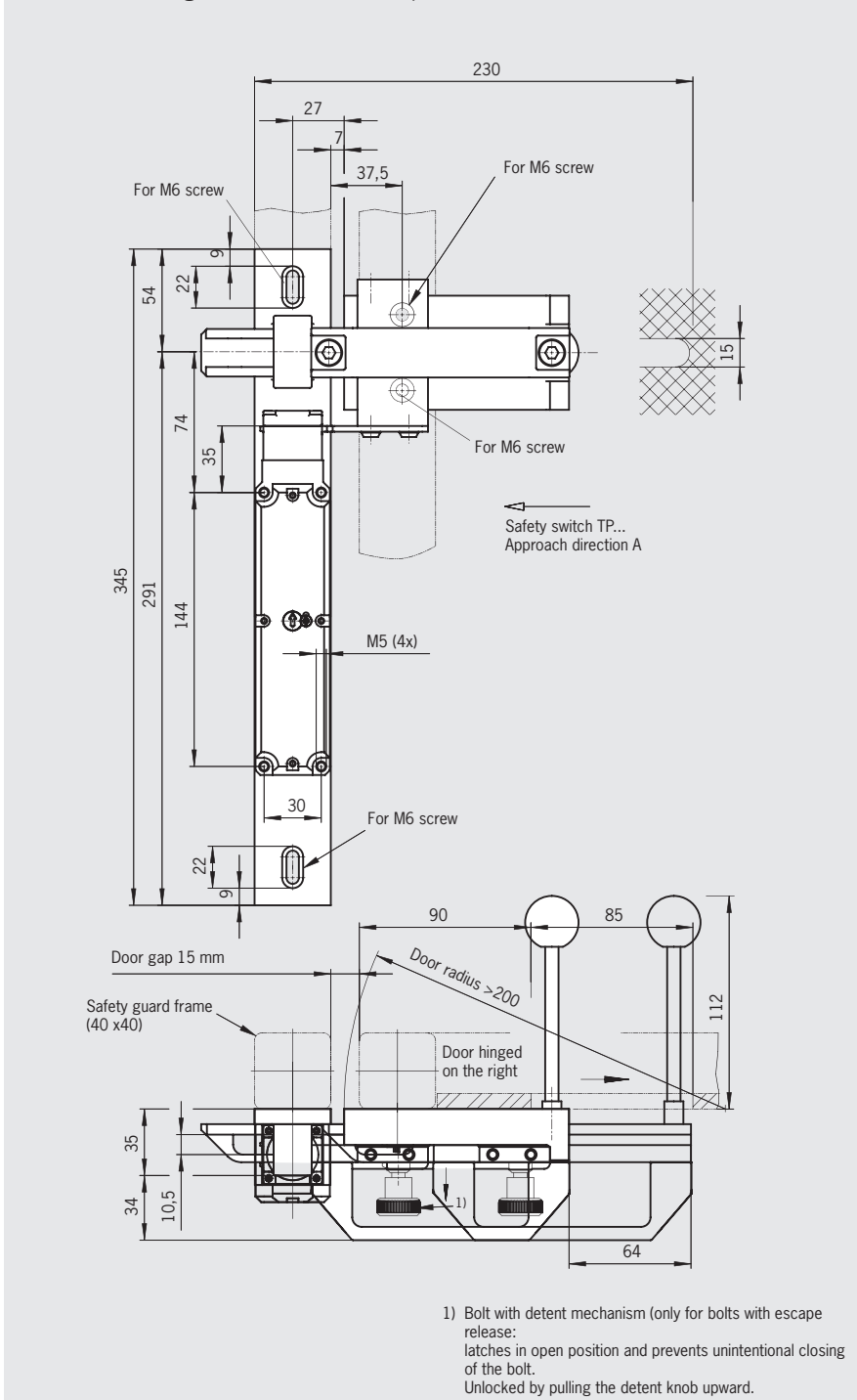
- ▶ Easily fitted to standard aluminum profiles and machine covers by screw connection
- ▶ Distinctive yellow color for easy recognition
- ▶ Robust construction for heavy doors
- ▶ No additional door handle necessary
- ▶ Slot on the bolt permits attachment of padlocks

Notes

- ▶ Functions only in conjunction with switch bracket **TP-GFK**
- ▶ Actuator included
- ▶ 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)



Ordering table

Designation	Detent mechanism	Version	Order no.
Bolt TP-GFK-F	Detent knob	For doors hinged on the right or left with escape release (also for GP)	097602 Bolt TP-GFK-F
Bolt TP-GFK	Without	For doors hinged on the right or left without escape release (also for GP)	096616 Bolt TP-GFK
Bolt STP-GFK	Without	For doors hinged on the right or left without escape release (also for SGP/STA)	098121 Bolt STP-GFK
Switch bracket TP-GFK		Separate (also for GP/SGP/STP/STA)	096613 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

For plug connector	Function	Manufacturer's designation	
SVM5 5 pins	Female connector M12	99-0436-57-05 Cable socket	Binder www.binder-conector.de
	Female flange connector M12	09-3442-700-05 Flange connector with flexible wires	
	Blanking plug M12	08-2425-000-000 Protective cap for socket with retaining strap	
CE5 3-pin + 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.amphenoltuchel.com
	Socket crimp contacts for C16-1, VPE 100 pcs.	VN02 016 0002 (1) Single contact, silver, 0.5-1.5 mm ²	
	Blanking plug	T6483 000 Protective cap for female receptacle	
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 connector)	09 20 010 3101 Socket contact insert crimp connection	
	Socket contacts for crimping	09 33 000 6220 Crimp contacts, socket, 0.5 mm ²	
	Blanking plug	09 20 010 5425 Cover	
RC17-Y coded 17 pins	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 connector	Function	Manufacturer's designation	
SR6 and SR11	Crimp tool	932 507-002 XZC 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.amphenoltuchel.com
	Extraction tool	FG 0300 1461 Extraction tool	
RC12	Crimp tool	RC-Z2378 Crimp pliers for machined contacts	Coninvers www.coninvers.com
	Extraction tool	RC-Z2097 Extraction tool/insertion tool	
RC18	Crimp tool	RC-Z2504 Crimp pliers for machined contacts	Coninvers www.coninvers.com
	Extraction tool	RC-Z2514 Extraction tool	
VP19	Crimp tool	T98143 DAK 83S-30 / 11-7576T3 Insertion tool	Littor/Veam www.littorveam.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.tbtc.com
	Extraction tool	TRT16 Contact removal tool	

For safety precautions see page 149
For technical data see page 117

Overview

Safety switch series															
NM															Safety switch NM
	NM..VZ														Safety switch NM..VZ
		NP													Safety switch NP
			GP												Safety switch GP
				SGP											Safety switch SGP
					SGP-TW										Safety switch SGP-TW
						SGA									Safety switch SGA
							TP								Safety switch TP
								STP							Safety switch STP
								STP-BI							Safety switch STP-BI
									STP-TW						Safety switch STP-TW
										STA					Safety switch STA
											STA-TW				Safety switch STA-TW
												STM			Safety switch STM
													TK		Safety switch TK
															Accessories for safety switches

Safety switch series															Accessories	Page
NM	NM..VZ	NP	GP	SGP	SGP-TW	SGA	TP	STP STP-BI	STP-TW	STA	STA-TW	STM	TK			
•																118
	•															120
		•														121
			•													123
				•												124
					•											126
						•										127
							•									129
								•								133
									•							136
										•						138
											•					141
												•				143
													•			145
														•		147

Safety switch NM...



