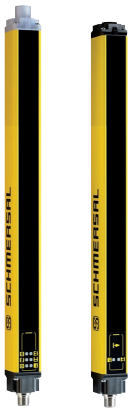
Machine Guarding Safety Products

GK-1 Catalog | 11th edition



SCHMERSAL

If machine safety regulations look like this to you…

let Schmersal show you the way.

Yes, there's a myriad of national and international regulations to follow with increasing emphasis on greater tamper-resistance, fail-to-safe design, and "control-reliable"operation. And frankly, some of it can be confusing. To satisfy these requirements, design engineers and safety professionals worldwide are choosing SCHMERSAL's tamper-resistant machine guarding components.

These rugged, watertight units feature positive-break NC contacts, a wide range of application accessories, and unique actuating mechanisms that resist bypassing/overriding. SCHMERSAL offers over 250 safety interlocks with matched safety relay modules to satisfy the highest levels of assessed risk.

Navigating through the maze of the latest ANSI, OSHA and international safety regulations to compliance need not be difficult. Easy-to-use solutions can be found in this latest edition of our catalog-handbook

SCHMERSAL

Turning Workplaces Into Safe Places

Content

Product overview

Important note!
The devices of our product range found in this catalog are not consumer goods; only competent and qualified persons with appropriate electrical and technical training may carry out the selection and installation of the devices.

The data specified in the catalog are fully checked typical values. Descriptions of technical correlations, details on external control units, installation and operating information or similar in this catalog have been checked thoroughly and are provided to the best of our knowledge at the time of publication. Products are constantly being modified and updated. Users must check our information and recommendations before using our components.

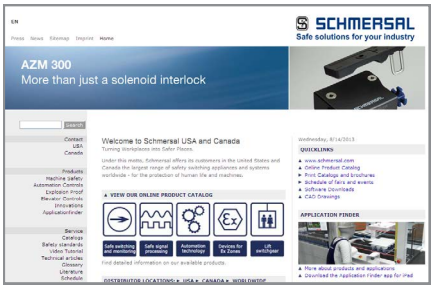
Complete technical data, wiring and installation instructions, wiring diagrams, ISD tables and other information is up to date in our online product catalog, available at www.usa.schmersal.net.

Schmersal North America

Always Available

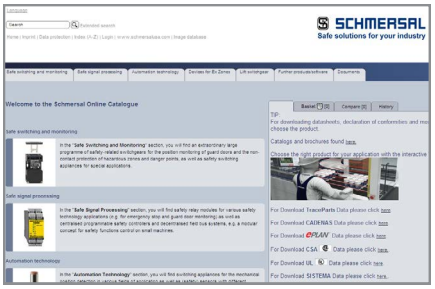
In the United States and Canada Schmersal is represented from locations in Tarrytown NY and Brampton, ON. From these two warehouse locations Schmersal supports and distributes products through our established distribution network. Utilizing the combination of stocking distributors and the knowledgeable engineering sales team at Schmersal, we are always available to supply products and support customer applications.

Our vast working knowledge of local and international standards has allowed Schmersal North America to lead the way in helping customers understand the requirements for specific applications. Our trained machine safety engineers are available to guide customers through the maze of safety standards that are seen today. Whether it is a simple application or a complex safety system Schmersal can help you understand the applicable safety standards to help guide you to the appropriate product selection which is best suited for your machine or process.



Schmersal USA Website
www.schmersalusa.com

Our home page is the place to find information on local distributors, company and product news, technical articles, videos and other resources.



Online Product Catalog
www.usa.schmersal.net

The online catalog allows users to view or download technical data, declarations of conformity, test certificates, and mounting & wiring instructions - in many different languages

Application Finder
www.applicationfinder.net/us/home/

Explore an interactive animated packaging plant floor to discover which Schmersal safety switching devices are optimal for the particular application.

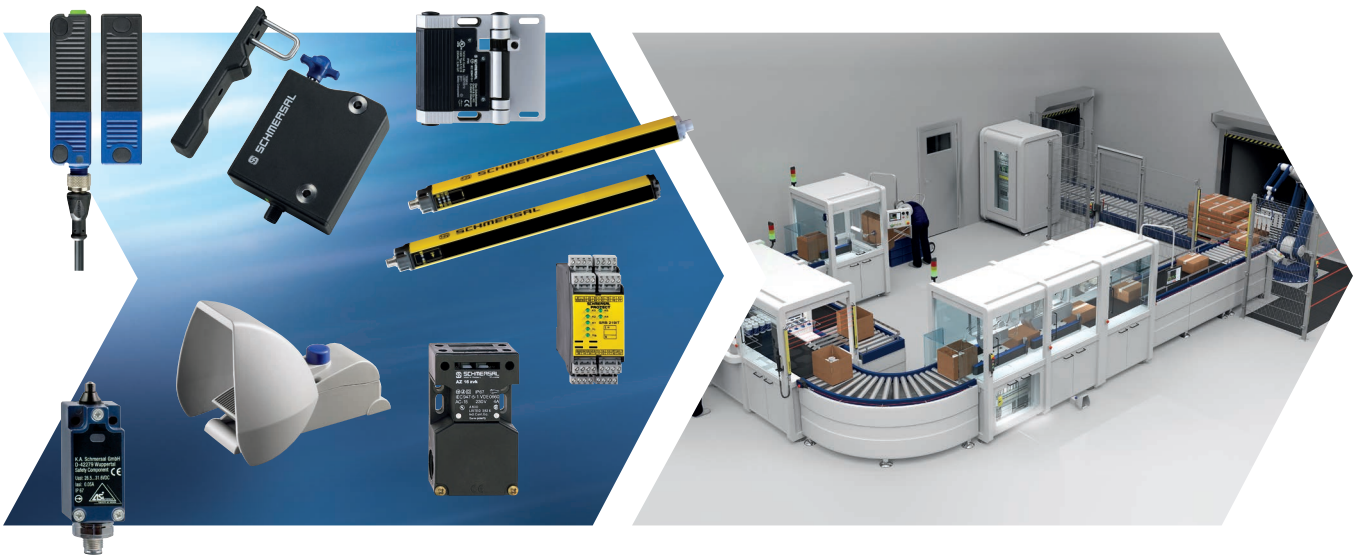
Find local distributors at
www.schmersalusa.com

USA

Canada

Safe Solutions for your industry

Safety in system – Protection for man and machine



Following this principle Schmersal has become a leader in the design and manufacture of safe switching products and systems for various industries. In almost every field of work or industrial application there are inherent risks and different requirements for safety for man and machine.

At Schmersal we realize that every application is different and that there are specific risks and specific environmental conditions that should be considered when selecting safe guarding products. By understanding this Schmersal has developed industry specific solutions to help guide you to the best suited product or system for your application.

AZM300 Electronic Solenoid Lock

CONTROL ENGINEERING
2014
ENGINEERS' CHOICE AWARDS
WINNER

Innovations

For over 65 years Schmersal has developed a reputation for the design and manufacture of reliable quality products. Today with over 25,000 products in the Schmersal product portfolio, innovation remains paramount as Schmersal continuously designs and develops products to meet the demands of the never ending evolution of industry. From precision electromechanical position switches to patented leading edge Pulse Echo technology, Schmersal continues to lead the way in machine safety product solutions and systems.

RSS260 Compact RFID Safety Sensor

TESK Hinged Safety Switch

Industrial Solutions
Food

Industries

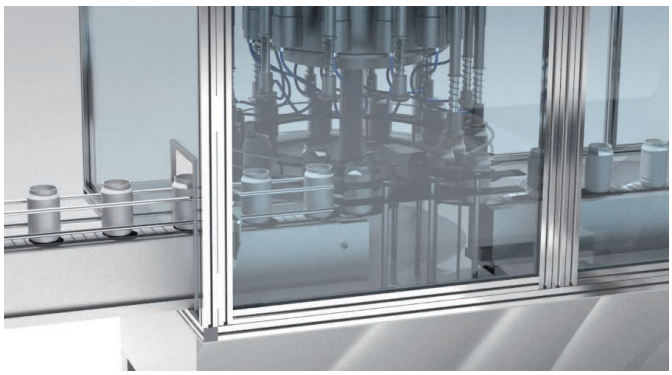
Harvesting, drying, filleting, heating, grinding, mixing, bottling and packaging: food production involves a lot of process steps, most of which are run by machines. Not only do machine safety standards and guidelines need to be followed during these processes, safety switchgear or controlgear at the human-machine interface also have to meet strict hygiene requirements. In other areas, a high degree of temperature resistance or resistance to moisture is required. Explosion protection also plays a role in the processing of powdered raw materials or products.

Products

Schmersal has developed several products which meet protection class IP69K and use stainless steel and other ECOLAB certified materials for their enclosures: The AZM300 Solenoid interlock, safety sensors like the BNS40S, CSS40S, RSS36, our Safety Light Curtain SLC420..69, and our K series of industrial grade joysticks.

Another product group dedicated to food production is the N series of command and signalling devices. They meet the requirements of EN 1672-2 (Food processing machinery: Basic concepts - Hygiene requirements), are IP69K rated, and are now certified for use in clean rooms.

