EN

Safety Switches with Plastic Housing

EUCHNER
More than safety.

EUCHNER

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

made in Germany

Contents

Safety Switches with Plastic Housing

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

With safety function	With separate actuator									TK	Acces-sories
NM	Without guard locking					With guard locking and guard lock monitoring					
	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

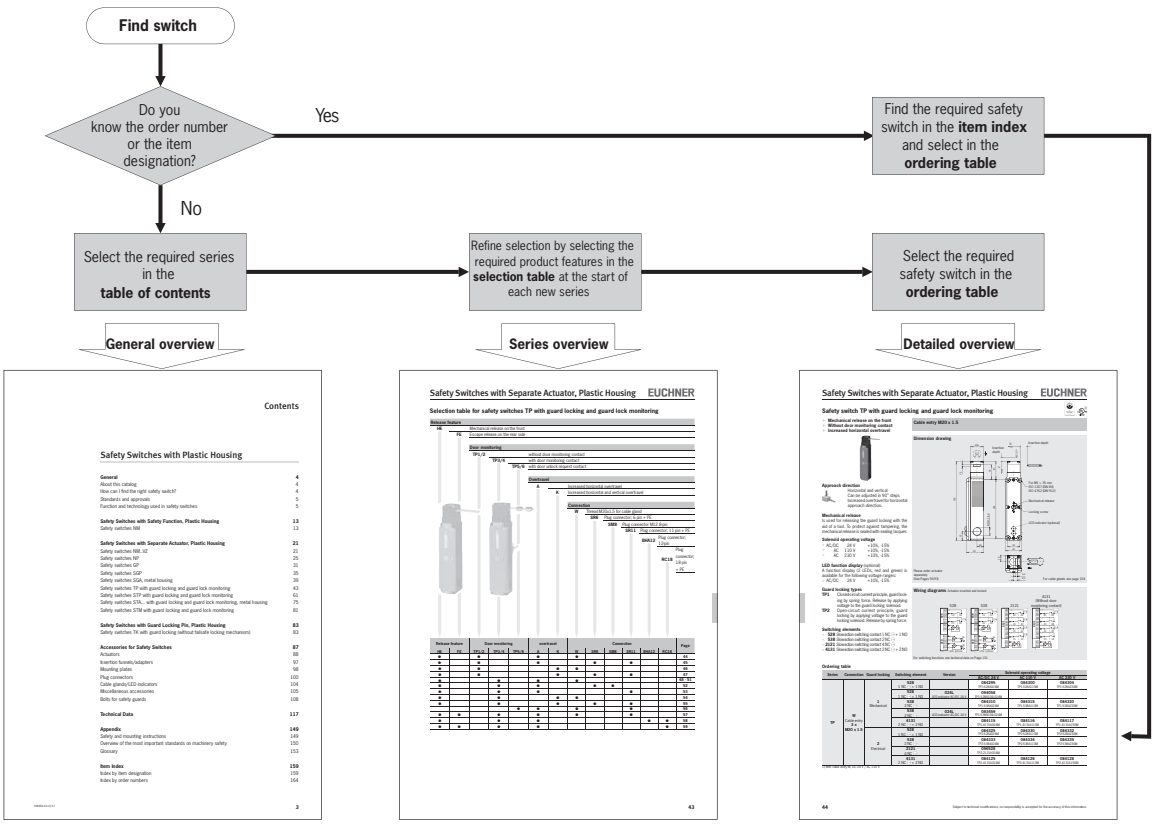
1) Switch interchangeable with the SGP; in metal housing

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:

DGUV Test ET Sicherheit geprüft tested safety	Switches with this symbol have the approval of the German Social Accident Insurance association (DGUV) – formerly the employers' liability insurance association (BG)
c UL us LISTED	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.

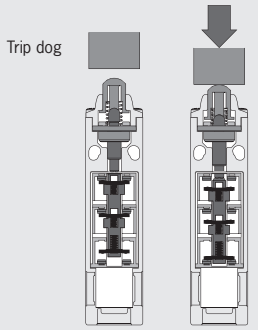
With safety function

With separate actuator

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

Safety switches with safety function

Safety switches with safety function are safety switches in which the actuating element and the switch are fitted in one housing. The actuating elements are available in various versions (e.g. in the form of a plunger or a lever arm).
To actuate a switch with safety function, trip dogs or cams are often used. The switch must be attached such that the switch is actuated if the safety guard is opened. The positively driven contact in the switching element is opened and the machine is shut down. A built-in spring in the switch returns the switch to the free position when the safety guard is closed and the positively driven contact is closed. In this way the safety circuit is enabled again.
A trip dog with a defined slope should be used to approach the switch. EUCHNER has various trip dogs in its range.



Safety switch with separate actuator with domed plunger

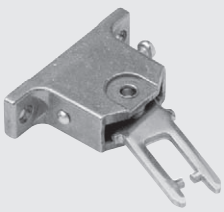
Safety switches with separate actuator

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

Straight actuator



Hinged actuator

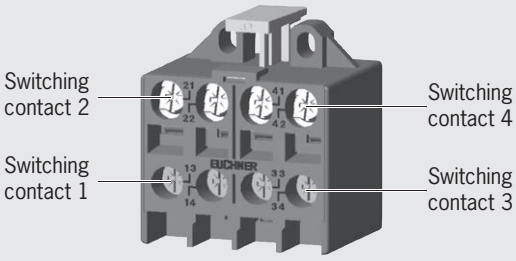
The positively driven contact in the switching element is closed by inserting the actuating element in the switch head. The positively driven contact is reliably opened by the positive application of force when the actuating element is removed – even if the contacts are welded together. In the open state, the machinery or systems are then safely interlocked against starting.
Straight actuators and hinged actuators are available for a wide range of applications in which hinged and sliding doors are used. Hinged actuators are spring-mounted actuators that adjust to the inner contours of the switch on insertion in the actuating head. They are suitable for small hinged doors with a radius from 90 mm. For sliding doors and hinged doors with an adequately large pivoting radius, a straight actuator can be used.

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

Switching elements

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

- 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



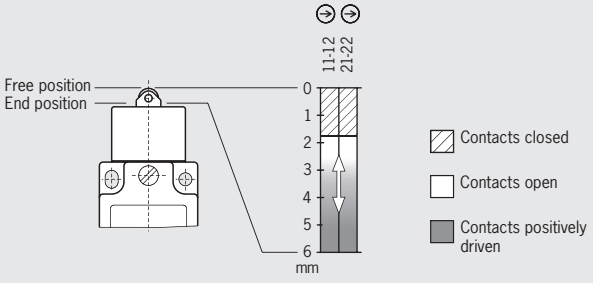
4 contact switching element

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

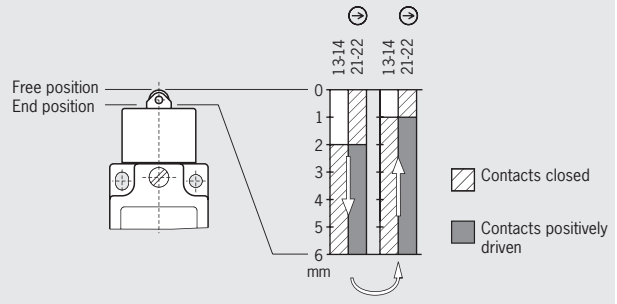
Slow-action switching elements are mostly used in safety switches. The opening of the switching element is directly dependent on the position of the actuator. The further the actuator is moved, the further the switching element is opened. The actuator travel is therefore directly proportional to the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



Travel diagram,
Slow-action switching element

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.

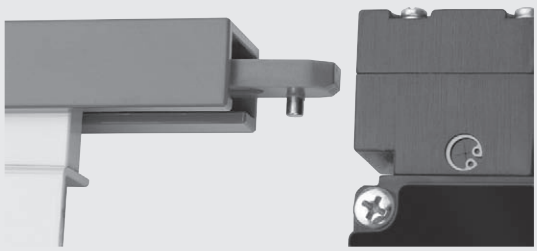
Auxiliary contacts

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

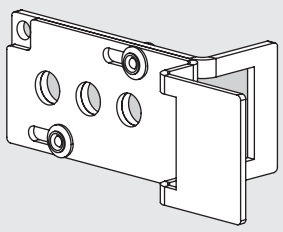
A safety switch can only ensure that operation is free of hazards if it is not bypassed. To prevent tampering on switches with separate actuator, the actuator must be positively mounted on the safety guard. All actuating elements are supplied with safety screws that can be fastened using commonly available 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.

Safety switch
TP

Safety switch
STM

Protection of personnel

Guard locking is required if a hazard cannot be removed immediately by shutting down a machine (e.g. a movement with overtravel). In this case fail-safe control of the 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

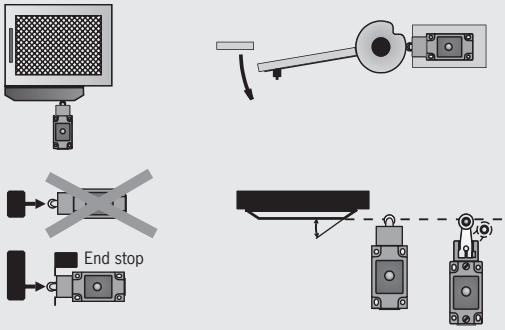
Often a safety guard is only to be locked to prevent interruption to the process due to unintentional opening of the safety guard. In this case the position of the guard locking solenoid does not need to be integrated in the safety circuit.

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).



Attaching safety switches and actuators

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

Changing the approach direction

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

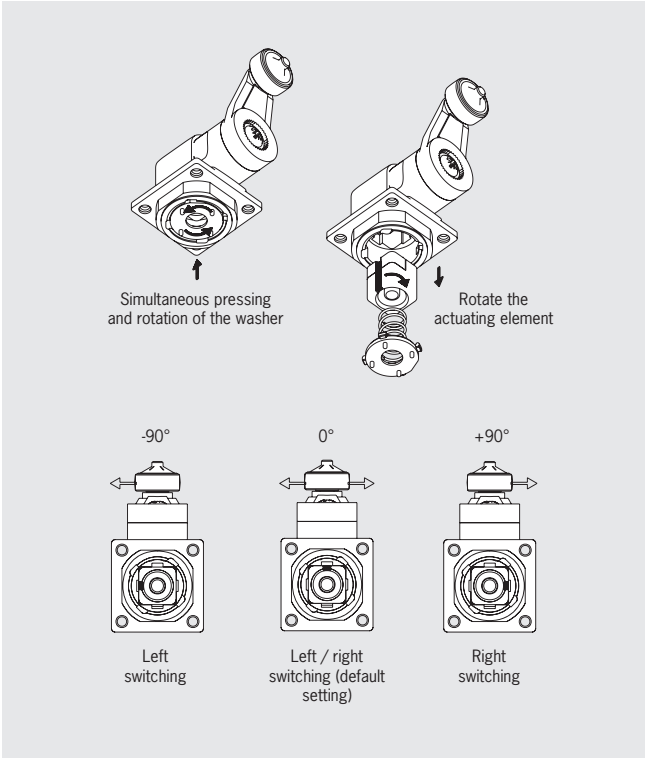
Changing the approach direction
safety switch NM

Changing the approach direction
safety switch TP

After undoing the four 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

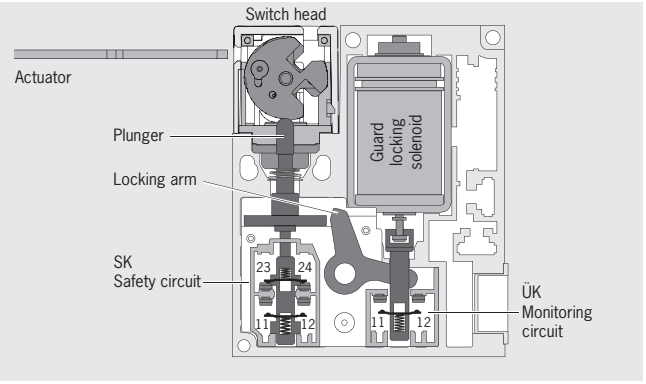
The locking arm ensures that the switch is guard locked by the solenoid. It acts directly on the switching element ÜK; the positively driven contact can only be closed in the locked state (see *Failsafe locking mechanism*, page 11).

- 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.

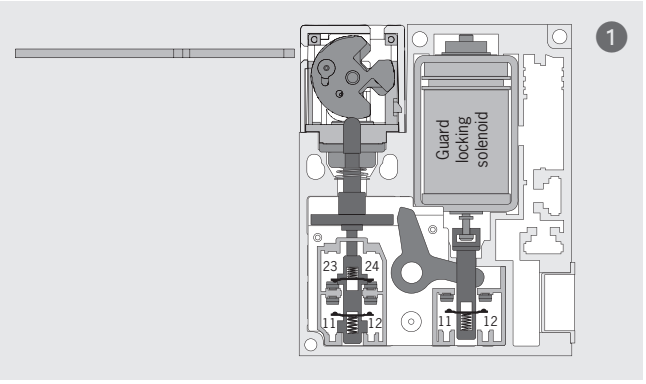


Principle of operation of STM

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

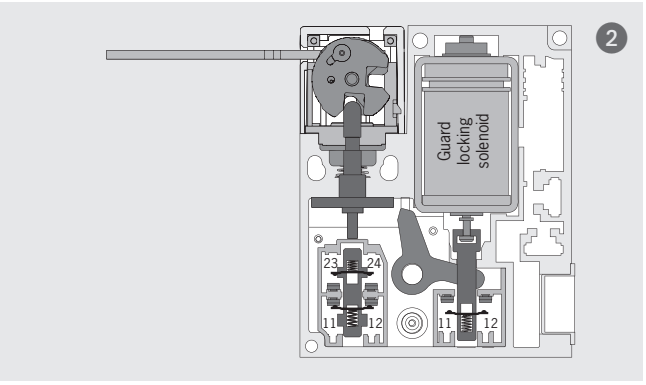
1 Door open and not locked

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).



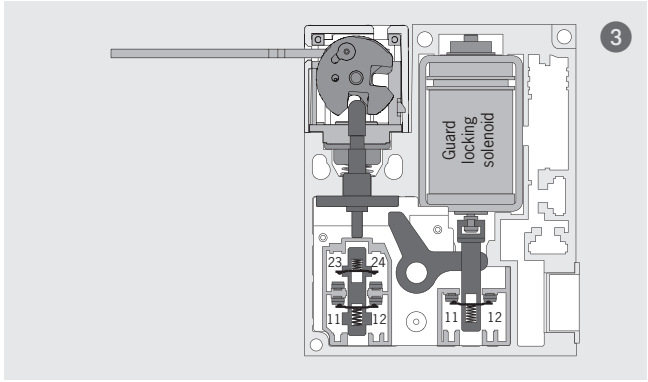
2 Door closed and not locked

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.

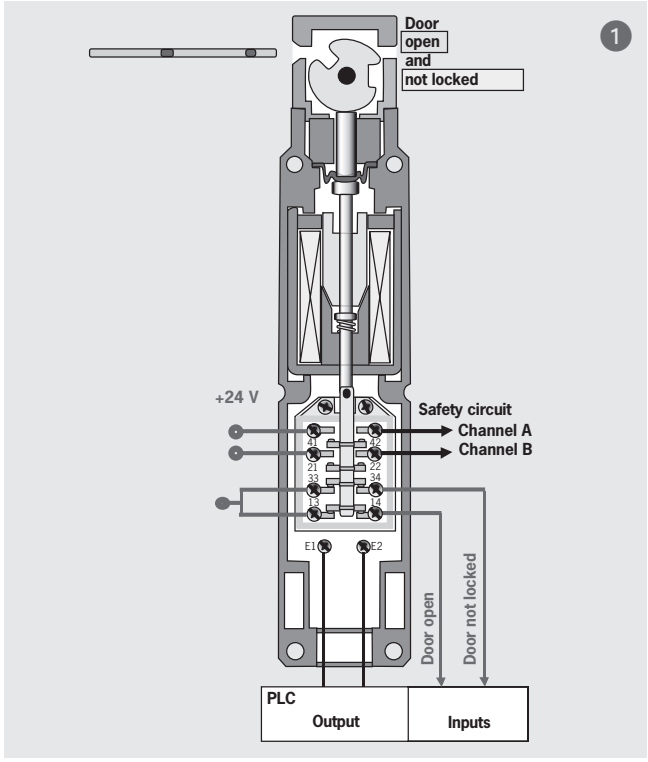


Principle of operation of TP/STA/STP

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

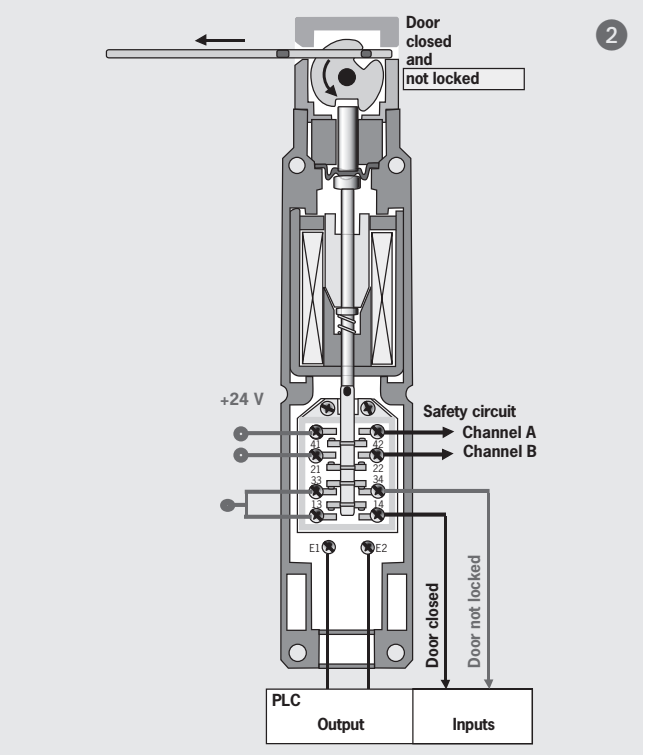
1 Door open and not locked

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).



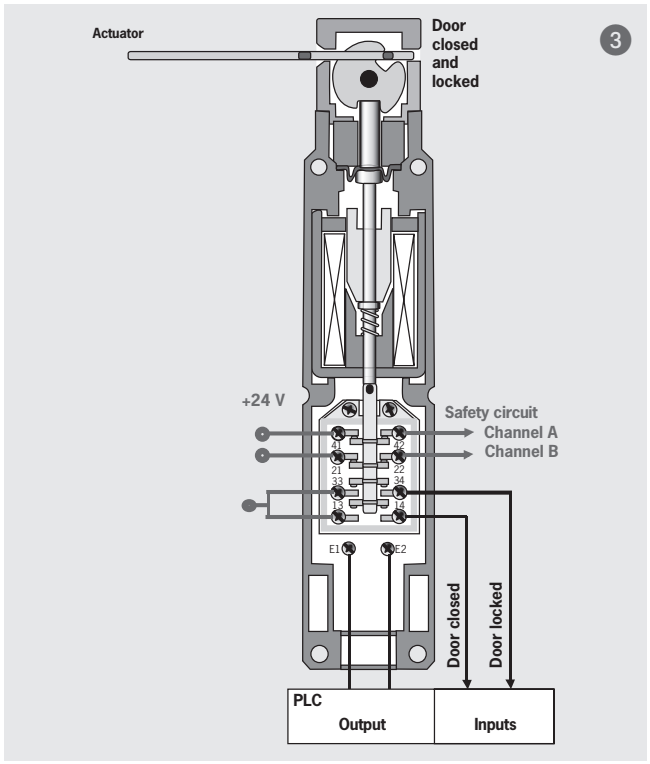
2 Door closed and not locked

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.

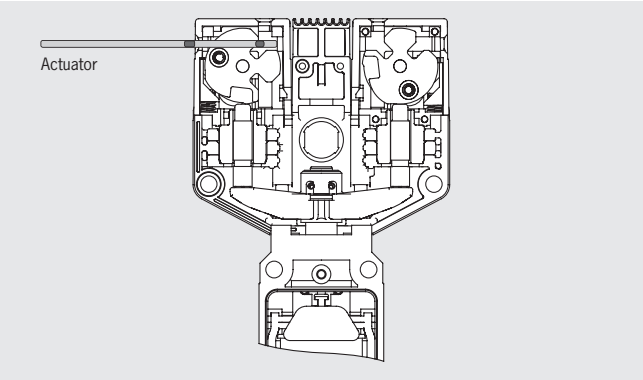
In other words, there is no chance of getting locked in.

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.

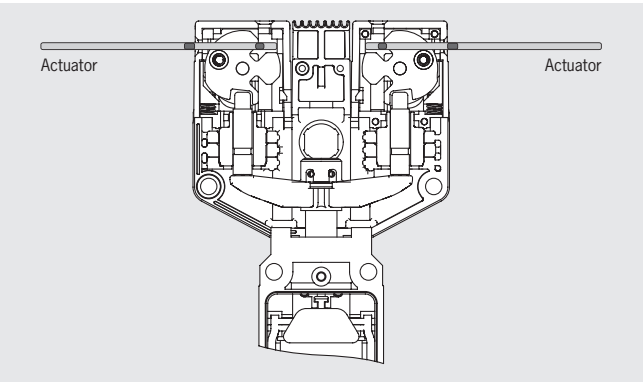
The sectional drawings show the function of the *Twin* version:

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

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

Connection

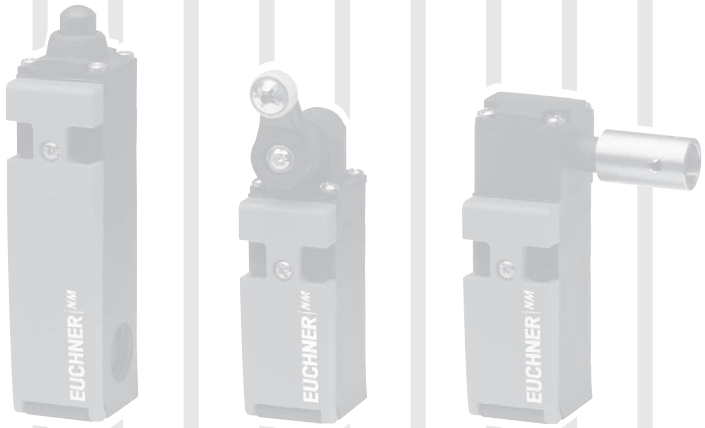
M	Thread M16x1.5 for cable glands
SM4	Plug connector M12 4-pin

Housing

Short	
Long	

Switching element

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



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

Safety switch NM..WO with domed plunger

Approach direction

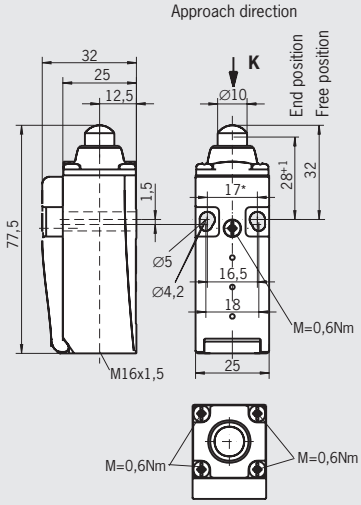
Vertical

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 ⊖

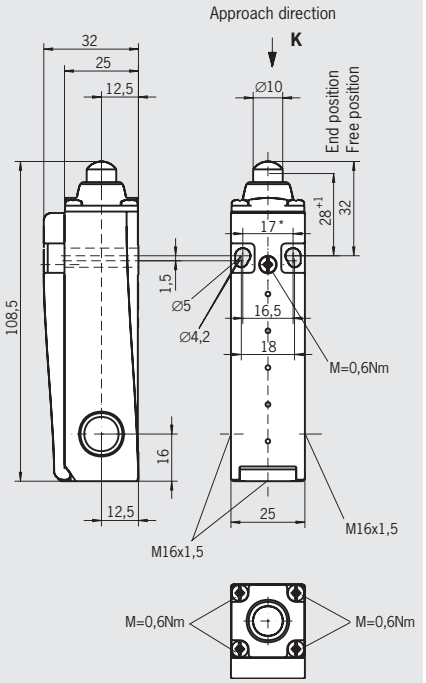
Cable entry M16 x 1.5
Short housing

Dimension drawing



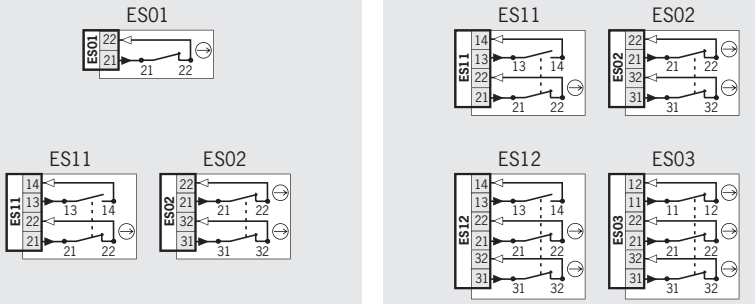
For cable glands see page 104

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

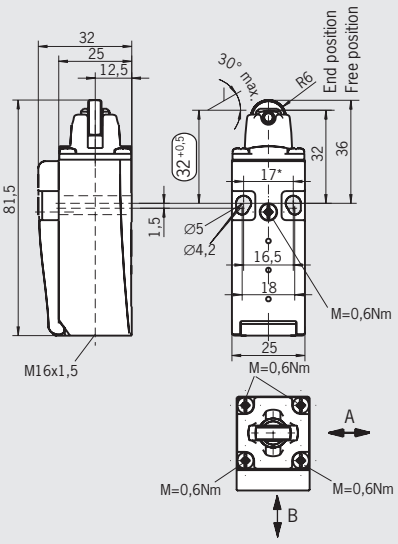
Horizontal
Adjustable in 90° steps.

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 ⊖

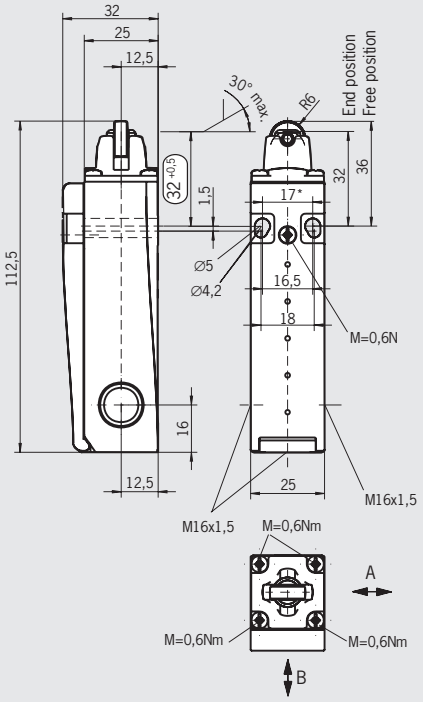
Cable entry M16 x 1.5
Short housing

Dimension drawing



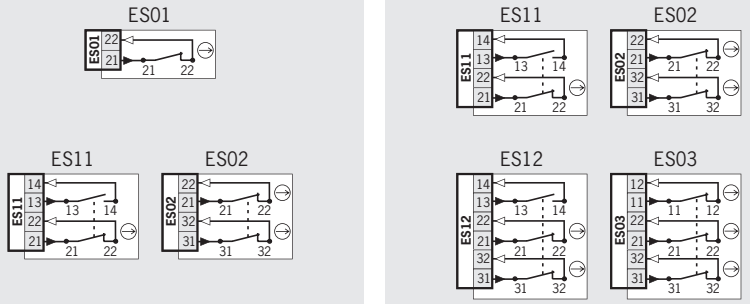
For cable glands see page 104

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

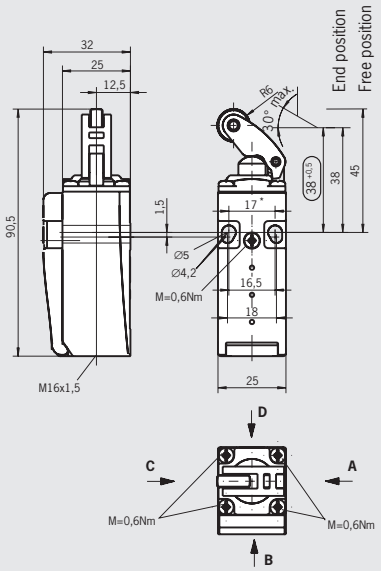
Horizontal
Adjustable in 90° steps.

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 ⊖

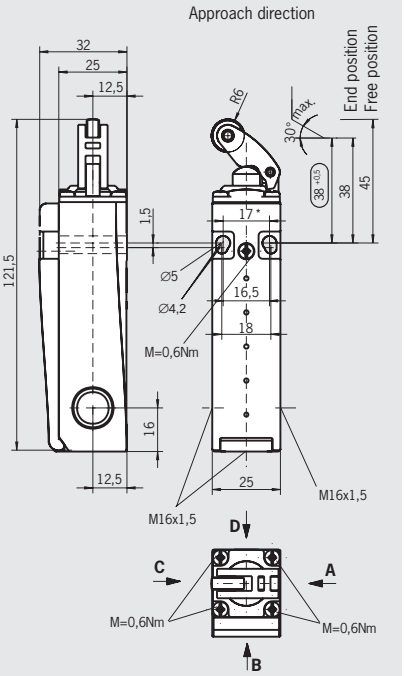
Cable entry M16 x 1.5
Short housing

Dimension drawing



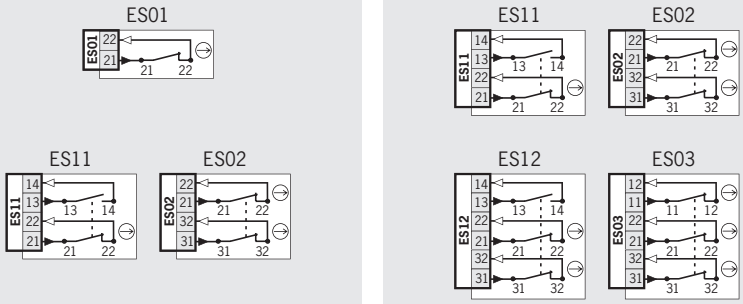
For cable glands see page 104

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**	**Short**	**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**	**Long**	**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

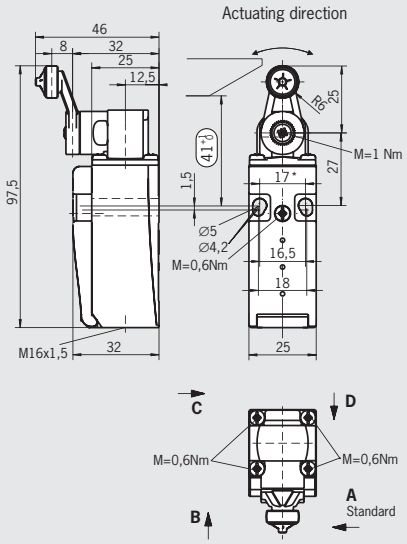
Horizontal
Adjustable in 90° steps.