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

Reliability values acc. to EN ISO 13849-1

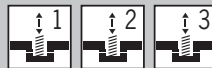
Parameter	Value	Unit
B10d	2 x 10 ⁷ operating cycles	

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 contact				
Switching element with 1 switching contact	ES01 1 NC ⊖				
Switching element with 2 switching contacts	ES11 1 NC ⊕ + 1 NO	ES02 2 NC ⊖	ES12 2 NC ⊖ + 1 NO	ES03 3 NC ⊖	
Min. switching current 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	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 acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15 DC-13	I _e 4 A U _e 230 V I _e 4 A U _e 24 V

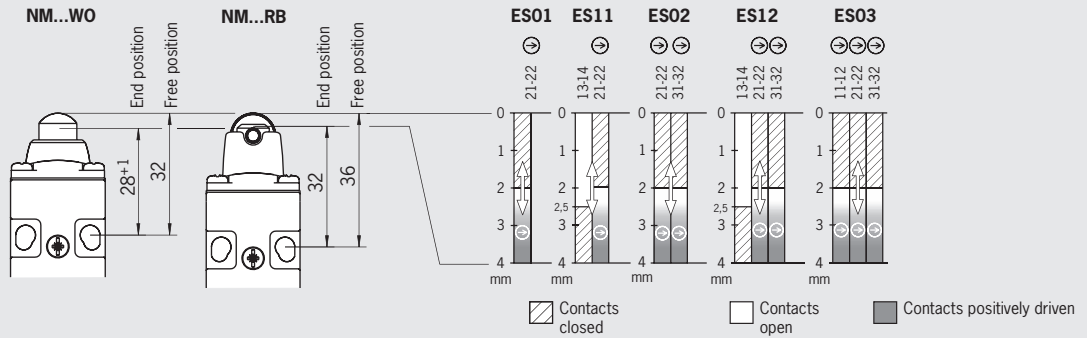
Connection, plug connector SM 4 (M12)



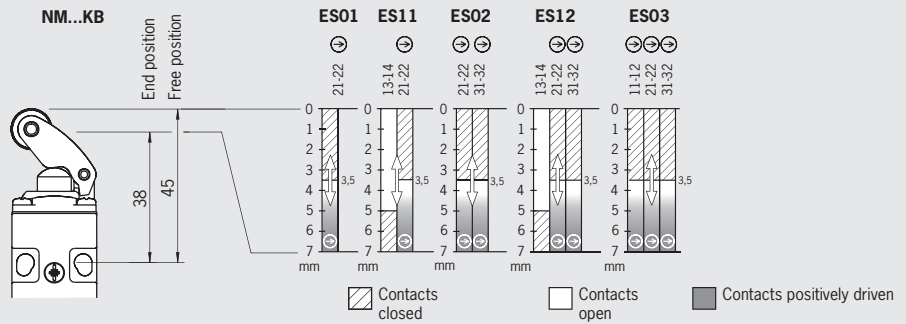
Parameter	Value	Unit
Ambient temperature	- 20 ... + 60	°C
Connection	Plug connector	
Version	M12 (4-pin)	
Degree of protection according to IEC 60529	IP 67 ¹⁾	
Rated insulation voltage U _i	250	V AC/DC
Rated impulse withstand voltage U _{imp}	2.3	kV
Conventional thermal current I _{th}	1.5	A
Short circuit protection acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15 DC-13	I _e 4 A U _e 30 V I _e 4 A U _e 24 V

3) Screwed tight with the related plug connector (see page 99)

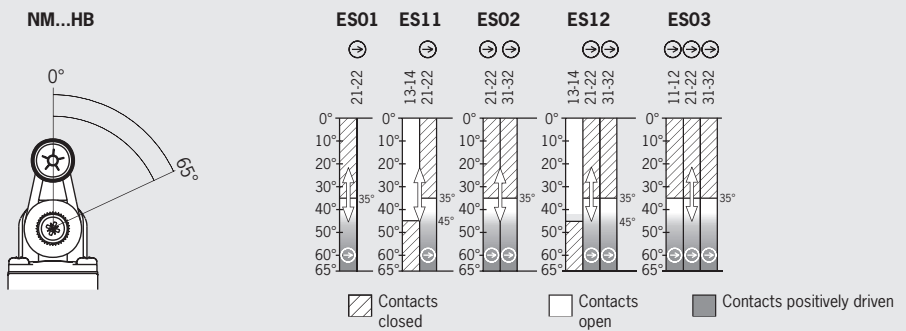
Travel diagram, NM.WO/NM.RB



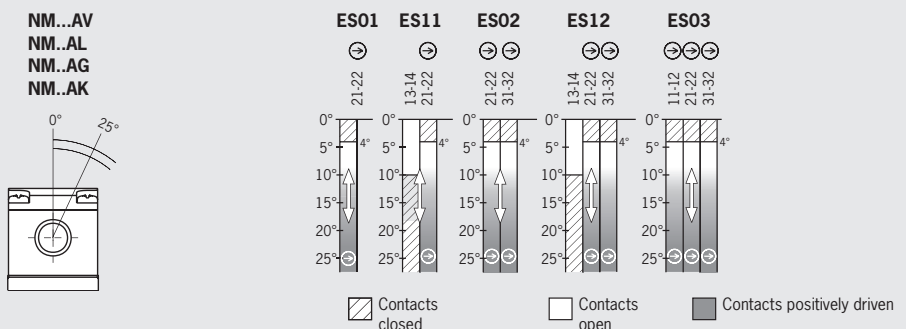
Travel diagram, NM.KB



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.

Reliability values acc. to EN ISO 13849-1

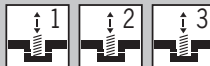
Parameter	Value	Unit
B10d	4 x 10 ⁶ operating cycles	

Switch



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

Switching element



Parameter	Value	Unit
Switching principle	Slow-action switching contact	
Switching element with 1 switching contact	ES01 1 NC ⊖	
Switching element with 2 switching contacts	ES11 1 NC ⊖ + 1 NO ES02 2 NC ⊖ ES12 2 NC ⊖ + 1 NO ES03 3 NC ⊖	
Min. switching current 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	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 acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V
	DC-13	I _e 4 A U _e 24 V

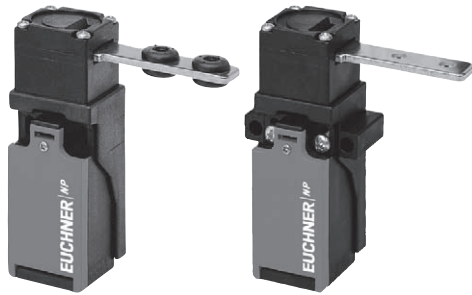
Connection, plug connector SM 4 (M12)



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 acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 30 V
	DC-13	I _e 4 A U _e 24 V

3) Screwed tight with the related plug connector (see page 99)