Applications



Industrial Solutions
Packaging

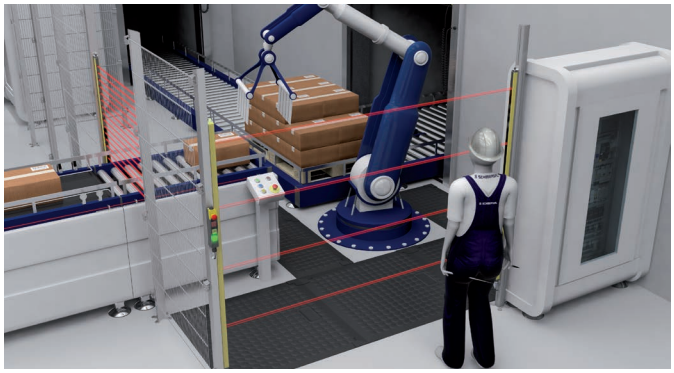
Industries

Machines and systems used in the packaging industry are often operated at high speed and with short cycle times. They are frequently part of the entire production and/or packaging lines. For this reason, guard systems should only interrupt production processes or negatively influence system productivity when absolutely necessary. They must also work with extreme accuracy on a 24/7 basis.

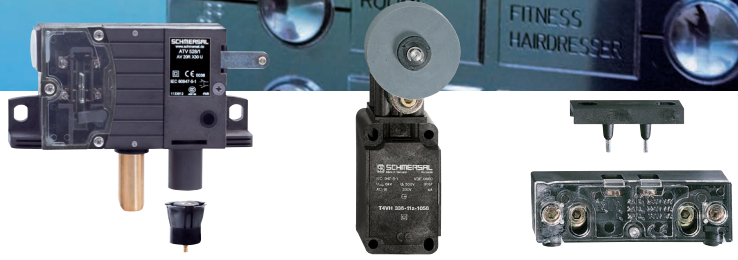
Products

Many safety switchgears from the Schmersal Group preferred in the packaging machine building industry are designed so that unplanned stoppages of machinery are avoided. Safety switchgears with an integrated AS safety at work interface and our compact safety control PROTECT SELECT are also often used in this industry. New and innovative solenoid interlocks such as the MZM 100 and AZM 300 were also developed with the special needs of the packaging industry in mind.

Applications



Industrial Solutions
Elevators and Escalators



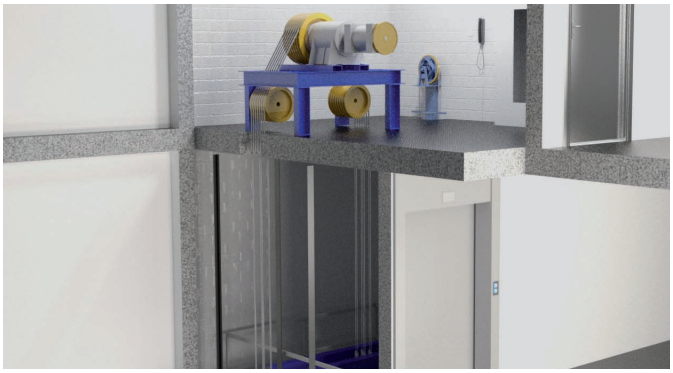
Industries

The Schmersal Group has a hand in the fact that elevators are the safest transport device in the world. For many decades now we have been one of the world's leading makers of switchgears for elevators and escalators, offering these industries a wide range of products. All lift switchgears meet relevant international requirements and operate fault-free and failproof even under adverse conditions.

Products

We have developed specific products used for locking and safely monitoring elevator doors and in the safety circuits of elevator control systems. The product line includes floor and fine-adjustment switches, positive-break door contacts, position switches, solenoid switches, emergency call systems, custom assembled top of car/ inspection control boxes, as well as the USP non-contact positioning system. We have also developed custom switchgear for special tasks such as the electric shutdown of the lift system upon actuation of the speed limiter. In addition, through the merger of Böhnke & Partner with the Schmersal Group, we can offer complete control technology at the highest level of engineering and quality

Applications



Industrial Solutions
Heavy industry

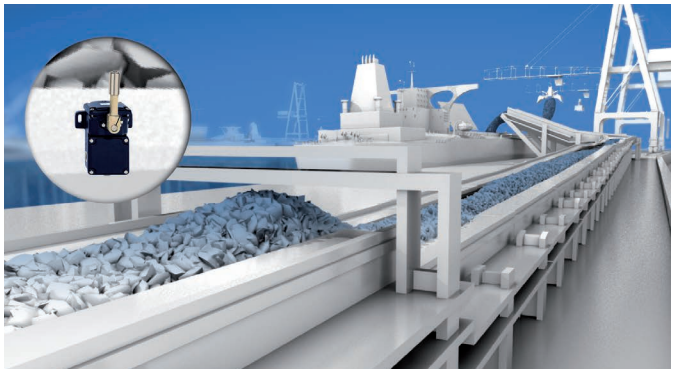
Industries

We have more than six decades of experience with heavy industry as the Schmersal Group was originally a manufacturer of high-grade switchgear. Today our products are used everywhere where special requirements exist in difficult and harsh operating environments mining, construction machinery, ship engineering, various types of cranes and hoisting devices as well as power generation

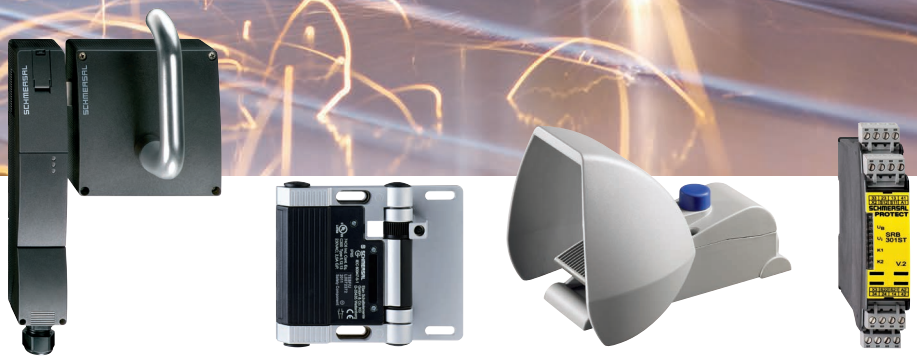
Products

Many of the switchgears we have developed for heavy industry, differ from other series. They are very robust, oftentimes even significantly larger, and are radically designed for high durability even at extreme stresses. This product group includes our heavy position switches, foot switches, heavy-duty command devices, belt alignment switches and pull-wire emergency stop switches.

Applications



Industrial Solutions
Machine tools



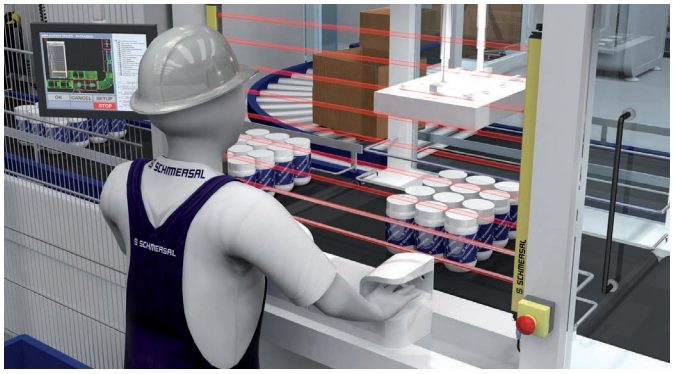
Industries

Machines in the metal processing industry operate with extremely high accuracy requirements at ever increasing speeds and need to be as flexible as possible. Safety switches used here should not affect machine productivity or flexibility. In addition, they must be easy to retrofit and must allow quick trouble-shooting. Protection against tampering must always be in the forefront.

Products

Solenoid interlocks are often used in machine tool building to prevent the interruption of processes or to protect against hazards arising due to overrunning The Schmersal Group offers a wide product range for the most diverse requirements, covering even special operating modes such as process monitoring and setting mode.

Applications



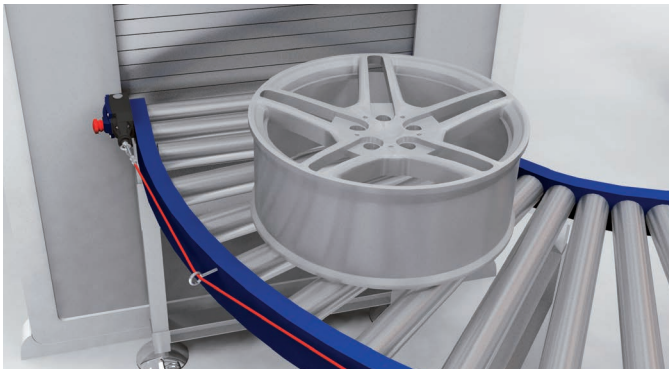
Industries

High degree of automation, interruption-free processes, high degree of standardization, great importance of factory standards: these, in brief, are the key features of automobile manufacturing in terms of machine safety. Another characteristic is the intensive use of robots and interlinked production lines.

Products

Our solenoid interlock program includes systems that were specifically developed for accessible hazardous areas and offer options such as an emergency exit with emergency handle. In the control engineering field we have also developed solutions that make it almost impossible for persons to be shut inside a hazardous area. In addition, we have extensive experience in the design of safe robot workstations with or without perimeter guarding.