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 ⊖

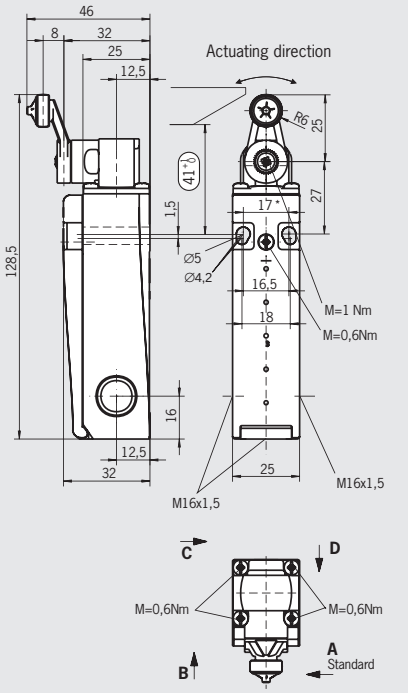
Cable entry M16 x 1.5
Short housing

Dimension drawing



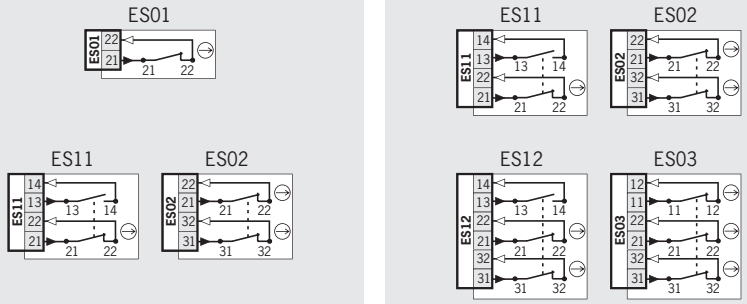
For cable glands see page 104

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**	**Short**	**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**	**Long**	**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

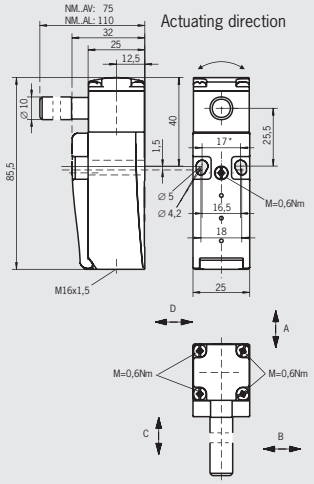
- **Hinged actuator as solid shaft**
- **Shaft length 75 mm or 110 mm**

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 ⊖

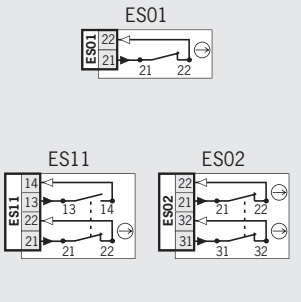
Cable entry M16 x 1.5
Short housing

Dimension drawing

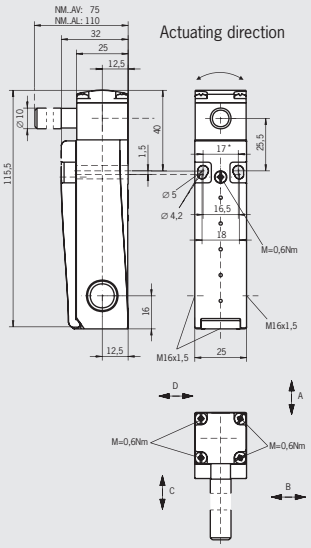


For cable glands see page 104

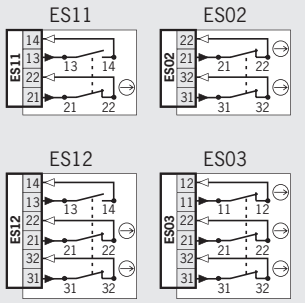
Wiring diagrams Switch not activated



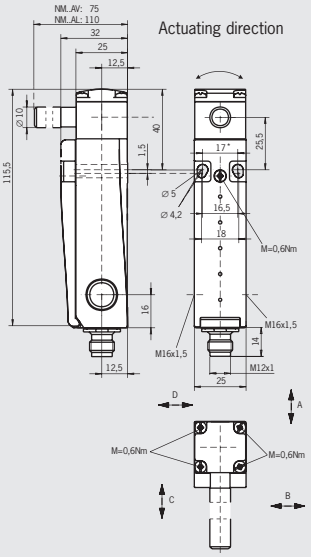
Cable entry M16 x 1.5
Long housing



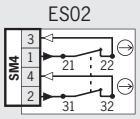
For cable glands see page 104



Plug connector M12
4-pin, long housing



For plug connectors see page 99



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
				03 3 NC ⊖	**084549** NM03AV-M
	AL Hinged axis Solid shaft Length 110 mm	Cable entry **1 x M16 x 1.5**	**Short**	**01** 1 NC ⊖	**079117** NM01AL-M
				11 1 NC ⊖ + 1 NO	**095365** NM11AL-MC2069
				02 2 NC ⊖	**095364** NM02AL-MC2069
		Cable entry **3 x M16 x 1.5**	**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
		Plug connector **M12**	**Long**	**02** 2 NC ⊖	**093246** NM02AL-SM4

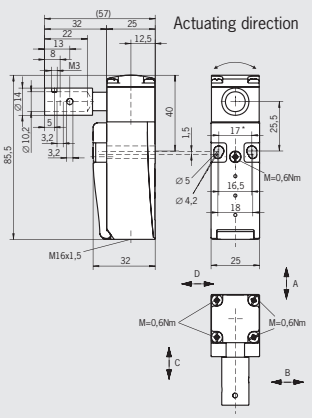
Safety switch NM..AG

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

Switching elements

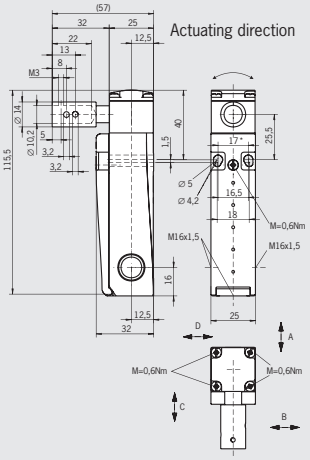
- **ES01** Slow-action switching contact 1 NC ⊖
- **ES11** Slow-action switching contact 1 NC ⊖ + 1 NO
- **ES02** Slow-action switching contact 2 NC ⊖
- **ES12** Slow-action switching contact 2 NC ⊖ + 1 NO
- **ES03** Slow-action switching contact 3 NC ⊖

Cable entry M16 x 1.5
Short housing



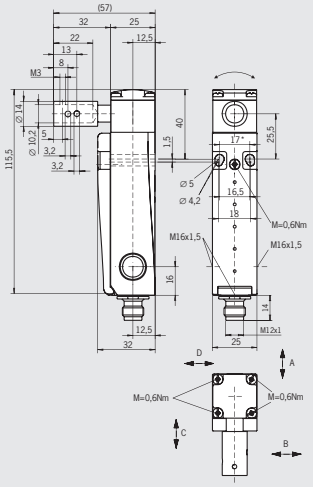
For cable glands see page 104

Cable entry M16 x 1.5
Long housing



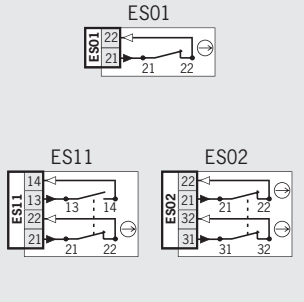
For cable glands see page 104

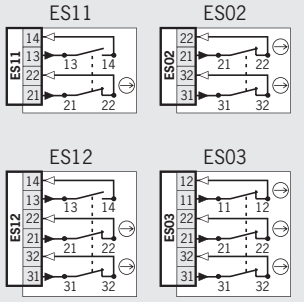
Plug connector M12
4-pin, long housing

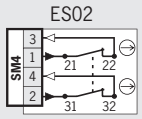


For plug connectors see page 99

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** NM01AG-M
				11 1 NC ⊖ + 1 NO	**095361** NM11AG-MC2069
				02 2 NC ⊖	**095360** NM02AG-MC2069
		Cable entry **3 x M16 x 1.5**	**Long**	**11** 1 NC ⊖ + 1 NO	**084554** NM11AG-M
				02 2 NC ⊖	**084555** NM02AG-M
				12 2 NC ⊖ + 1 NO	**084556** NM12AG-M
				03 3 NC ⊖	**084557** NM03AG-M
		Plug connector **M12**	**Long**	**02** 2 NC ⊖	**084565** NM02AG-SM4

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

Safety switch NM..AK

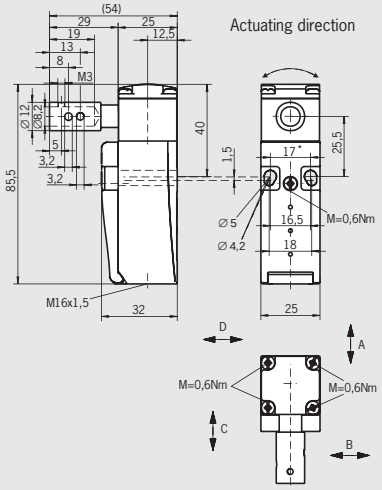
- **Hinged actuator as hollow shaft**
- **Internal diameter 8.2 mm**

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 ⊖

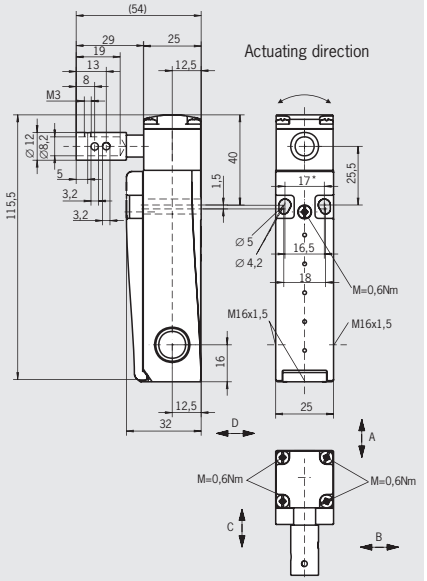
Cable entry M16 x 1.5
Short housing

Dimension drawing



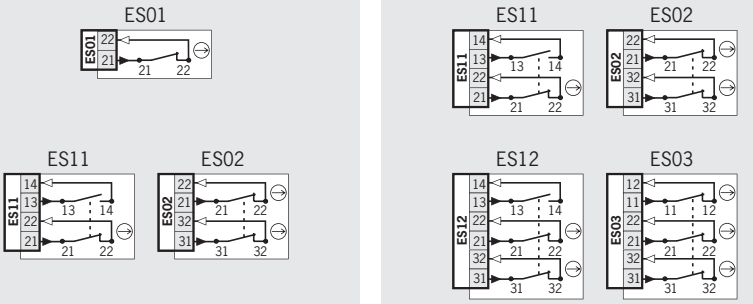
For cable glands see page 104

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

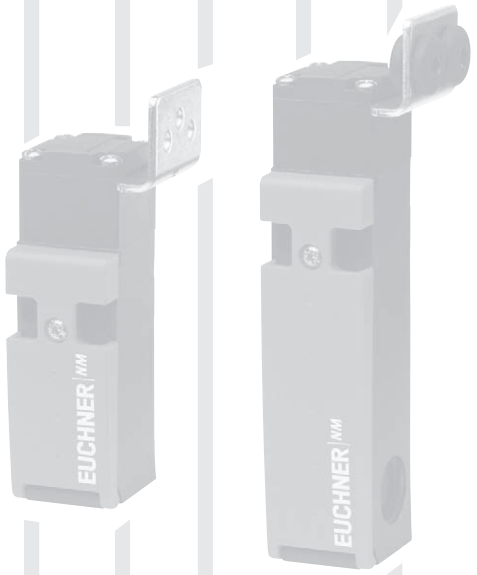
- **M** Thread M16x1.5 for cable glands
- **SM4** Plug connector M12 4-pin

Housing

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

Switching element

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



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

Safety switch NM..VZ

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

Approach direction

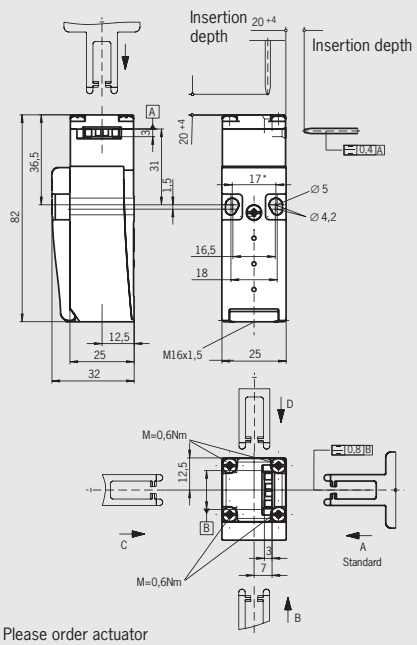
Horizontal and vertical
Can be adjusted in 90° steps

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

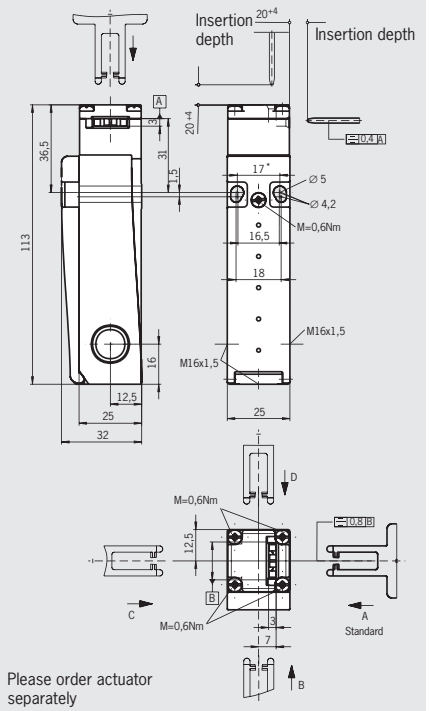
Dimension drawing



Please order actuator separately
(See pages 88-89)

For cable glands see page 104

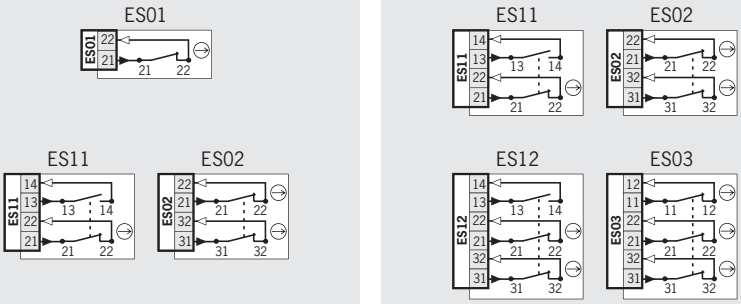
Cable entry M16 x 1.5
Long housing



Please order actuator separately
(See pages 88-89)

For cable glands see page 104

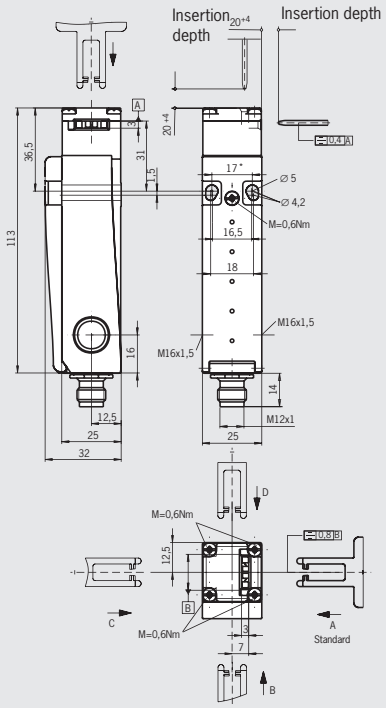
Wiring diagrams Actuator inserted



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

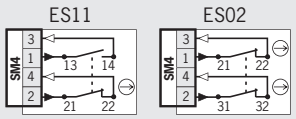
Plug connector M12
4-pin, long housing



Please order actuator separately
(See pages 88-89)

For plug connectors see page 99

Wiring diagrams Actuator inserted



Ordering table

Series	Actuator	Connection	Housing	Switching element	Order no./item
NM	**VZ** Separate actuator	Plug connector **M12**	**Long**	**11** 1 NC ⊖ + 1 NO	**085626** NM11VZA-SM4
				02 2 NC ⊖	**084564** NM02VZA-SM4

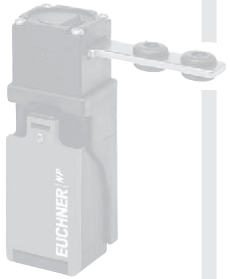
For safety precautions see page 149
For technical data see page 117

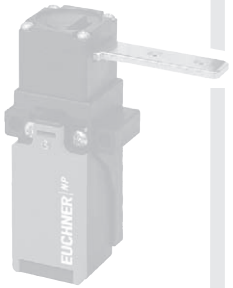
Selection table for safety switches NP

Mounting

AS Mounting to DIN EN 50047

AB Mounting with 40 mm spacing





Connection

M Thread M20 x 1.5 for cable gland

SM Plug connector M12 4-pin

SR6 Plug connector; 6 pin + PE

Switching element

One contact 1 NC ⊖

Two contacts 1 NC ⊖ + 1 NO, 2 NC ⊖

Three contacts 2 NC ⊖ + 1 NO

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

Safety switch NP

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

Approach direction

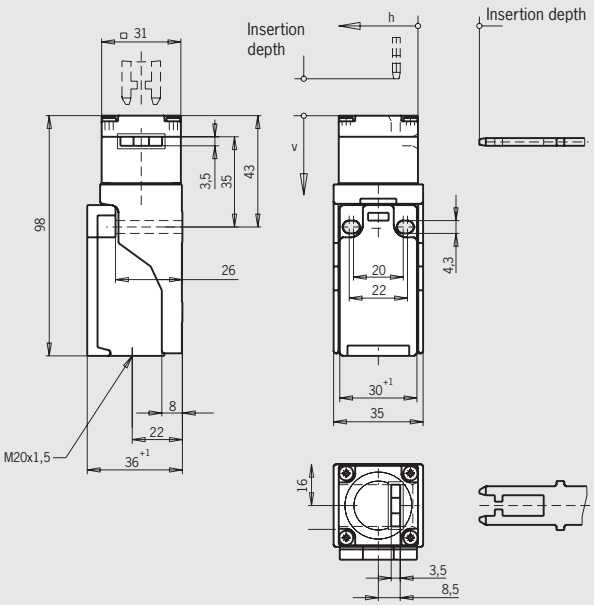
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- **618** Slow-action switching 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

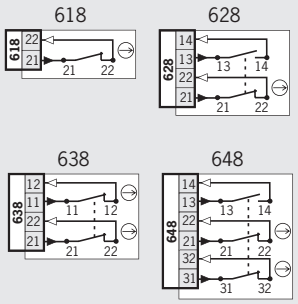
Dimension drawing



Please order actuator separately
(See pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted



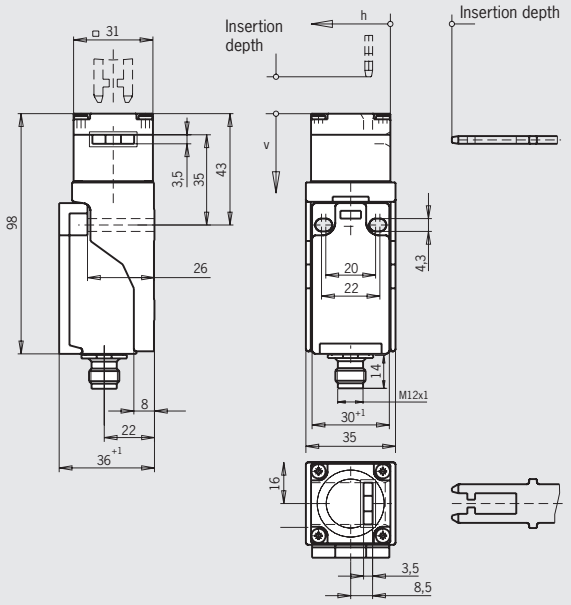
Ordering table

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 cULus Approval

Plug connector SM4
Plug M12, 4-pin

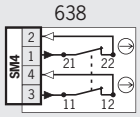
Dimension drawing



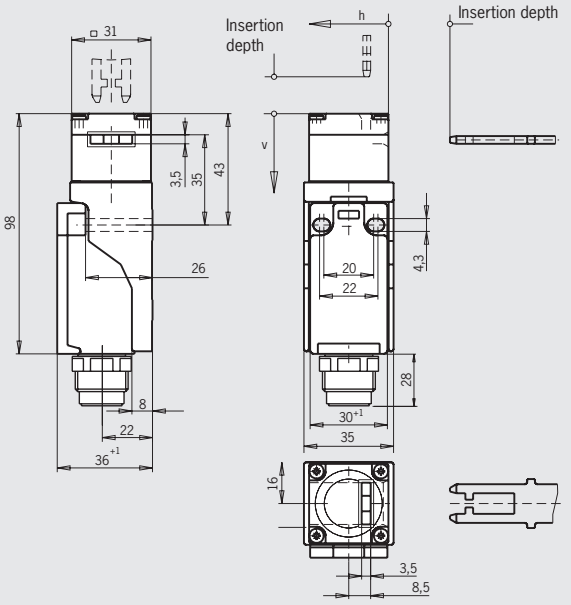
Please order actuator separately
(See pages 90-93)

For plug connectors see page 99

Wiring diagrams Actuator inserted

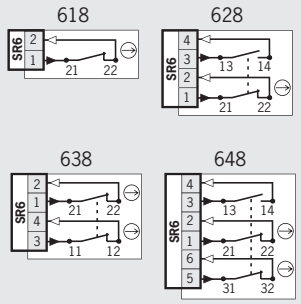


Plug connector SR6
6-pin + PE



Please order actuator separately
(See pages 90-93)

For plug connectors see page 100



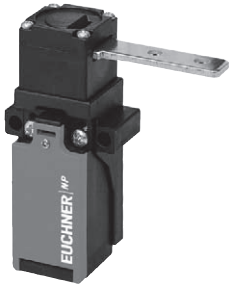
Ordering table

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

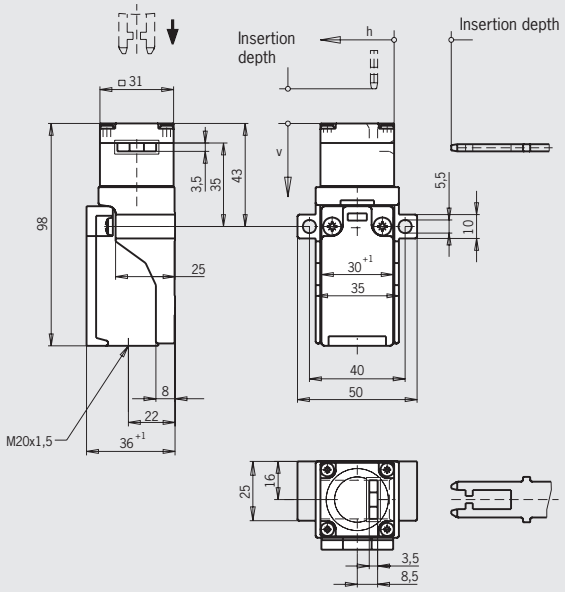
Horizontal and vertical
Can be adjusted in 90° steps

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

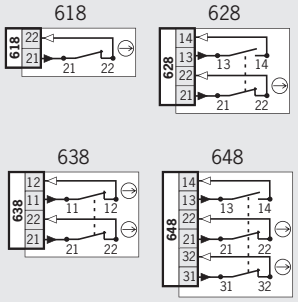
Dimension drawing



Please order actuator separately
(See pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted



Ordering table

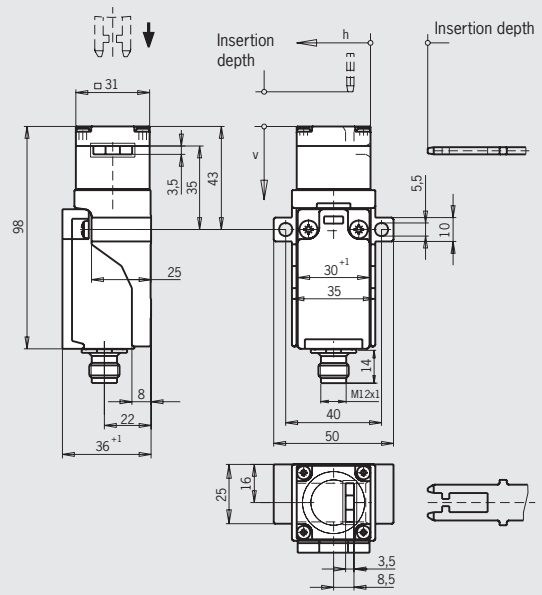
Series	Mounting	Connection	Switching element	Order no./item
NP	**AB** with 40 mm spacing	**1** Cable entry **1 x M20 x 1.5**	**618** 1 NC ⊖	**083680** NP1-618AB-M
			628 1 NC ⊖ + 1 NO	**083686** NP1-628AB-M
			638 2 NC ⊖	**083690** NP1-638AB-M
			648 1) 2 NC ⊖ + 2 NO	**082276** 1) NP1-648AB-M

1) No cULus Approval

Plug connector SM4
Plug M12, 4-pin

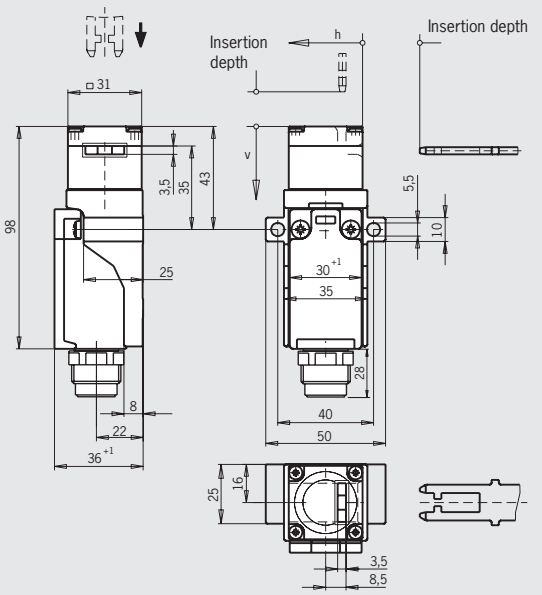
Plug connector SR6
6-pin + PE

Dimension drawing



Please order actuator separately
(See pages 90-93)

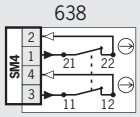
For plug connectors see page 99

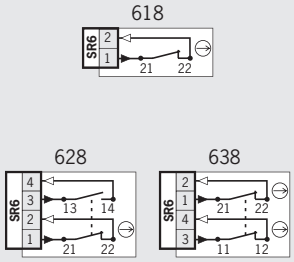


Please order actuator separately
(See pages 90-93)

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 ⇒	**094509** NP3-638AB
		2 Plug connector **SR6**	**618** 1 NC ⇒	**059446** NP2-618AB
			628 1 NC ⇒ + 1 NO	**059448** NP2-628AB
			638 2 NC ⇒	**059450** NP2-638AB

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

Selection table for safety switches GP

Connection		Switching element		
M	Thread M20 x 1.5 for cable gland			
SR11	Plug connector; 11 pin + PE			
		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

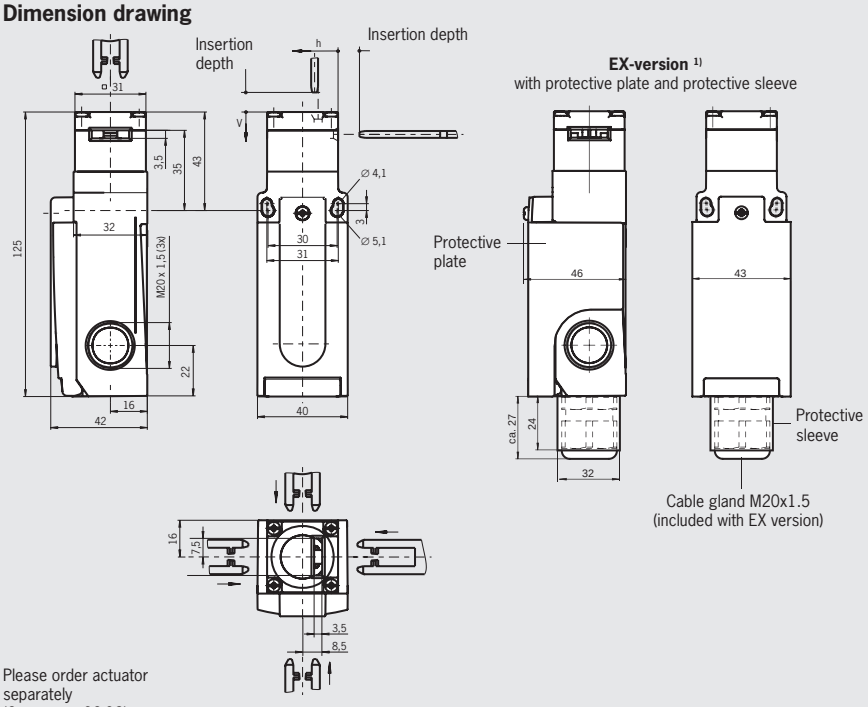
Horizontal and vertical
Can be adjusted in 90° steps

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

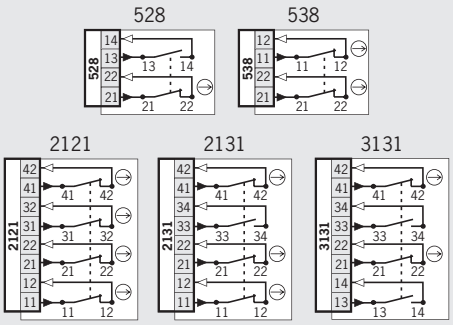
Cable entry M20 x 1.5

Dimension drawing



For cable glands see page 104

Wiring diagrams Actuator inserted



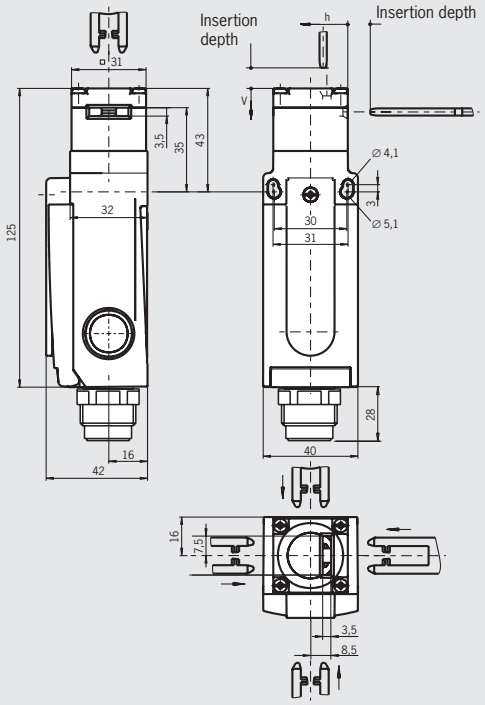
Ordering table

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

Plug connector SR11
11-pin + PE

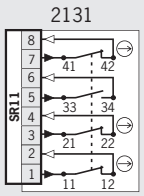
Dimension drawing



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 ⇾ + 1 NO	**096227** GP2-2131ASR11

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

Selection table for safety switches SGP

Version

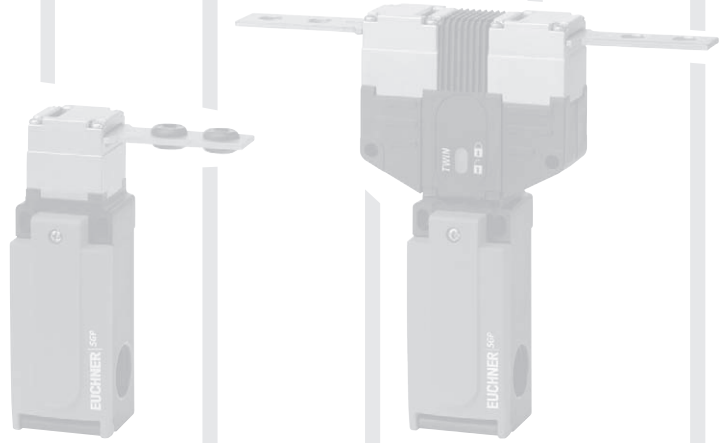
- **Standard** — Mounting to DIN EN 50047
- **TW** — Mounting with 40 mm spacing

Connection

- **M** — Thread M20 x 1.5 for cable gland
- **SR6** — Plug connector SR6; 6-pin + PE
- **SR11** — Plug connector SR11; 11-pin + PE

Switching element

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



Version		Connection			Switching element		Page
Standard	TW	M	SR6	SR11	Two contacts	Four contacts	
●		●				●	36
●			●	●	●	●	37
	●	●				●	38

Safety switch SGP

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

Approach direction

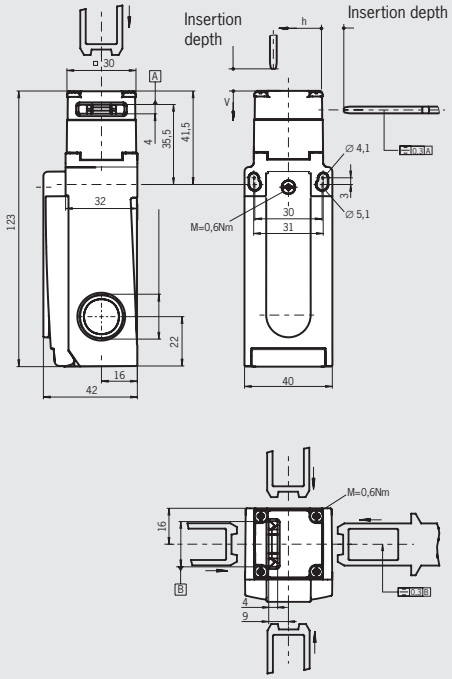
Horizontal and vertical
Can be adjusted in 90° steps

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

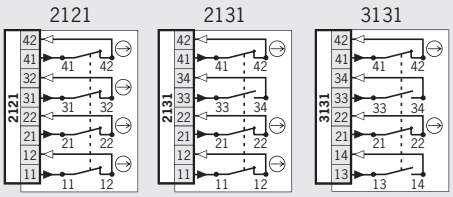
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted

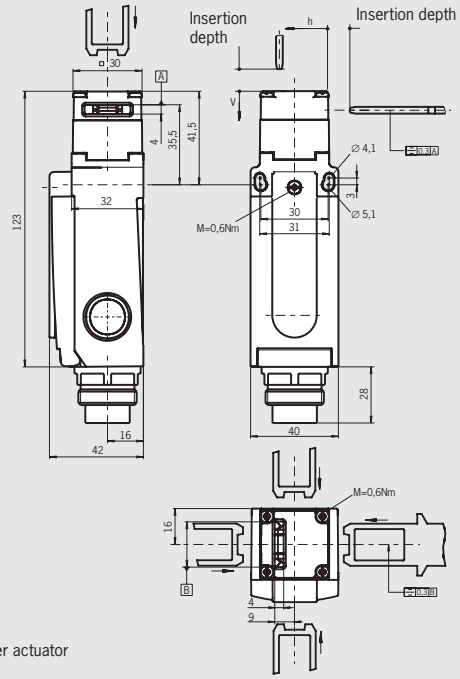


Ordering table

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

Plug connector SR6
6-pin + PE

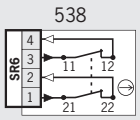
Dimension drawing



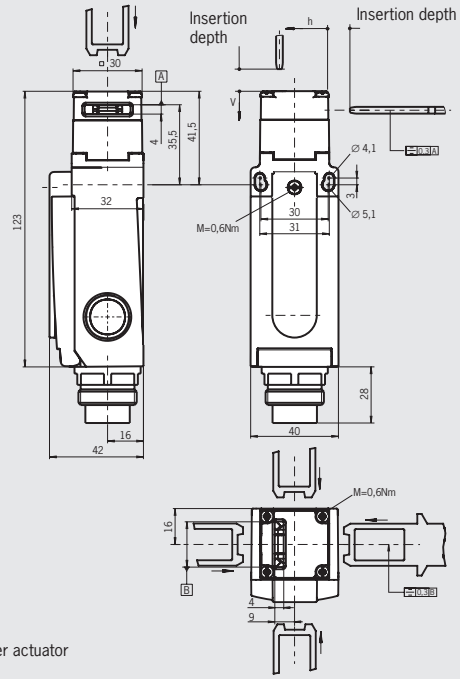
Please order actuator separately
(See pages 94-96)

For plug connectors see page 100

Wiring diagrams Actuator inserted

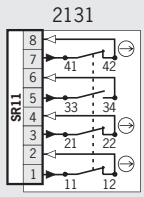


Plug connector SR11
11-pin + PE



Please order actuator separately
(See pages 94-96)

For plug connectors see page 100



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 switch SGP-TW

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

Approach direction

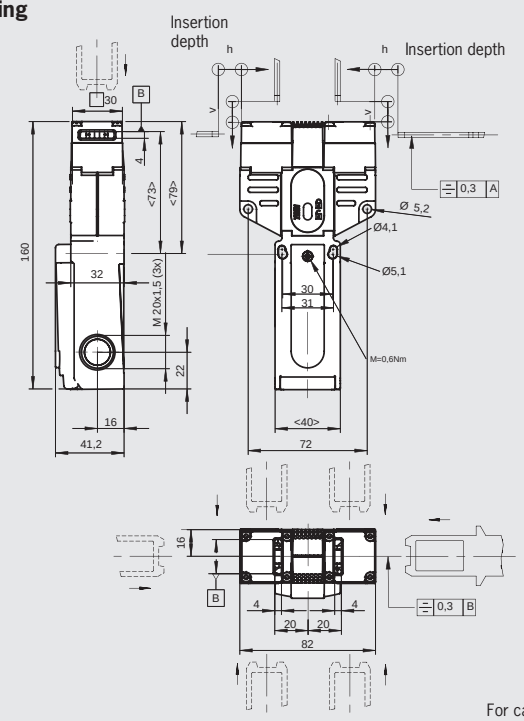
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- **2131** Slow-action switching contact
  3 NC ⊖ + 1 NO

Cable entry M20 x 1.5

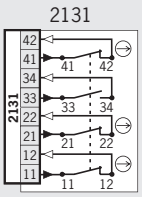
Dimension drawing



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 ⊖ + 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	Connection M	Connection SR11	Connection RC18	Switching element Two contacts	Switching element Four contacts	Page
●	●				●	40
●		●			●	41
●			●		●	42

Safety switch SGA

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

Approach direction

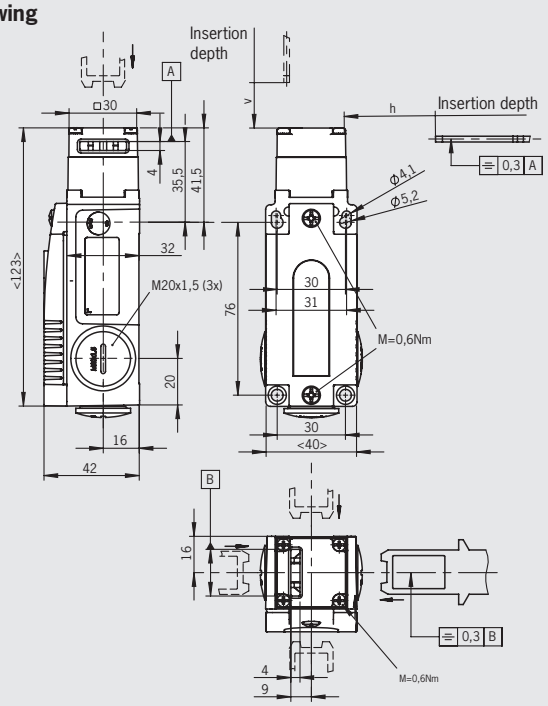
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