Safety switch NP





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

Reliability values acc. to EN ISO 13849-1

Parameter	Value	Unit
B10d	3 x 10 ⁶ operating cycles	

Switch		Value		Unit
Parameter				
Housing material		Reinforced thermoplastic		
Mechanical life		10 ⁶ operating cycles		
Ambient temperature		- 20 ... + 80		°C
Weight		Approx. 0.11		kg
Approach speed, max.		20		m/min
Actuating force		5		N
Extraction force		15		N
Retention force		2		N
Insertion depth (minimum required travel + permissible overtravel)		Standard actuator	Overtravel actuator	
Lateral approach direction (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. 074578 / page 97	mm

Switching element		Value		Unit
Parameter				
Switching principle		Slow-action switching contact		
Switching element with 1 switching contact		618 1 NC ⊖		
Switching element with 2 switching contacts		628 1 NC ⊖ + 1 NO	638 2 NC ⊖	
Switching element with 3 switching contacts		648 2 NC ⊖ + 1 NO		
Min. switching current 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		Value		Unit
Parameter				
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 acc. to IEC 60269-1 (control circuit fuse)		4		A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V		
	DC-13	I _e 4 A U _e 24 V		

Connection, plug connector 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 acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 30 V	
	DC-13	I _e 4 A U _e 24 V	

3) Screwed tight with the related plug connector (see page 99)

Connection, plug connector SR6



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 acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V	
	DC-13	I _e 4 A U _e 24 V	

1) Screwed tight with the related plug connector (see page 100)

Safety switch GP



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

Reliability values acc. to EN ISO 13849-1

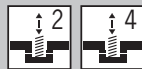
Parameter	Value	Unit
B _{10d}	3 x 10 ⁶ operating cycles	

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	
Approach speed, max.	20	m/min	
Actuating force	5	N	
Extraction force	15	N	
Retention force	2	N	
Insertion depth (minimum required travel + permissible overtravel)	Standard actuator	Overtravel actuator	
Lateral approach direction (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 contact		
Switching element with 2 switching contacts	528 1 NC \ominus + 1 NO	538 2 NC \ominus	
Switching element with 4 switching contacts	2121 4 NC \ominus	2131 3 NC \ominus + 1 NO	3131 2 NC \ominus + 2 NO
Min. switching current 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 acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15 DC-13	I _e 4 A U _e 230 V I _e 4 A U _e 24 V

Connection, plug connector SR11



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 acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15 DC-13	I _e 4 A U _e 50 V I _e 4 A U _e 24 V

1) Screwed tight with the related plug connector (see page 100)


Safety switch SGP

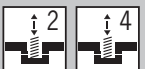
The technical data on switches and switching elements apply to all connections. Further technical data are given for the connection selected.





Reliability values acc. to EN ISO 13849-1

Parameter	Value	Unit
B10d	3 x 10 ⁶ operating cycles	


Switch				Value	Unit
Parameter					
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
Approach speed, max.				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	
Lateral approach direction (h)		24.5 + 5		28.5 + 5	mm
Approach direction from top (v)		24.5 + 5		28.5 + 5	mm

Switching element				Value	Unit
Parameter					
Switching principle				Slow-action switching contact	
Switching element with 2 switching contacts				538 2 NC ⊖	
Switching element with 4 switching contacts		2121 4 NC ⊖	2131 3 NC ⊖ + 1 NO	3131 2 NC ⊖ + 2 NO	
Min. switching current 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				Value	Unit
Parameter					
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 acc. to IEC 60269-1 (control circuit fuse)				4	A gG
Utilization category according to IEC 60947-5-1	AC-15			I _e 4 A U _e 230 V	
	DC-13			I _e 4 A U _e 24 V	

Connection, plug connector SR6				
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 acc. to IEC 60269-1 (control circuit fuse)			4	A gG
Utilization category according to IEC 60947-5-1		AC-15	I _e 4 A U _e 230 V	
		DC-13	I _e 4 A U _e 24 V	

1) Screwed tight with the related plug connector (see page 100)

Connection, plug connector SR11				
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 acc. to IEC 60269-1 (control circuit fuse)			4	A gG
Utilization category according to IEC 60947-5-1		AC-15	I _e 4 A U _e 50 V	
		DC-13	I _e 4 A U _e 24 V	

1) Screwed tight with the related plug connector (see page 100)

Safety switch SGP-TW



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

Reliability values acc. to EN ISO 13849-1

Parameter	Value	Unit
B10d	3 x 10 ⁶ operating cycles	

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 ... + 80	°C
Weight	Approx. 0.32	kg
Approach speed, max.	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	
Lateral approach direction (h)	24.5 + 5	mm
Approach direction from top (v)	24.5 + 5	mm

Switching element



Parameter	Value	Unit
Switching principle	Slow-action switching contact	
Switching element with 4 switching contacts	2131 3 NC \ominus + 1 NO	
Min. switching current 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 acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V
	DC-13	I _e 4 A U _e 24 V


Safety switch SGA





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

Reliability values acc. to EN ISO 13849-1

Parameter	Value	Unit
B10d	3 x 10 ⁶ operating cycles	

Switch			Value	Unit
Material	Housing		Reinforced thermoplastic	
Mechanical life			1 x 10 ⁶ operating cycles	
Ambient temperature			- 20 ... + 80	°C
Weight			Approx. 0.275	kg
Approach speed, max.			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	
Lateral approach direction (h)			24.5 + 5	mm
Approach direction from top (v)			24.5 + 5	mm

Switching element			Value	Unit
Switching principle			Slow-action switching contact	
Switching element with 4 switching contacts			2121 4 NC \ominus	2131 3 NC \ominus + 1 NO
Min. switching current 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			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 acc. to IEC 60269-1 (control circuit fuse)			4	A gG
Utilization category according to IEC 60947-5-1	AC-15		I _e 4 A U _e 230 V	
	DC-13		I _e 4 A U _e 24 V	

Connection, plug connector SR11



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 acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 100)

Connection, plug connector RC18



Parameter		Value	Unit
Connection		Plug connector	
Version		18-pin + PE	
Degree of protection according to IEC 60529		IP 65 ^{1) 2)}	
Rated insulation voltage U_i		110	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 110 V	
	DC-13	I_e 4 A U_e 24 V	





1) Screwed tight with the related plug connector (see page 101 - 102)

2) Version SGA...EXT5 with 2 push buttons IP 54

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.