Applications



AS-i Safety At Work
Safety system with simple structure

ASi INTERFACE
SAFETY AT WORK

Safety with system:

This is in a few words the basic idea behind the Schmersal System. This system has a simple structure: at field level, safety switchgear with integrated „AS-Interface Safety at Work“ (AS-i Safety) interface are used. They are wired to a master-monitor combination or Safety Gateway modules, which can process up to 60 safe dual-channel input and output signals, through the cost-efficient installation system AS-Interface. The status and diagnostic signals can be processed by higher-level control systems and from there on transmitted to control or visualization systems.

The user can decide between two basic concepts.

Safety Separated …

Many machinery builders also like to use uniformly structured safety circuits for different operational PLC systems. Therefore, they prefer a safety control system, which is separated from the normal control system. For this „Safety Separated“ concept, the Schmersal System offers master/monitor combinations with different field bus interfaces. The entire safety logic is programmed using the easy-to-use ASIMON software in the safety monitors.

Three solutions are available:

- for one AS-i circuit with up to 30 safe inputs/outputs
- for two AS-i circuits with up to 60 safe inputs/outputs
- for a safe cross-communication between up to 31 master-monitor combinations and therefore for more than 1,000 safe inputs/outputs

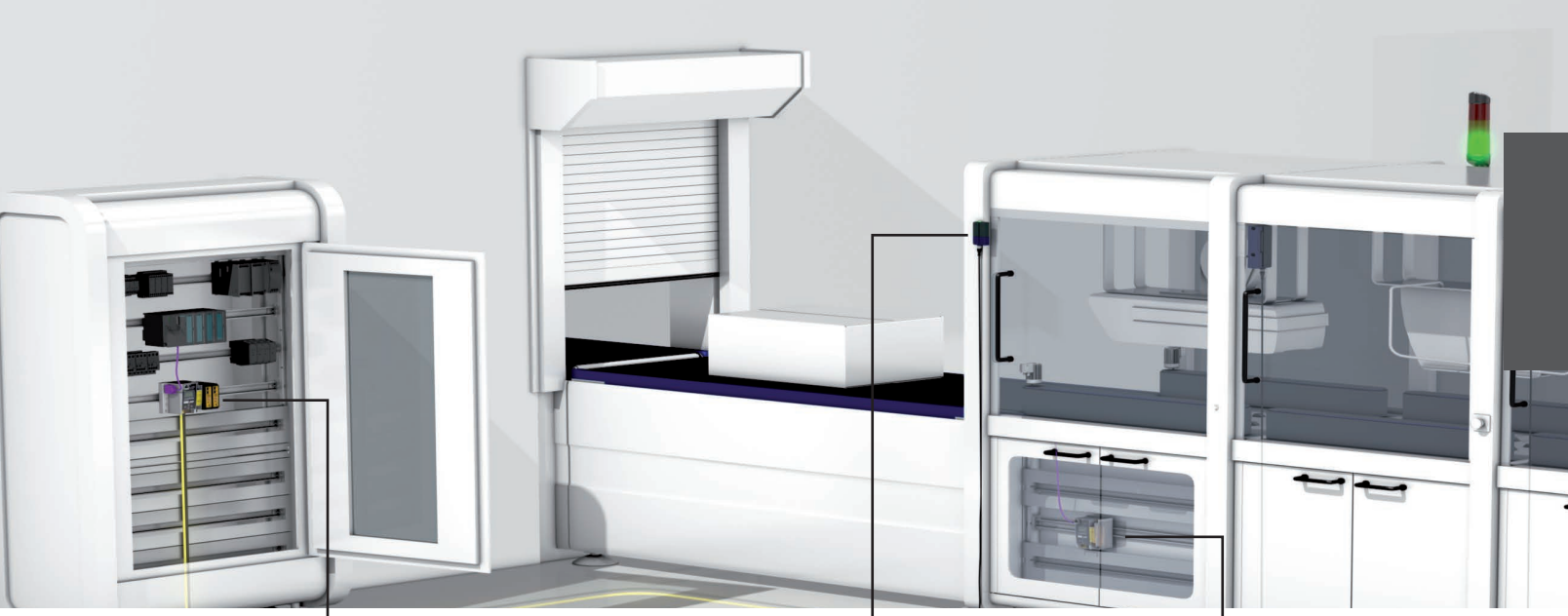
Through the conventional field bus interfaces PROFIBUS, PROFINET, EtherNet/IP or ModbusTCP, the master-monitor combinations with the normal PLC to transmit the non-safety-related status and diagnostic signals. The entire integration of the safety control system simplifies the diagnostics and reduces the standstill times in case of failures.

… or Safety Integrated?

The Schmersal System also includes Safety Gateways, which can be directly connected to safety control systems with safe field bus. They are designed for two AS-i circuits and transmit up to 60 safe inputs/outputs to the safety control system through a safe field bus. The operational, diagnostic-relevant signals are also transmitted to the higher-level control system, where they can be accordingly processed. A pre-processing of the safe signals in the Safety Gateway is also enabled through the ASIMON Software.

A complete program

With the Schmersal System, the machine builder has complete solutions for machinery safety from a single source.
For both concepts - either Safety Separated or Safety Integrated - multiple master-monitor combinations or Safety Gateways for the commonly used field bus systems are available. The basic solution for Safety Separated is a master-monitor combination for the input/output link of the safety circuit to the control system. This is a field bus-independent solution for safety circuits with up to eight safety switchgear and two safe outputs.



In addition to that, the Schmersal System program includes other monitoring-modules, such as safe speed monitoring, safe input and output modules, repeaters as well as a comprehensive range of accessories (bus distributors, power supply units, bus cables, M12 connecting cables...).

AS-i Safety as basis

The basis of the Schmersal System are the tried-and-tested safety switchgear with integrated AS-i safety interface. All essential ranges of the Schmersal program are available with AS-i nodes - for instance:

- Safety switch
- Solenoid interlocks
- Safety sensors
- Emergency stop button
- Control panels
- Pull-wire emergency stop switches
- Safety foot switches.

If the desired safety switchgear is not available with integrated AS-i Safety interface, it can be simply integrated into the AS-i Safety circuit through an external input module.

More information on this system is available in our **Schmersal - system solution** catalog or online at www.usa.schmersal.net.

Non-contact

The electronic monitoring of moving safety guards including actuation in non-contact solenoid interlocks enables the wear-free and non-contact detection of the respective actuator. The patented pulse-echo technology permits large tolerances in the approach of the coded actuator, both in the switching distance and the misalignment.
Despite this, the switching points and hysteresis are extremely repeatable and constant.

The performance and capabilities of the safety sensors and solenoid interlocks are covered by the following testing standards:

- Defined behavior under fault conditions to EN 60947-5-3, self-monitoring classification PDF-M
- Requirements on safety-related parts up to PL e to EN ISO 13849-1 or control category 4 to EN 954-1
- Requirements of IEC 61508 use up to SIL 3 applications

The requirements of IEC 61508 furthermore guarantee the user extremely high EM interference immunity. In addition, the standard allows that a signal is given for certain failures before the machinery completely switched off. This enables putting the machinery safely to a hold position before being switched off.

The using of microprocessor technology allows an intelligent diagnostic as well as a smooth and fast failure detection, e.g. in case of cross-shorts or wiring errors.

The safety channels of the electronic sensors and electronic solenoid interlocks can be wired in series to build a chain of up to 31 components, depending on the type of device used. Because of the independent functional check, control category 4 to EN 954-1 is retained for this series-wired chain. Due to the self-monitoring circuit technology and the resulting favorable PFHd values, Sub-SIL 3 or Sub-PL e to IEC 61508 (EN IEC 62061) or EN ISO 13849-1 is regularly obtained. The chains can also consist of a mix of the safety sensors and solenoid interlocks described in this brochure.

Operating principle
All products of the CSS series have the same operating principle. They use the pulse-echo technology patented by Schmersal to detect the actuator.

The sensor emits electromagnetic pulses. When the actuator approaches the sensor, the actuator starts oscillating at a predetermined resonant frequency due to the induced energy. These oscillations are in turn read by the sensor. While doing this, the sensor evaluates the distance with regard to the actuator as well as the coding of the actuator. The actuator identified by the sensor is interpreted as a closed safety guard and the safety outputs are enabled.

Due to this operating principle, the sensor is not suitable for mounting behind metal walls, considering that the oscillation to be detected cannot penetrate the metal.

The CSS 30S stainless steel sensor is an exception here. This sensor can be used under covers in antimagnetic stainless steel.

with CSS technology

Application
The electronic safety sensors and solenoid interlocks are used for monitoring moving safety guards. When the safety guard is opened, the machine is stopped and the dangerous restart of the machine is in all cases suppressed.

Their essential advantage is in the non-contact detection of the safety guard's position. They therefore are completely wear-free and insensitive to misalignment or offset of the sensor and the actuator.

Electronic safety sensors
Due to their compactness, there are numerous applications for CSS sensors. Because of their high repeatability, an extremely low hysteresis and the absence of double switching points in the actuation range, they can be fitted to a wide variety of safety guards or they can be employed for position monitoring on machines axes.

The application possibilities, especially for the CSS 34, are further enlarged by the four different actuating planes as well as a large variety of actuators.

Mounting on aluminum profiles is in particular carried out smoothly and quickly by means of just two screws using the integral mounting plate. Rotating slotted washers in the mounting plate facilitate an accurate alignment, even with inaccurate mounting holes.

In this way, the sensors can be used in almost any place where required.

The encapsulated sensors and their actuator are insensitive to shocks, vibrations and dirt.