- **2121** Slow-action switching contact 4 NC ⊖
- **2131** Slow-action switching contact 3 NC ⊖ + 1 NO

Cable entry M20 x 1.5

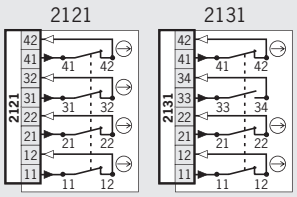
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted

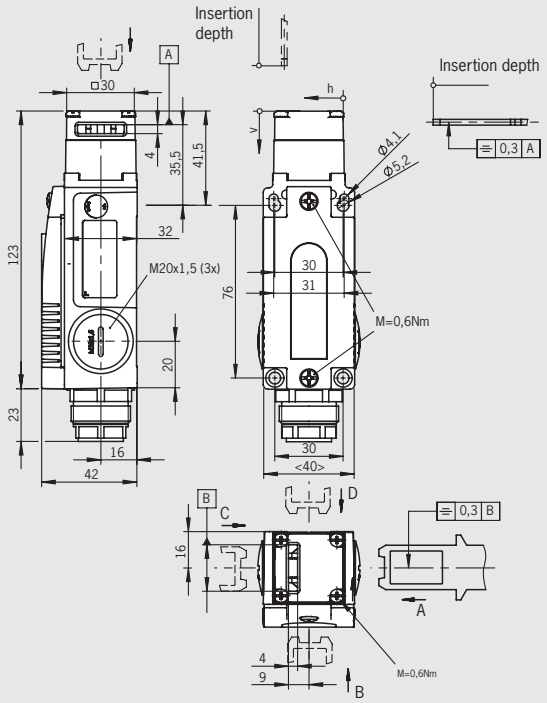


Ordering table

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

Plug connector SR11
11-pin + PE

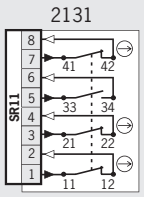
Dimension drawing



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 ⊖ + 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

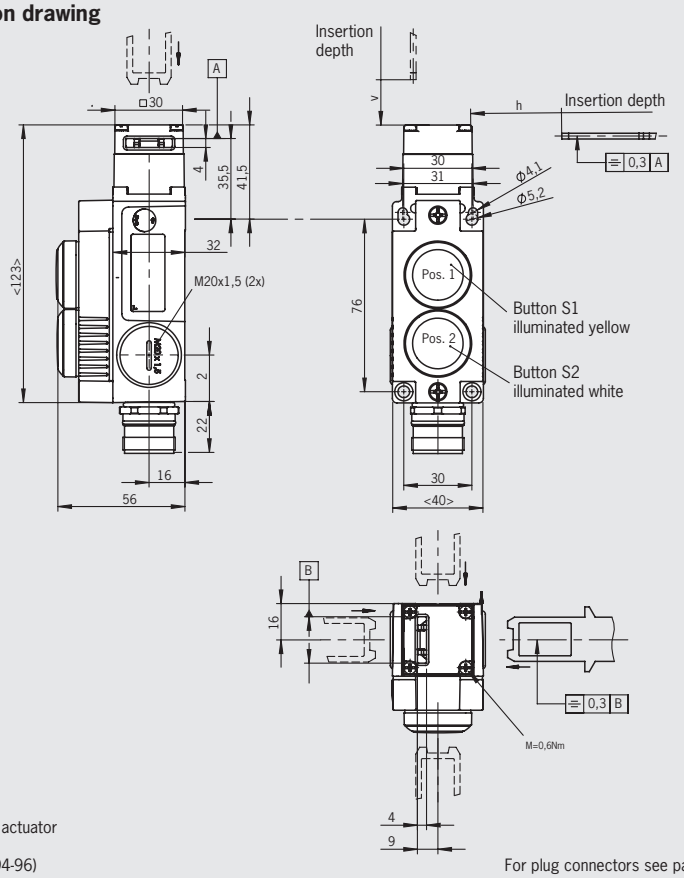
Horizontal and vertical
Can be adjusted in 90° steps

Switching elements

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

Plug connector RC18
18-pin + PE

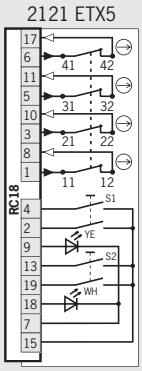
Dimension drawing



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

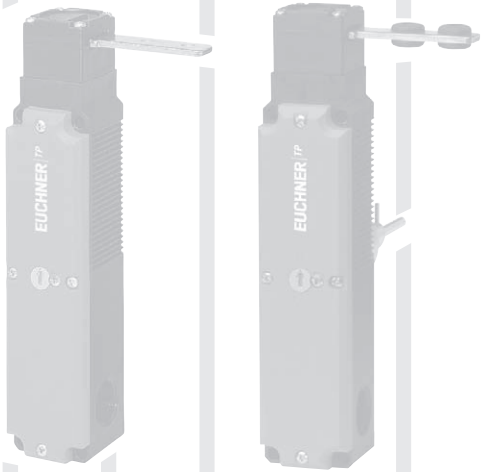
- **TP1/2** without door monitoring contact
- **TP3/4** with door monitoring contact
- **TP5/6** with door unlock request contact

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%

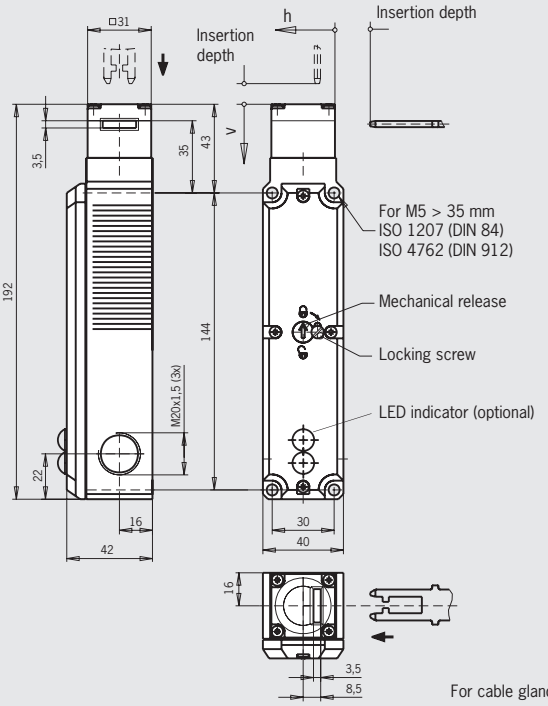
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

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

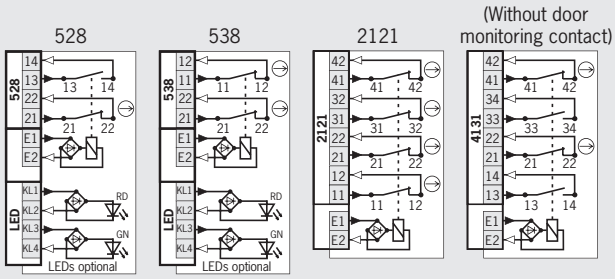
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 131

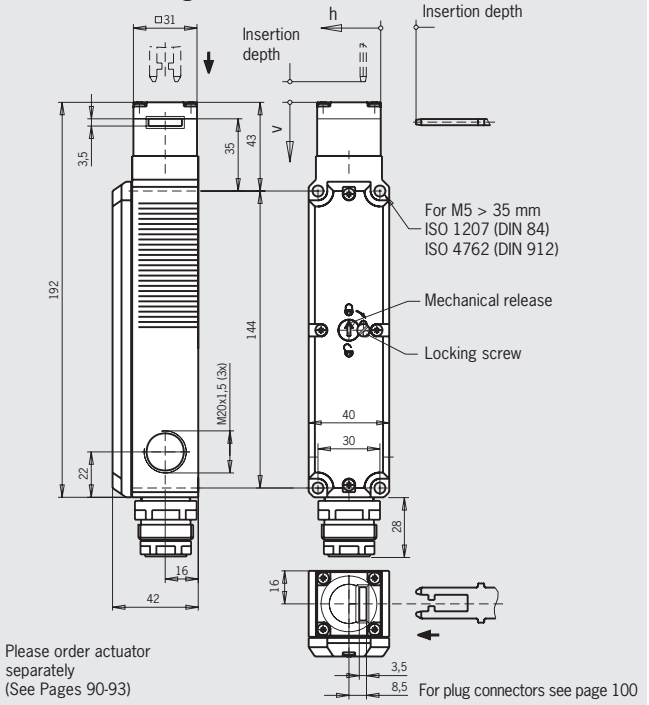
Ordering table

Series	Connection	Guard locking	Switching element	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
		2 Electrical	**528** 1 NC ⊖ + 1 NO		**084325** TP2-528A024M	**084330** TP2-528A110M	**084332** TP2-528A230M
			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

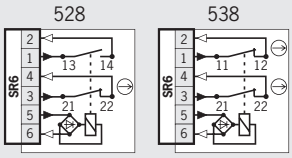
Dimension drawing



Please order actuator separately
(See Pages 90-93)

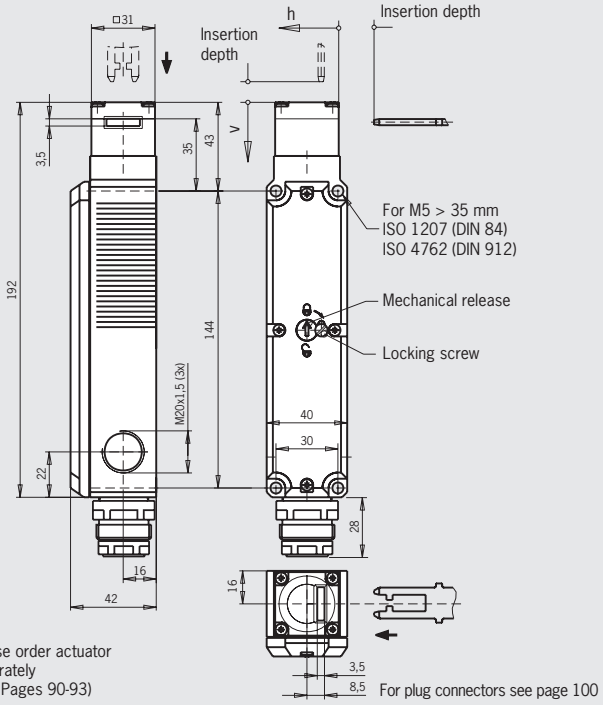
For plug connectors see page 100

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 131

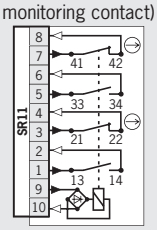
Plug connector SR11
11-pin + PE



Please order actuator separately
(See Pages 90-93)

For plug connectors see page 100

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.

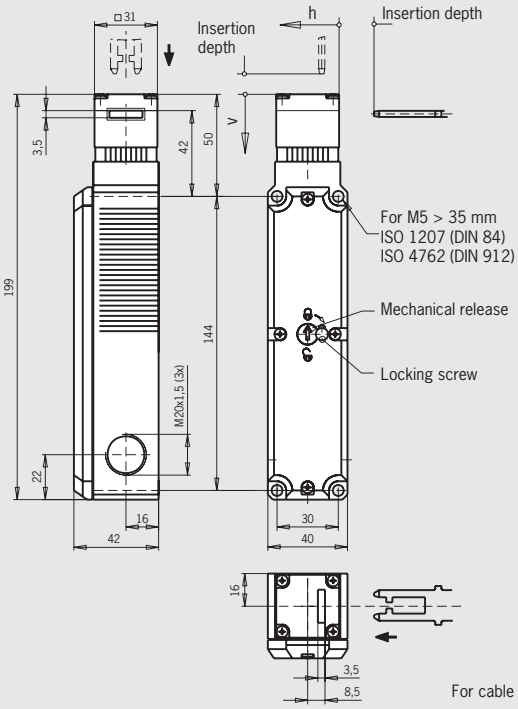
TP2 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

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

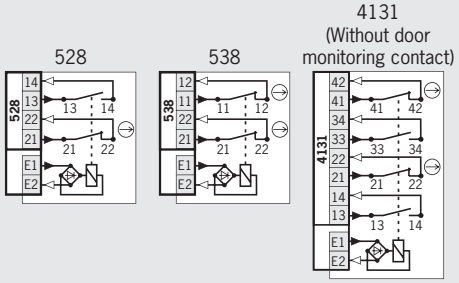
Dimension drawing



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

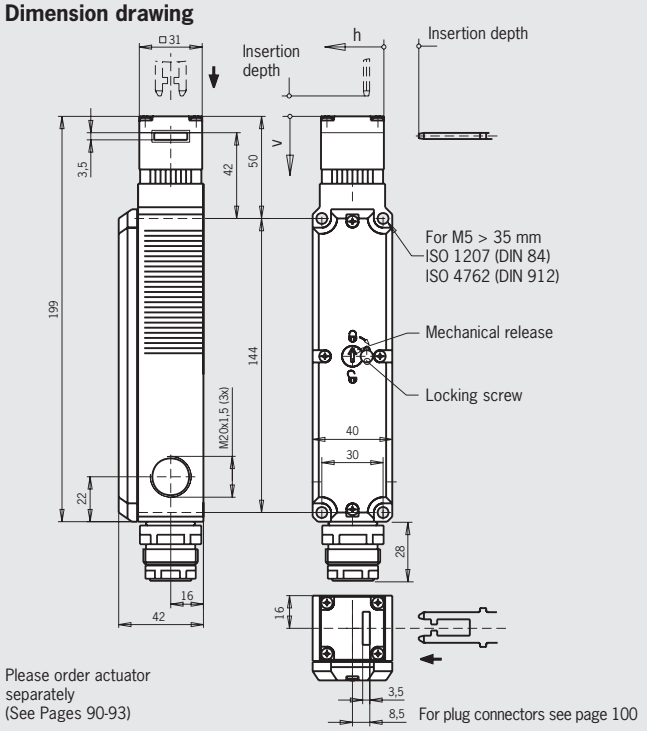
Ordering table

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

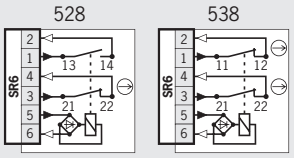
Dimension drawing



Please order actuator separately
(See Pages 90-93)

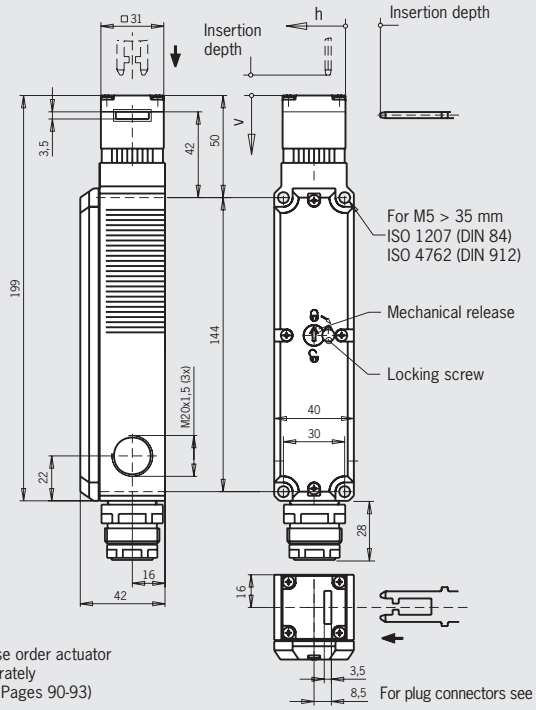
For plug connectors see page 100

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 131

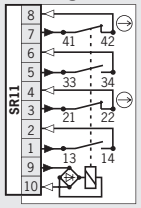
Plug connector SR11
11-pin + PE



Please order actuator separately
(See Pages 90-93)

For plug connectors see page 100

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	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.

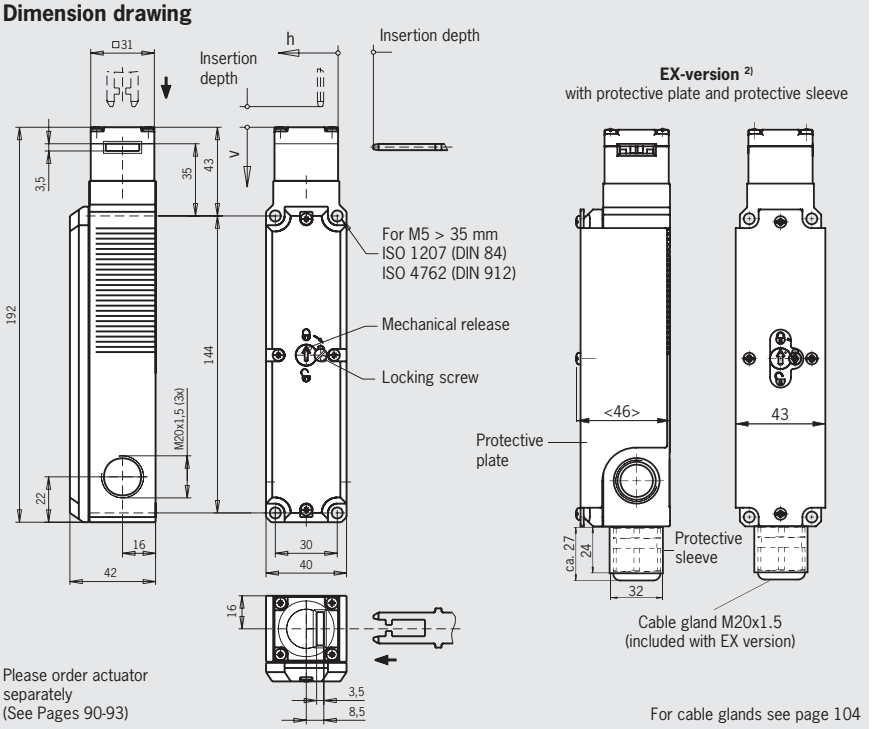
TP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

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)

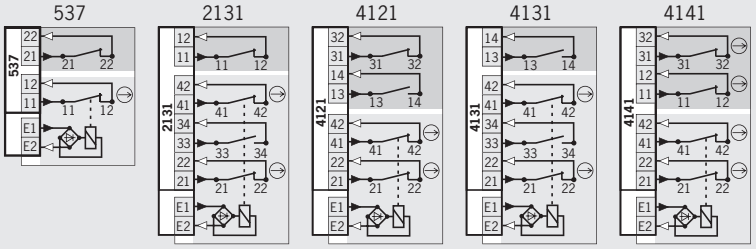
Cable entry M20 x 1.5

Dimension drawing



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

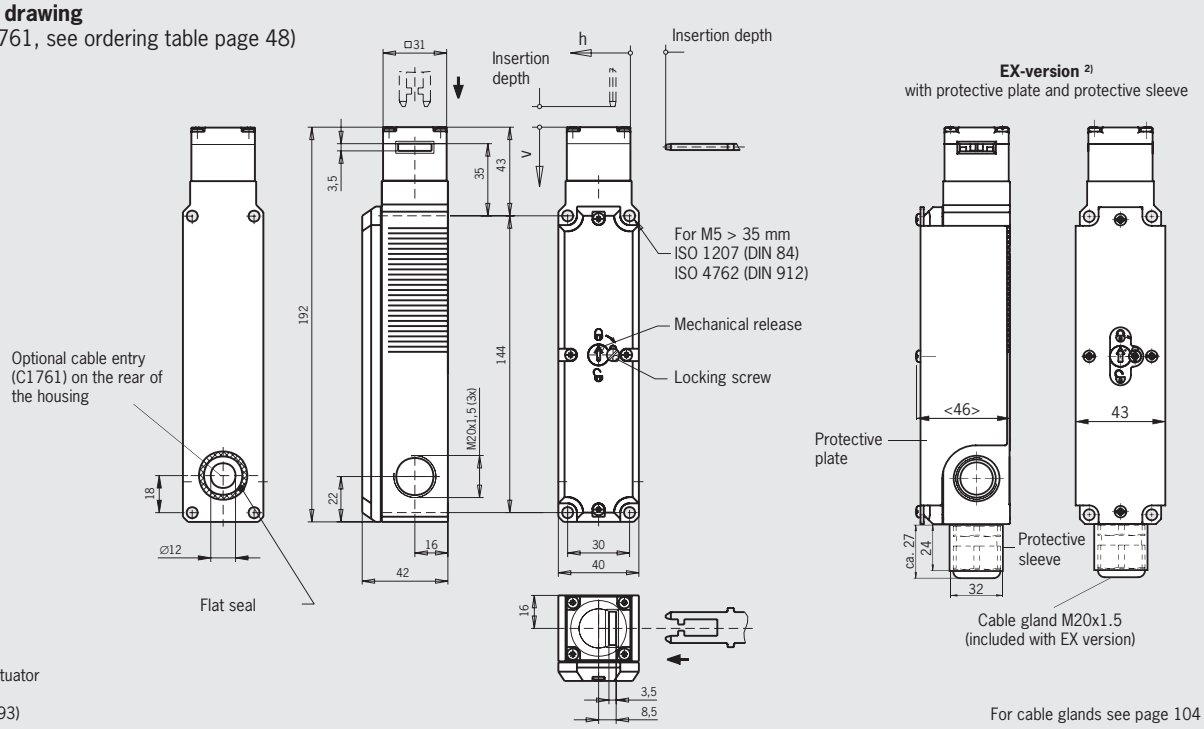
Ordering table

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) ⟨Ex⟩ II 3 G Ex nC IIB T4 Gc X / ⟨Ex⟩ II 3 D Ex tc IIIC T110°C Dc X 3) No approvals

Cable entry M20 x 1.5

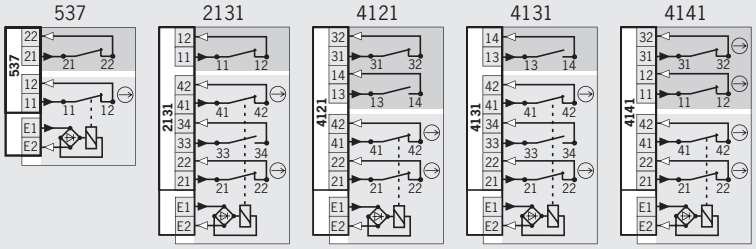
Dimension drawing
(Version C1761, see ordering table page 48)



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) ⟨Ex⟩ II 3 G Ex nC IIB T4 Gc X / ⟨Ex⟩ 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%

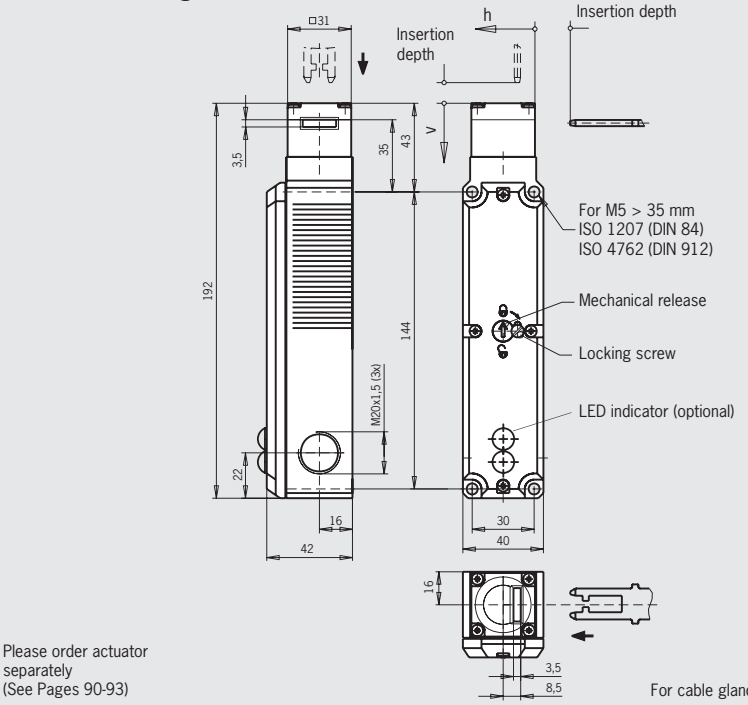
LED function display
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

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

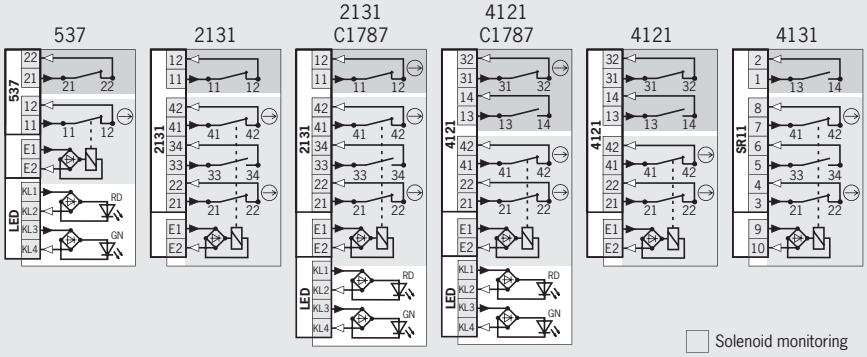
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



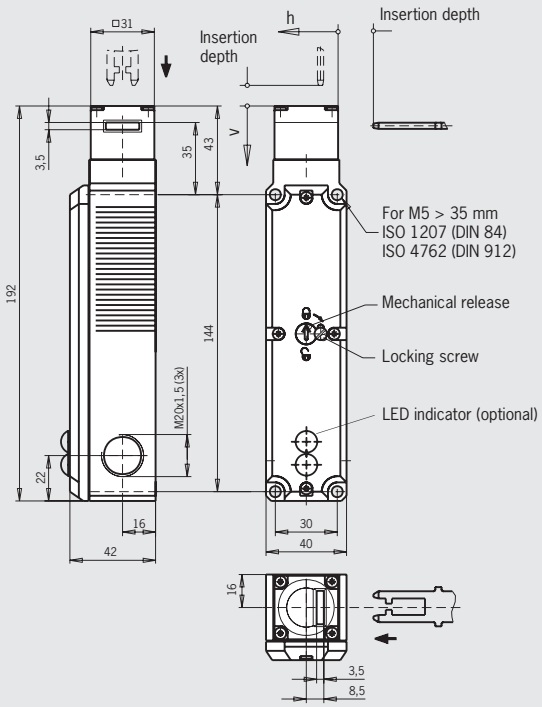
For switching functions see technical data on Page 132

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

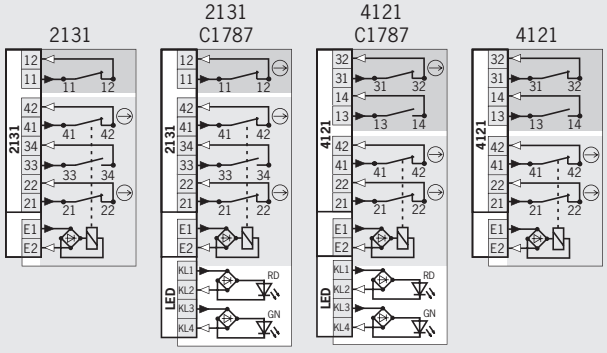
Dimension drawing



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

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.

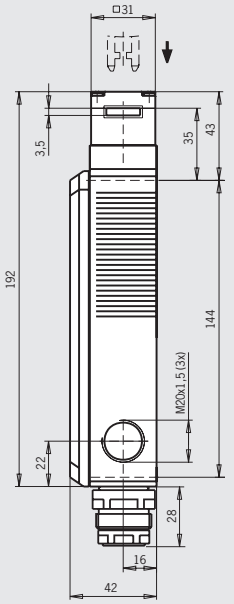
Switching elements

- **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

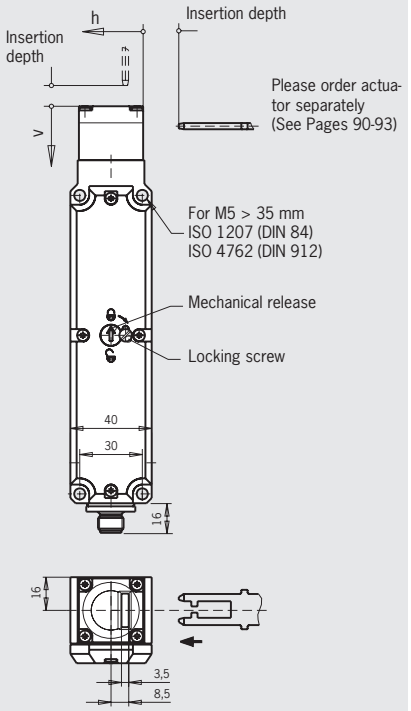
Plug connector SM8
Plug M12, 8-pin

Dimension drawing

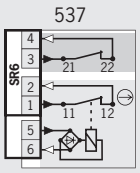


Please order actuator separately
(See Pages 90-93)

For plug connectors see page 100

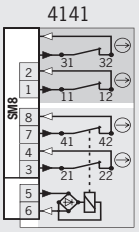


Wiring diagrams Actuator inserted and locked



☐ Solenoid monitoring
☐ Door monitoring

For switching functions see technical data on Page 132



☐ Solenoid monitoring
☐ Door monitoring

For switching functions see technical data on Page 132

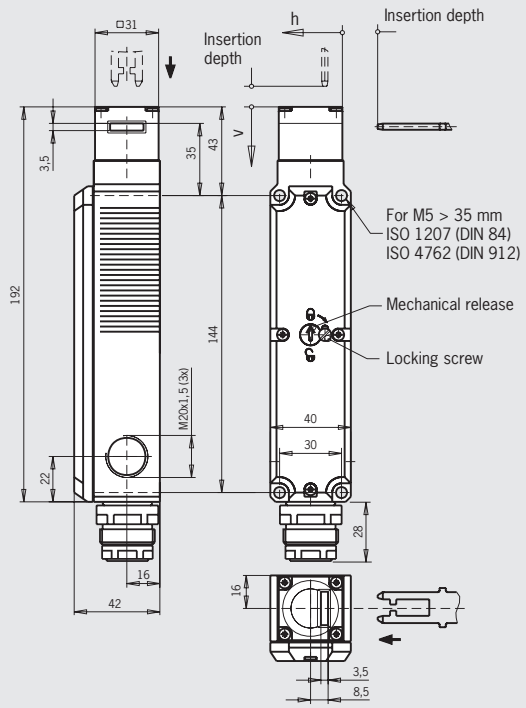
Ordering table

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

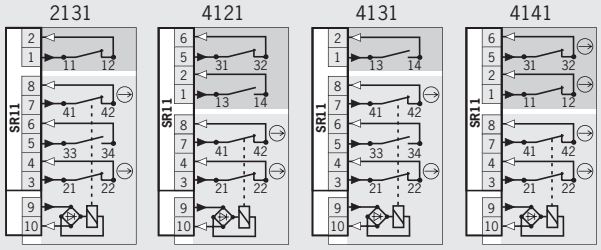
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For plug connectors see page 100

Wiring diagrams Actuator inserted and locked



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

Safety switch TP with guard locking and guard lock monitoring

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

Approach direction

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

Mechanical release

Is used for releasing the guard locking with the aid of a tool. 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.