Reliability values acc. to EN ISO 13849-1				
Parameter	Value			Unit
B _{10d}	3 x 10 ⁶ operating cycles			
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
Approach speed, max.	20			m/min
Actuating force	10			N
Extraction force (not locked)	20			N
Retention force	10			N
Locking force, max.	Approach direction			
	From top (v)	Side (h)		N
	1300 (800 for door unlock request contact)	1300 (800 for door unlock request contact)		
Locking force F _{Zn} in acc. with GSET-19	Approach direction			
	From top (v)	Side (h)		N
	1000	1000		
Insertion depth (minimum required travel + permissible overtravel)	Actuator S standard		Actuator L for insertion funnel	
Lateral approach direction (h)	28 + 2		28 + 7	
Approach direction from top (v)	29.5 + 1.5		⚠ only on TP...K... 29.5 + 7	
Switching element				
				
Parameter	Value			Unit
Switching principle	Slow-action switching contact			
Switching element with 2 switching contacts	528 1 NC ⊕ + 1 NO	537 1 NC ⊕ + 1 NC	538 2 NC ⊕	
	4120 2 NC ⊕ + 1 NO			
Switching element with 4 switching contacts	2131 2 NC ⊕ + 1 NO + 1 NC	4121 2 NC ⊕ + 1 NC + 1 NO	4131 2 NC ⊕ + 2 NO	4141 4 NC ⊕
	Min. switching current at 24 V DC			1
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	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	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 acc. to IEC 60269-1 (control circuit fuse)	4			A gG
	Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V	
	DC-13	I _e 4 A U _e 24 V		

Connection, plug connector SR6



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 acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 230 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 100)

Connection, plug connector SM8



Parameter		Value	Unit
Connection		Plug connector	
Version		8-pin	
Degree of protection according to IEC 60529		IP 65 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 acc. to IEC 60269-1 (control circuit fuse)		1	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 1 A U_e 24 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector

Connection, plug connector SR11



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 acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 100)

Connection, plug connector BHA12



Parameter		Value	Unit
Connection		Plug connector	
Version		12-pin	
Degree of protection according to IEC 60529		IP 65 ^{1),2)}	
Rated insulation voltage U_i		50	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		2	A
Short circuit protection acc. to IEC 60269-1 (control circuit fuse)		2	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 2 A U_e 50 V	
	DC-13	I_e 2 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 103)

2) Version TP...EXT... with push button/cover for indicators IP 54

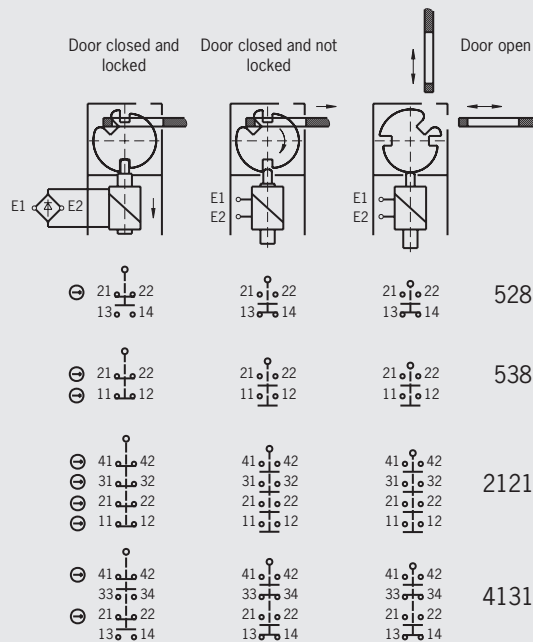
Connection, plug connector RC18



Parameter		Value	Unit
Connection		Plug connector	
Version		18-pin + PE	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U_i		110	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 110 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 101 - 102)

Switching functions TP1/TP2 without door monitoring contact




Safety switch STP.../STP-BI 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.


Reliability values acc. to EN ISO 13849-1

Parameter		Value	Unit
B _{10d}	STP	5 x 10 ⁶ operating cycles	
	STP-BI	2 x 10 ⁶ operating cycles	

Switch			Value	Unit
Parameter				
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
Approach speed, max.			20	m/min
Actuating force			35	N
Extraction force (not locked)			30	N
Retention force			20	N
Locking force, max.			Approach direction	
		From top (v)	Side (h)	N
		2500	2500	
Locking force F _{zn} in acc. with GSET-19			Approach direction	
		From top (v)	Side (h)	N
		2000	2000	
Insertion depth (minimum required travel + permissible overtravel)		Actuator S standard	Actuator L for insertion funnel	
Lateral approach direction (h)		24.5 + 5	28.5 + 5	mm
Approach direction from top (v)		24.5 + 5	28.5 + 5	mm

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

Guard locking			Value	Unit
Parameter		 		
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			100	%
Power consumption			8	W

Connection, cable entry M20 x 1.5			Value	Unit
Parameter				
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 acc. to IEC 60269-1 (control circuit fuse)			4	A gG
Utilization category according to IEC 60947-5-1	AC-15		I _e 4 A U _e 230 V	
	DC-13		I _e 4 A U _e 24 V	

Connection, plug connector SR11



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 acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 100)

Connection, plug connector RC18

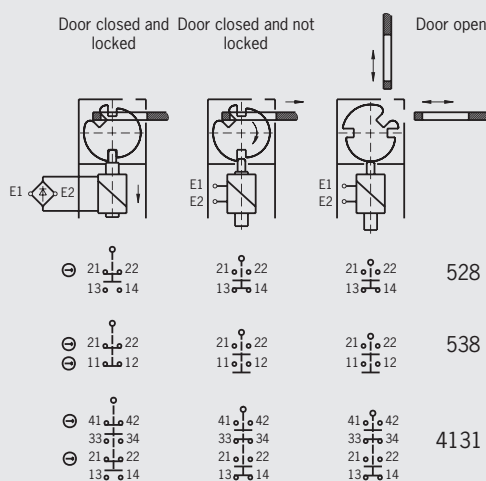


Parameter		Value	Unit
Connection		Plug connector	
Version		18-pin + PE	
Degree of protection according to IEC 60529		IP 65 ¹⁾²⁾	
Rated insulation voltage U_i		110	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 110 V	
	DC-13	I_e 4 A U_e 24 V	

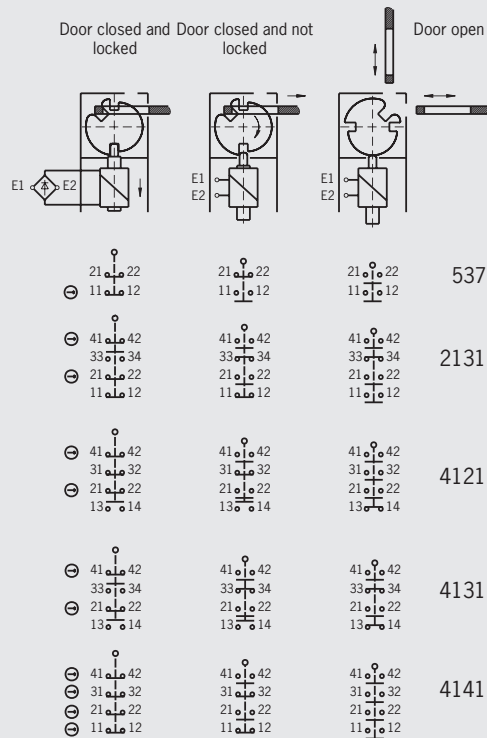
1) Screwed tight with the related plug connector (see page 101 - 102)

2) Version STP...EXT... with push button/cover for indicators IP 54

Switching functions STP1/STP2 without door monitoring contact



Switching functions STP3/STP4 with door monitoring contact



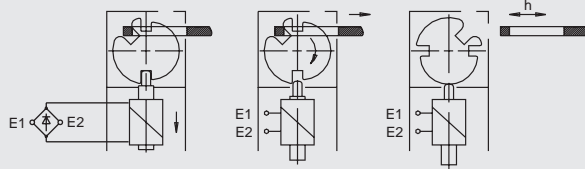
Safety functions STP-BI

Actuator: Inserted
Switching position: Locked

Inserted
Not locked

Removed
Not locked

Type

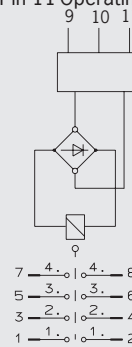


Type	Inserted Locked	Inserted Not locked	Removed Not locked
STP-BI-3-2131..			