The CSS safety sensors consequently can be used anywhere, especially where protection against dangerous run-down movements of the machine is not required.

The CSS 30S safety sensor with stainless steel enclosure extends the range of application es-pecially for hygiene-critical applications.

Due to its high resistance to mechanical or chemical influences, this safety sensor is also perfectly suitable for use in aggressive ambient conditions.

For safety guards, which are particularly exposed to tampering, the paired assignment (coding) of the CSP 34 safety sensor and its actuator offers an increased protection.

The CSP 34 is also available with the "on-site acknowledgment" option and integrated reset button connection.

Because of a special feedback circuit monitoring with reset function, the CSS 34F sensors are suitable for the direct control of safety contactors. This enables saving on wiring expenses and avoids the need of buying a dedicated safety controller.

Further information can be found in the "Electronic Safety Sensors and Solenoid Interlocks" brochure and in our online product catalog at www.usa.schmersal.com.

Solutions for your industry.

Application Finder

www.applicationfinder.net/us/home/

The Application Finder displays an interactive animated packaging plant floor. Users can click on one of the work areas which will open a window with a selection of Schmersal safety switching devices that are optimal for the particular application.

Each selection ultimately links to the Schmersal online product catalog website, where users can see technical data on the selected components.

There are many product-specific animations available throughout, explaining the operation of the switch or providing recommendations for the integration of safety technology into the processes of the machine.

Also available as an app for the iPad. Download from iTunes: search *Schmersal*

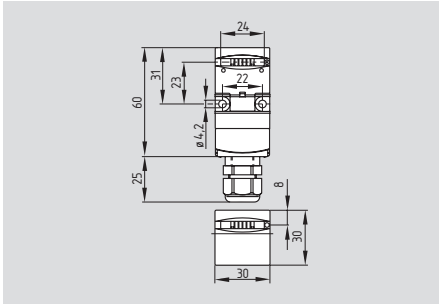
Safe switching and monitoring
Safety switch with separate actuator

Keyed interlock switches are used on sliding, hinged and removable guard doors that must be closed for operator safety. It is a two part system consisting of a switch body, mounted to the guard frame, and a separate actuator key, mounted to the door.

Models are available in a several mounting profiles and housing materials. Each model has a variety of actuator key options: straight, right angle mounting, floating head, and keys integrated into door handle assemblies.

Safety switch with separate actuator

AZ 17



- Thermoplastic enclosure
- Small body
- Long life
- Double insulated ⧈
- Including cable gland M16
- Slot sealing plug included
- High level of contact reliability with low voltages and currents
- Not sensitive to dirty conditions by virtue of patented roller system
- 8 actuating planes
- Cut clamp terminals (IDC method) or connector
- EX version available

Approvals

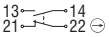
Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	cut clamp terminals (IDC method) or connector M12, 4-pole
Cable section:	0.75 - 1.0 mm², flexible
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	10 A
Utilization category:	AC-15
I_e/U_e:	4 A / 230 VAC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	11 mm
Positive break force:	17 N for each NC contact fitted
Ambient temperature:	−30 °C … +80 °C
Mechanical life:	> 1 million operations
Latching force:	30 N for ordering suffix R
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

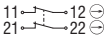
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NO / 1 NC

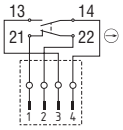


2 NC

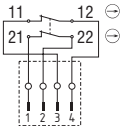


Connector

1 NO / 1 NC

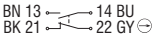


2 NC



Front cable output

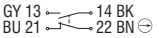
1 NO / 1 NC



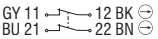
2 NC

Rear cable output

1 NO / 1 NC



2 NC

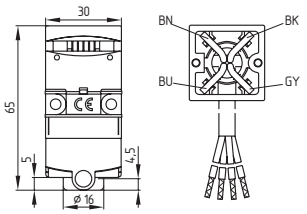


Ordering details

AZ 17-①Z②K-③-④-⑤

No.	Option	Description
①	11	1 NO / 1 NC
	02	2 NC
②		Latching force 5 N
	R	Latching force 30 N
③		Cable gland M16
	2243	Cable output front
	2243-1	rear
	ST	Connector M12
④	1637	Gold-plated contacts
⑤	5M	Cable length 5 m
	6M	Cable length 6 m

Note



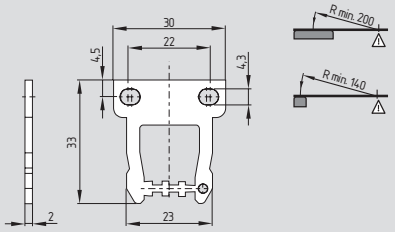
- Front cable output, ordering suffix -2243
- Rear cable output, ordering suffix -2243-1

Note

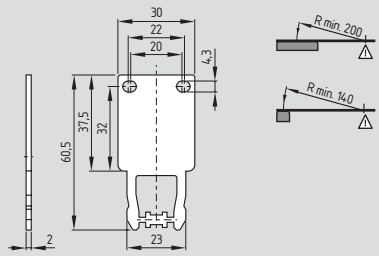
Actuators must be ordered separately.

Safety switch with separate actuator

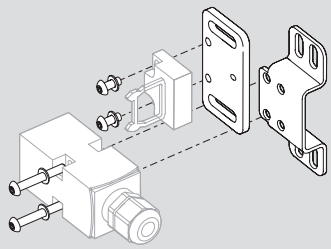
System components



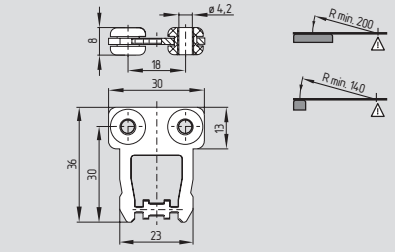
Straight actuator AZ 17/170-B1



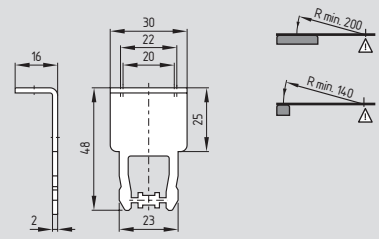
Long straight actuator AZ 17/170-B11



Mounting set MS AZ 17

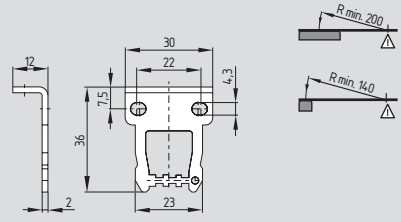


With rubber mounting AZ 17/170-B1-2245

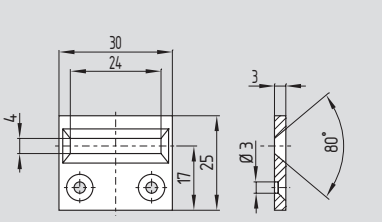


Long angled actuator AZ 17/170-B15

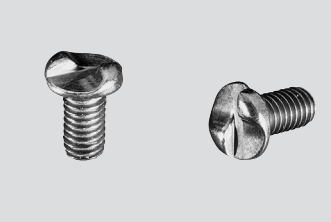
Connector plug



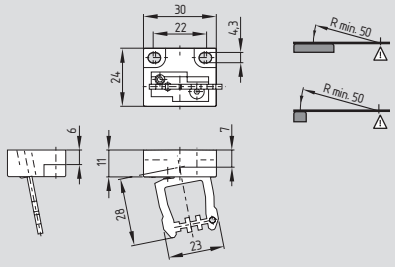
Angled actuator AZ 17/170-B5



Centering guide AZM 170-B



Tamperproof screws



Flexible actuator AZ 17-B6

Ordering details

Straight actuator	**AZ 17/170-B1**
with rubber mounting	**AZ 17/170-B1-2245**
Angled actuator	**AZ 17/170-B5**
Flexible actuator	**AZ 17-B6**

Ordering details

Long straight actuator	**AZ 17/170-B11**
Long angled actuator	**AZ 17/170-B15**
Centering guide	**AZM 170-B**
Centering device	
Mounting outside	**TFA-020**
Mounting inside	**TFI-020**

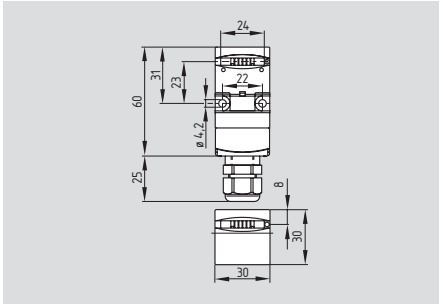
(Product information see page 1-52)

Ordering details

Mounting set	**MS AZ 17 P**
	MS AZ 17 R/P
Connector plug M12, 4-pole	
without cable	**101209950**
with cable 5 m	**101208523**
Tamperproof screws with unidirectional slots M4 x 8 (Quantity 2 pcs)	**101147463**

Safety switch with separate actuator

AZ 17-...I



- **With individual coding, up to 200 combinations**
- Thermoplastic enclosure
- Small body
- Long life
- Double insulated ⧈
- Including cable gland M16
- Slot sealing plug included
- High level of contact reliability with low voltages and currents
- Not sensitive to dirty conditions by virtue of patented roller system
- 8 actuating planes
- Cut clamp terminals (IDC method) or connector