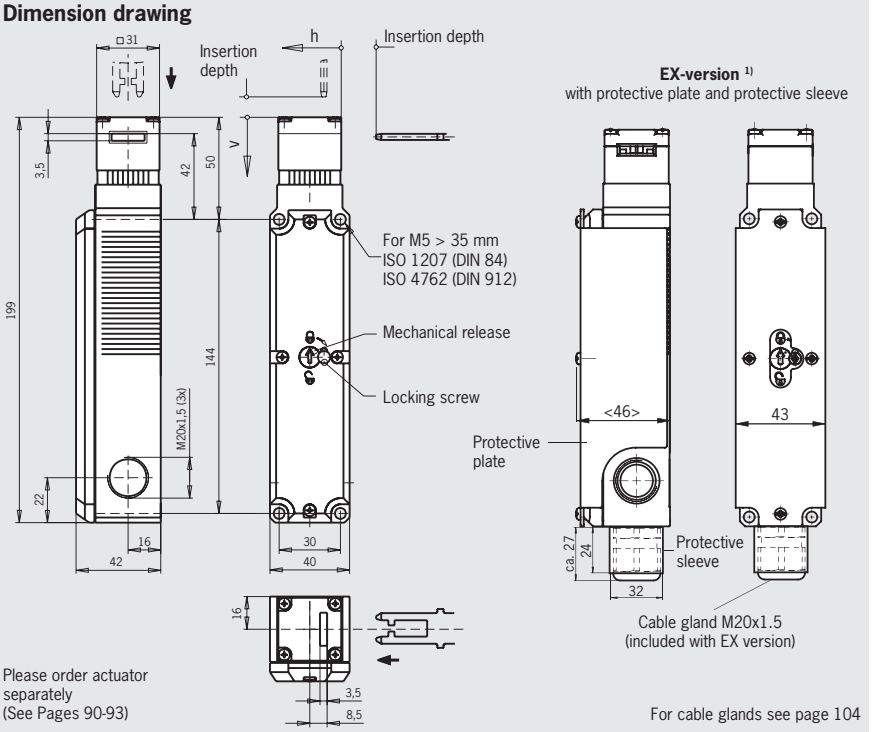
TP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

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

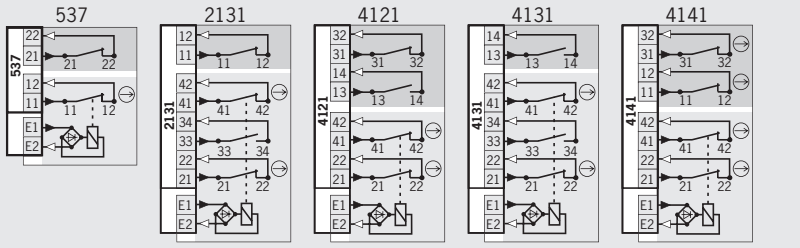
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



For switching functions see technical data on Page 132

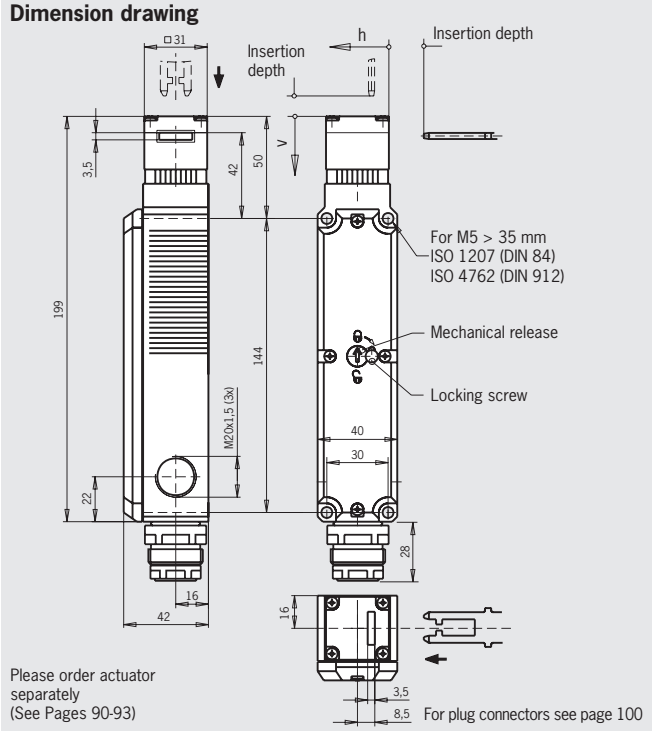
Ordering table

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		084347 TP3-537K024M	On request	On request
			2131 2 NC ⊖ + 1 NO + 1 NC		084264 TP3-2131K024M	On request	084265 TP3-2131K230M
			4121 2 NC ⊖ + 1 NC / 1 NO		084260 TP3-4121K024M	084261 TP3-4121K110M	084262 TP3-4121K230M
			4121 2 NC ⊖ + 1 NC / 1 NO	ATEX incl. cable gland	094152 2) TP3-4121K024M-EX	-	-
			4131 2 NC ⊖ + 1 NO + 1 NO		084256 TP3-4131K024M	084257 TP3-4131K110M	084258 TP3-4131K230M
			4141 2 NC ⊖ + 2 NC ⊖		100684 TP3-4141K024M	-	-
		4 Electrical	537 1 NC ⊖ + 1 NC		084348 TP4-537K024M	084349 TP4-537K110M	On request
			2131 2 NC ⊖ + 1 NO + 1 NC		084266 TP4-2131K024M	On request	On request
			4121 2 NC ⊖ + 1 NC / 1 NO		084263 TP4-4121K024M	084380 TP4-4121K110M	On request
			4131 2 NC ⊖ + 1 NO + 1 NO		084259 TP4-4131K024M	On request	On request
			4141 2 NC ⊖ + 2 NC ⊖		096296 TP4-4141K024M	-	-

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

Plug connector SR6
6-pin + PE

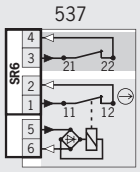
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For plug connectors see page 100

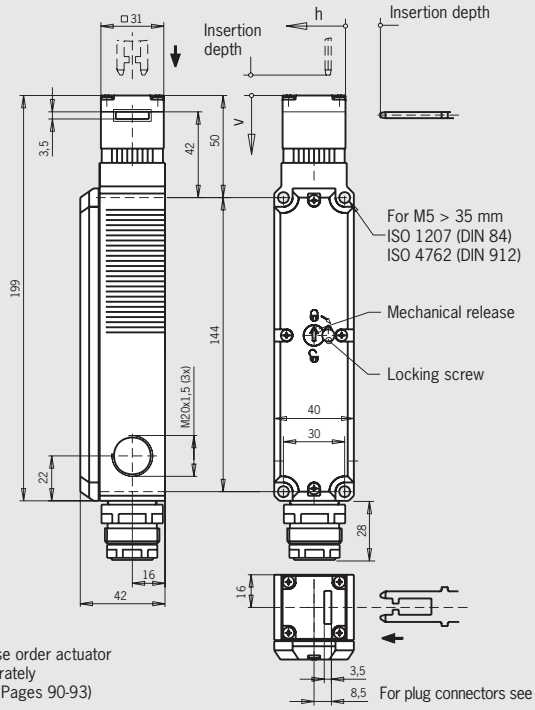
Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

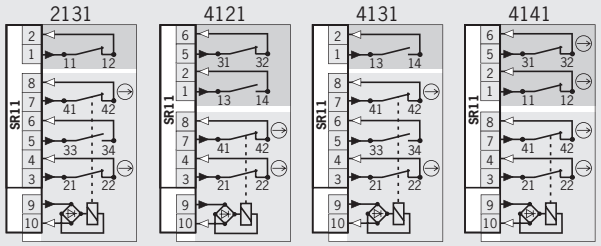
For switching functions see technical data on Page 132

Plug connector SR11
11-pin + PE



Please order actuator separately
(See Pages 90-93)

For plug connectors see page 100



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
		4 Electrical	2131 2 NC ⊖ + 1 NO + 1 NC	088223 TP4-2131K024SR11
			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

1) 2)

- **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%

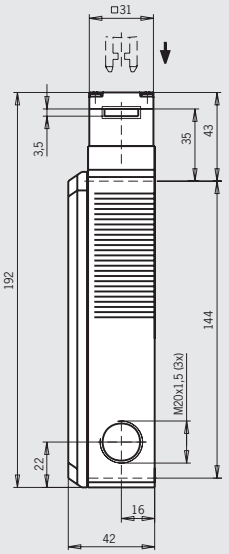
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

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

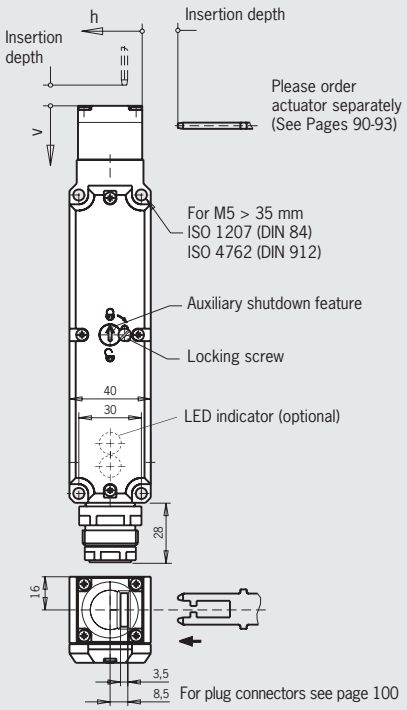
Dimension drawing



Please order actuator separately
(See Pages 90-93)

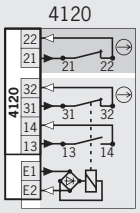
For cable glands see page 104

Plug connector SR11
11-pin + PE



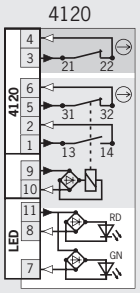
For plug connectors see page 100

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	**024L** LED indicator AC/DC 24 V	**094902** 2) TP5-4120A024L024SR11	-	-
		6 Electrical	**4120** 1 NC ⊖ + 1 NC ⊖ + 1 NO		**096204** 2) TP5-4120A024L024SR11	-	-

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..

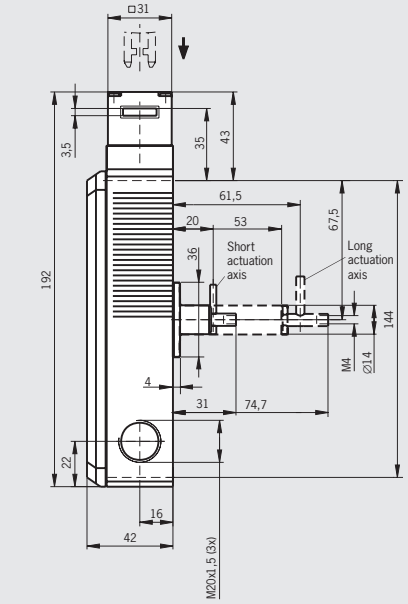
Solenoid operating voltage
- AC/DC 24 V +10%, -15%

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

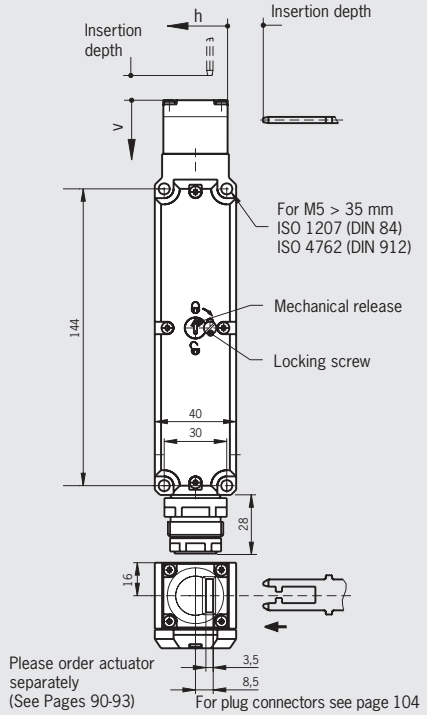
Dimension drawing



Please order actuator separately
(See Pages 90-93)

For cable glands see page 104

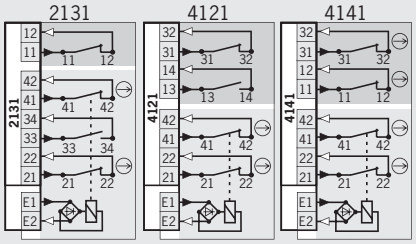
Plug connector SR11
11-pin + PE



Please order actuator separately
(See Pages 90-93)

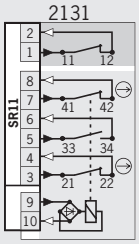
For plug connectors see page 104

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
			4131 2 NC ⊖ + 1 NO + 1 NO	**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

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**
- **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%

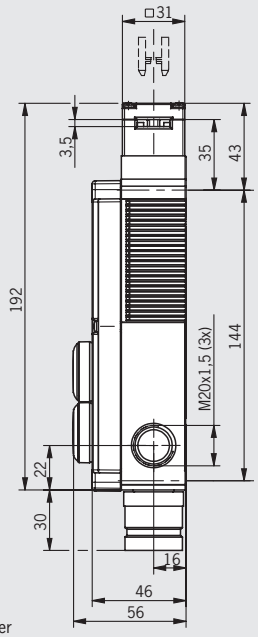
Cover for indicators
A cover for indicators (1 LED, green) is available for the following voltage ranges:
- DC 24 V +10%, -15%

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

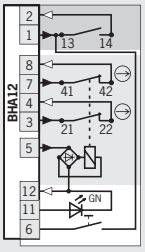


Please order actuator separately (See Pages 90-93)

For plug connectors see page 103

Wiring diagrams Actuator inserted and locked

4121 EXT1A

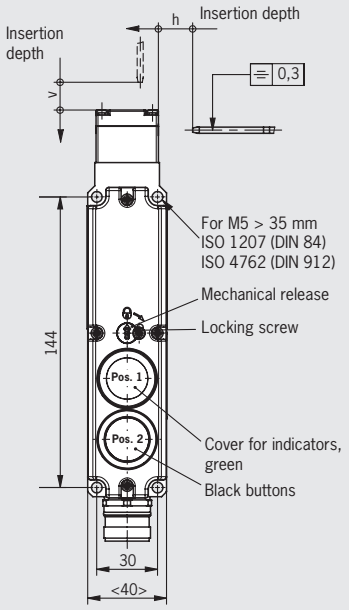


☐ Solenoid monitoring
☐ Door monitoring

For switching functions see technical data on Page 132

Plug connector RC18
18-pin + PE

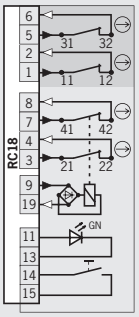
Dimension drawing



Please order actuator separately (See Pages 90-93)

For plug connectors see page 101/102

4141



☐ 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..

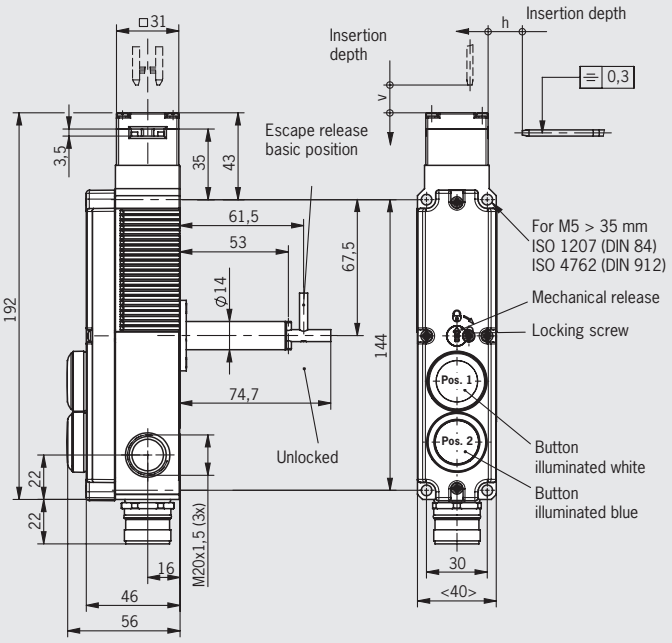
Solenoid operating voltage
- AC/DC 24 V +10%, -15%

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)

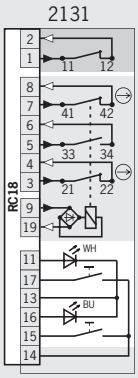
Plug connector RC18
18-pin + PE



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

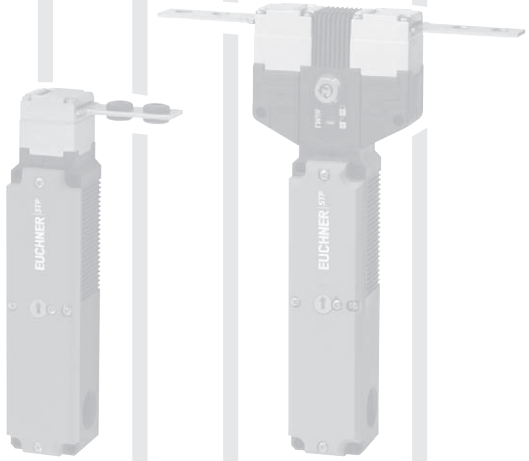
- **HE** – Mechanical release on the front
- **FE** – Escape release on the rear side

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.

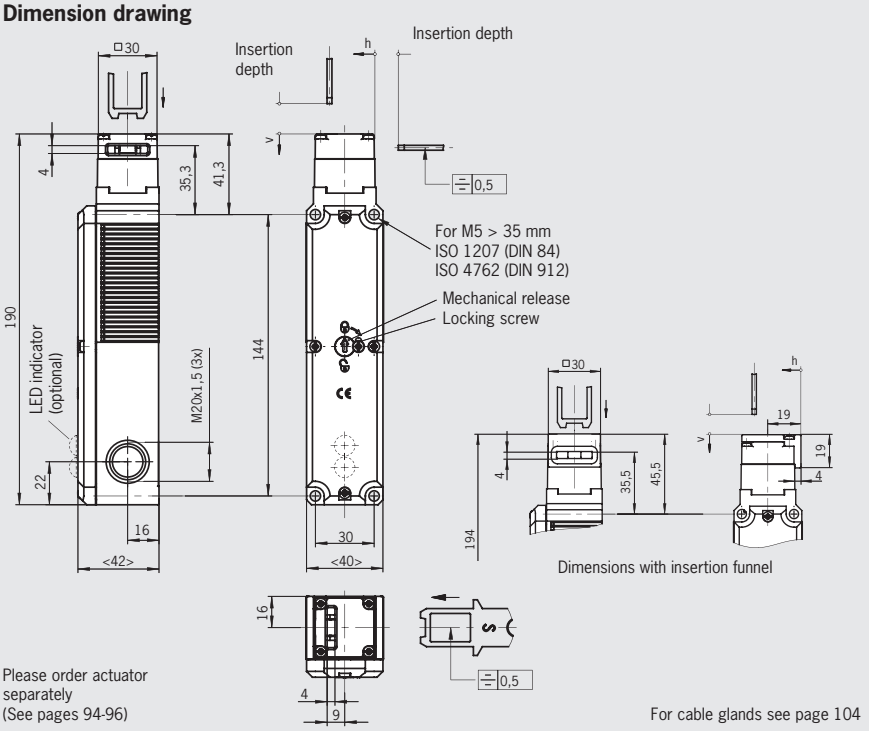
STP4 Open-circuit current principle, guard locking by applying voltage to the guard locking solenoid. Release by spring force.

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

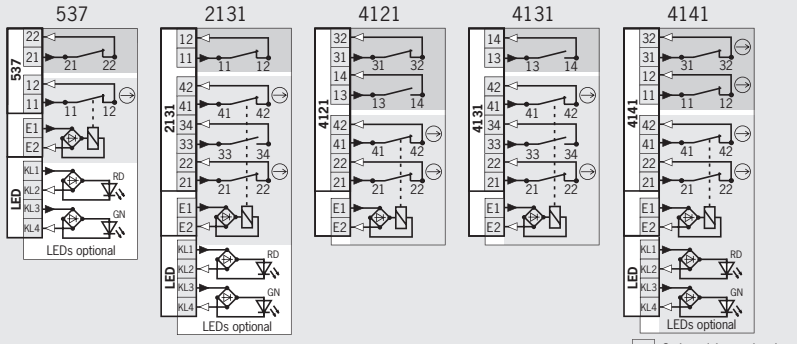
Dimension drawing



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

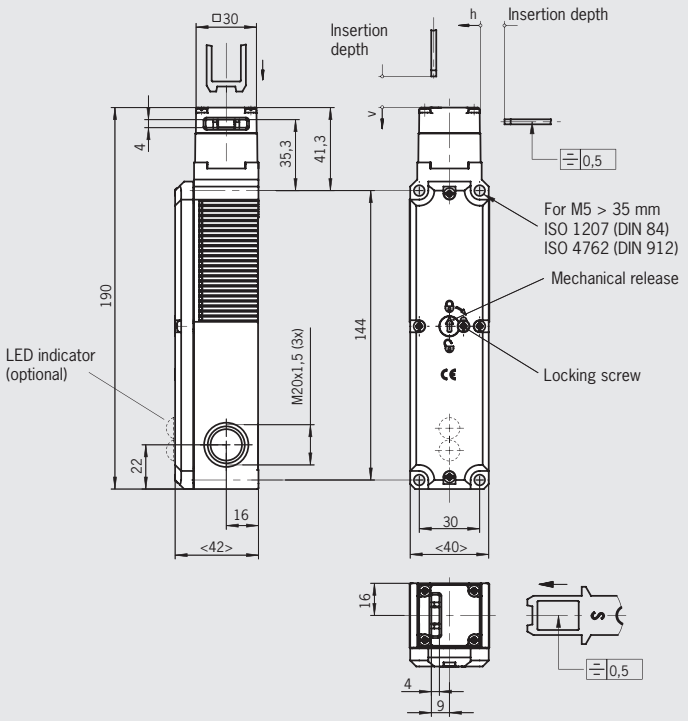
Ordering table

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	024L LED indicator AC/DC 24 V D With insertion funnel	097210 STP3D-537A024L024M	On request	On request
			2131 2 NC ⊖ + 1 NO + 1 NC		091493 STP3A-2131A024M	099326 STP3A-2131A110M	105972 STP3A-2131A230M
				024L LED indicator AC/DC 24 V	091748 STP3A-2131A024L024M	On request	On request
			4121 2 NC ⊖ + 1 NC / 1 NO		096890 STP3A-4121A024M	On request	094792 STP3A-4121A230M
			4131 2 NC ⊖ + 1 NO + 1 NO		091776 STP3A-4131A024M	On request	On request
			4141 2 NC ⊖ + 2 NC ⊖		099272 STP3A-4141A024M	On request	On request
				D With insertion funnel	097891 STP3D-4141A024M	On request	On request
				024L LED indicator AC/DC 24 V D With insertion funnel	099412 STP3D-4141A024L024M	On request	On request

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

Cable entry M20 x 1.5

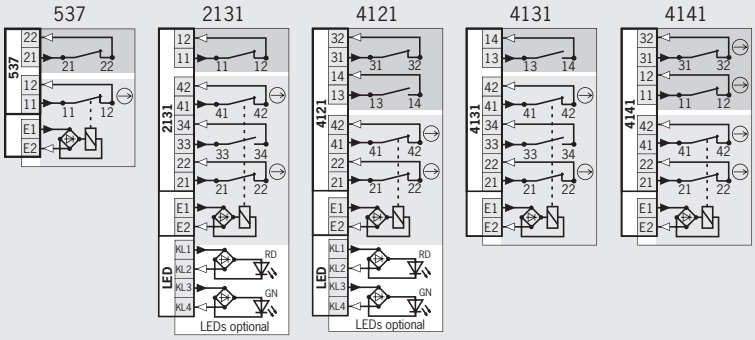
Dimension drawing



Please order actuator separately
(See pages 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 135

Ordering table

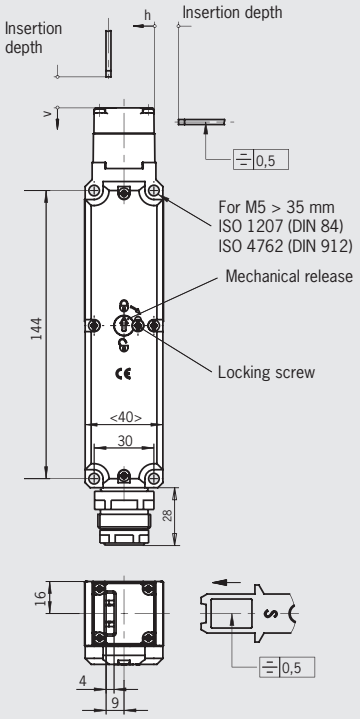
Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	AC 110 V	AC 230 V
STP	M Cable entry 3 x M20 x 1.5	4 Electrical	**537** 1 NC ⊖ + 1 NC		**092259** STP4A-537A024M	On request	On request
			2131 2 NC ⊖ + 1 NO + 1 NC		**091494** STP4A-2131A024M	**097754** STP4A-2131A110M	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

Please turn over

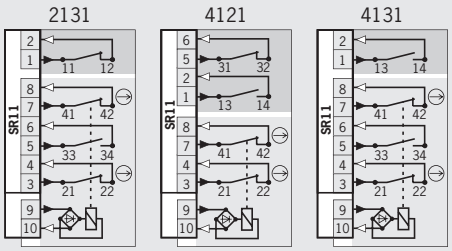
For safety precautions see page 149
For technical data see page 117

Plug connector SR11
11-pin + PE



Please order actuator separately
(See pages 94-96)

For plug connectors see page 100



Solenoid monitoring
Door monitoring

For switching functions see technical data on Page 135

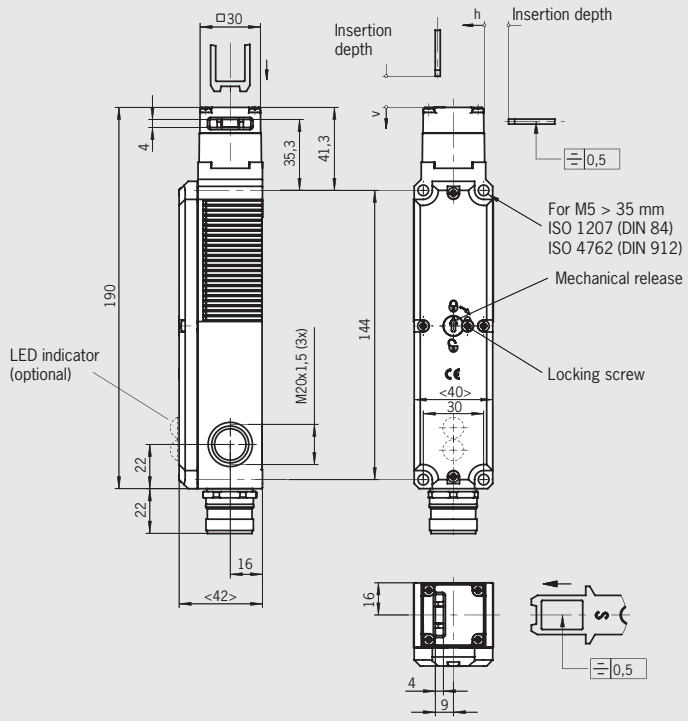
Ordering table

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

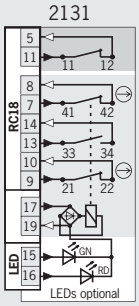
Dimension drawing



Please order actuator separately
(See pages 94-96)

For plug connectors see page 101/102

Wiring diagrams Actuator inserted and locked



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	**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%

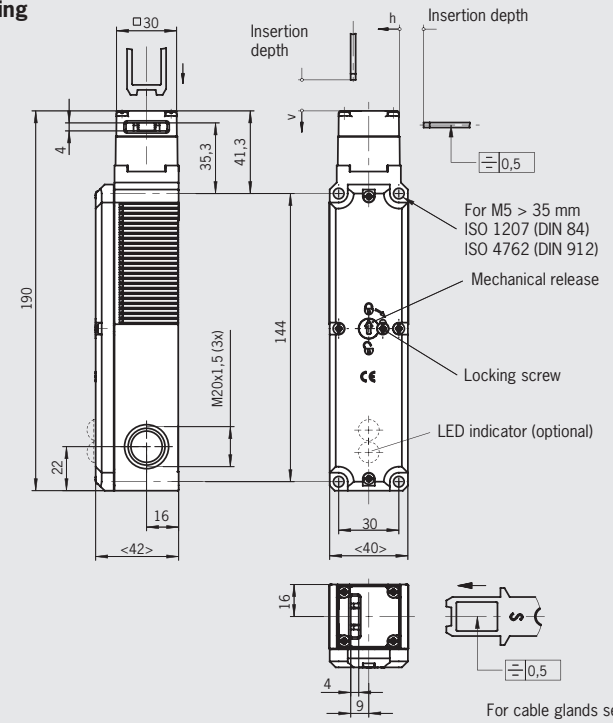
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

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

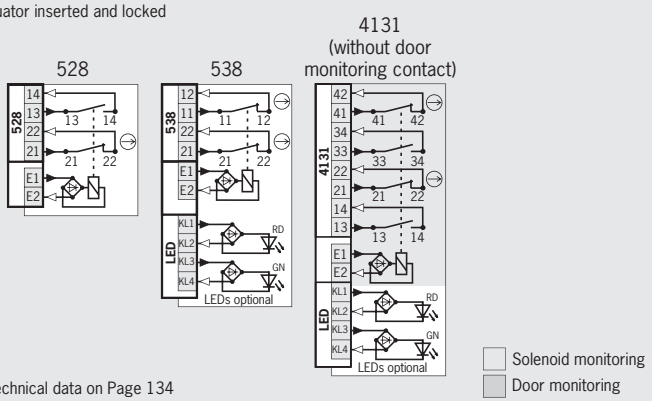
Dimension drawing



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

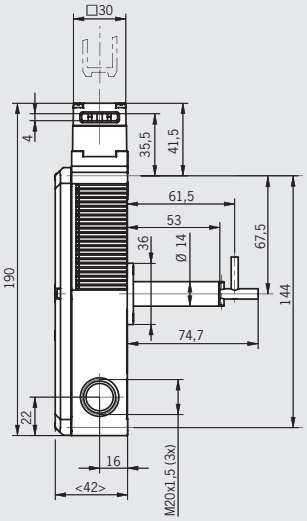
Solenoid operating voltage
- AC/DC 24 V +10%, -15%

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

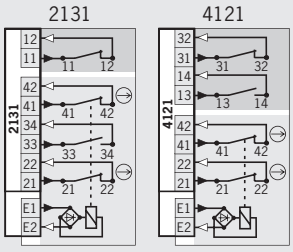
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

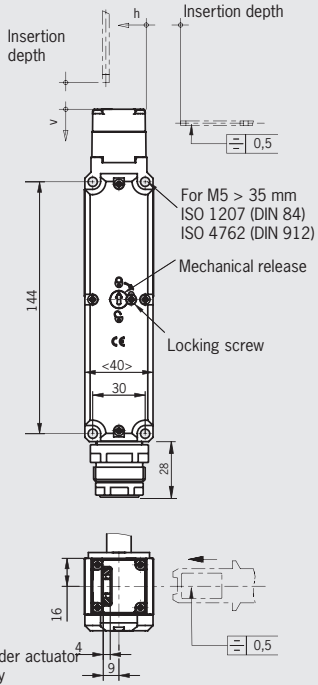
Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring
For switching functions see technical data on Page 135

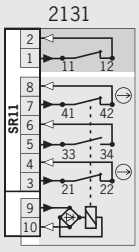
Plug connector SR11

11-pin + PE



Please order actuator separately
(See pages 94-96)

For plug connectors see page 100



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%

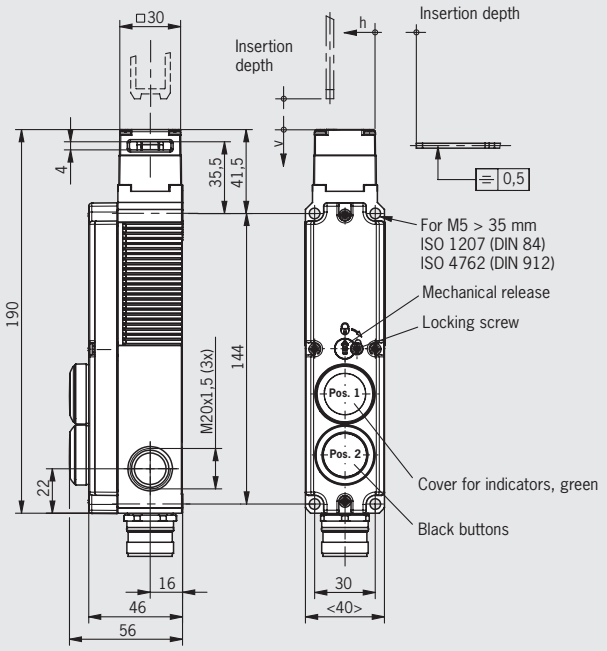
Cover for indicators
A cover for indicators (1 LED, green) is available for the following voltage ranges:
- DC 24 V +10%, -15%

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 ⊖ + 1 NO

Plug connector RC18
18-pin + PE

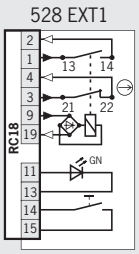
Dimension drawing



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 ⊖ + 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%

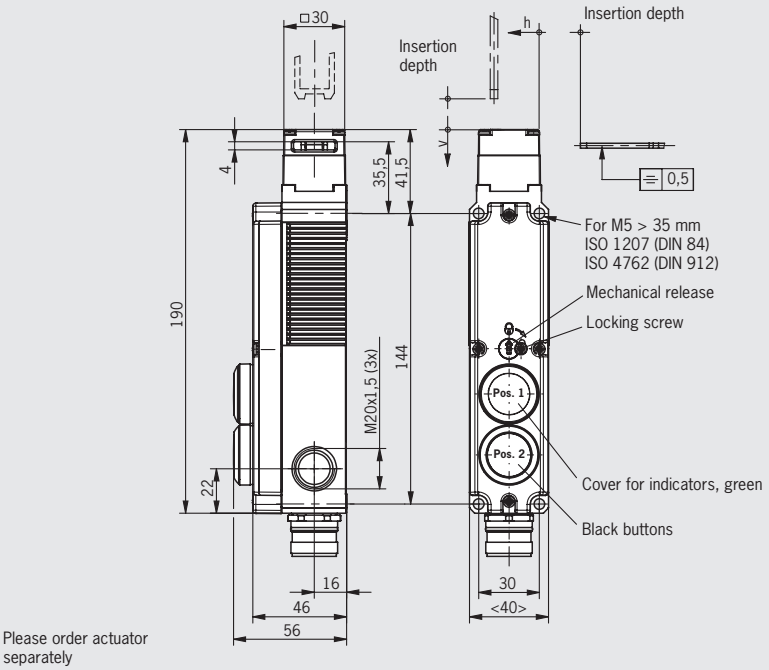
Cover for indicators
A cover for indicators (1 LED, green) is available for the following voltage ranges:
- DC 24 V +10%, -15%

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

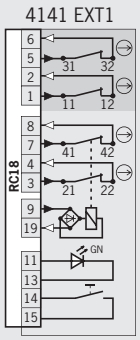
Dimension drawing



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

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**
- **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%

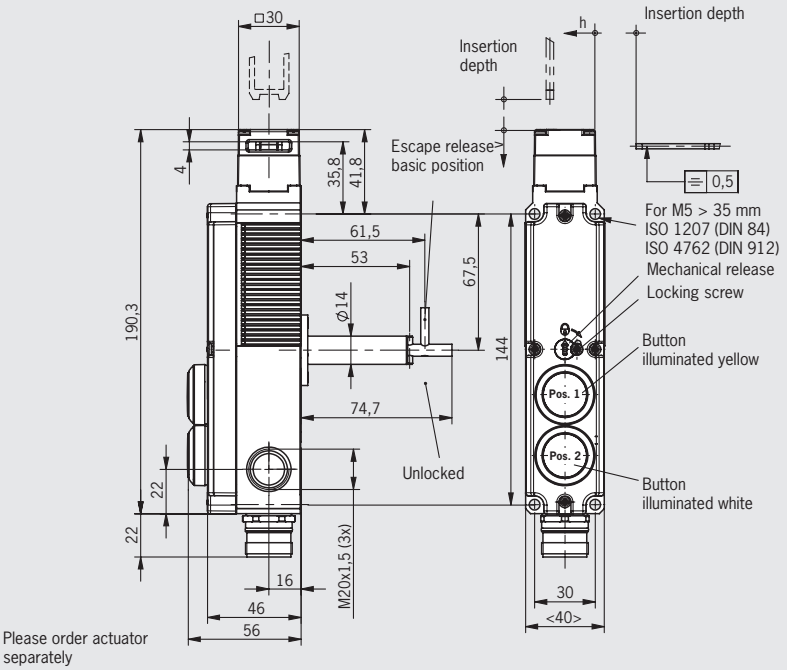
Button LED
A cover for indicators (1 LED, green) is available for the following voltage ranges:
- DC 24 V +10%, -15%

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

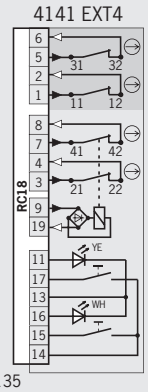
Dimension drawing



Please order actuator separately
(See pages 94-96)

For plug connectors see page 101/102

Wiring diagrams
Actuator inserted and locked



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 ⇒	**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

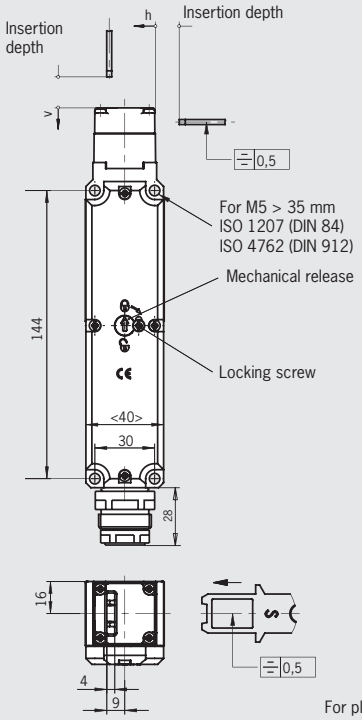
STP3 Closed-circuit current principle, guard locking by spring force. Release by applying voltage to the guard locking solenoid.