**Terminal assignment
Plug connector**

SR11

- Pin 9 0 V
- Pin 10 Control voltage + 24 V
- Pin 11 Operating voltage + 24 V



Ordinal numbers of switching contacts

Safety switch STP-TW 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.

Reliability values acc. to EN ISO 13849-1

Parameter	Value	Unit
B10d	4.5 x 10 ⁶ operating cycles	

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. 0.62	kg
Approach speed, max.	20	m/min
Actuating force	35	N
Extraction force (not locked)	30	N
Retention force	20	N
Locking force, max.	Approach direction	
	From top (v)	Side (h)
	2500	2500
Locking force F _{zh} in acc. with GS-ET-19	Approach direction	
	From top (v)	Side (h)
	2000	2000
	Straight actuator	
Insertion depth (minimum required travel + permissible overtravel)	Actuator S standard	
Lateral approach direction (h)	24.5 + 5	mm
Approach direction from top (v)	24.5 + 5	mm

Switching element



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

Guard locking



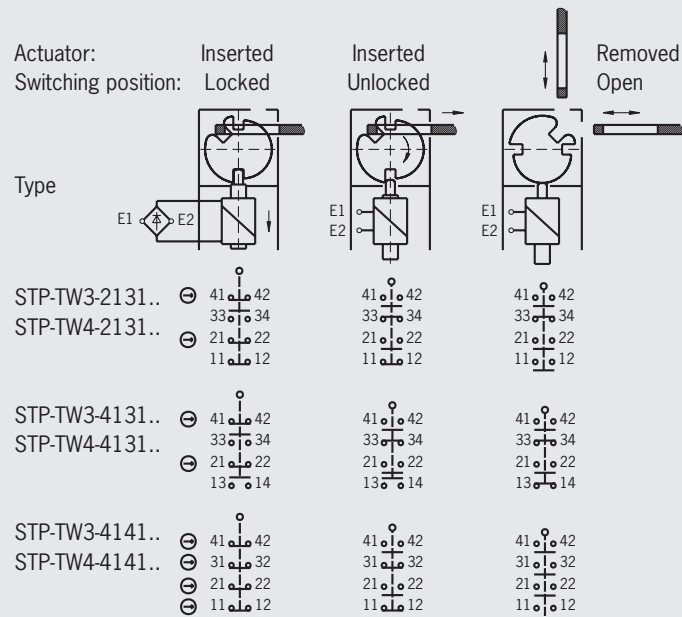
Parameter	Value	Unit
Solenoid operating voltage	AC/DC 24 V +10/-15%	
Connection	Reverse polarity protected, integrated bridge rectifier	
Duty cycle	100	%
Power consumption	8	W

Connection, cable entry M20 x 1.5



Parameter	Value	Unit
Connection	Screw terminal	
Version	M20 x 1.5	
Conductor cross-section	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 acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V
	DC-13	I _e 4 A U _e 24 V

Switching functions STP-TW



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.

Reliability values acc. to EN ISO 13849-1

Parameter	Value	Unit
B10d	1.2 x 10 ⁷ operating cycles	

Switch		Value		Unit
Material	Housing	Anodized die-cast		
Mechanical life		1 x 10 ⁶ operating cycles		
Ambient temperature		- 20 ... + 80		°C
Weight		Approx. 0.6		kg
Approach speed, max.		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 acc. with GS-ET-19	Straight actuator	Approach direction		N
		From top (v)	Side (h)	
		2300	2300	
Insertion depth (minimum required travel + permissible overtravel)		Actuator S standard	Actuator L for insertion funnel	
Lateral approach direction (h)		24.5 + 5	28.5 + 5	mm
Approach direction from top (v)		24.5 + 5	28.5 + 5	mm

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

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

Connection, cable entry M20 x 1.5		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 acc. to IEC 60269-1 (control circuit fuse)		4		A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V		
	DC-13	I _e 4 A U _e 24 V		

Connection, plug connector SR11



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 acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 50 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 100)

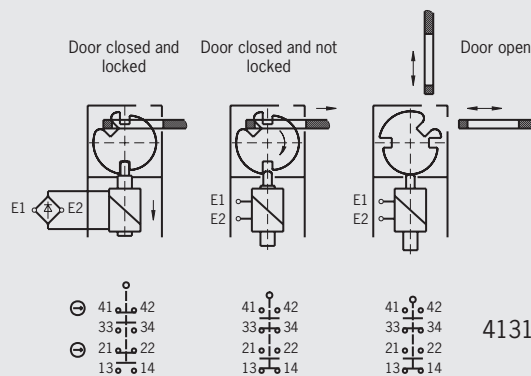
Connection, plug connector RC18



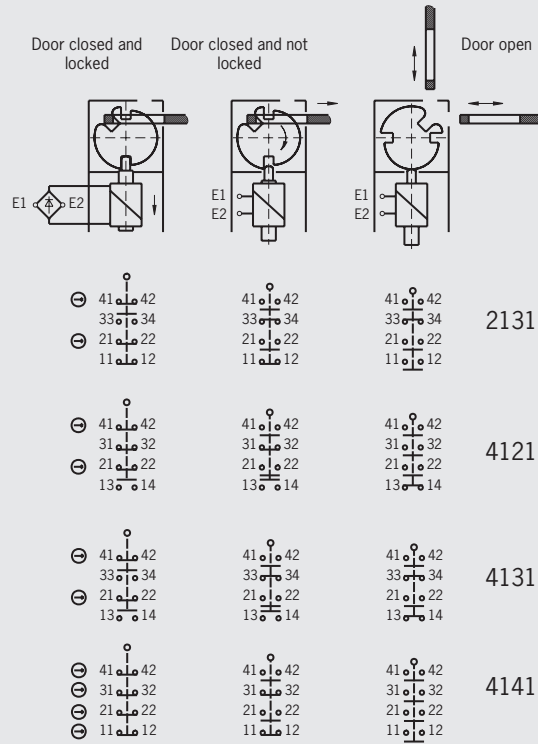
Parameter		Value	Unit
Connection		Plug connector	
Version		18-pin + PE	
Degree of protection according to IEC 60529		IP 65 ¹⁾	
Rated insulation voltage U_i		110	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection acc. to IEC 60269-1 (control circuit fuse)		4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I_e 4 A U_e 110 V	
	DC-13	I_e 4 A U_e 24 V	

1) Screwed tight with the related plug connector (see page 101 - 102)

Switching functions STA1/STA2 without door monitoring contact



Switching functions STA3/STA4
with door monitoring contact



Safety switch STA-TW 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.