Approvals

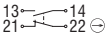
Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	cut clamp terminals (IDC method) or connector M12, 4-pole
Cable section:	0.75 - 1.0 mm², flexible
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	10 A
Utilization category:	AC-15
I_e/U_e:	4 A / 230 VAC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	11 mm
Positive break force:	17 N for each NC contact fitted
Ambient temperature:	−30 °C … +80 °C
Mechanical life:	> 1 million operations
Latching force:	30 N for ordering suffix R
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

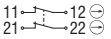
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

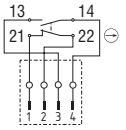
1 NO / 1 NC



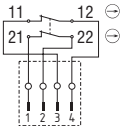
2 NC



Connector
1 NO / 1 NC



2 NC



Ordering details

AZ 17-①Z②I-③-④-⑤

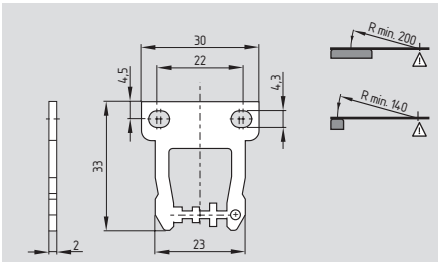
No.	Option	Description
①	11	1 NO / 1 NC
	02	2 NC
②		Latching force 5 N
	R	Latching force 30 N
③		Cable gland M16
	ST	Connector M12
④	B1	Incl. actuator B1
	B5	Incl. actuator B5
	B6L	Incl. actuator B6L
	B6R	Incl. actuator B6R
⑤	1637	Gold-plated contacts

Note

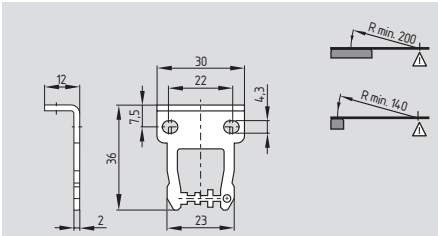
The part number of the actuator is appended to the part number of the switch. The actuators are **not individually** available.

Safety switch with separate actuator

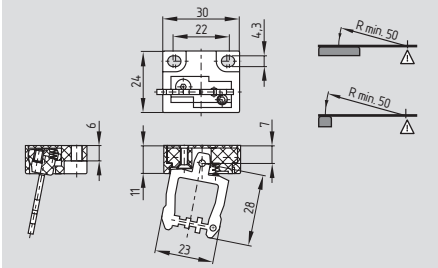
System components



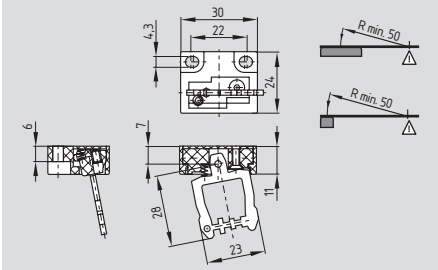
Straight actuator B1



Angled actuator B5

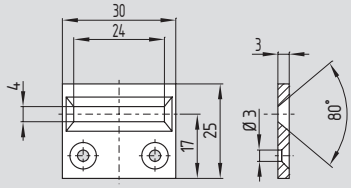


Flexible actuator B6L

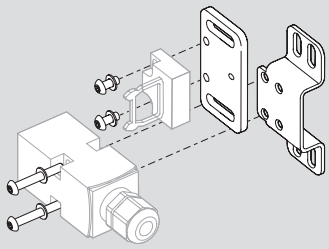


Flexible actuator B6R

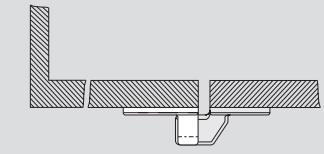
System components



Centering guide AZM 170-B



Mounting set MS AZ 17 P



Centering device TF.

System components

Connector plug

Tamperproof screws

Ordering details

Straight actuator	**B1**
Angled actuator	**B5**
Flexible actuator left	**B6L**
Flexible actuator right	**B6R**

Ordering details

Centering guide	**AZM 170-B**
Mounting set	**MS AZ 17 P**
	MS AZ 17 R/P
Centering device	
Mounting outside	**TFA-020**
Mounting inside	**TFI-020**

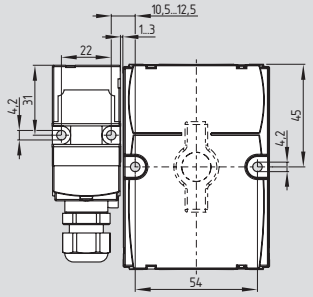
(Product information see page 1-52)

Ordering details

Connector plug M12, 4-pole	
without cable	**101209950**
with cable 5 m	**101208523**
Tamperproof screws with unidirectional slots M4 x 8 (Quantity 2 pcs)	**101147463**

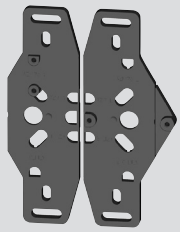
Safety switch with separate actuator

Actuator AZ 17-B25

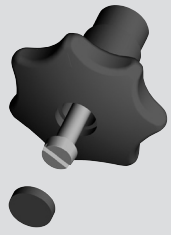


- Door-handle actuator for safety switches with separate actuator AZ 17-…ZRK (latching)
- Ergonomic operation
- No supplementary door-handle required
- No protruding actuator
- Simple mounting
- Several door-handles available
- Possibility to mount custom handles using a default square screw (8mm)
- Mounting plate for fitting to standard profiles optionally available

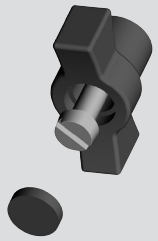
System components



Mounting plate



Star grip



T-grip

Note

The safety switch or solenoid interlock is not included in delivery and must be ordered separately.

Please note that you need a device with latching (R).

The technical data of the AZ 17-…ZRK safety switch can be found in this main catalog page 1-2 or in the online catalog at www.usa.schmersal.net

Approvals

CE

Ordering details

AZ 17-B25-①-②

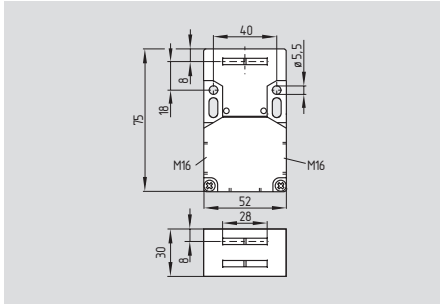
No.	Option	Description
①	L	Door hinge left
	R	Door hinge right (View directed towards the inside of the hazardous area)
②	G0	Actuator without handle
	G1	Star grip
	G2	T-grip

Ordering details

Mounting plate	**MP AZ 17/170-B25**
Star grip	**G1**
T-grip	**G2**

Safety switch with separate actuator

AZ 15



- Long life
- Multiple coding
- Thermoplastic enclosure
- Double insulated ⧈
- 3 cable entries M20
- Large wiring compartment
- High level of contact reliability with low voltages and currents
- Not sensitive to dirty conditions by virtue of patented roller system
- Slotted holes for adjustment, circular holes for location

Approvals

Technical data

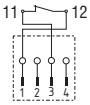
Standards:	IEC/EN 60947-5-1
	BG-GS-ET-15
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	1 NC contact
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals or connector M12, 4-pole
Cable section:	max. 2.5 mm² min. 0.25 mm² (incl. conductor ferrules)
Cable entry:	3 x M20
U_{imp}:	6 kV
U_i:	500 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	8 mm
Positive break force:	10 N for each NC contact fitted
Ambient temperature:	−30 °C … +80 °C
Mechanical life:	> 1 million operations
Latching force:	30 N for ordering suffix R
Actuating speed:	max. 2 m/s
Max. switching frequency:	4,000 operations/h
Classification:	
Standards:	EN ISO 13849-1
B_{10d} NC:	2,000,000
B_{10d} NO:	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NC

Connector
1 NC



Ordering details

AZ15-ZV①K-②-③

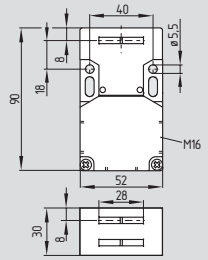
No.	Option	Description
①		Ejection force
	R	Latching force 30 N
②		Cable entry M20
	ST	Connector M12
③	2254	Latching force 5 N
	1762	Front mounting
	1637	Gold-plated contacts

Note

Actuators must be ordered separately.
see page 1-9 for actuators

Safety switch with separate actuator

AZ 16



- Thermoplastic enclosure
- Long life
- Double insulated ⧈
- 3 cable entries M20
- Large wiring compartment
- High level of contact reliability with low voltages and currents
- Not sensitive to dirty conditions by virtue of patented roller system
- Available with LED
- Slotted holes for adjustment, circular holes for location
- EX version available
- AS-Interface Safety at Work available

Approvals

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC or 3 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals or connector M12, 4-pole
Cable section:	max. 2.5 mm² min. 0.25 mm² (incl. conductor ferrules)
Cable entry:	3 x M20
U_{imp}:	6 kV
U_i:	500 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	8 mm
Positive break force:	10 N for each NC contact fitted
Ambient temperature:	−30 °C … +80 °C
Mechanical life:	> 1 million operations
Latching force:	30 N for ordering suffix R
Actuating speed:	max. 2 m/s
Max. switching frequency:	4,000 operations/h

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NO / 1 NC

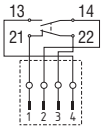
2 NC

3 NC

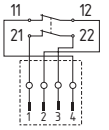
1 NO / 2 NC

Connector

1 NO / 1 NC



2 NC



Ordering details

AZ16-①ZV②K-③-④-⑤

No.	Option	Description
①		1 NO / 1 NC
	02	2 NC
	03	3 NC
	12	1 NO / 2 NC
②		Ejection force
	R	Latching force 30 N
③	G24	With LED
④		Cable entry M20
	M16	Cable entry M16
	ST	Connector M12 bottom
	STL	Connector M12 left
	STR	Connector M12 right

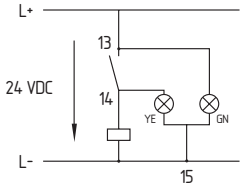
Ordering details

AZ16-①ZV②K-③-④-⑤

No.	Option	Description
⑤	2254	Latching force 5 N
	1762	Front mounting
	1637	Gold-plated contacts

Note

Actuators must be ordered separately.