Switching elements

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

Plug connector SR11
11-pin + PE

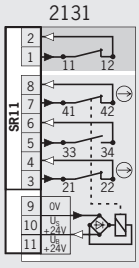
Dimension drawing



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 ⊖ + 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%

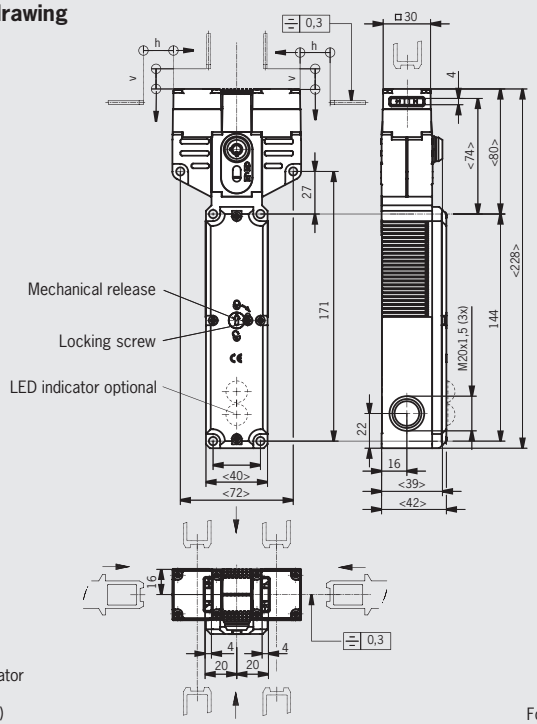
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

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

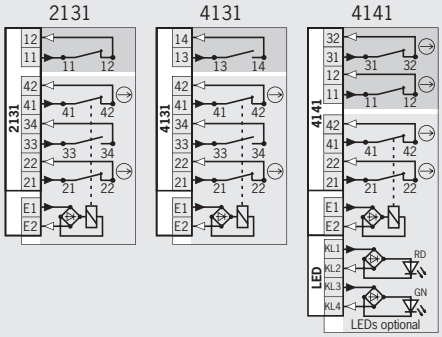
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on Page 137

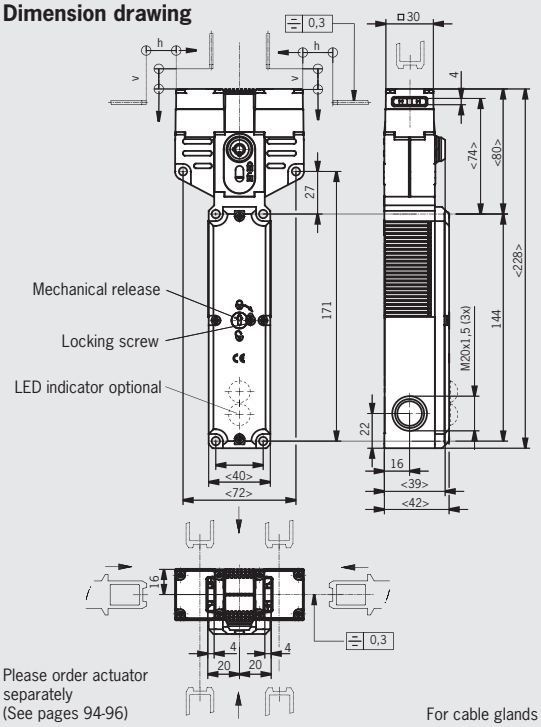
Ordering table

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

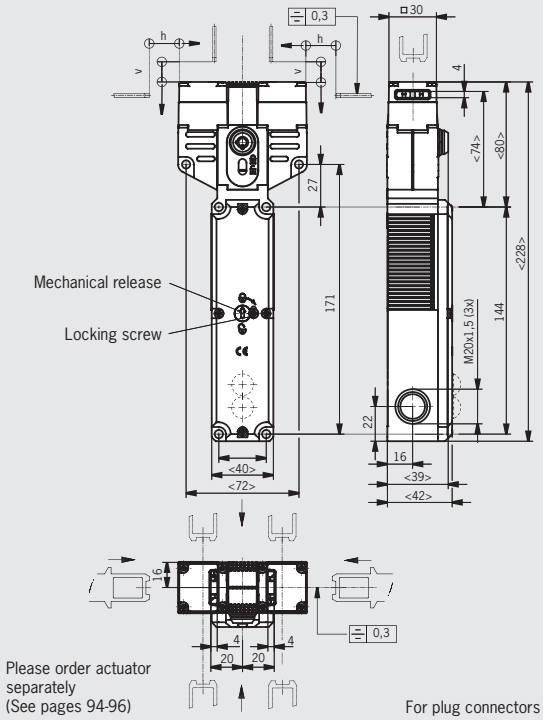
Cable entry M20 x 1.5

Plug connector SR11
11-pin + PE

Dimension drawing

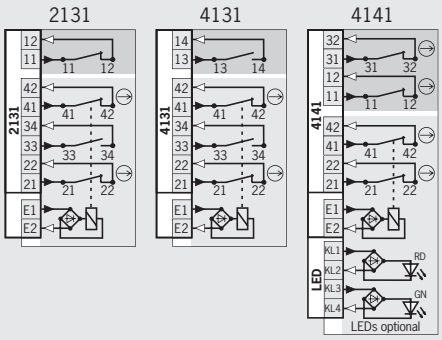


For cable glands see page 104



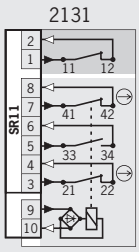
For plug connectors see page 100

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on Page 137



Solenoid monitoring
Door monitoring

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		**100849** STP-TW-4A-2131AC024M
				With mechanical key release (indentical locking)	**100850** STP-TW-4A-2131AC024M-S1
			4131 2 NC ⊖ + 1 NO + 1 NO		**103910** STP-TW-4A-4131AC024M
			4141 2 NC ⊖ + 2 NC ⊖	**024L** LED indicator AC/DC 24 V	**103636** STP-TW-4A-4141AC024L024M
	SR11 Plug connector	**3** Mechanical	**2131** 2 NC ⊖ + 1 NO + 1 NC		**106547** STP-TW-3A-2131AC024SR11
		4 Electrical	**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

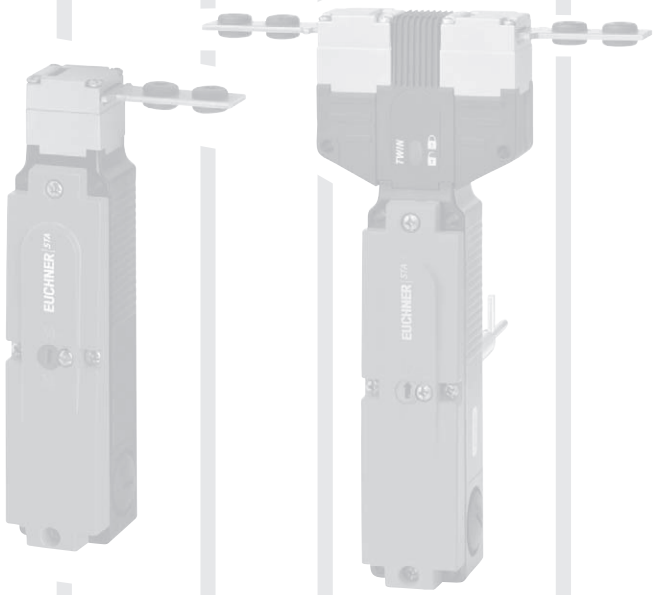
- **HE** – Mechanical release on the front
- **FE** – Escape release on the rear side

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%

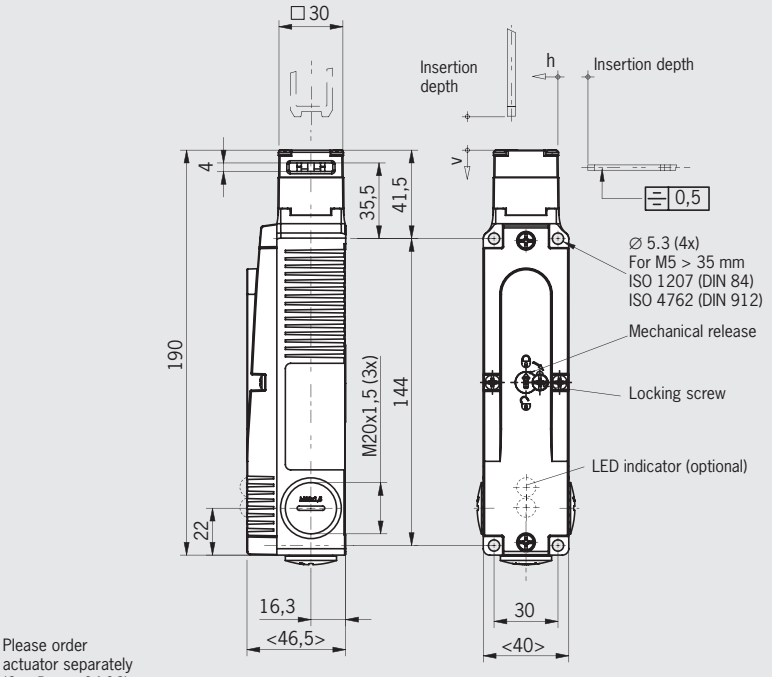
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

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

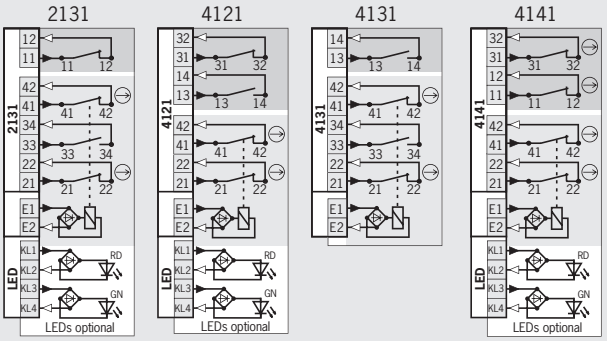
Dimension drawing



Please order actuator separately (See Pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



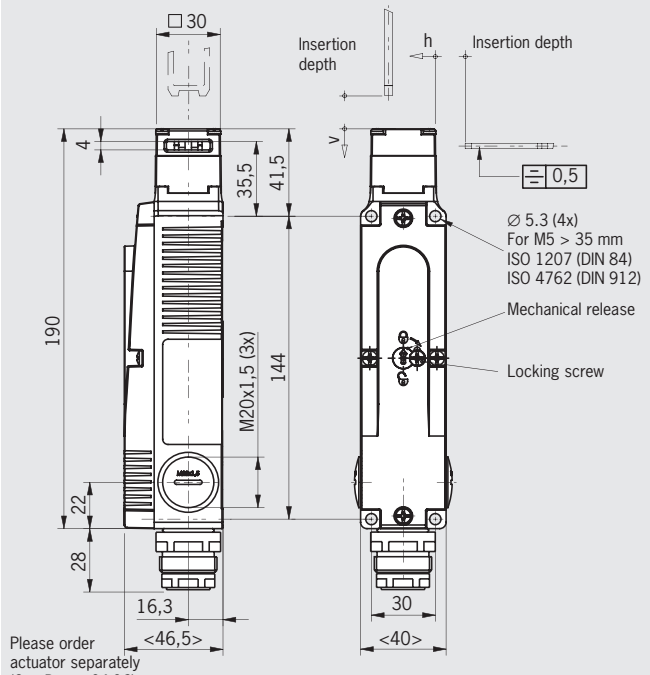
For switching functions see technical data on Page 139

Ordering table

Series	Connection	Guard locking	Switching element	Version	Solenoid operating voltage AC/DC 24 V	Solenoid operating voltage 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		**096936** STA3A-4121A024M	-
				024L LED indicator AC/DC 24 V	**106535** STA3A-4121A024L024M	-
			4131 2 NC ⊖ + 1 NO + 1 NO		**099480** STA3A-4131A024M	-
			4141 2 NC ⊖ + 2 NC ⊖		**099274** STA3A-4141A024M	-
				024L LED indicator AC/DC 24 V	**100898** STA3A-4141A024L024M	-
		4 Electrical	**2131** 2 NC ⊖ + 1 NO + 1 NC		**096939** STA4A-2131A024M	-
				024L LED indicator AC/DC 24 V	**103926** STA4A-2131A024L024M	-
			4121 2 NC ⊖ + 1 NC / 1 NO		**096937** STA4A-4121A024M	-
			4131 2 NC ⊖ + 1 NO + 1 NO		**099481** STA4A-4131A024M	-
			4141 2 NC ⊖ + 2 NC ⊖		**109172** STA4A-4141A024M	-

Plug connector SR11
11-pin + PE

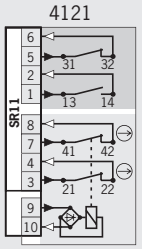
Dimension drawing



Please order actuator separately (See Pages 94-96)

For plug connectors see page 100

Wiring diagrams Actuator inserted and locked

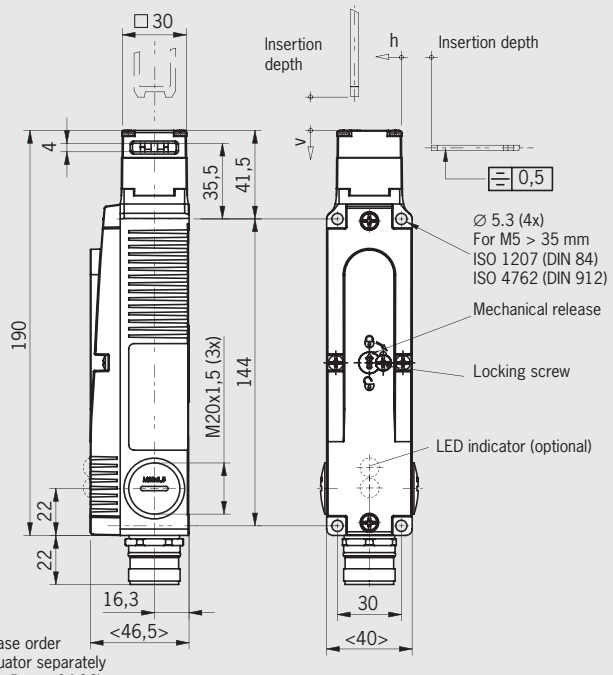


Solenoid monitoring
Door monitoring

For switching functions see technical data on Page 139

Plug connector RC18
18-pin + PE

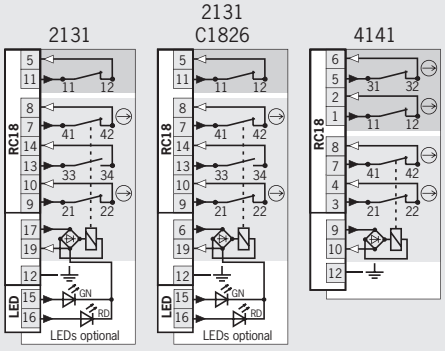
Dimension drawing



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 139

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 **C1826** Special wiring	**106623** STA3A-2131A024L024RC18C1826
			4141 2 NC ⊖ + 2 NC ⊖		**100029** STA3A-4141A024RC18
		4 Electrical	**2131** 2 NC ⊖ + 1 NO + 1 NC	**024L** LED indicator AC/DC 24 V	**105303** STA4A-2131A024L024RC18
				024L LED indicator AC/DC 24 V **C1826** Special wiring	**106622** STA4A-2131A024L024RC18C1826

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.

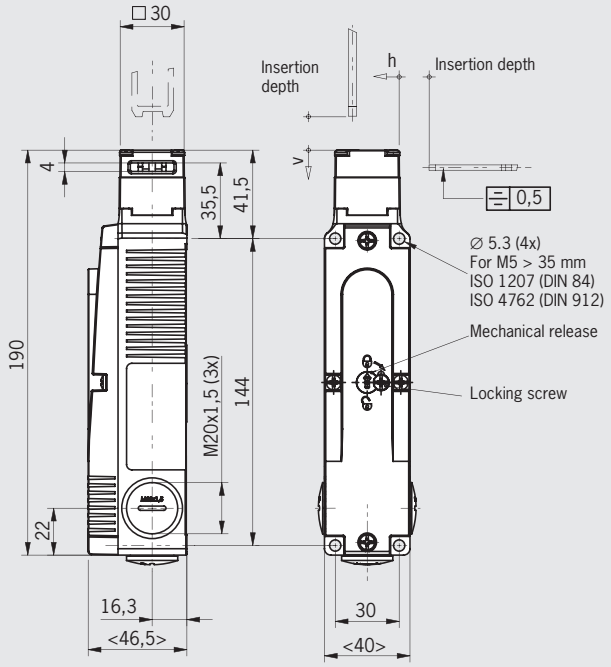
Solenoid operating voltage
- AC/DC 24 V +10%, -15%

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

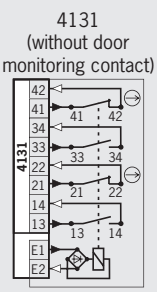
Dimension drawing



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 STA1A-4131A024M
		2 Electrical	4131 2 NC ⊖ + 2 NO	096935 STA2A-4131A024M

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..

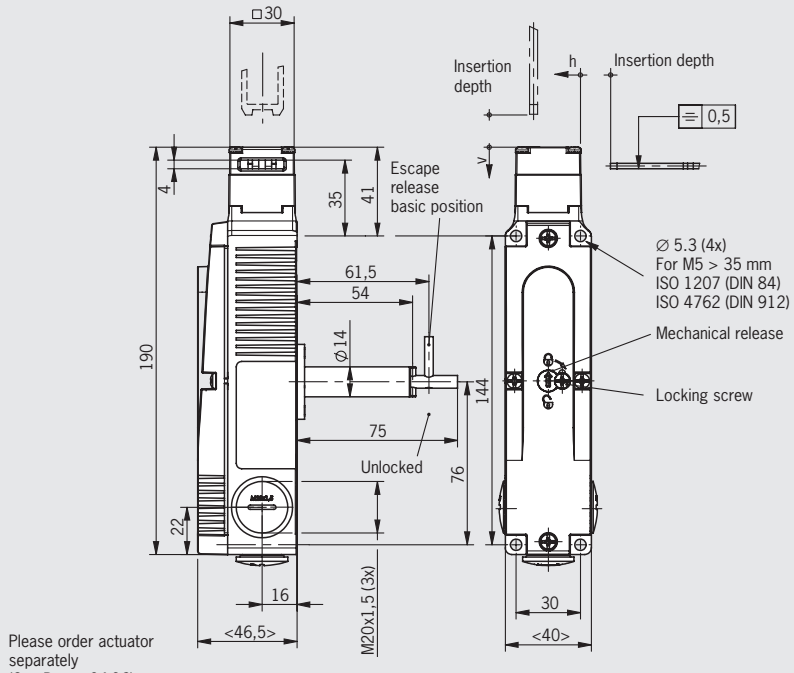
Solenoid operating voltage
- AC/DC 24 V +10%, -15%

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

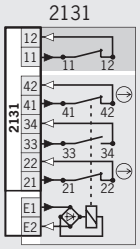
Dimension drawing



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
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%

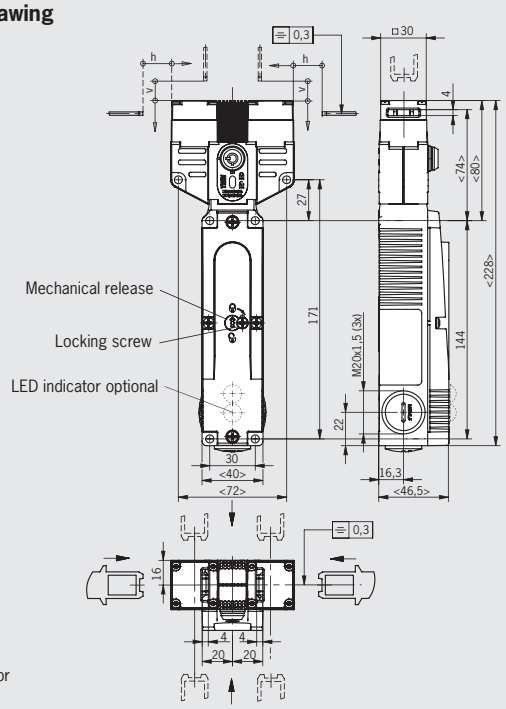
LED function display (optional)
A function display (2 LEDs, red and green) is available for the following voltage ranges:
- AC/DC 24 V +10%, -15%

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

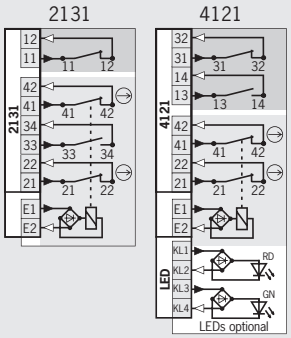
Dimension drawing



Please order actuator separately
(See Pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



Solenoid monitoring
Door monitoring

For switching functions see technical data on Page 141

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		**105617** STA-TW-3A-2131AC024M
				With mechanical key release (indentical locking)	**105888** STA-TW-3A-2131AC024M-S1
			4121 2 NC ⊖ + 1 NC / 1 NO		**106545** STA-TW-3A-4121AC024M
				024L LED indicator AC/DC 24 V	**106379** STA-TW-3A-4121AC024L024M

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

Release feature, front

HE Mechanical release on the front

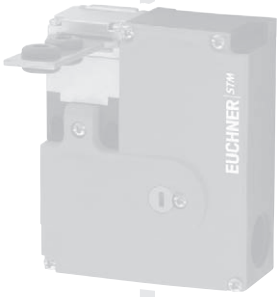
Connection

M Thread M20x1.5 for cable glands

Switching element

Three contacts

- 1 NC ⇒ (ÜK) + 2 NC ⇒ (SK) or
- 1 NC ⇒ (ÜK) + 1 NC ⇒ (SK) + 1 NO (SK)



Manual release HE	Connection M	Switching element Three contacts	Page
●	●	●	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 ⊖

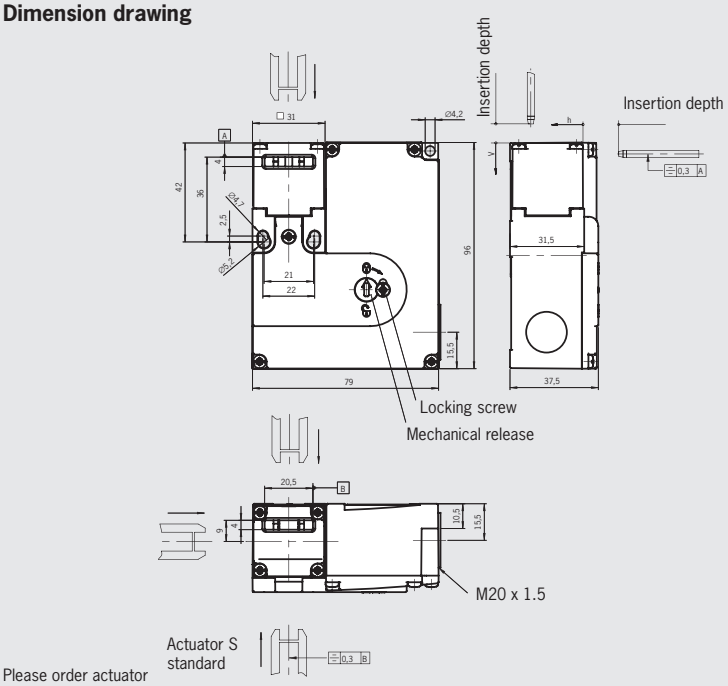
SK For monitoring the door/actuator position

222 Slow-action switching contact 2 NC ⊖

242 Slow-action switching contact 1 NC ⊖ +1 NO

Cable entry M20 x 1.5

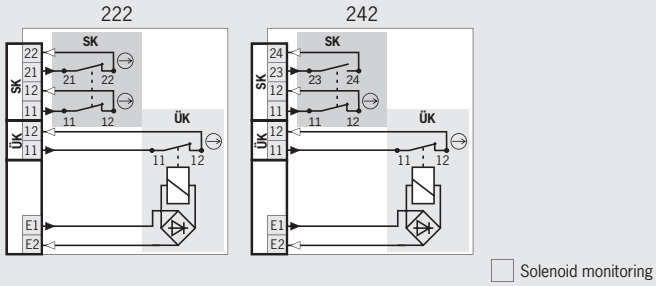
Dimension drawing



Please order actuator separately
(See pages 94-96)

For cable glands see page 104

Wiring diagrams Actuator inserted and locked



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 Right

C Left

Connection

M Thread M20x1.5 for cable gland

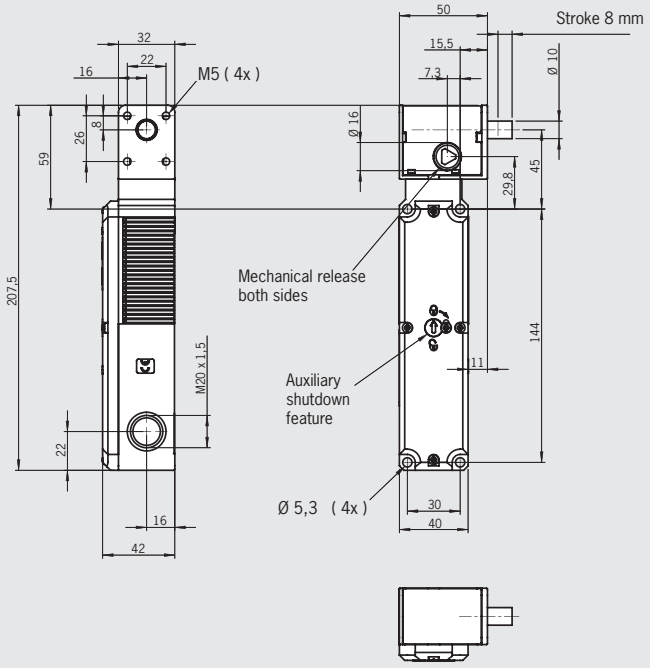
Release feature HE	Guard locking pin A	Guard locking pin C	Connection M	Page
●	●		●	84
●		●	●	85

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**

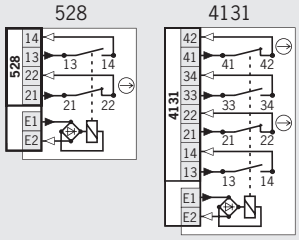
Cable entry M20 x 1.5
Guard locking pin right

Dimension drawing



For cable glands see page 104

Wiring diagrams Switch locked



For switching functions see technical data on page 145

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.

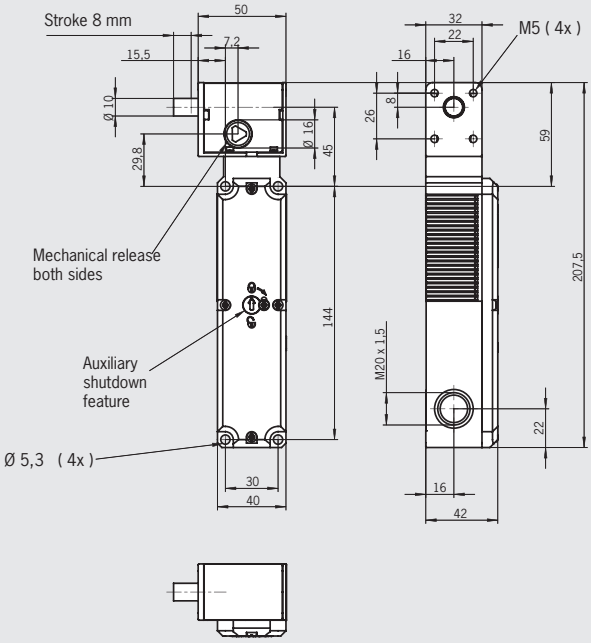
Switching elements
- **528** Slow-action switching contact 1 NC ⇒ + 1 NO
- **4131** Slow-action switching contact 2 NC ⇒ + 2 NO

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	-	-

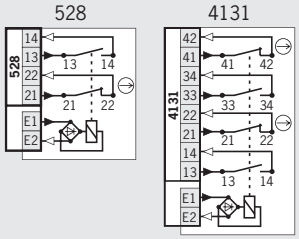
Cable entry M20 x 1.5
Guard locking pin left

Dimension drawing



For cable glands see page 104

Wiring diagrams Switch locked



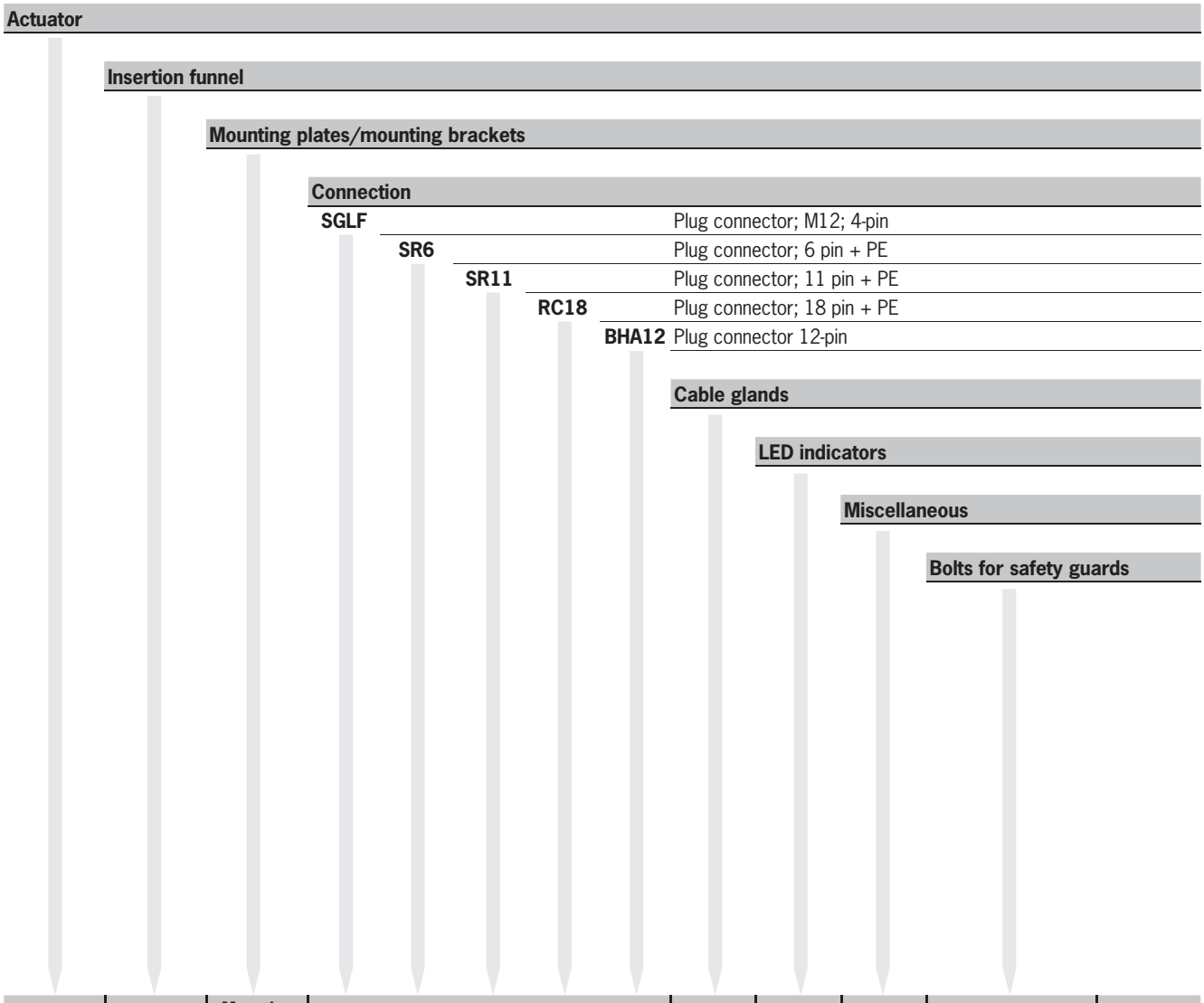
For switching functions see technical data on page 145

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	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**

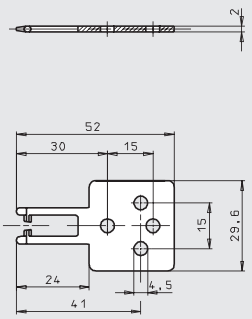
Straight actuator
The straight actuator is used on sliding doors or hinged doors with door radii greater than 150 mm. Safety screws prevent unscrewing of the actuator.

Actuators with rubber bushings
For flexible mounting of the actuator.

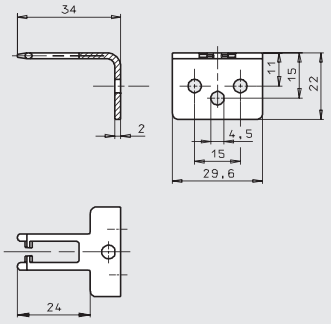
Screws made of stainless steel
The safety screws included can be inserted with a normal tool, but cannot be removed again.

Actuator M-G straight
Overtravel 4 mm

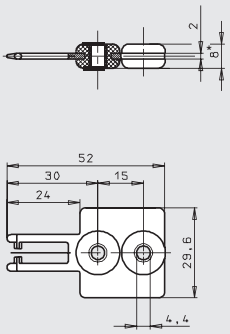
Dimension drawings



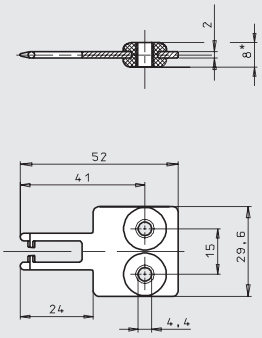
Actuator M-W bent
Overtravel 4 mm



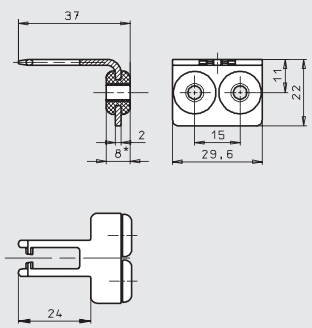
Actuator M-GT straight
Longitudinal rubber bush, overtravel 4 mm



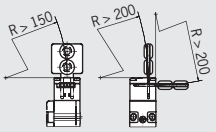
Actuator M-GQ straight
Transverse rubber bush, overtravel 4 mm



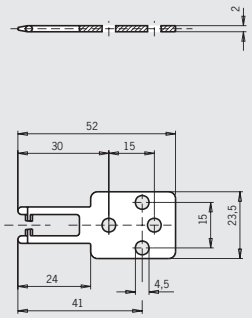
Actuator M-WT bent
Rubber bush, overtravel 4 mm



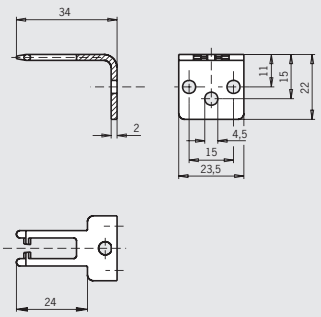
Ordering table

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-GQ
Actuator Angled rubber bush	**M-WT** Overtravel 4 mm incl. 2 safety screws M4 x 14		1 ea.	**074080** ACTUATOR-M-WT

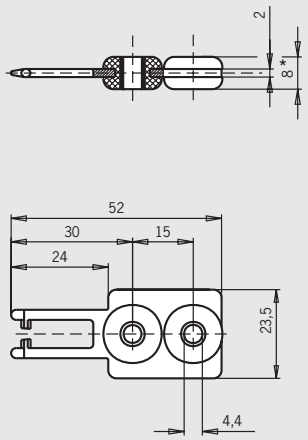
Actuator M-GS straight
Narrow, overtravel 4 mm



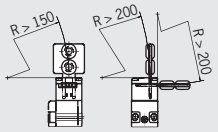
Actuator M-WS bent
Narrow, overtravel 4 mm



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.