Reliability values acc. to EN ISO 13849-1

Parameter	Value	Unit
B10d	4.5 x 10 ⁶ operating cycles	

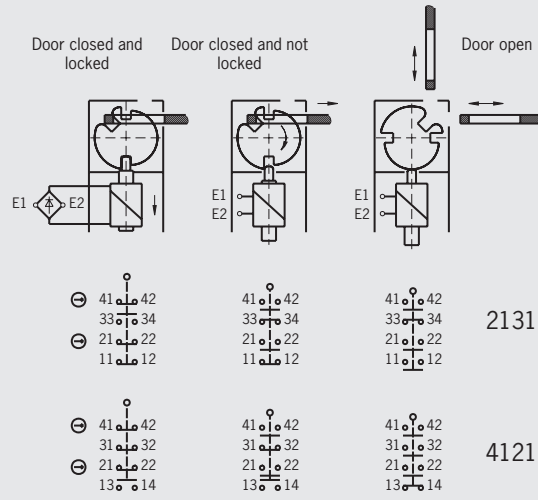
Switch		Value		Unit
Material				
	Housing	Anodized die-cast		
	Actuating head	Die-cast aluminum		
	Cam in actuating head	Stainless steel		
Mechanical life		1 x 10 ⁶ operating cycles		
Ambient temperature		- 20 ... + 55		°C
Weight		Approx. 0.62		kg
Approach speed, max.		20		m/min
Actuating force		35		N
Extraction force (not locked)		30		N
Retention force		20		N
Locking force, max.		Approach direction		
		From top (v)	Side (h)	N
		2500	2500	
Locking force F _{zn} in acc. with GSET-19		Approach direction		
		From top (v)	Side (h)	N
	Straight actuator	2000	2000	
Insertion depth (minimum required travel + permissible overtravel)		Actuator S standard		
Lateral approach direction (h)		24.5 + 5		mm
Approach direction from top (v)		24.5 + 5		mm

Switching element		Value		Unit
Switching principle		Slow-action switching contact		
Switching element with 4 switching contacts		2131 2 NC ⊕ + 1 NO + 1 NC	4121 2 NC ⊕ + 1 NC + 1 NO	
Min. switching current at 24 V DC		1		mA
Switching voltage, min., at 10 mA		12		V
Contact material		Silver alloy, gold flashed		

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

Connection, cable entry M20 x 1.5		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 acc. to IEC 60269-1 (control circuit fuse)		4		A gG
Utilization category according to IEC 60947-5-1		AC-15	I _e 4 A U _e 230 V	
	DC-13	I _e 4 A U _e 24 V		

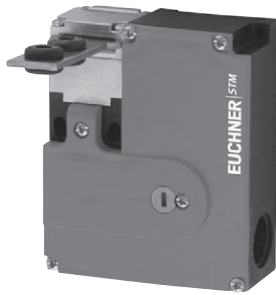
Switching functions STA-TW



2131

4121


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.


Reliability values acc. to EN ISO 13849-1

Parameter	Value	Unit
B10d	2 x 10 ⁶ operating cycles	

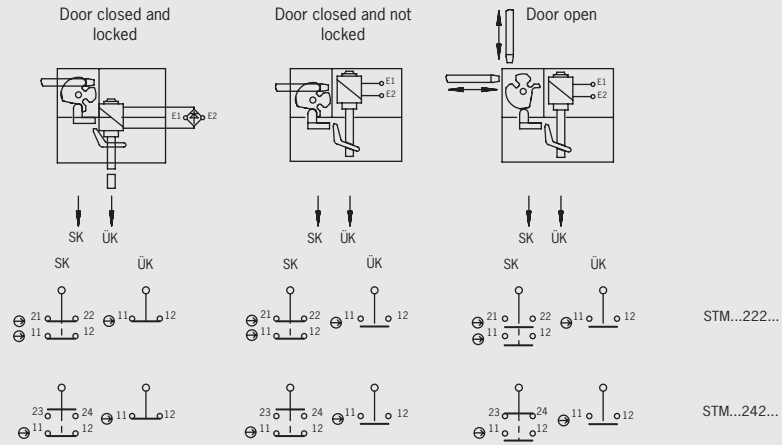
Switch		Value		Unit
				
Parameter		Value		Unit
Housing material		Reinforced thermoplastic		
Mechanical life		2 x 10 ⁶ operating cycles		
Ambient temperature		- 20 ... + 55		°C
Weight		Approx. 0.4		kg
Approach speed, max.		20		m/min
Actuating force		35		N
Extraction force (not locked)		30		N
Retention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

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

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

Connection, cable entry M20 x 1.5		Value		Unit
				
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 acc. to IEC 60269-1 (control circuit fuse)		4		A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V		
	DC-13	I _e 4 A U _e 24 V		

Switching functions STM



Safety switch TK... with guard locking (without failsafe locking mechanism)



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

Reliability values acc. to EN ISO 13849-1

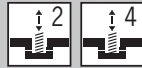
Parameter	Value	Unit
B10d	2 x 10 ⁶ operating cycles	

Switch



Parameter	Value	Unit
Material	Housing	Reinforced thermoplastic
	Actuating head	Metal
	Cam in actuating head	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 contact	
Switching element with 2 switching contacts	528 1 NC ⊖ + 1 NO	
Switching element with 4 switching contacts	4131 2 NC ⊖ + 2 NO	
Min. switching current 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	100	%
Power consumption	8	W

Connection, cable entry M20 x 1.5

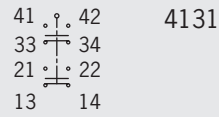
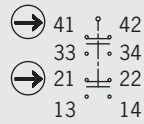
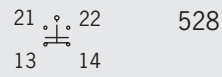
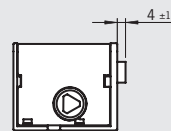
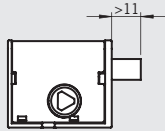


Parameter	Value	Unit
Connection	Screw terminal	
Version	M20 x 1.5	
Conductor cross-section	0.34 ... 1.5	mm ²
Degree of protection according to IEC 60529	IP 67	
Rated insulation voltage U _i	250	V AC/DC
Rated impulse withstand voltage U _{imp}	2.5	kV
Conventional thermal current I _{th}	4	A
Short circuit protection acc. to IEC 60269-1 (control circuit fuse)	4	A gG
Utilization category according to IEC 60947-5-1	AC-15	I _e 4 A U _e 230 V
	DC-13	I _e 4 A U _e 24 V

Switching functions TK

Locked

Not locked



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	4	
Nominal voltage max.	30	V AC/DC
Degree of protection according to IEC 60529 (inserted)	IP 68	
Connection	4 open cable ends	

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

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 strands	
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.



Notes on installation

Safety switches with safety function

- ▶ To obtain the direct opening travel, 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	Safety of machinery. Basic concepts, general principles for design. Part 1: Basic terminology, methodology
(EN 292-2) withdrawn	ISO 12100-2	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles
EN 1050	ISO/DIS 14121	Safety of machinery. Principles for risk assessment
Type B standards		
EN 294		Safety of machinery. Safety distances to prevent danger zones being reached by the upper limbs
EN 418		Safety of machinery. Emergency stop equipment, functional aspects. Principles for design
EN 547-1		Safety of machinery. Human body measurements. Part 1: Principles for determining the dimensions required for openings for whole body access into machinery
EN 574		Safety of machinery. Two-hand control 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		Sicherheit von Maschinen – Sicherheitsbezogene Teile von Steuerungen – Leitfaden für Benutzung und Anwendung der EN 954-1 (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-R3-2000	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.