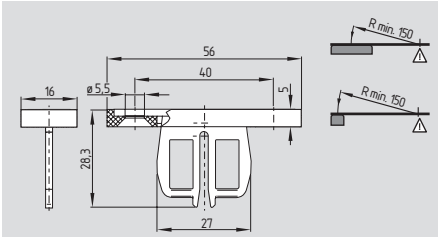


LED version:
Ordering suffix G24, only available for version with one NO and one NC contact. Protected against incorrect polarity and voltage spikes.

For more information, see our online product catalog: www.usa.schmersal.net

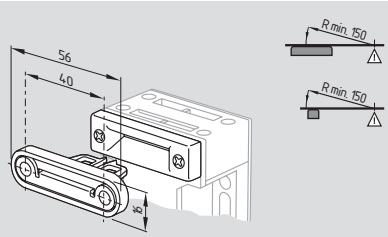
Safety switch with separate actuator

System components



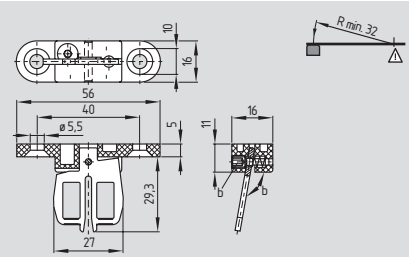
Straight actuator AZ 15/16-B1

System components

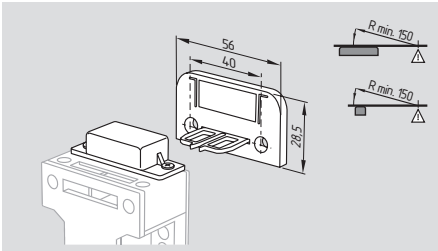


AZ 15/16-B1-2177 with centering guide

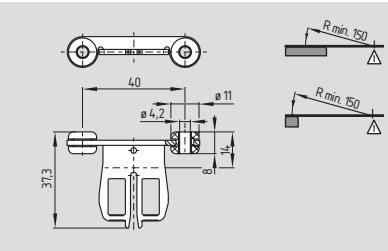
System components



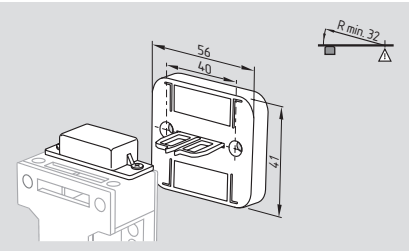
Flexible actuator AZ 15/16-B3



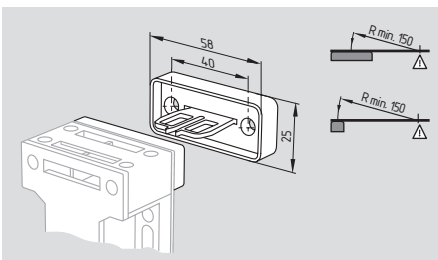
AZ 15/16-B1-1747 with magnetic latch



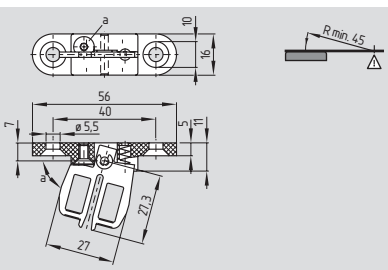
AZ 15/16-B1-2245 with rubber mounting



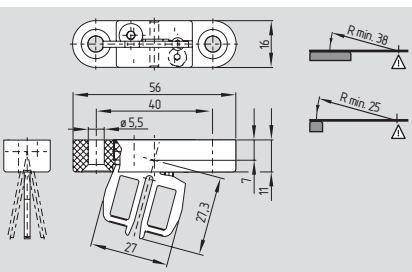
AZ 15/16-B3-1747 with magnetic latch



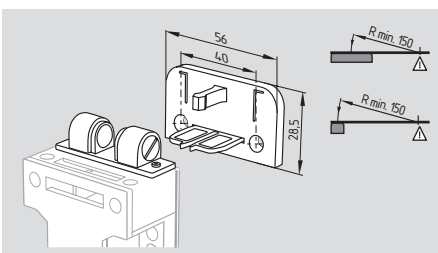
AZ 15/16-B1-2024 with slot lip-seal



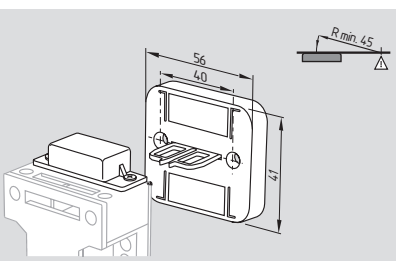
Flexible actuator AZ 15/16-B2



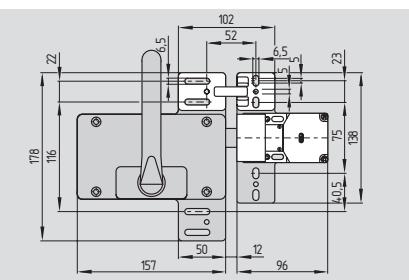
Flexible actuator AZ 15/16-B6



AZ 15/16-B1-2053 with ball latch



AZ 15/16-B2-1747 with magnetic latch



Actuator AZ 16-STS30

Ordering details

Straight actuator	**AZ 15/16-B1**
with magnetic latch	**AZ 15/16-B1-1747**
with slot lip-seal	**AZ 15/16-B1-2024**
with ball latch	**AZ 15/16-B1-2053**

Ordering details

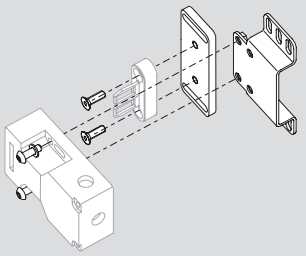
Straight actuator	
with centering guide	**AZ 15/16-B1-2177**
with rubber mounting	**AZ 15/16-B1-2245**
Flexible actuator	**AZ 15/16-B2**
with magnetic latch	**AZ 15/16-B2-1747**

Ordering details

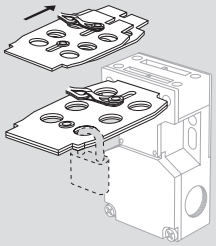
Flexible actuator	**AZ 15/16-B3**
with magnetic latch	**AZ 15/16-B3-1747**
Flexible actuator	**AZ 15/16-B6**
Actuator with or without emergency handle	**AZ 16-STS30**

A detailed product description can be found on page 1-11

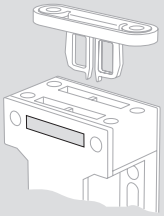
System components



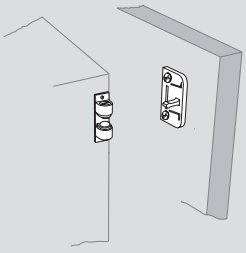
Mounting set MS AZ 15/16



Lockout tag SZ 16/335

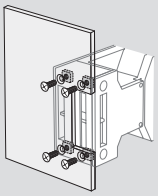


Slot sealing plug AZ 15/16-1476



Ball catch AZ 15/16-2053-2

System components



Front mounting AZ 15/16 -1762

Connector plug

Tamperproof screws

Ordering details

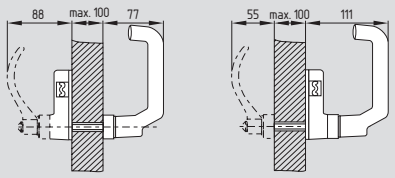
Mounting set	**MS AZ 15/16 P** **MS AZ 15/16 R/P**
Lockout tag	**SZ 16/335**
Slot sealing plug	**AZ 15/16-1476**
Ball catch	**AZ 15/16-2053-2**

Ordering details

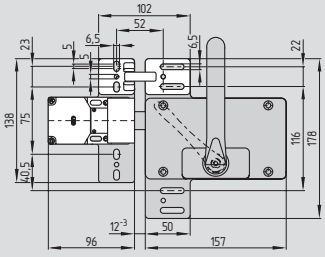
Front mounting with M5 nuts	**-1762**
Connector plug M12, 4-pole	
without cable	**101209950**
with cable 5 m	**101208523**
Connector plug M12, 8-pole	
with cable 5 m	**101209964**
Tamperproof screws with unidirectional slots	
M5 x 12	**101135338**
M5 x 16	**101135339**
M5 x 20	**101135340**
(Quantity 2 pcs)	