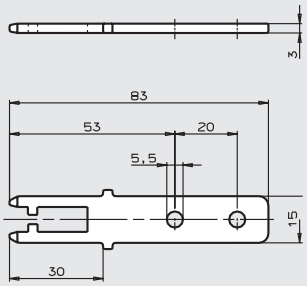
Actuator with overtravel
- 2 mm for doors with normal play
- 7 mm for doors with large play (optional)

Actuators with rubber bushings
For flexible mounting of the actuator.

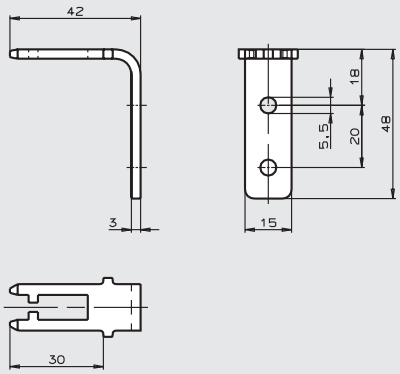
Screws made of stainless steel
The safety screws included can be inserted with a normal tool, but cannot be removed again.

Actuator P-G straight
Overtravel 2 mm

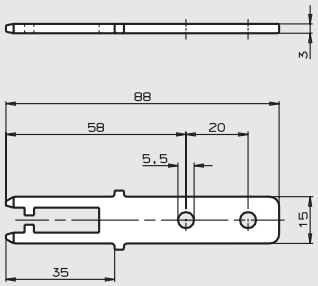
Dimension drawings



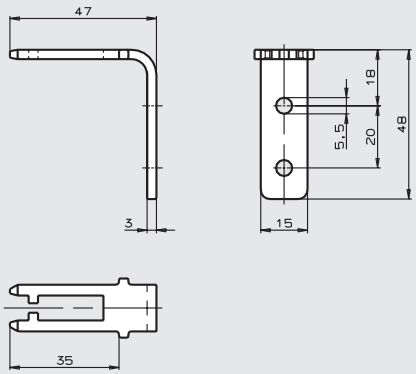
Actuator P-W bent
Overtravel 2 mm



Actuator P-GN straight
Overtravel 7 mm



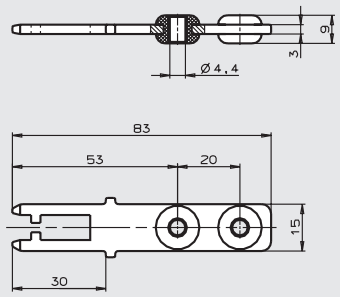
Actuator P-WN bent
Overtravel 7 mm



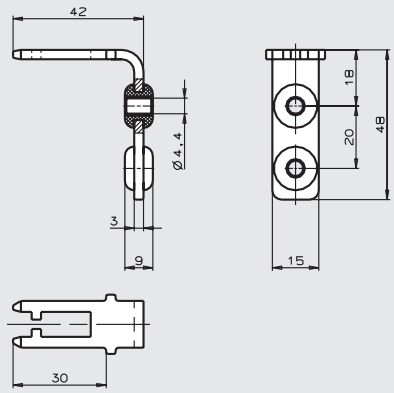
Ordering table

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

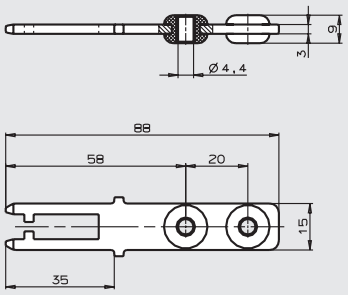
Actuator P-GT straight
Rubber bush, overtravel 2 mm



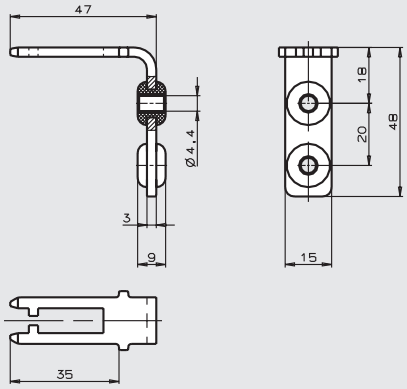
Actuator P-WT bent
Rubber bush, overtravel 2 mm



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

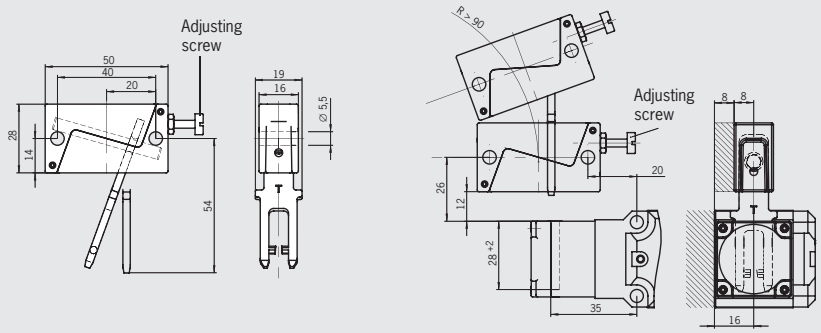
Hinged actuators for safety switches NP/GP/TP

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

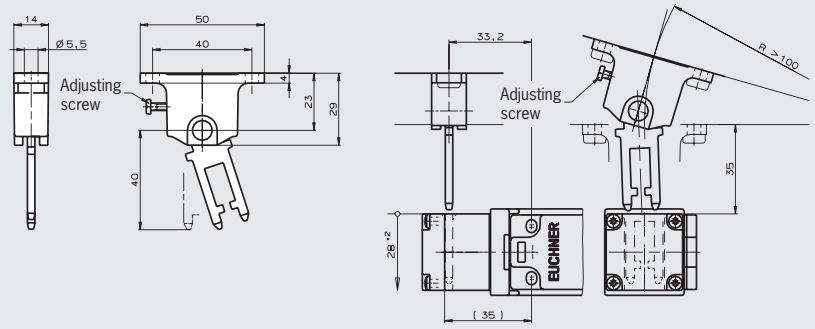
Hinged actuator
For door radii less than 1000 mm a hinged actuator should be used. The spring action movement of the actuator prevents damage due to the actuator jamming in the actuating head. Depending on the movement of the safety guard, the actuator must be selected for left/right or top/bottom.

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

Dimension drawings



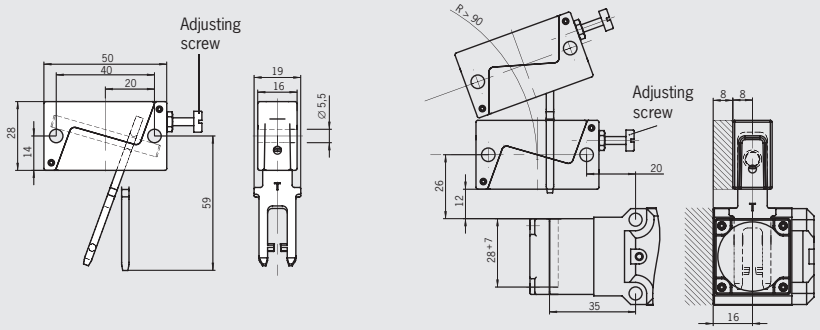
Hinged actuator P-LR
Safety guard hinged on left/right, overtravel 2 mm



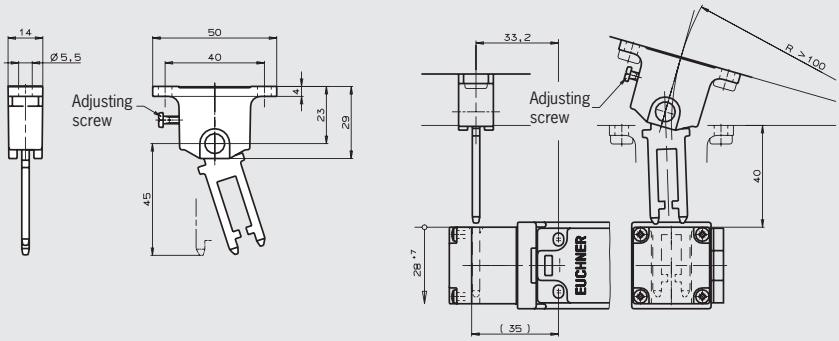
Ordering table

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.

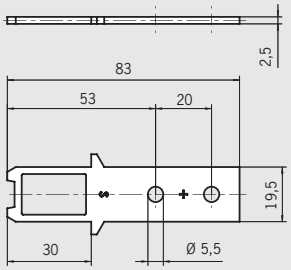
Straight actuator
Suitable for a maximum tensile force of 2500 N for STP, or 3000 N for STA.
The straight actuator is used on sliding doors or hinged doors with door radii greater than 300 mm. Safety screws prevent unscrewing of the actuator.

Bent actuator
Suitable for a maximum tensile force of 1500 N

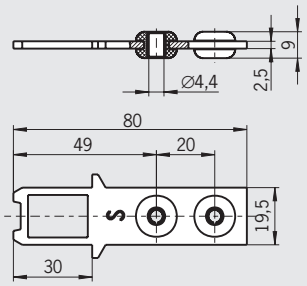
Screws made of stainless steel
The safety screws included can be inserted with a normal tool, but cannot be removed again.

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

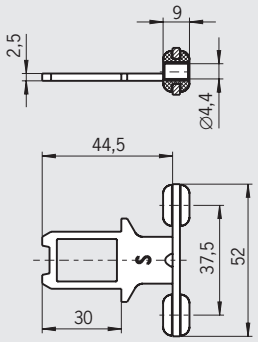
Dimension drawings



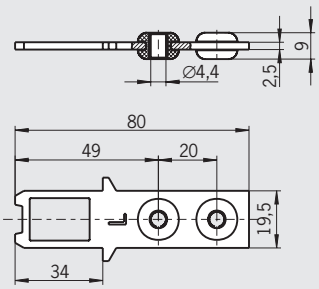
Standard actuator S, straight
With rubber bush, overtravel 5 mm



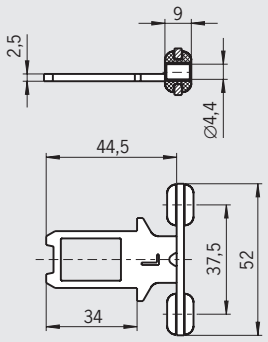
Standard actuator S, bent
With rubber bush, overtravel 5 mm



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

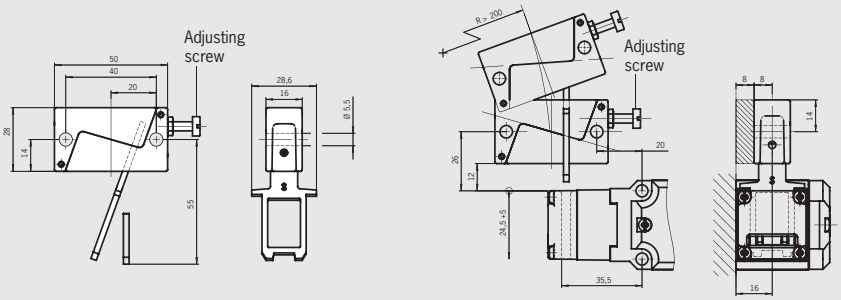
Hinged actuators for safety switches SGA/SGP/STA/STP/STM

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

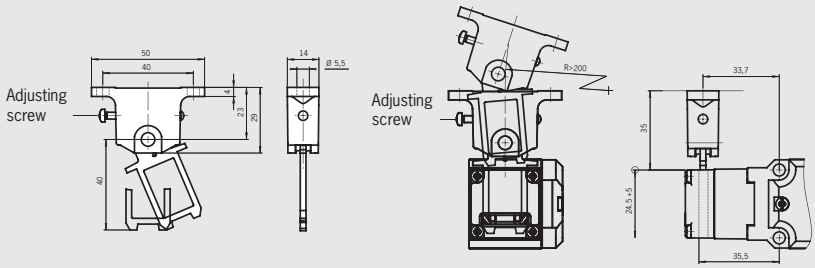
Hinged actuator
For door radii less than 1000 mm a hinged actuator should be used. The spring action movement of the actuator prevents damage due to the actuator jamming in the actuating head. Depending on the movement of the safety guard, the actuator must be selected for left/right or top/bottom.

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

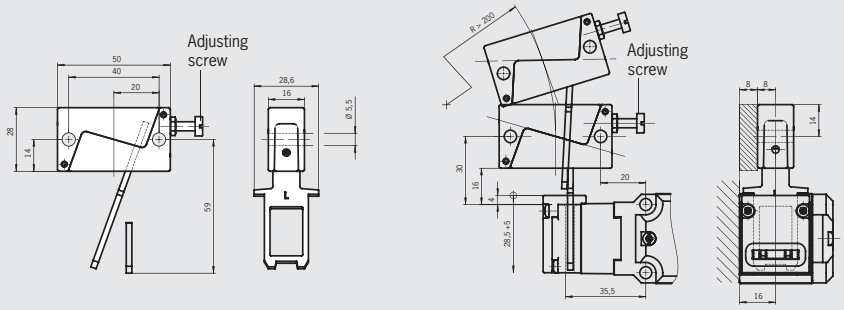
Hinged actuators for safety switches SGA/SGP/STA/STP/STM

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

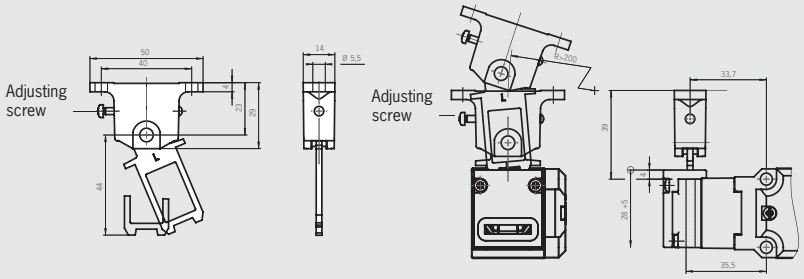
Hinged actuator
For door radii less than 1000 mm a hinged actuator should be used. The spring action movement of the actuator prevents damage due to the actuator jamming in the actuating head. Depending on the movement of the safety guard, the actuator must be selected for left/right or top/bottom.

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

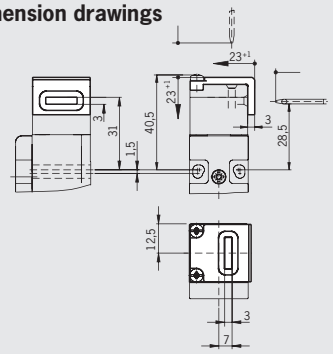
- Cannot be used in conjunction with TP safety switches with increased overtravel from top
- The insertion funnel for TP can only be used in conjunction with an actuator with long overtravel
- The insertion funnel for STP can only be used in conjunction with an actuator for insertion funnel

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

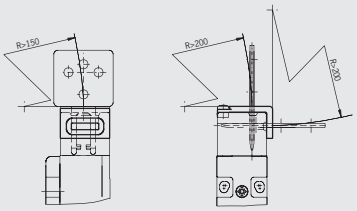
- The adapter can **not** be used for safety switches of the GP/TP series
- 4 screws 3 x 38 (not safety screws) are included

Insertion funnel
for safety switches NM..VZ

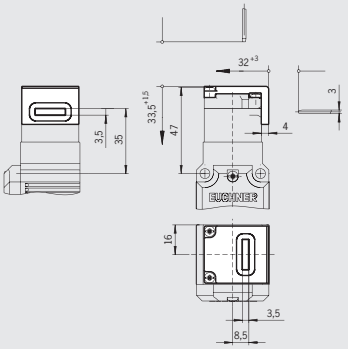
Dimension drawings



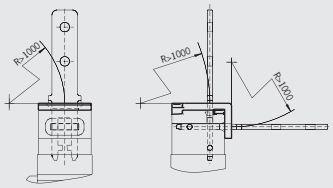
Minimum door radii with insertion funnel



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

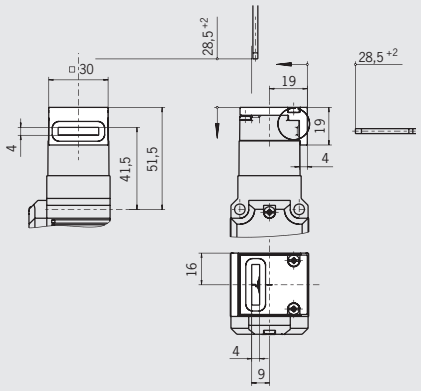


Minimum door radii with insertion funnel



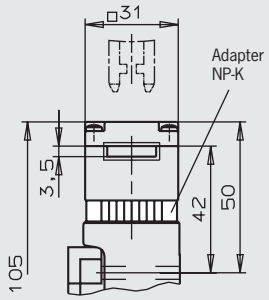
Insertion funnel
for safety switches SGP/STA/STP/STM

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

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

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

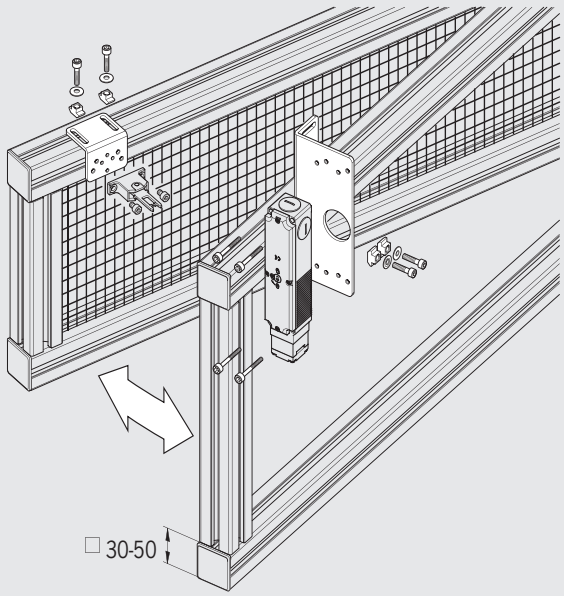
- **For vertical and horizontal mounting of safety switches SGA, SGP, TP...A, STA and STP**

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.

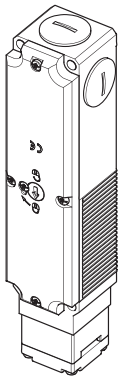
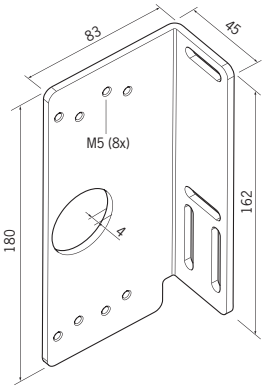
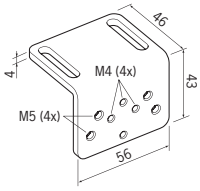
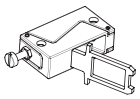
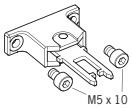
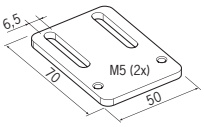
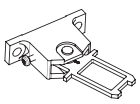
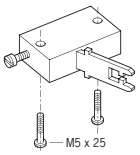
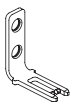
Note

- Mounting plate material: galvanized St37.

Installation example, safety switch vertical



Ordering table

Switch	Installation method switch	Mounting plate switch	Mounting plate actuator	Actuator ST...	Actuator TP...A	Minimum distance hinged actuator to switch ST...	Minimum distance hinged actuator to switch TP...A
SGA... SGP... TP...A... STA... STP... 	**A** Vertical	**093456** EMP-SB 	**093457** EMP-B1 	**095315 096697**  Page 95/96	**059440 074573**  Page 92/93	> 200 mm	> 100 mm
	B Horizontal		**093458** EMP-B2 	**096838 096844**  Page 95/96	**070050 074572**  Page 92/93	> 200 mm	> 90 mm
				ST...	**070038 074577**  Page 91	> 300 mm	> 1000 mm

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

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

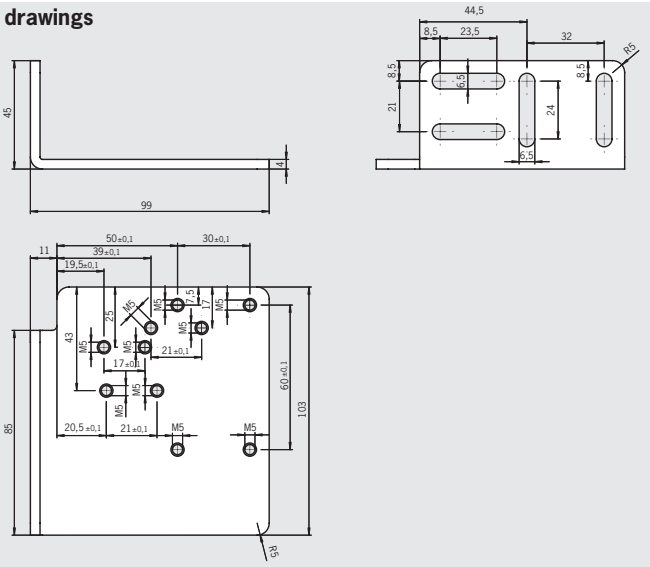
The mounting bracket is used for fastening safety switches NM and NP...AS to safety guards. The safety switches can be attached horizontally or vertically.

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

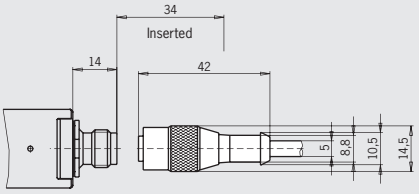
Plug connector M12

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

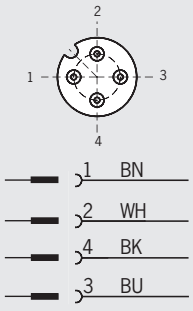
Cable
Cable sleeve PUR, color black, halogen-free, flame retardant. Reduction of toxic gases and smoke in case of fire. Conductor cross-section 0.34 mm².

Plug connector SGLF with cable
M12 plug, 4-pin

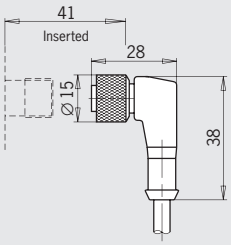
Dimension drawings



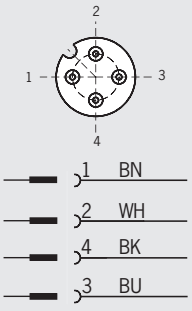
Wiring diagram
(view of connection side)



Plug connector SWLF with cable
M12 plug, 4-pin



Wiring diagram
(view of connection side)



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

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

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.

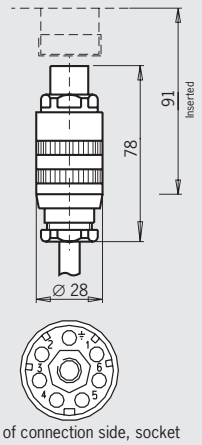
Male socket
For fitting in safety switches.

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).

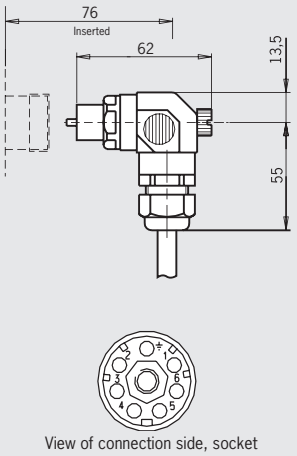
Female connector SR6 EF
6-pin + PE

Dimension drawings



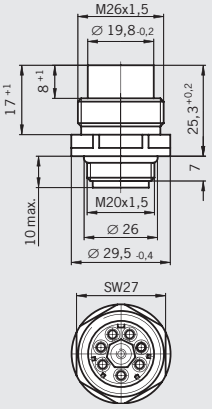
View of connection side, socket

Female connector SR6 WF angled 6-pin + PE



View of connection side, socket

Male socket SR6 AM
6-pin + PE

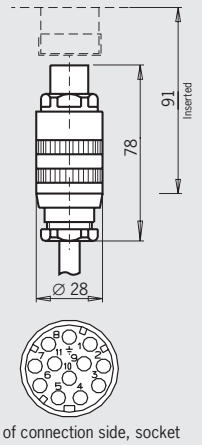


View of connection side, plug

Connector assignment for plug with cable

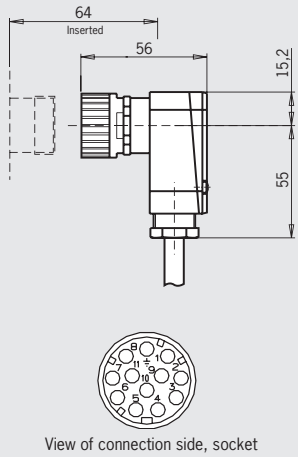
SR6		SR11	
Pin	Wire	Pin	Wire
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
⏚	7	7	7
		8	8
		9	9
		10	10
		11	11
		⏚	12

Female connector SR11 EF
11-pin + PE



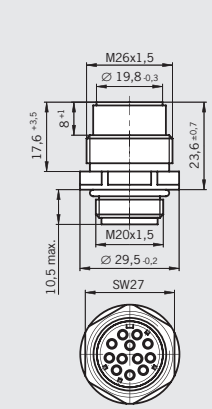
View of connection side, socket

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

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 mm²	**071260** SRF	-	-	-	-	-
	Pin crimp contacts Conductor cross-section 0.5 - 1.5 mm²	**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.

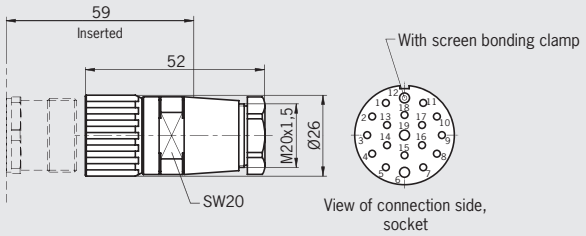
Angled plug connector (optional)
On plug connectors with cables the direction of the cable exit can be chosen on left/right. On plug connectors without cables the direction can be adjusted in 45° steps.

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

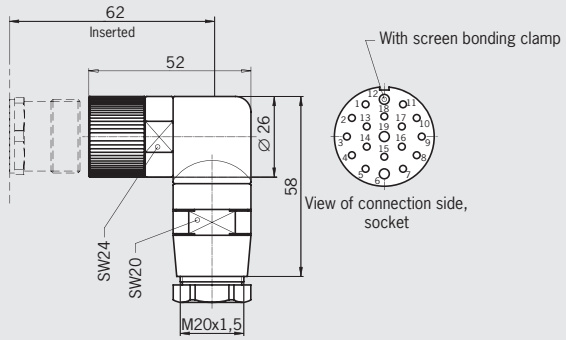
Halogen-free cable (optional)
Cable sleeve PUR, color black, halogen-free, silicone-free. Reduction of toxic gases and smoke in case of fire.
Conductor cross-section 0.5 mm² or 1.0 mm².

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

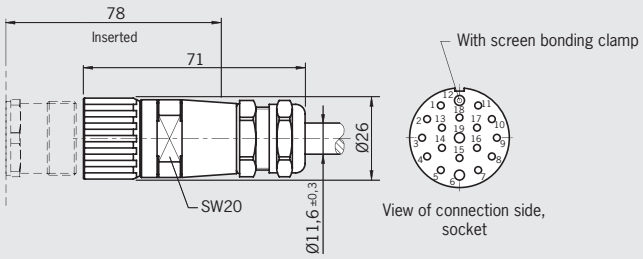
Designation	Version	Without cable
RC18 [2] 18-pin + PE	**EF** Female connector	**074616** RC18EF
	WF [1] Female connector angled	**074617** RC18WF
	Replacement pin crimp contacts Conductor cross-section 19 x 0.75 - 1 mm²	**094309** Pin crimp contact RCM
	EF-C1825 Female connector	**077025** RC18EF-C1825
	WF-C1825 [1] Female connector angled	**077026** RC18WF-C1825
	Replacement pin crimp contacts Conductor cross-section 16 x 0.38 - 0.5 mm² 3 x 0.75 - 1 mm²	**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.

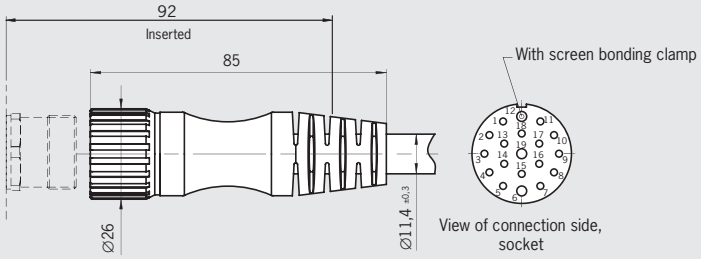
For safety precautions see page 149
For technical data see page 117

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
2	RD	0.5
3	GY	0.5
4	RD/BU	0.5
5	GN	0.5
6	BU	1.0
7	GY/PK	0.5
8	GN/WH	0.5
9	YE/WH	0.5
10	GY/WH	0.5
11	BK	0.5
12	GN/YE	1.0
13	PK	0.5
14	BN/GY	0.5
15	BN/YE	0.5
16	BN/GN	0.5
17	WH	0.5
18	YE	0.5
19	BN	1.0

Ordering table

Descrp.	Version	Cable									
		1.5 m	3 m	6 m	8 m	10 m	15 m	20 m	25 m	30 m	40 m
RC18 18-pin + PE **with cable**	**EF-C1825** Female connector	**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 halogen-free**	**EFF-C1825** Female connector	**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** C-M23F19-PU01,5-MA-110301	**110302** C-M23F19-PU03,0-MA-110302	**110303** C-M23F19-PU06,0-MA-110303	**110304** C-M23F19-PU10,0-MA-11030	**110305** C-M23F19-PU15,0-MA-110305	**110306** C-M23F19-PU20,0-MA-110306	**110307** C-M23F19-PU25,0-MA-110307

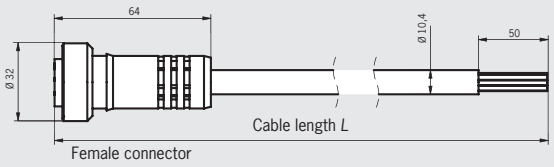
* Conductor cross-section as for connection cable above.

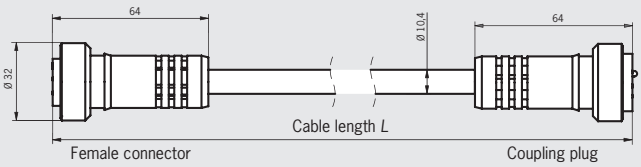
Plug connector BHA12 with cable

Female connector with cable
12-pin

Extension cable
12-pin

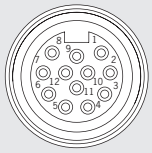
Dimension drawings





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

12-pin



View of connection side, socket

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

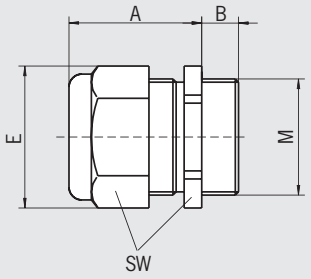
Version	Number of pins	Material	Cable length *L* [mm]								
			910	1800	3600	6000	9100	12100	15200	18200	24300
Female connector with cable	12	PVC	-	100959	100960	100961	100962	103158	103159	103160	-
		PUR	-	100966	100967	102522	102523	102524	102525	102526	-
Extension cable	12	PVC	-	-	100963	100964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

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

Cable glands

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

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



Item	Thread	Cable∅ [mm]	A [mm]	B [mm]	E [mm]	SW [mm]
EKP.16/05	M16 x 1.5	5 - 10	28	8	22	20
EKP.20/06	M20 x 1.5	6 - 12	26	11	27	24

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

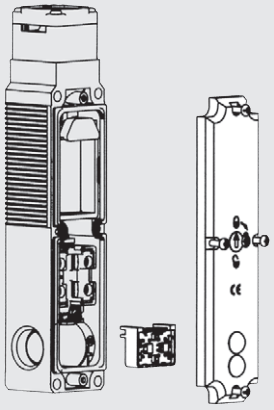
LED indicators for safety switches GP/ TP and STP

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

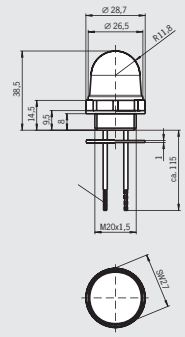
LED set
Consisting of cover with lamp caps, LED module with rectifier and two LEDs (green/red). For retrofitting safety switches TP and STP with an LED indicator.
Operating voltage AC/DC 24 V +10%, -15%.

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

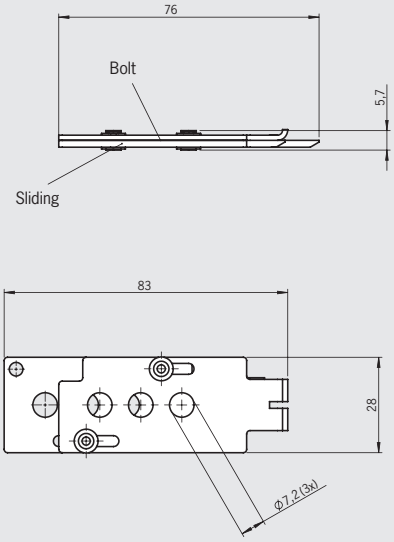
Miscellaneous accessories

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

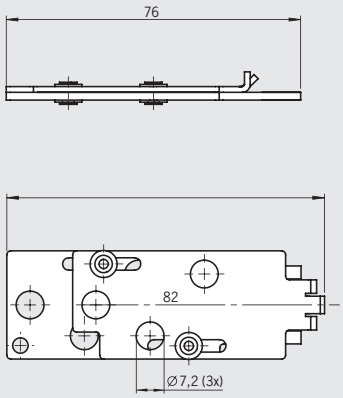
Lockout bar
With the safety door open, it can be slid into the actuating head on a switch with separate actuator (NP/GP/TP/STA/STP) instead of an actuator. Removal can be prevented using a commercially available padlock (max. 3 ea.). For the protection of people in areas with a possible hazard.

Lockout bar
For safety switches NP/GP/TP

Dimension drawings

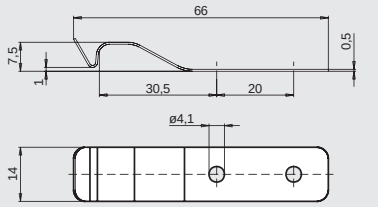


Lockout bar
For safety switches SGA/SGP/STA/STP



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).