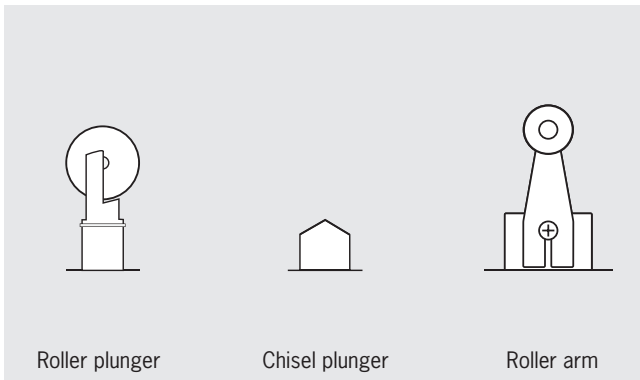
Actuation (electrical / mechanical)

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.



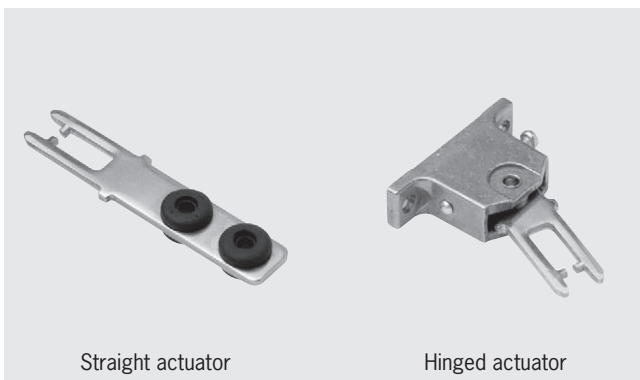
Roller plunger

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

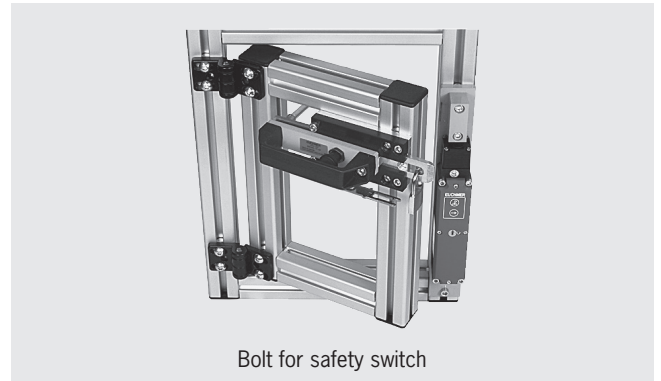
Speed at which a position switch can be mechanically actuated. The permitted approach speed is dependent on the shape and material of the *actuating element* and the approach angle. The higher the approach speed, the shallower the approach angle that should be chosen.

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 actuating head of the *safety switch*. 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 bracket 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 ISO 13849-1 (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 guard locking solenoid is supplied with power. Unlocking is by solenoid force. The term *mechanical guard locking*.

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

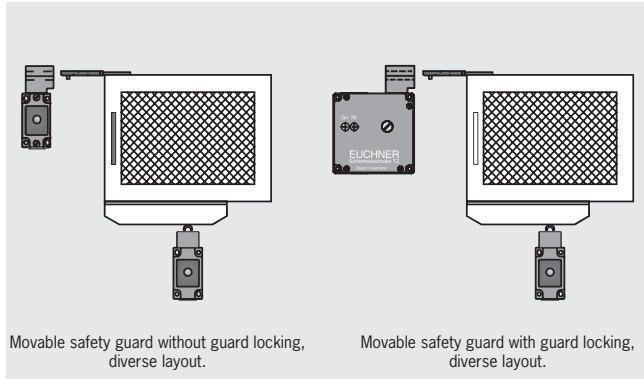
- ▶ Either be present continuously on the correct use of the machine (movement of hazardous moving parts, arcs during welding, etc.)
- ▶ Or can occur unexpectedly (unintentional, unexpected starting, etc.).

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.



Electrical guard locking

Guard locking based *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

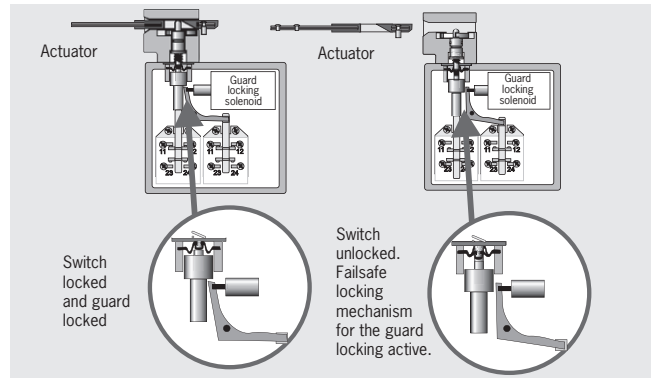
The escape release must make it possible to unlock the safety guard from within the *danger area* without the use of tools. The device must be manually operated and must positively act on the *locking mechanism*. Actuation must result in permanent disabling of the *guard locking*.

Extraction force

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

Failsafe locking mechanism

The failsafe locking mechanism on an interlock device with *guard locking* mechanically prevents the *safety switches* changing to the locked position with the *safety guard* open and therefore signaling a safe state.