Safety switch with separate actuator

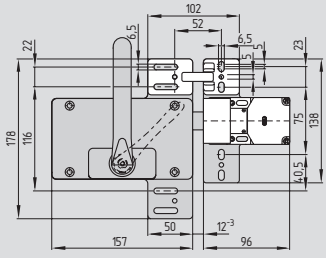
AZ 16-STS30-…



Mounting inside **Mounting outside**



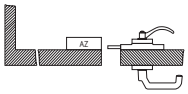
AZ 16 STS30-02/-04/-05/-07



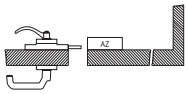
AZ 16 STS30-01/-03/-06/-08

System variants

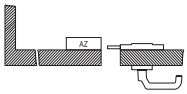
AZ 16-STS30-01



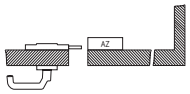
AZ 16-STS30-02



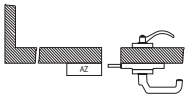
AZ 16-STS30-03



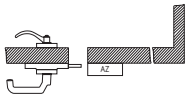
AZ 16-STS30-04



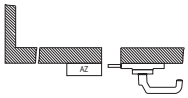
AZ 16-STS30-05



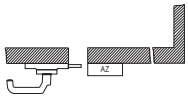
AZ 16-STS30-06



AZ 16-STS30-07

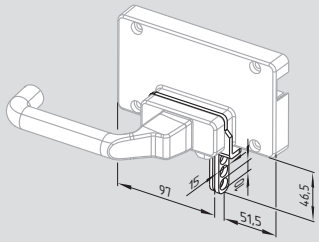


AZ 16-STS30-08

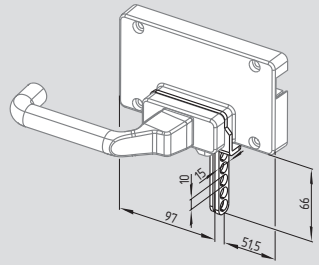


The drawings are always shown with a view to the switch.

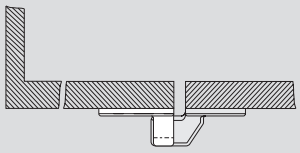
System components



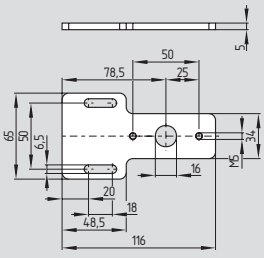
Lockout tag SZ 415-1/-2



Lockout tag SZ 415-1/-2 -2477



Centering device TF.



Mounting plate MP TG-01

Ordering details

Included in delivery
- Mounting plate for safety switch
- Actuator incl. mounting plate
- Emergency handle (for variant -05 and -06 incl. mounting plate)

Ordering example
To order, first choose the desired safety switch and then the door handle system:
for example AZ 16-02ZVRK-ST and
AZ 16-STS30-01.

Ordering details

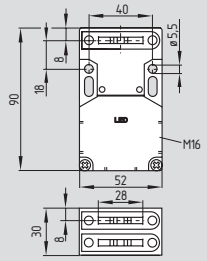
Mounting inside	
with emergency handle	
door hinge right	**AZ 16-STS30-01**
door hinge left	**AZ 16-STS30-02**
without emergency handle	
door hinge right	**AZ 16-STS30-03**
door hinge left	**AZ 16-STS30-04**
Mounting outside	
with emergency handle	
door hinge right	**AZ 16-STS30-05**
door hinge left	**AZ 16-STS30-06**
without emergency handle	
door hinge right	**AZ 16-STS30-07**
door hinge left	**AZ 16-STS30-08**

Ordering details

Lockout tag	
for …STS30-01/-03/-06/-08	**SZ 415-1**
for …STS30-02/-04/-05/-07	**SZ 415-2**
Lockout tag with 5 circular holes	
for …STS30-01/-03/-06/-08	**SZ 415-1-2477**
for …STS30-02/-04/-05/-07	**SZ 415-2-2477**
Centering device only for AZ 16-STS30… and AZM 161-STS30…:	
Mounting outside	**TFA-020**
Mounting inside	**TFI-020**
(Product information see page 1-52)	
Mounting plate	**MP TG-01**

Safety switch with separate actuator

AZ 16-…I



- **With individual coding, up to 600 combinations**
- Thermoplastic enclosure
- Long life
- Double insulated ⧈
- 3 cable entries M16
- Large wiring compartment
- High level of contact reliability with low voltages and currents
- Not sensitive to dirty conditions by virtue of patented roller system
- Slotted holes for adjustment, circular holes for location

Approvals

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC or 3 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals or connector M12, 4-pole
Cable section:	max. 2.5 mm² min. 0.25 mm² (incl. conductor ferrules)
Cable entry:	3 x M20
U_{imp}:	6 kV
U_i:	500 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	8 mm
Positive break force:	10 N for each NC contact fitted
Ambient temperature:	−30 °C … +80 °C
Mechanical life:	> 1 million operations
Latching force:	30 N for ordering suffix R
Actuating speed:	max. 0.2 m/s
Max. switching frequency:	4,000 operations/h
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

3 NC

1 NO / 2 NC

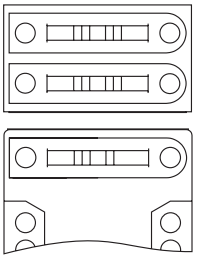
Ordering details

AZ16-①ZI-②-③-④

No.	Option	Description
①	03	3 NC
	12	1 NO / 2 NC
②	B1	Incl. actuator B1
	B1-1747	Incl. actuator B1-1747
	B1-2024	Incl. actuator B1-2024
	B1-2053	Incl. actuator B1-2053
	B1-2177	Incl. actuator B1-2177
③	1762	Front mounting
④	M16	Cable entry M16
	M20	Cable entry M20

Note

The actuating direction of the actuator is identified by means of the marking on the enclosure.

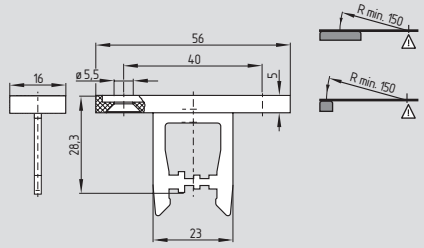


Note

The part number of the actuator is appended to the part number of the switch. The actuators are **not individually** available.

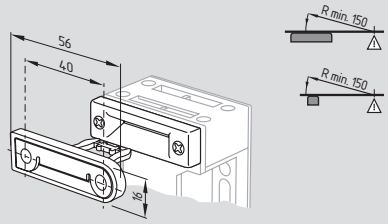
Safety switch with separate actuator

System components



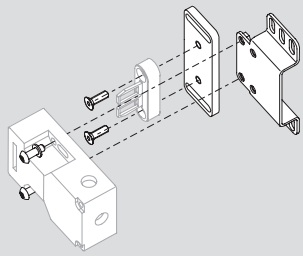
Straight actuator B1

System components

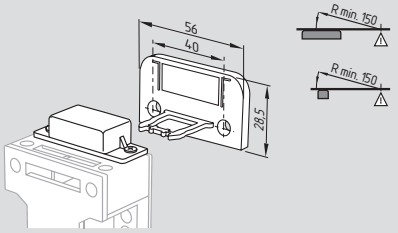


Actuator B1-2177 with centering guide

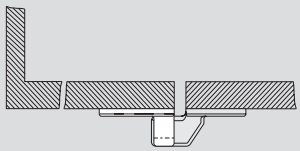
System components



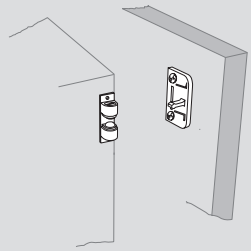
Mounting set MS AZ 15/16



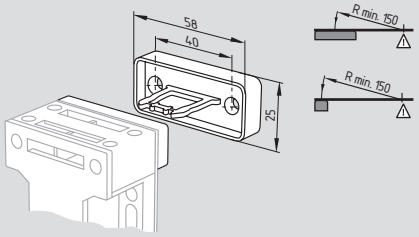
Actuator B1-1747 with magnetic latch



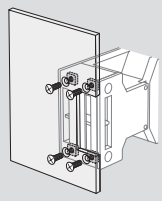
Centering device TF.