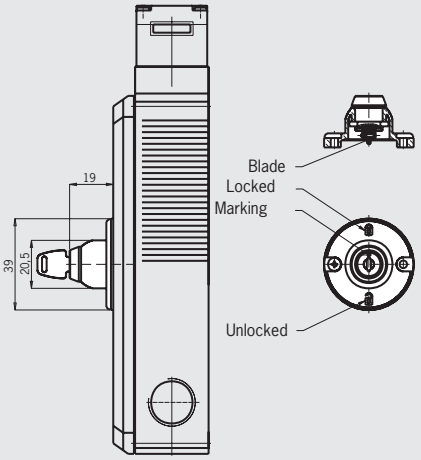
Latch spring for increased retention force
For safety switches NP/GP/TP



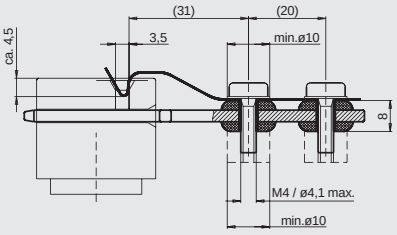
Lock
The lock is used in combination with safety switch TP/STP. The mechanical key release enables authorized personnel to actuate the mechanical release using the related key in certain situations. The unlocking mechanism holds the solenoid in the "unlocked" position.
Two screws are used to fix the lock to the cover of the safety switch TP/STP (above the mechanical release).

- Order safety switch TP/STP separately
- 2 keys are included
- Every safety switch of the series TP/STP can be upgraded to include a lock

Lock
For safety switches TP/STP



Installation example



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

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

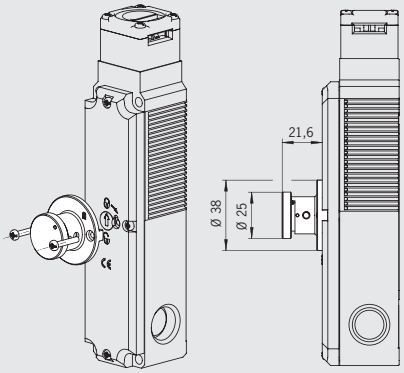
Miscellaneous accessories

- **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**

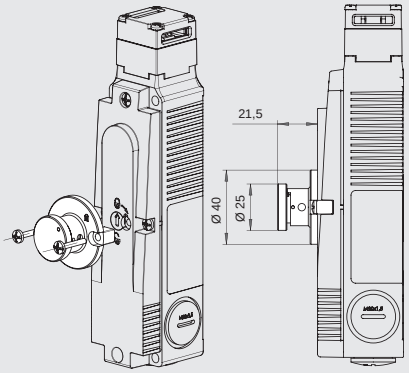
Emergency unlocking
Is used for the manual release of the guard locking without tools. The emergency unlocking mechanism must be returned to the locked state manually. A sealing wire can be fitted to protect against tampering.
Warning: Prior to mounting, the locking screw for the mechanical release must be removed.

Emergency unlocking
For safety switches TP/STP

Dimension drawings



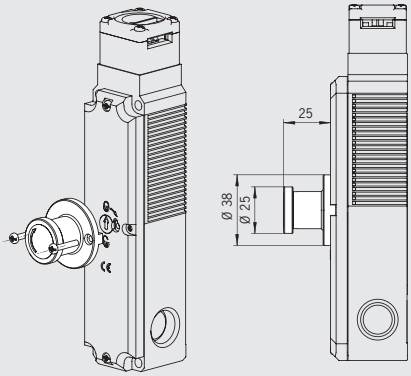
Emergency unlocking
For safety switch STA



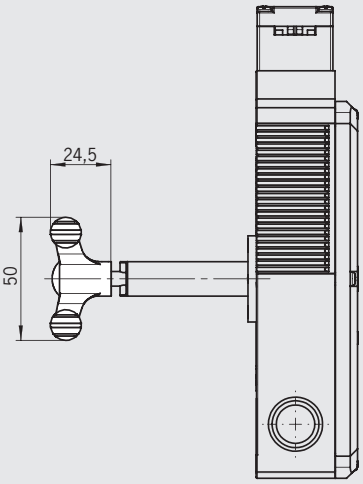
Release
Is used for the manual release of the guard locking. The integrated spring automatically resets the release to the locked state.
Attention: Prior to mounting, the locking screw for the mechanical release must be removed.

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

Release with automatic reset
For safety switches TP/STP



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



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**

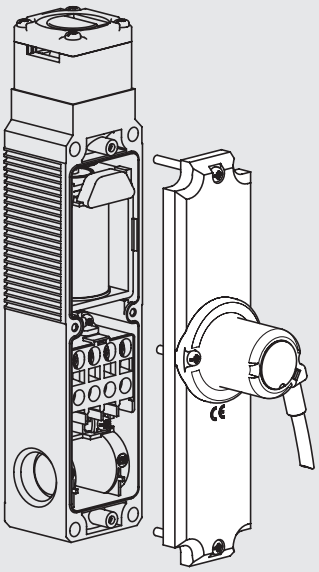
Wire front release (bowden)
Flexible routing of the pull wire permits release of the guard locking in inaccessible installation situations.

- 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

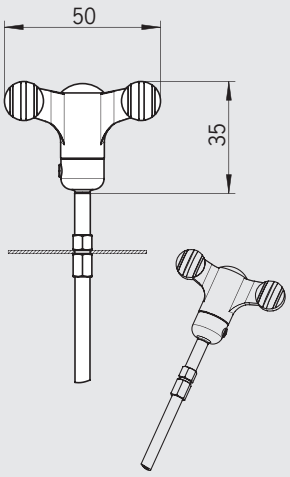
Safety screws
To prevent unscrewing of actuators and actuatingheads. The screws can be tightened using a normal tool, but cannot be removed again.

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

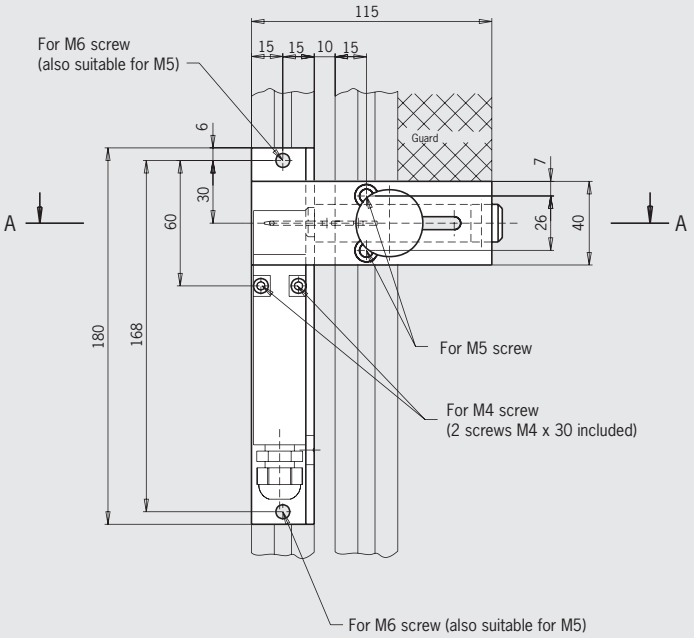
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Symmetrical design for doors hinged on the right or left
- No additional door handle necessary
- Bolt with detent mechanism in opened position
- Through hole on the bolt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

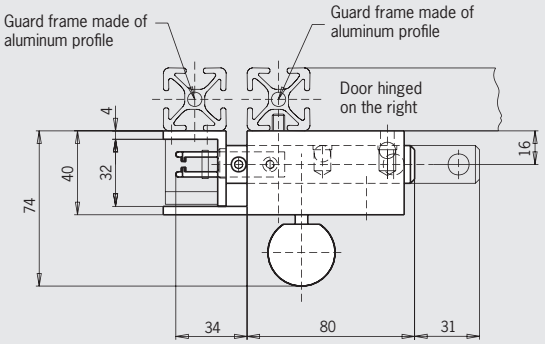
Notes

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

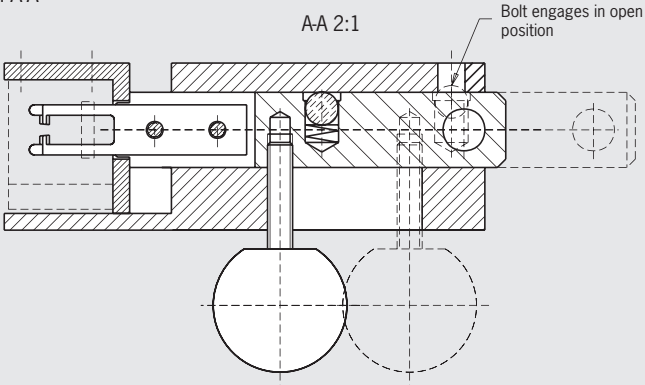
Bolt for safety switches NM..VZ

Dimension drawings





Section A-A



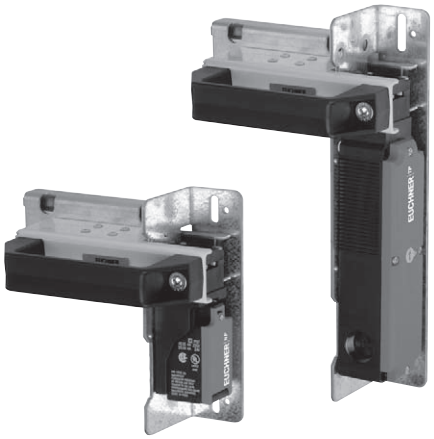
Ordering table

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**

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



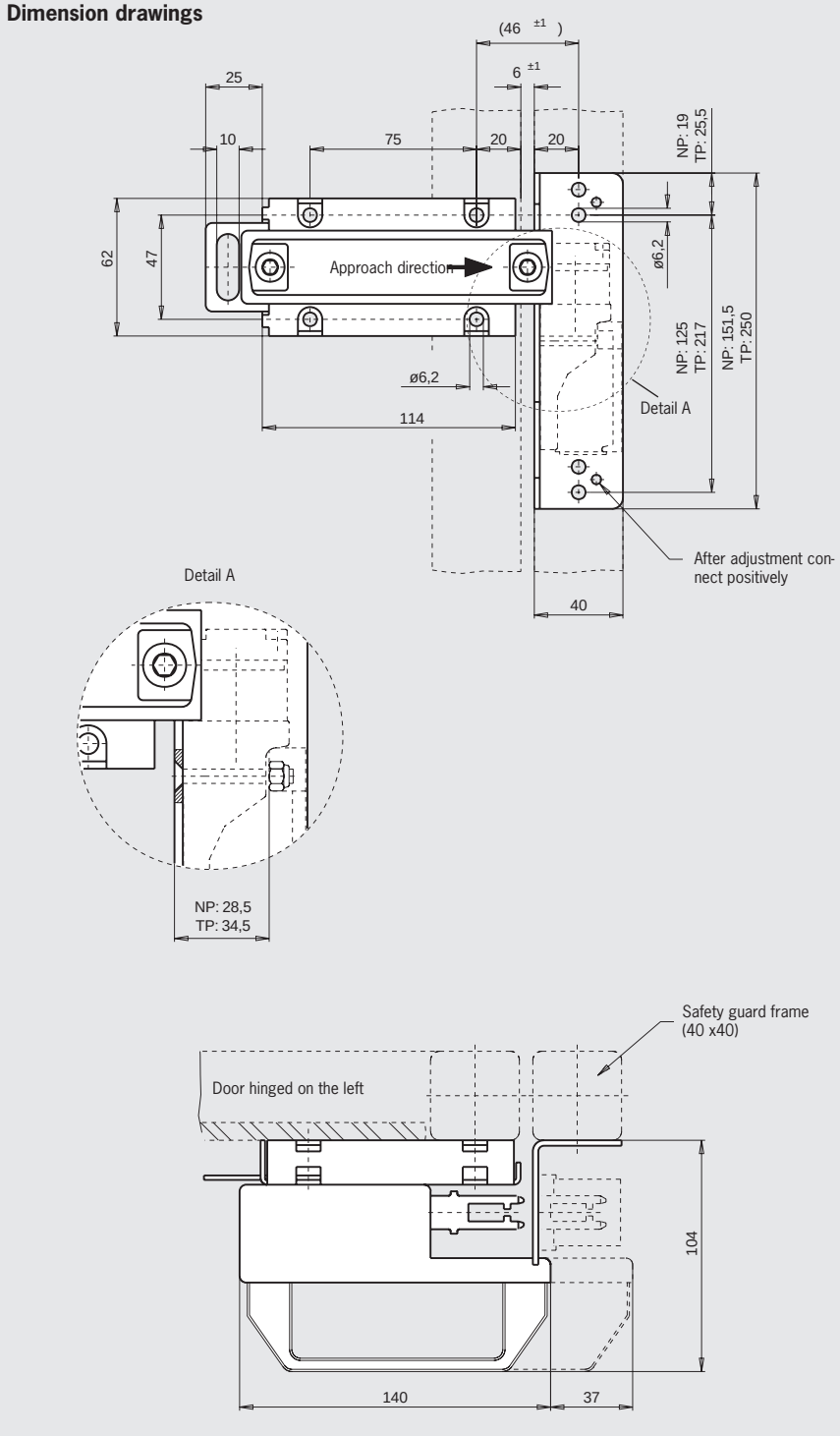
Features

- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Symmetrical design for doors hinged on the right or left
- No additional door handle necessary
- Automatic detent mechanism 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

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

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

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

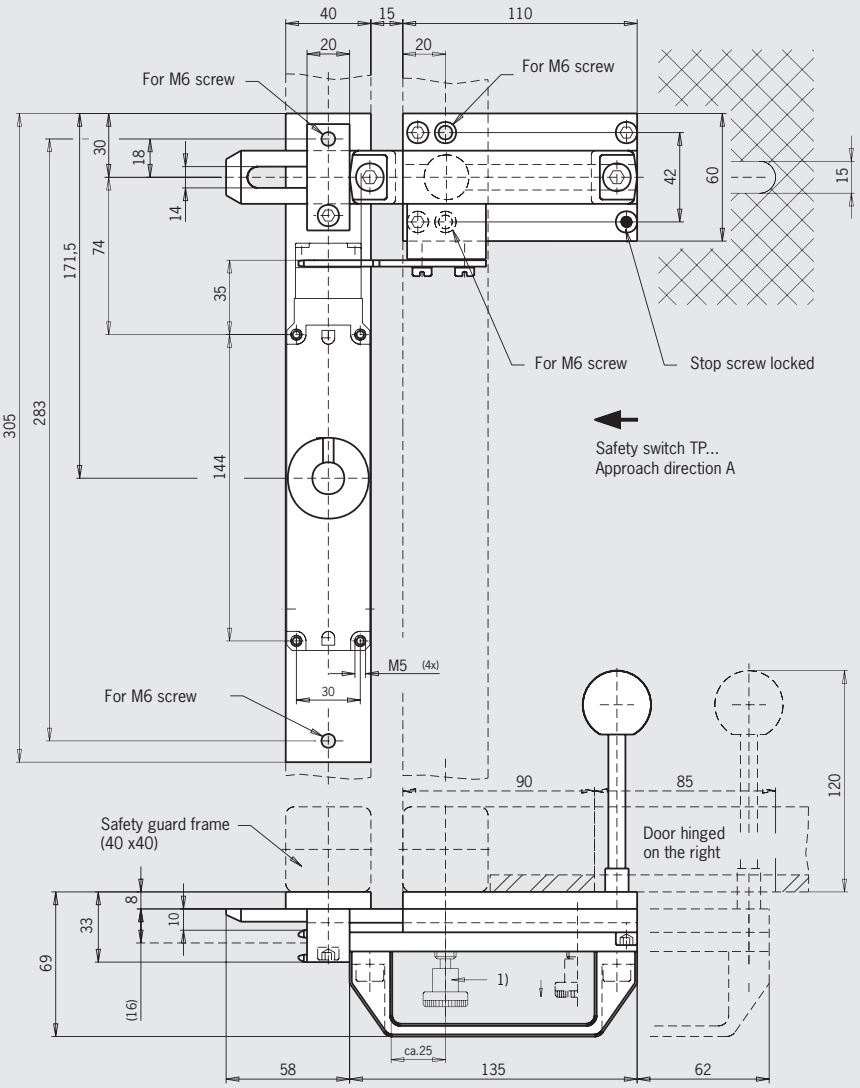
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Robust construction for heavy doors
- No additional door handle necessary
- Slot on the bolt permits attachment of padlocks

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)



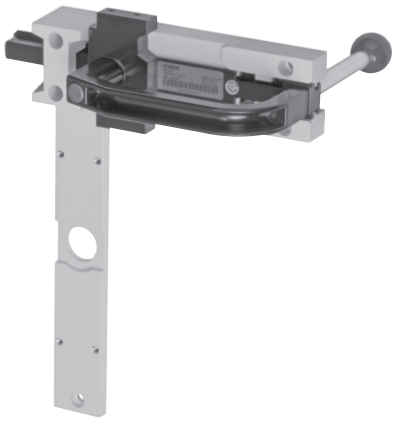
1) Bolt with detent mechanism (only for bolt TP-AF and TP-CF with escape release):
latches in open position and prevents unintentional closing of the bolt.
Unlocked by pulling the detent knob upward.

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

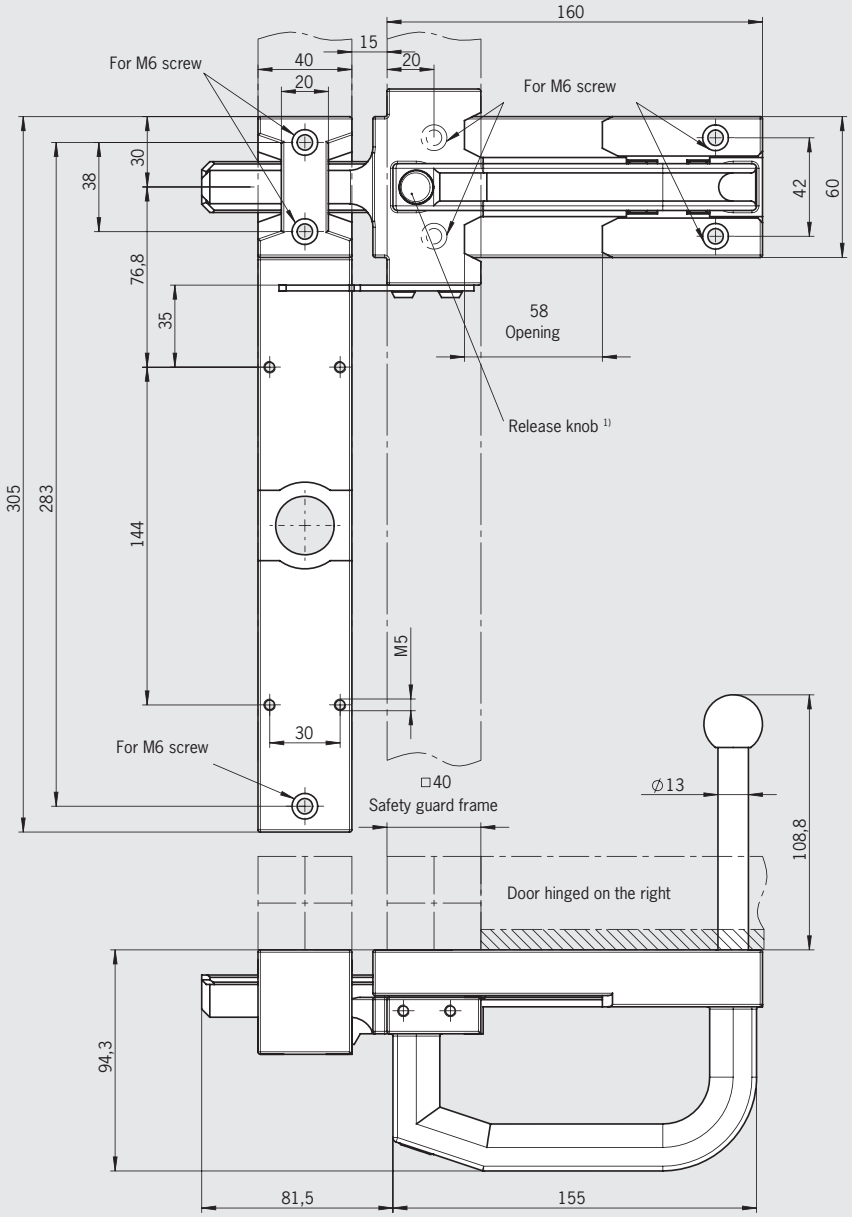
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Robust construction for heavy doors
- No additional door handle necessary

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

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

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

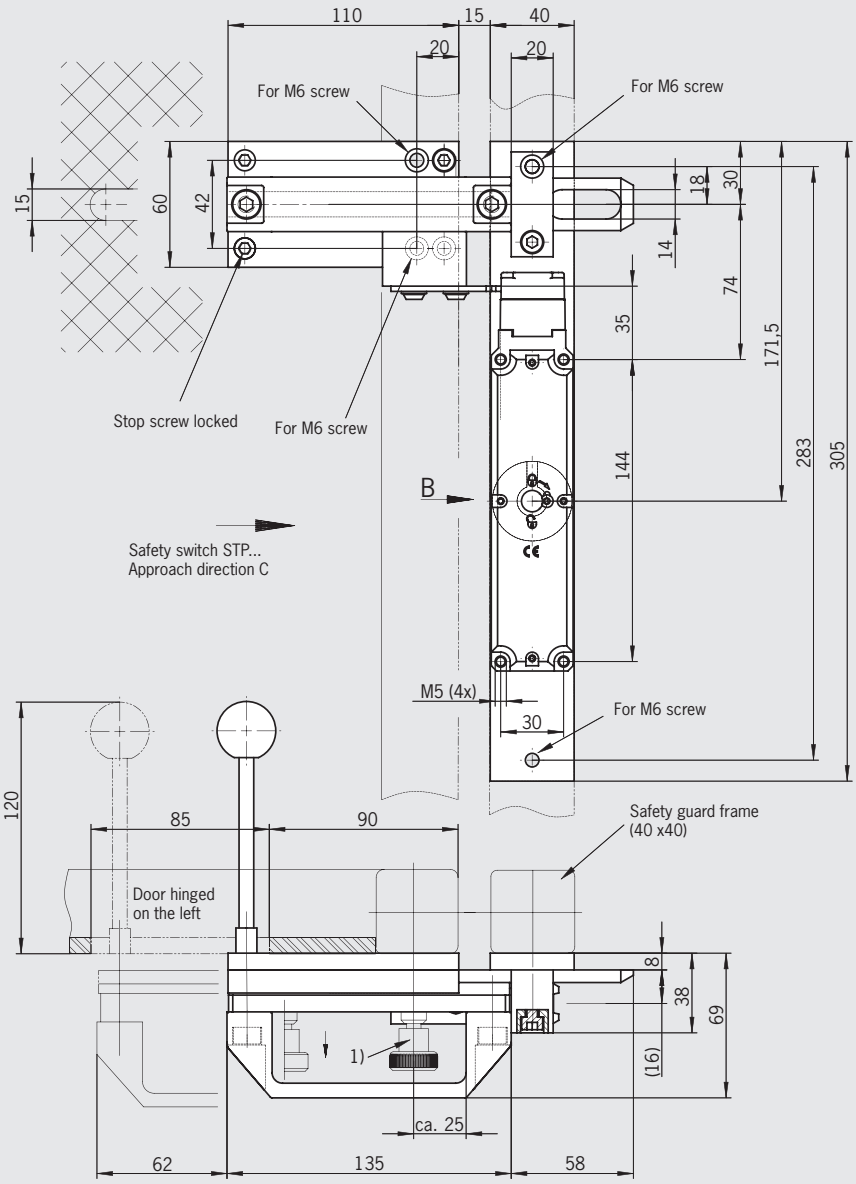
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Robust construction for heavy doors
- No additional door handle necessary
- Slot on the bolt permits attachment of padlocks

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)



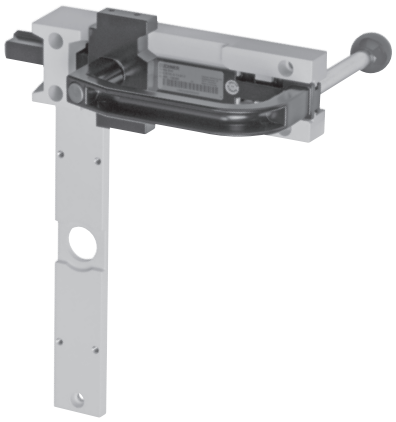
1) Bolt with detent mechanism (only for bolt STP-AF and STP-CF with escape release):
latches in open position and prevents unintentional closing of the bolt.
Unlocked by pulling the detent knob upward.

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

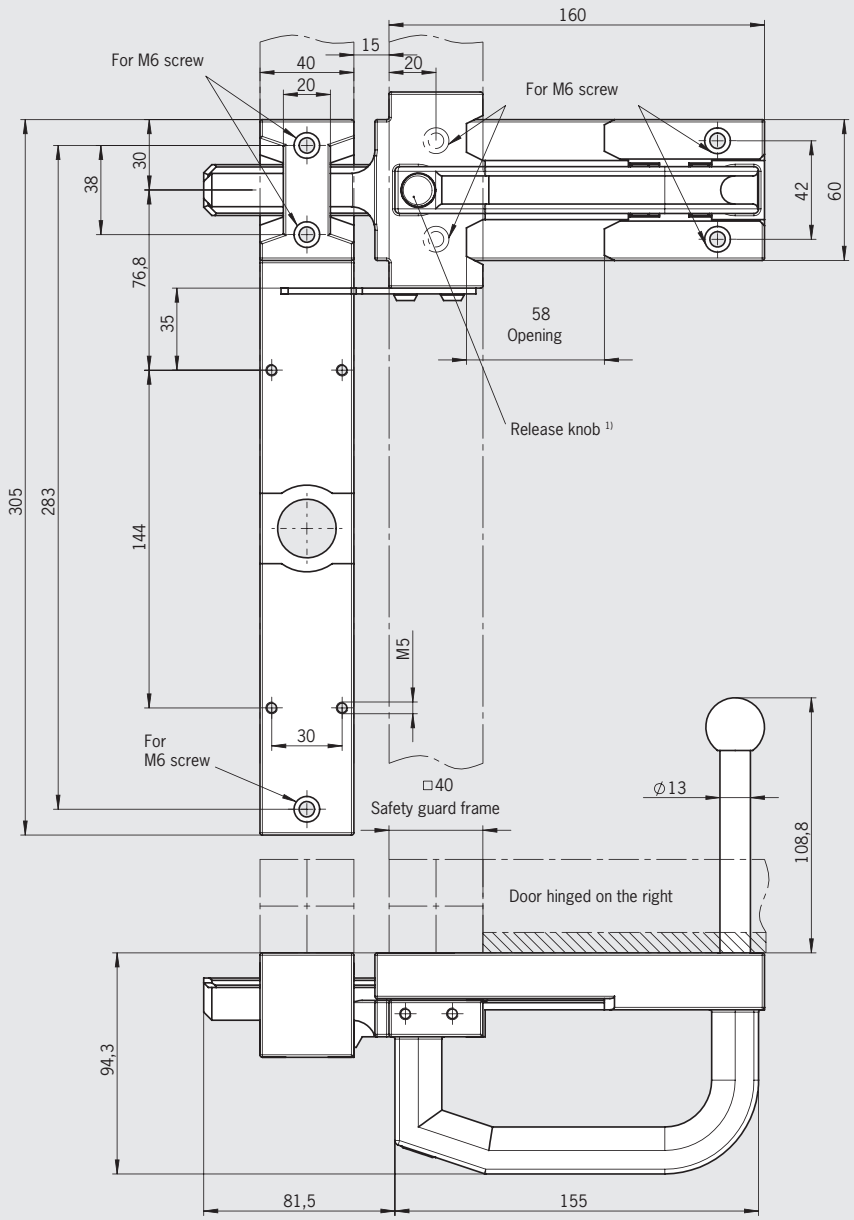
- Easily fitted to standard aluminum profiles and machine covers by screw connection
- Distinctive yellow color for easy recognition
- Robust construction for heavy doors
- No additional door handle necessary

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

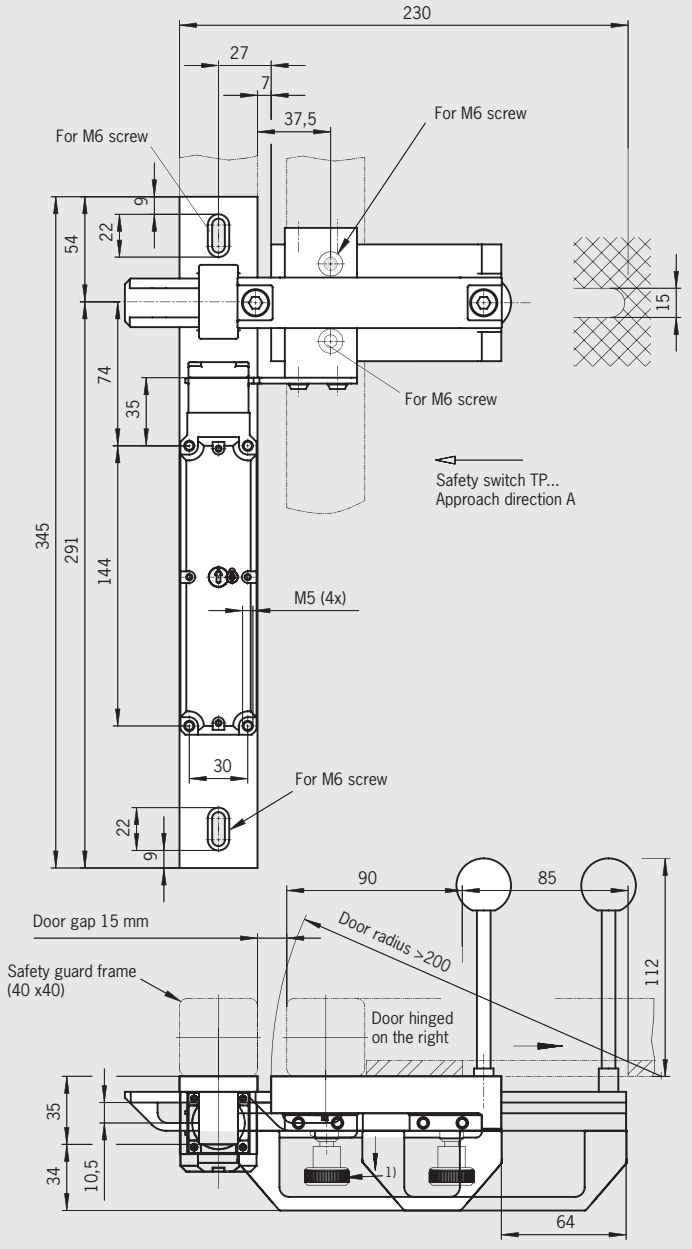
For safety precautions see page 149
For technical data see page 117

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**

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

Dimension drawings (here: shown with escape release)



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

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

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

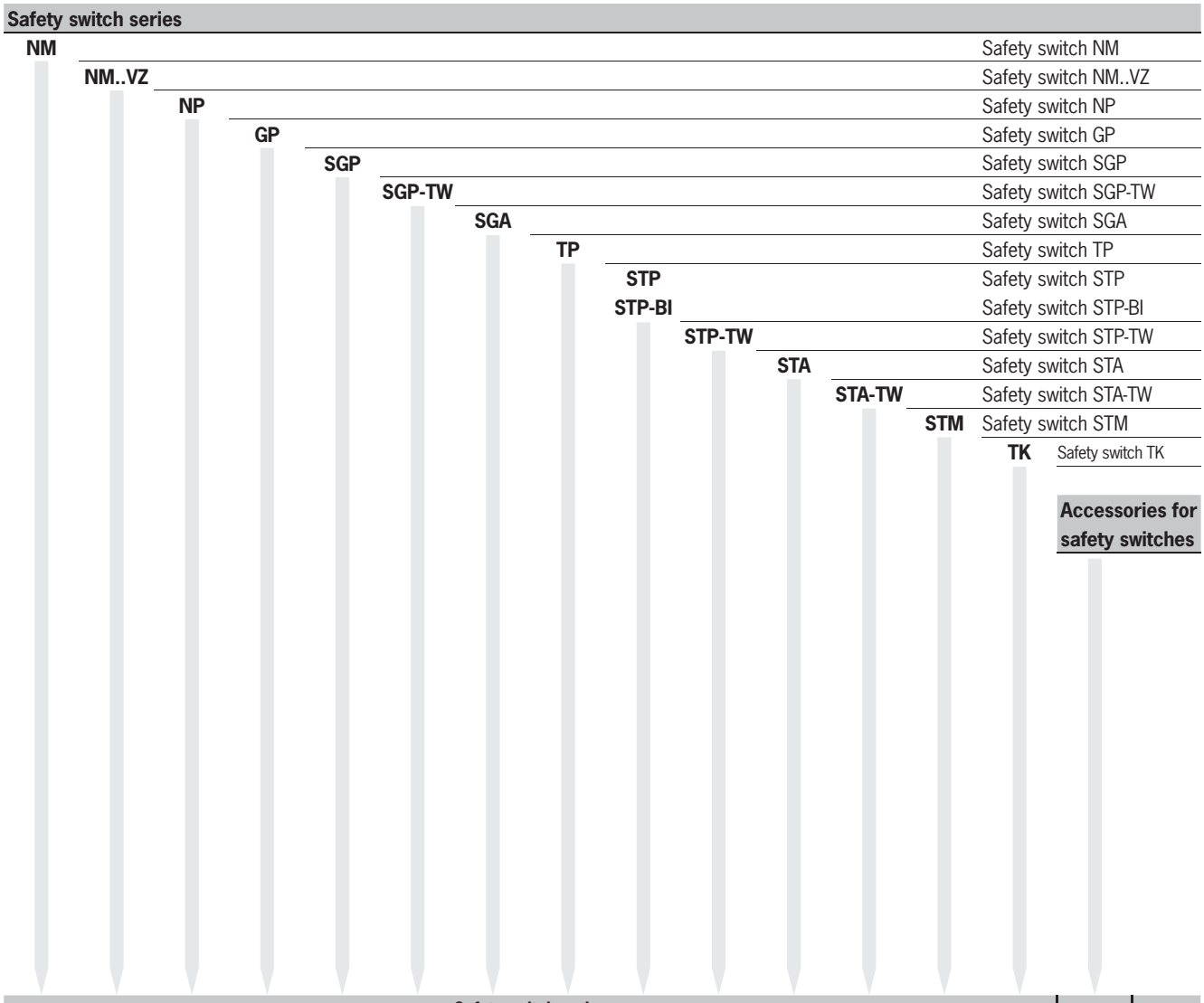
For plug connector	Function	Manufacturer's designation	
SVM5 5 pins	Female connector M12	**99-0436-57-05** Cable socket	**Binder** www.binder-connector.de
	Female flange connector M12	**09-3442-700-05** Flange connector with flexible wires	
	Blanking plug M12	**08-2425-000-000** Protective cap for socket 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.amphenol-tuchel.com
	Socket crimp contacts for C16-1, VPE 100 pcs.	**VN02 016 0002 (1)** Single contact, silver, 0.5-1.5 mm2	
	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 mm2	
	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.hirsch-mann.com
	Extraction tool	**931 812-001** XWA 164	
C16-1	Crimp tool	**TA0500 + TA0000163 + TA0002016001** Crimp pliers, jaws and contact receptacle	**Amphenol-Tuchel** www.amphenol-tuchel.com
	Extraction tool	**FG 0300 1461** Extraction tool	
RC12	Crimp tool	**RC-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	
	Extraction tool	**RC-Z2514** Extraction tool	
VP19	Crimp tool	**T98143 DAK 83S-30 / 11-7576T3** Insertion tool	**Litton/Veam** www.littonveam.com
	Extraction tool	**46592-MT50 / 11-7576T3** Removal tool	
UT23	Crimp tool	**Y16RCM** Crimping tool for machined contacts	**Burndy** www.burndy.com
	Extraction tool	**RX2025GE1** Extraction tool	
TB24	Crimp tool	**WT10-04** Crimp tool	**Thomas & Betts** www.tnb.com
	Extraction tool	**TRT16** Contact removal tool	