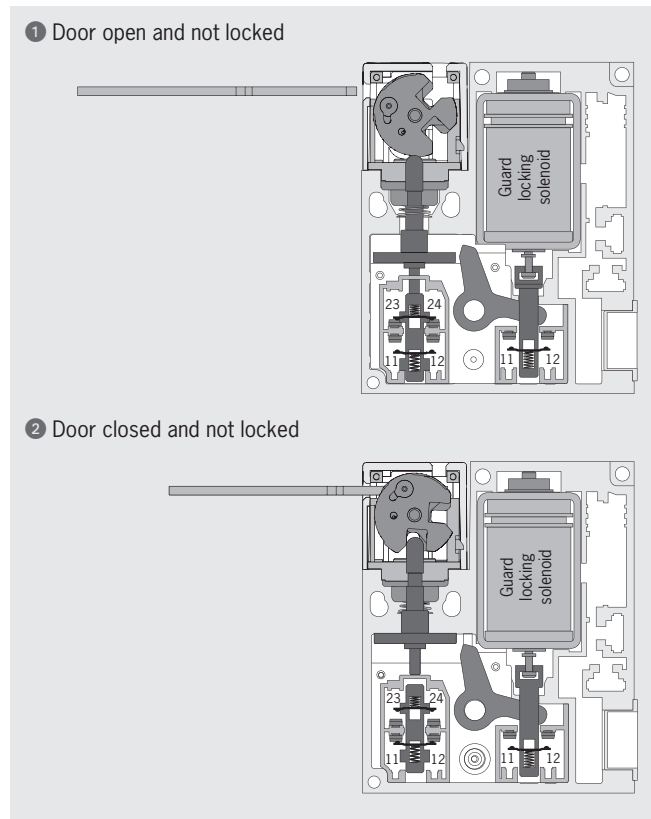


Guard locking

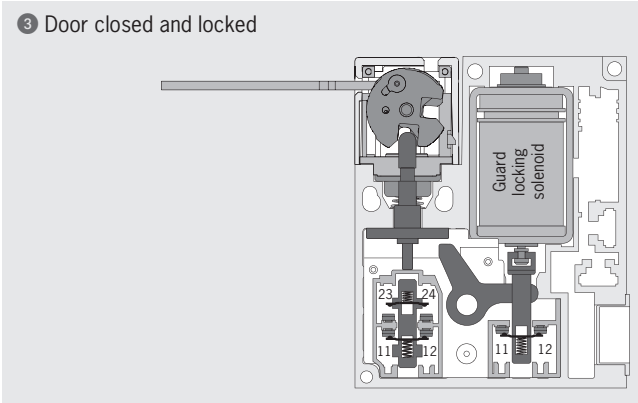
The guard locking retains a movable safety guard in the closed position until the machine can no longer pose any risk of injury. With the guard locking open, unintentional starting of the machine is prevented.

Guard lock monitoring

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



3 Door closed and locked

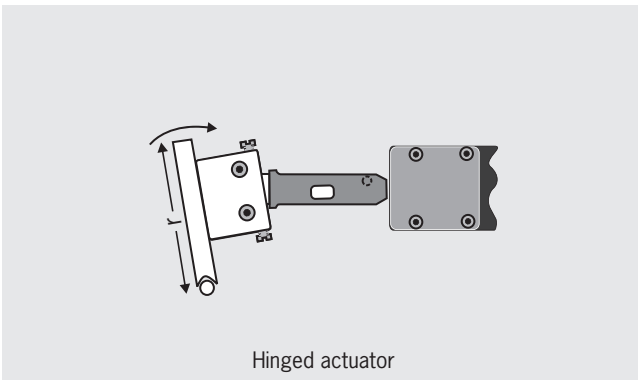


Hazardous states

Are states that could result in injury. *safety switches prevent, on the correct use of the *safety guard 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 actuating head without problems even with small door radii. With larger radii, a straight actuator can be used.



Interlocking, interlocking device

According to EN 1088 an interlock 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 *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 *closed-circuit current principle.

Mechanical release

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



Mounting safety switches and actuators

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

Movable safety guard

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

Open-circuit current principle

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

Operating modes

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

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

PDF

The abbreviation PDF can have several meanings in safety engineering:

1 Probability of Dangerous Failure

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

2 Proximity Devices with defined behaviour under Fault conditions

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

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 switches

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 contacts with this switching characteristic are termed positively driven contacts. These NC contacts are drawn with the symbol shown below. Also switches must meet the requirements of EN 60947-5-1 annex K.

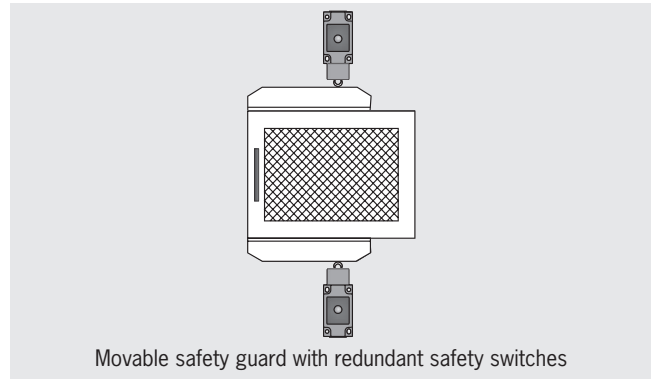


Symbol for a positively driven contact

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 ISO 13849-1), both the mechanism (two position switches) and the electronics should be of dual-channel layout. By means of *diversity the safety of a redundant system is further increased.



Movable safety guard with redundant safety switches

Retention force

The retention force is the maximum force, with the *safety switch in the locked state, that is may be applied to the *actuator so that the guard locking can still 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 the 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 relay

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



Safety relay ESM

Safety switch

A safety switch is part of a safety chain. It provides a safe signal in the input circuit. On opening the *safety guard a stop signal is generated. 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 contact 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 position of the *actuator*. The movement of the switching contact 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.

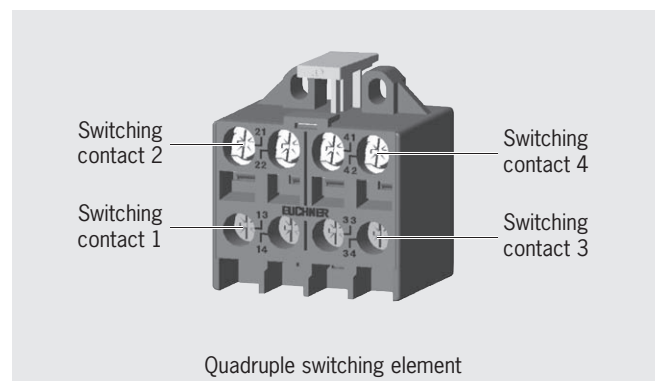
Stop category 0 means that the machine is shutdown by the immediate shutdown of the power.

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 or four switching elements for the various switch types. Switching elements can be designed as a *slow-action contact element* and as a *snap-action contact element*.



Tampering

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

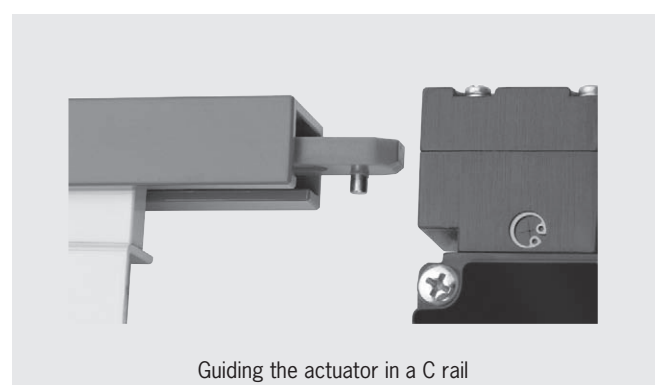
- ▶ Screwdriver
- ▶ Ball-point pens
- ▶ Nails
- ▶ Pieces of wire
- ▶ Adhesive tape
- ▶ etc.

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 usage of a second *actuator*
- ▶ The bridging of the contacts

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

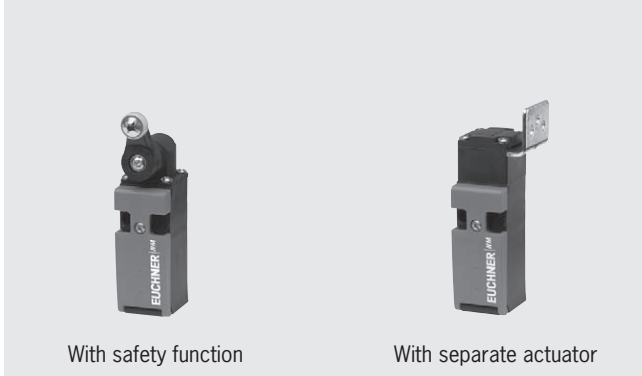


Testing

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

With safety function and with separate actuator (switches)

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



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