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

Overview



Safety switch series															
NM	NM..VZ	NP	GP	SGP	SGP-TW	SGA	TP	STP STP-BI	STP-TW	STA	STA-TW	STM	TK	Acces-sories	Page
●															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
B_{10d}	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

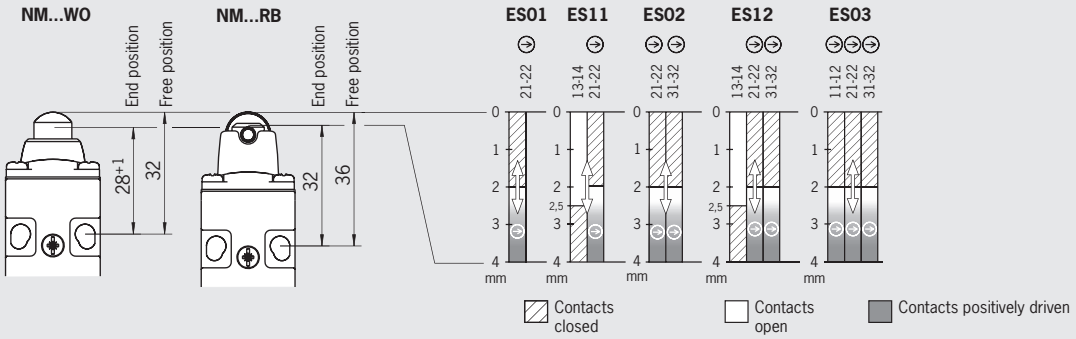
Parameter		Value	Unit
Ambient temperature		- 20 ... + 80	°C
Connection		Screw terminal	
Version		M16 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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 4A U_e 24 V	

Connection, plug connector SM 4 (M12)

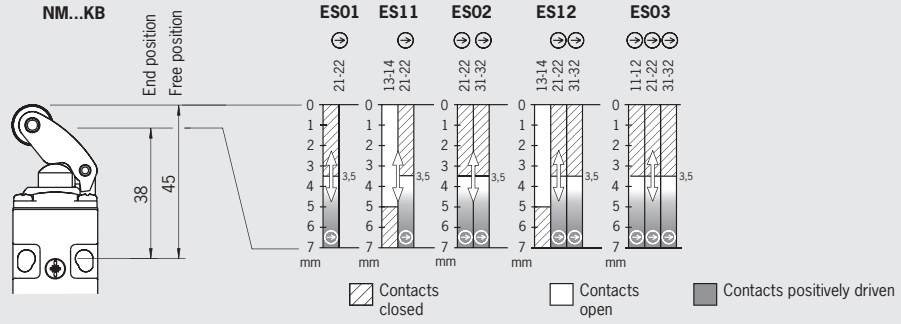
Parameter		Value	Unit
Ambient temperature		- 20 ... + 60	°C
Connection		Plug connector	
Version		M12 (4-pin)	
Degree of protection according to IEC 60529		IP 67 [1)]	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.3	kV
Conventional thermal current I_{th}		1.5	A
Short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

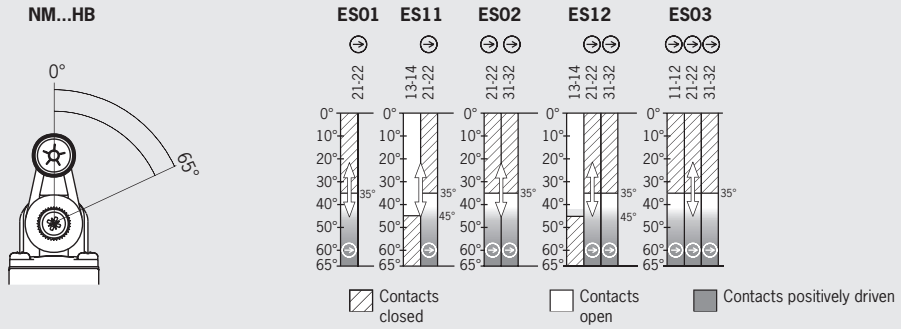
Travel diagram, NM.WO/NM.RB



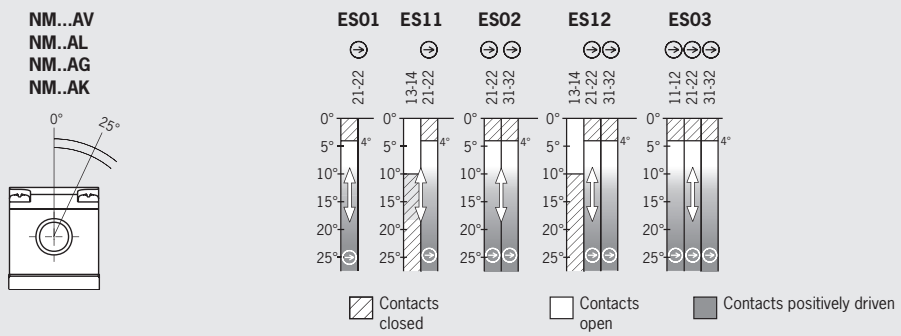
Travel diagram, NM.KB



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
B_{10d}	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	mm
	permissible overtravel	4	mm

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

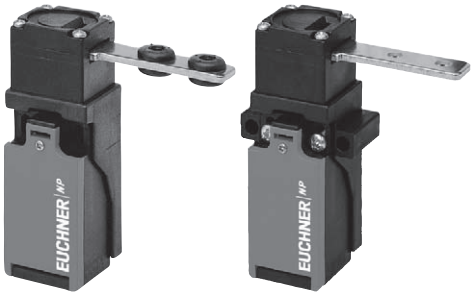
Parameter		Value	Unit
Ambient temperature		- 20 ... + 80	°C
Connection		Screw terminal	
Version		M16 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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 4A 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
B_{10d}	3 x 10^6 operating cycles	

Switch

Parameter	Value		Unit
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

Parameter	Value		Unit
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

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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.

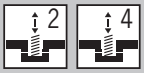
Reliability values acc. to EN ISO 13849-1

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 ⊖ + 1 NO	**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

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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)

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
B_{10d}	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		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

Parameter	Value			Unit
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

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 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
B_{10d}	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 ⇒ + 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
B_{10d}	3 x 10^6 operating cycles	

Switch

Parameter	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

Parameter	Value		Unit
Switching principle	Slow-action switching contact		
Switching element with 4 switching contacts	**2121** 4 NC ⇒	**2131** 3 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		

Connection, cable entry M20 x 1.5

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm²
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	N
	From top (v): 1300 (800 for door unlock request contact) / Side (h): 1300 (800 for door unlock request contact)	
Locking force F_{Zh} in acc. with GS-ET-19	Approach direction	N
	From top (v): 1000 / Side (h): 1000	
Insertion depth (minimum required travel + permissible overtravel)	Actuator *S* standard: 28 + 2 / Actuator *L* for insertion funnel: 28 + 7	mm
Lateral approach direction (h)	28 + 2	mm
Approach direction from top (v)	29.5 + 1.5 / ⚠ only on TP...K... 29.5 + 7	mm

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 ⊖	
Switching element with door unlock request contact	**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	mA
Switching voltage, min., at 10 mA	12	V
Contact material	Silver alloy, gold flashed	

Guard locking

Parameter	Value	Unit
Solenoid operating voltage	AC/DC 24 V +10/-15% / AC 110 V +10/-15% / AC 230 V +10/-15%	
Connection	Reverse polarity protected, integrated bridge rectifier	
Duty cycle	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	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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)

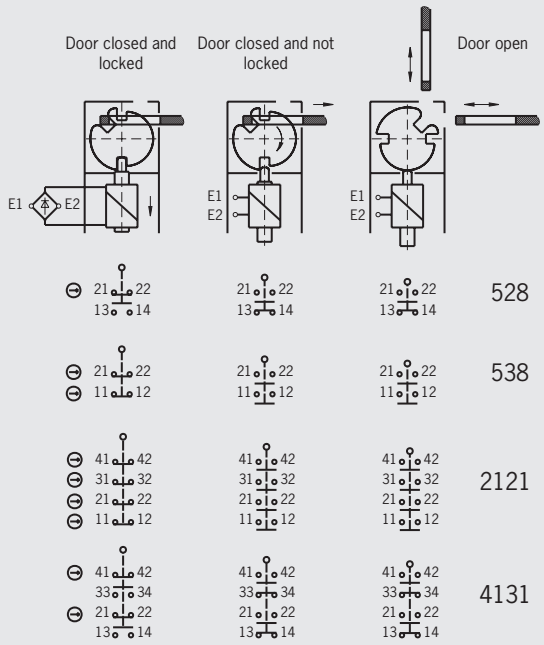
2) Version TP...EXT... with push button/cover for indicators IP 54

Connection, plug connector RC18

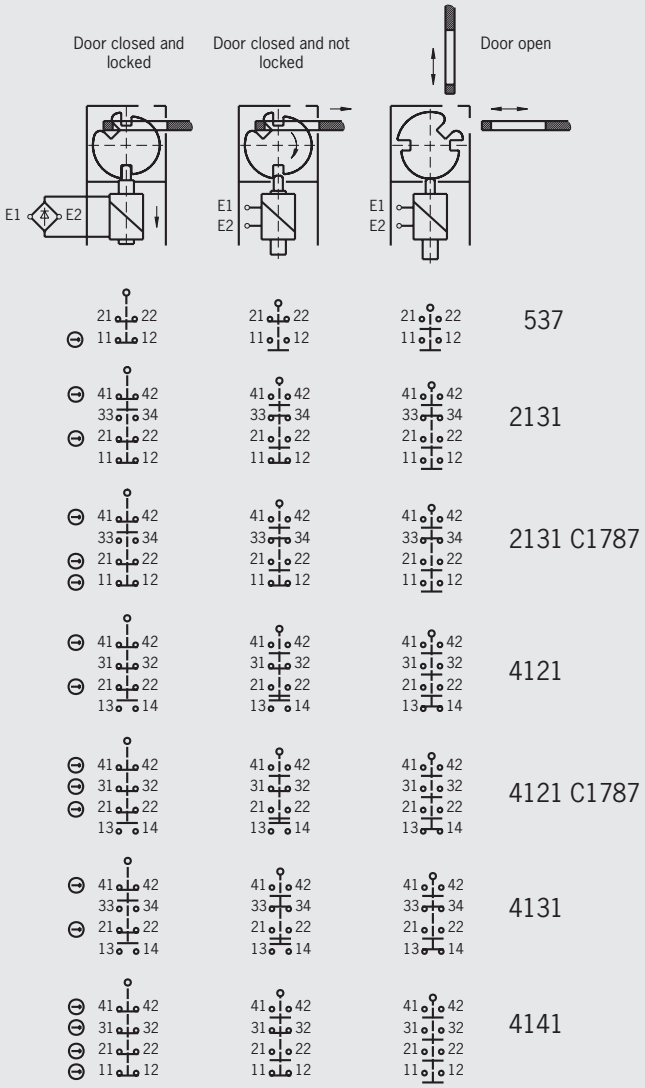
Parameter		19-pol	Value	Unit
Connection			Plug connector	
Version			18-pin + PE	
Degree of protection according to IEC 60529			IP 65 [1]	
Rated insulation voltage U_i			110	V AC/DC
Rated impulse withstand voltage U_{imp}			2.5	kV
Conventional thermal current I_{th}			4	A
Short circuit protection acc. 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)

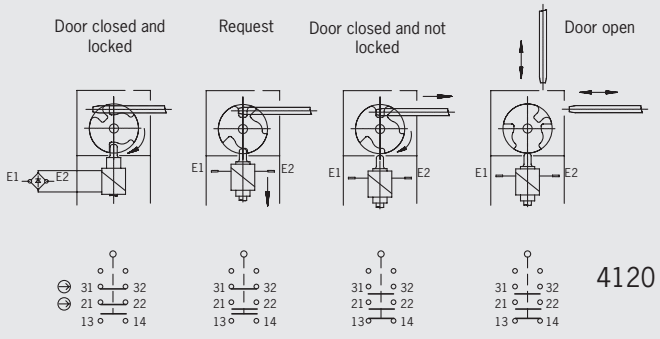
Switching functions TP1/TP2 without door monitoring contact



Switching functions TP3/TP4 with door monitoring contact



Switching functions TP5/TP6 with door unlock request 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

Parameter		Value	Unit
Material	Housing	Reinforced thermoplastic	
	Actuating head	Die-cast aluminum	
	Cam in actuating head	Stainless steel	
Mechanical life		1 x 10^6 operating cycles	
Ambient temperature		- 20 ... + 55	°C
Weight		Approx. 0.5	kg
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)	
		2500 / 2500	
Locking force F_{Zh} in acc. with GS-ET-19		Approach direction	N
		From top (v) / Side (h)	
	Straight actuator	2000 / 2000	
Insertion depth (minimum required travel + permissible overtravel)		Actuator *S* standard / Actuator *L* for insertion funnel	
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

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 ⊖	
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

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	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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)

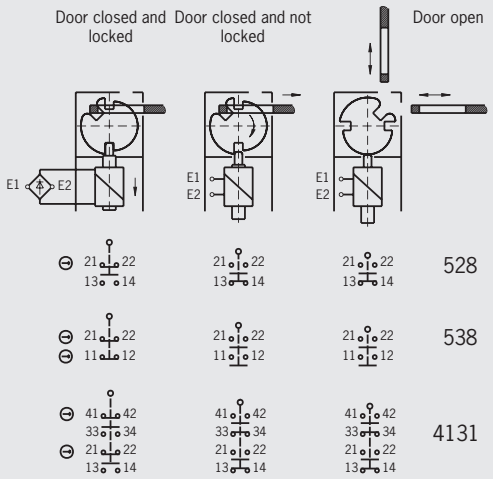
Connection, plug connector RC18

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	

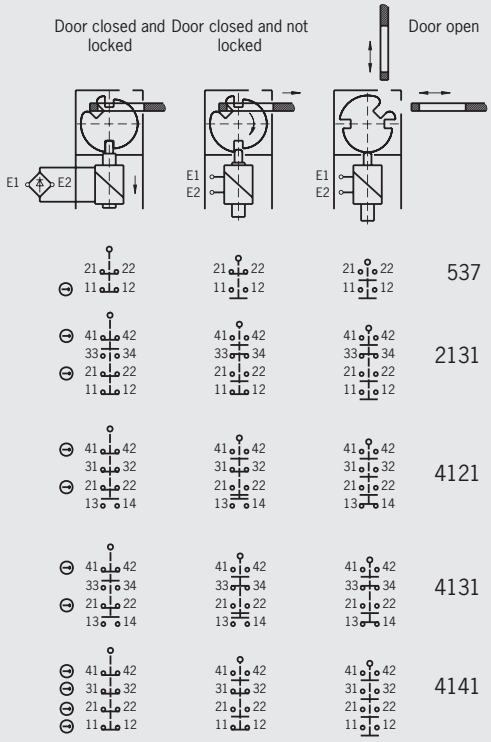
1) Screwed tight with the related plug connector (see page 101 - 102)

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

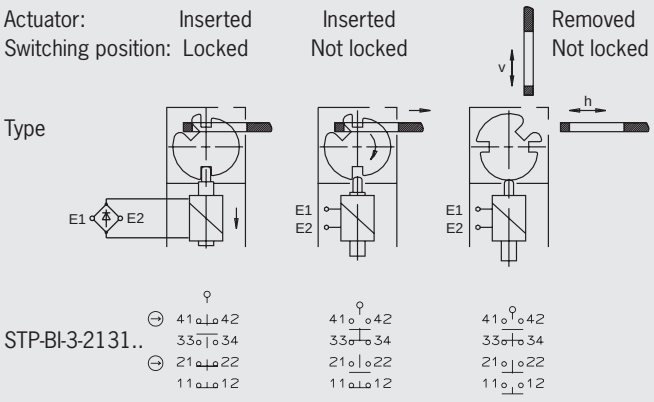
Switching functions STP1/STP2 without door monitoring contact



Switching functions STP3/STP4 with door monitoring contact



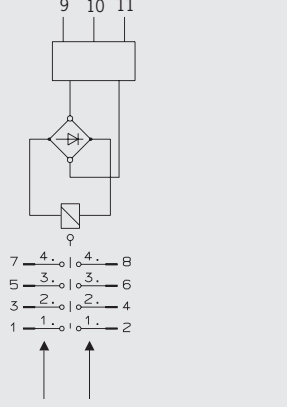
Safety functions STP-BI



Terminal assignment
Plug connector

SR11

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



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
B_{10d}	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	N
		From top (v) / Side (h)	
		2500 / 2500	
Locking force F_{Zh} in acc. with GS-ET-19		Approach direction	N
		From top (v) / Side (h)	
Straight actuator		2000 / 2000	
Insertion depth (minimum required travel + permissible overtravel)		Actuator *S* standard	
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	

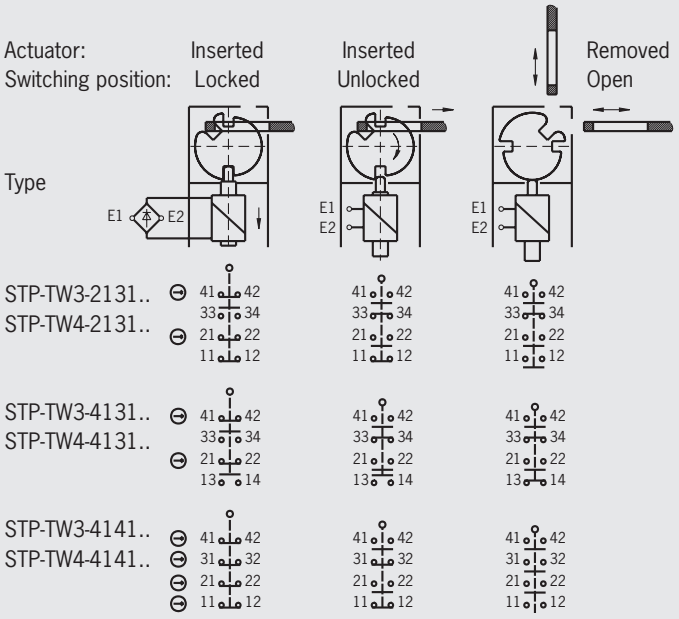
Guard locking

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
B_{10d}	1.2 x 10^7 operating cycles	

Switch

Parameter	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	Approach direction		N
	From top (v)	Side (h)	
Straight actuator	2300	2300	
Insertion depth (minimum required travel + permissible overtravel)	Actuator *S* standard	Actuator *L* for insertion funnel	
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

Parameter	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

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	

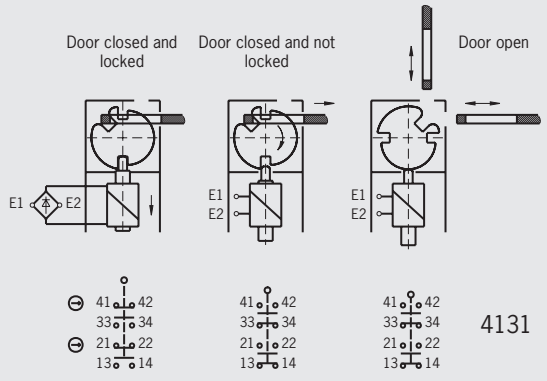
Connection, plug connector SR11		12-pol	
Parameter		**Value**	**Unit**
Connection		Plug connector	
Version		11-pin + PE	
Degree of protection according to IEC 60529		IP 65 1)	
Rated insulation voltage U_i		50	V AC/DC
Rated impulse withstand voltage U_{imp}		1.5	kV
Conventional thermal current I_{th}		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)

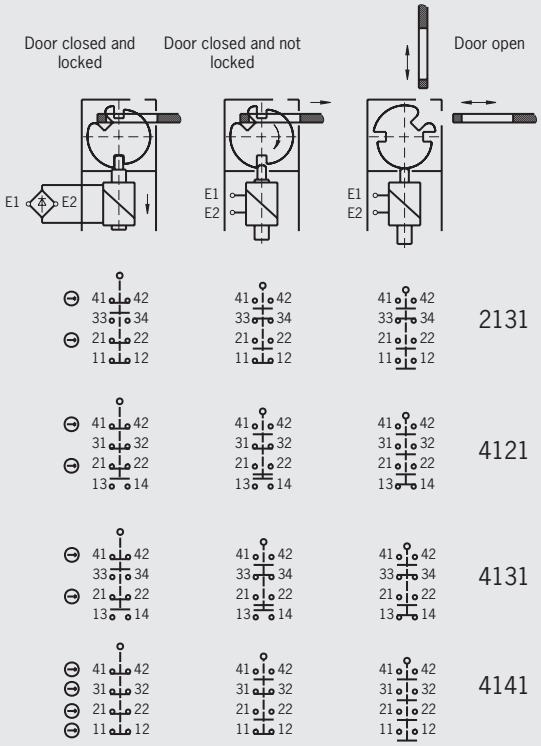
Connection, plug connector RC18		19-pol	
Parameter		**Value**	**Unit**
Connection		Plug connector	
Version		18-pin + PE	
Degree of protection according to IEC 60529		IP 65 1)	
Rated insulation voltage U_i		110	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		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
B_{10d}	4.5 x 10^6 operating cycles	

Switch

Parameter		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	N
		From top (v): 2500 / Side (h): 2500	
Locking force F_{zh} in acc. with GS-ET-19		Approach direction	N
		From top (v): 2000 / Side (h): 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; **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	

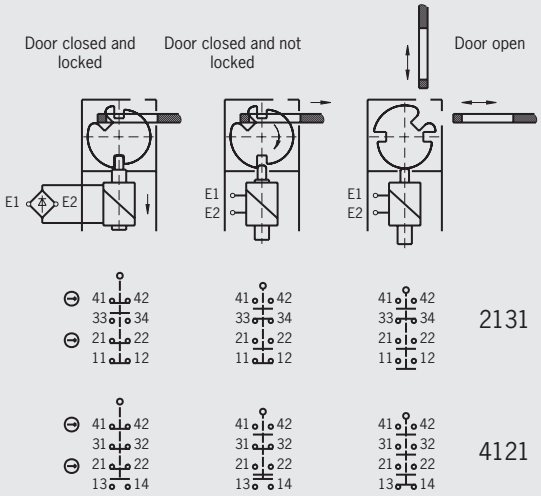
Guard locking

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	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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



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
B_{10d}	2 x 10^6 operating cycles	

Switch

Parameter		Value		Unit
Housingmaterial		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		N
		From top (v)	Side (h)	
	STM.A... (metal head)	2000	2000	
	STM.N... (plastic head)	1000	1000	
Locking force F_{Zh} in acc. with GS-ET-19		Approach direction		N
		From top (v)	Side (h)	
	STM.A... (metal head)	1500	1500	
	STM.N... (plastic head)	700	700	
Insertion depth (minimum required travel + permissible overtravel)		Actuator *S* standard		
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 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		

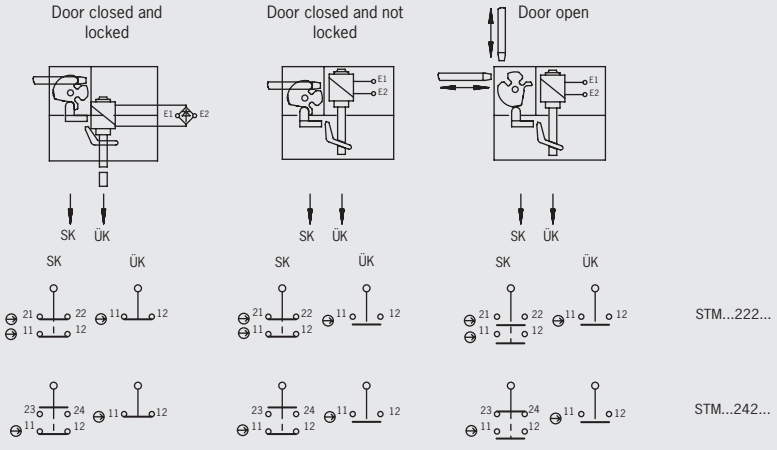
Guard locking

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

Parameter		Value	Unit
Connection		Screw terminal	
Version		M20 x 1.5	
Conductor cross-section		0.34 ... 1.5	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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
B_{10d}	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	

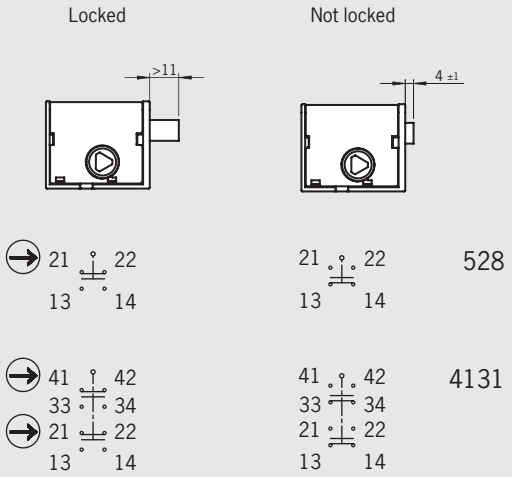
Guard locking

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	mm²
Degree of protection according to IEC 60529		IP 67	
Rated insulation voltage U_i		250	V AC/DC
Rated impulse withstand voltage U_{imp}		2.5	kV
Conventional thermal current I_{th}		4	A
Short circuit protection 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



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 mm²	

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 mm²	

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 mm²	

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

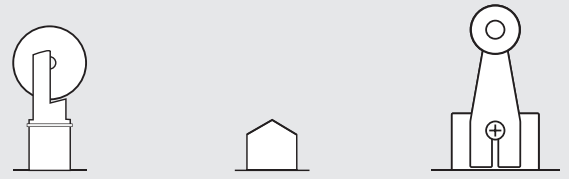
JIS standards in English	
JIS B 6014:1980	General code of safety for machine tools
JIS B 6507:1981	General code of safety for wood working machinery
JIS B 6607:1983	Safety standards for construction of band saw machines with feed carriages
JIS B 9650:1988	General design rules for safety and sanitation 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.

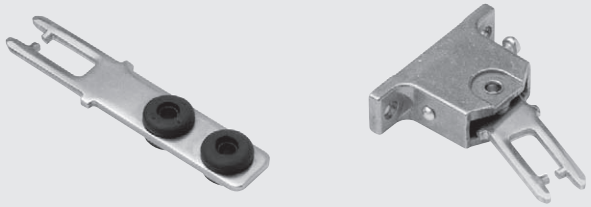
Actuation (electrical / mechanical)
Transition of a moving contact from one switch position to another. This will result in a change to the switch state of an item of switchgear. A differentiation is made between electrical actuation (e.g. switching on – switching off) and mechanical actuation (e. g.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

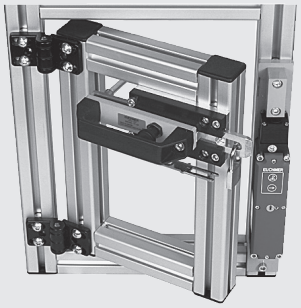


Straight actuator Hinged actuator

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.

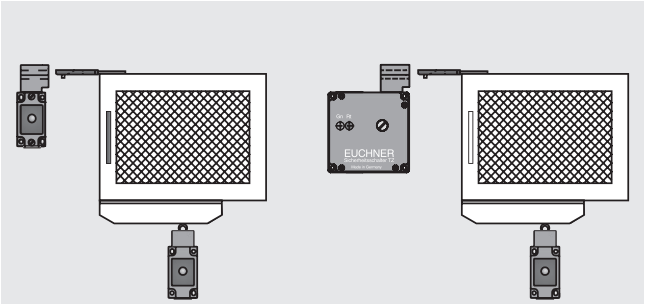
Closed-circuit current principle
On a *safety guard* with *guard locking* based on the closed-circuit current principle, the safety guard is locked by spring force until the guard locking solenoid is supplied with power. Unlocking is by solenoid force. The term *mechanical guard locking*.

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.



Movable safety guard without guard locking, diverse layout.

Movable safety guard with guard locking, diverse layout.

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.

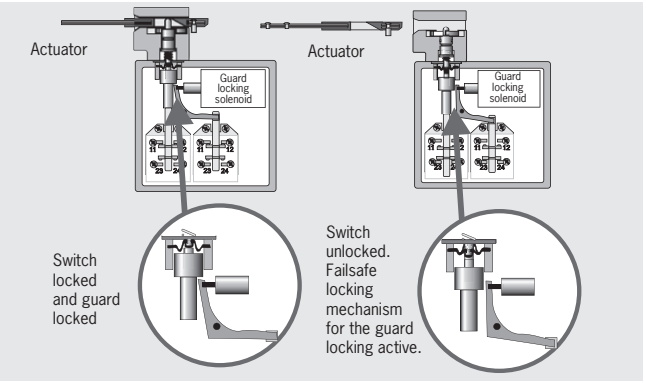
Enabling switch
If a ▸*safety guard* is open, movements are only to be possible if the controls are operated continuously. These are controls with automatic return to their original position. In general the term enabling switches is used here.

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.

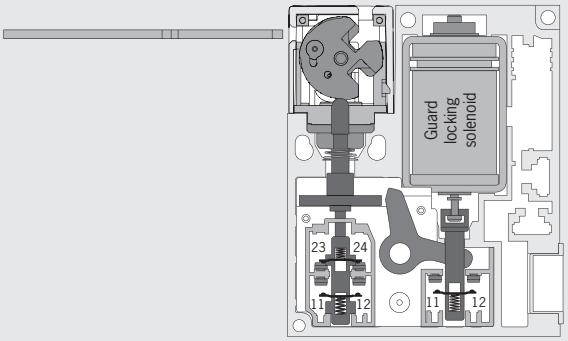
Failsafe locking mechanism
The failsafe locking mechanism on an interlock device with ▸*guard locking* mechanically prevents the ▸*safety switches* changing to the locked position with the ▸*safety guard* open and therefore signaling a safe state.



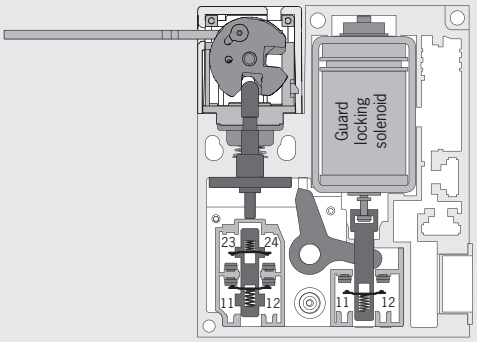
Guard locking
The guard locking retains a movable safety guard in the closed position until the machine can no longer pose any risk of injury. With the guard locking open, unintentional starting of the machine is prevented.

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:

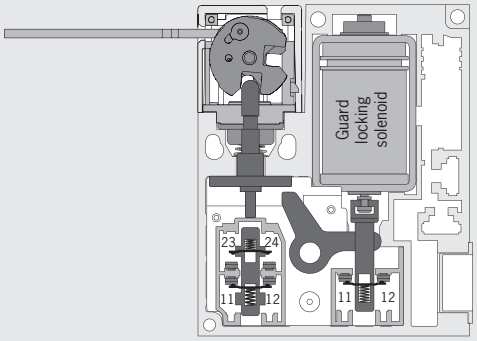
❶ Door open and not locked



❷ Door closed and not locked

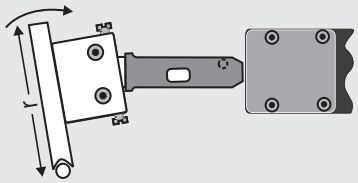


❸ Door closed and locked



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.



Hinged actuator

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).

Safety switch with mechanical release

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

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

Open-circuit current principle
On a ▪*safety guard* with ▪*guard locking* based on the open-circuit current principle, the safety guard is locked until the power supply to the 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 beprevented by suitable means (e.g. key-operated switch, access code). The selection of an operating mode on its own is not allowed to trigger machine operation. A separate action on the part of the operator must be required to start the operation of the machine. A means of indication of the selected operating mode is to be provided (e.g. the position of an operating mode selector switch, an indicator, a screen indication, etc.). Technical protective measures must remain effective for all operating modes. If it is necessary to disable technical protective measures (e. g. for setting up or maintenance work), a device for operating mode selection is to be provided that can be secured in the required operating mode (e.g. locked with a key) so that automatic operation can be prevented. In addition, one or more of the following devices should be provided:

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

PDF
The abbreviation PDF can have several meanings in safety engineering:

1. **P**robability of **D**angerous **F**ailure

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

2. **P**roximity **D**evices with defined behaviour under **F**ault conditions

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

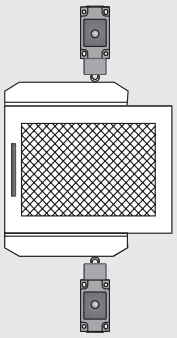
Positive actuation
Positive actuation is the positive movement of a moving mechanical component together with another component – either by direct contact or via rigid parts. The second component is, as a result, moved positively by the first.

Position 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.

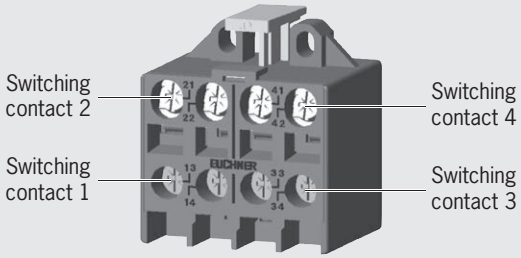
Snap-action contact element
On snap-action contact *elements* the ▸*switching element* jumps to the other switch state from a defined position of the ▸*actuator*. The movement of the switching contact is independent of the speed at which the actuator is moved. Snap-action contact elements typically have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



Quadruple switching 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:

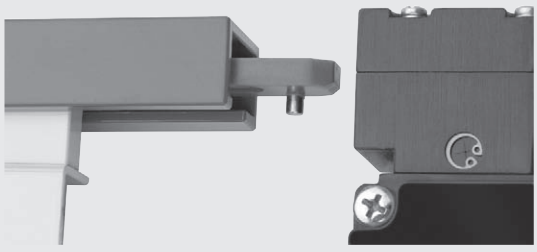
- Screwdriver
- Ball-point pens
- Nails
- Pieces of wire
- Adhesive tape
- etc.

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.


Guiding the actuator in a C rail

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

With safety function and with separate actuator (switches)

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

With safety function

With separate actuator

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