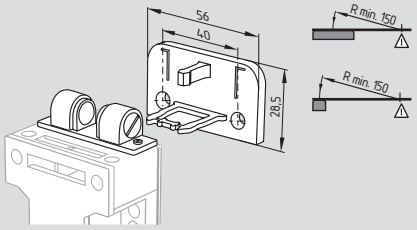
Ball catch AZ 15/16-2053-2



Actuator B1-2024 with slot lip-seal



Front mounting -1762



Actuator B1-2053 with ball latch

Tamperproof screws

Ordering details

Straight actuator	**B1**
with magnetic latch	**B1-1747**
with slot lip-seal	**B1-2024**
with ball latch	**B1-2053**

Ordering details

Straight actuator	
with centering guide	**B1-2177**
Centering device	
Mounting outside	**TFA-020**
Mounting inside	**TFI-020**

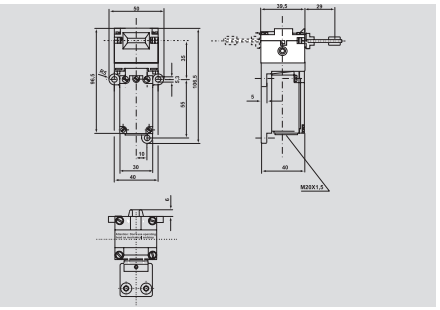
(Product information see page 1-52)

Ordering details

Mounting set	**MS AZ 15/16 P**
	MS AZ 15/16 R/P
Ball catch	**AZ 15/16-2053-2**
Front mounting with M5 nuts	**-1762**
Tamperproof screws with unidirectional slots	
M5 x 12	**101135338**
M5 x 16	**101135339**
M5 x 20	**101135340**
(Quantity 2 pcs)	

Safety switch with separate actuator

TZG



- Thermoplastic enclosure
- 2 contacts
- Long life
- High level of contact reliability with low voltages and currents
- Mounting details to EN 50041
- Actuator heads can be repositioned in steps 4 x 90°
- Can be mounted on a flat surface
- 1 cable entry M20
- Funnel shaped key entry
- Padlockable actuator key

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	glass fiber reinforced thermoplastic
Actuator:	galvanized steel
Protection class:	IP67
Contact material:	silver
Contact type:	double pole, double break with electrically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals
Cable section:	max. 2.5 mm², min. 0.75 mm² (incl. conductor ferrules)
Cable entry:	M20
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	10 A
Utilization category:	AC-15; DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	10 A gG D-fuse
Positive break travel:	12.5 mm
Positive break force:	20 N
Ambient temperature:	-13 deg F ... +158 deg F
Mechanical life:	> 1 million operations
Latching force:	20 N
Actuating speed:	max. 0.2 m/s
Max. switching frequency:	1,200 operations/h
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NO / 1 NC

2 NC

Approvals

cULus

CE

Ordering details

TZG01-①

No.	Option	Description
①	103	1 NO & 1 NC
	110	2 NC

Note

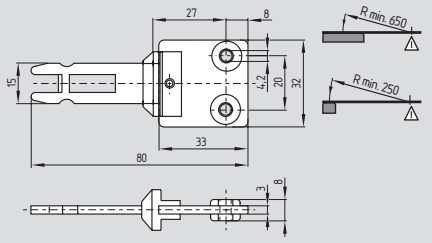
Actuators must be ordered separately.

Note

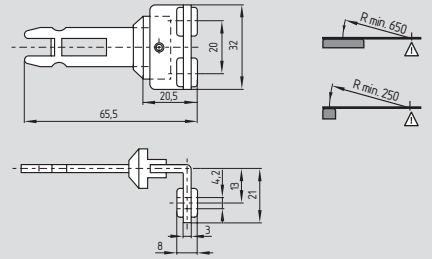
By turning the head in 4 x 90° steps, 4 actuating planes are possible. A Torx T15 screwdriver is needed for this purpose.

Solenoid interlocks

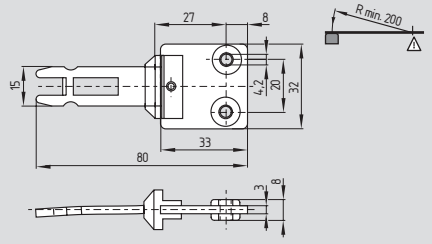
System components



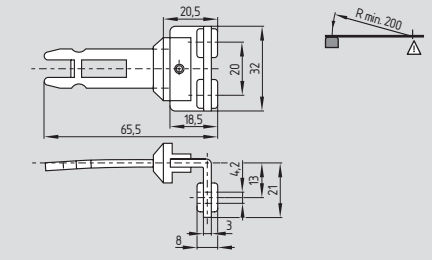
Straight actuator TZ/CO



Angled actuator TZ/CW

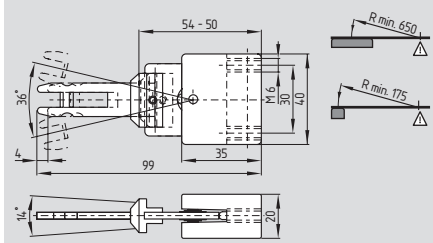


Straight radius actuator TZ/COR

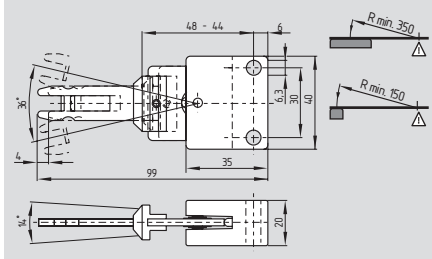


Angled radius actuator TZ/CWR

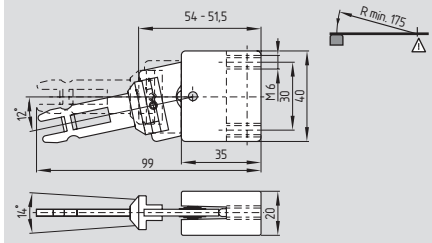
System components



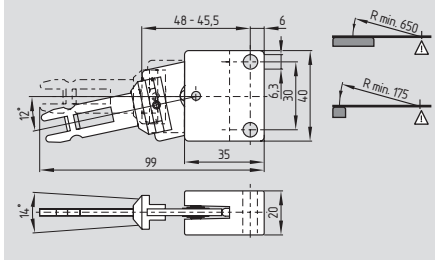
Flexible actuator TZ/COF/HIS.1



Flexible actuator TZ/COF/HIS.2

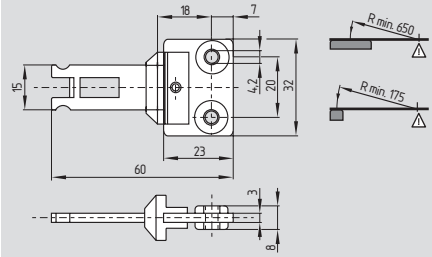


Flexible actuator TZ/CORF/HIS.1

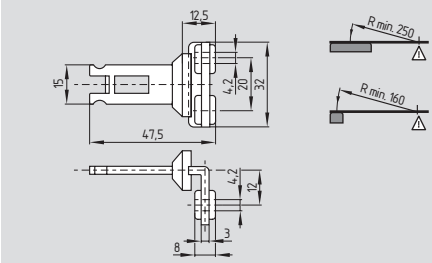


Flexible actuator TZ/CORF/HIS.2

System components



Shortened straight actuator TZ/CK



Shortened angled actuator TZ/CWK

Ordering details

Straight actuator	**TZ/CO**
Angled actuator	**TZ/CW**
Straight radius actuator	**TZ/COR**
Angled radius actuator	**TZ/CWR**

Ordering details

Flexible actuator	**TZ/COF/HIS.1**
Flexible actuator	**TZ/COF/HIS.2**
Flexible actuator	**TZ/CORF/HIS.1**
Flexible actuator	**TZ/CORF/HIS.2**

Ordering details

Shortened straight actuator	**TZ/CK**
Shortened angled actuator	**TZ/CWK**

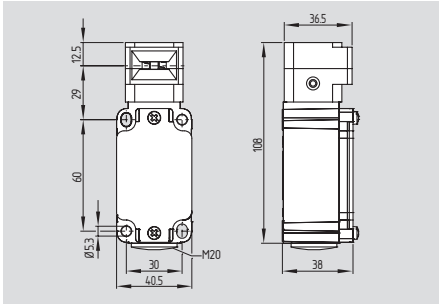
Centering device

Mounting outside	**TFA-020**
Mounting inside	**TFI-020**

(Product information see page 1-52)

Safety switch with separate actuator

AZ 3350



- Metal enclosure
- 3 contacts
- Long life
- High level of contact reliability with low voltages and currents
- Mounting details to EN 50041
- Actuator heads can be repositioned in steps 4 x 90°
- Can be mounted on a flat surface
- 1 cable entry M20
- Slotted holes for adjustment, circular holes for location
- EX version available

Approvals

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	light-alloy diecast, paint finish
Actuator:	steel
Protection class:	IP67
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 3 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals
Cable section:	max. 2.5 mm², min. 0.75 mm² (incl. conductor ferrules)
Cable entry:	M20
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	10 A
Utilization category:	AC-15; DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	10.7 mm
Positive break force:	5 N for each NC contact fitted
Ambient temperature:	−30 °C … +90 °C
Mechanical life:	> 1 million operations
Latching force:	5 N
Actuating speed:	max. 0.2 m/s
Max. switching frequency:	1,200 operations/h
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NO / 2 NC

3 NC

Ordering details

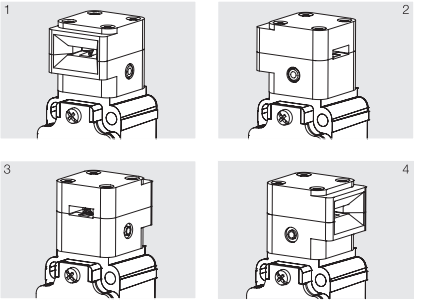
AZ 3350-①-②

No.	Option	Description
①	03ZK	3 NC
	12ZUEK	1 NO / 2 NC
②	1637	Gold-plated contacts

Note

Actuators must be ordered separately.

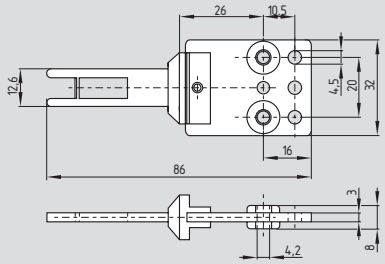
Note



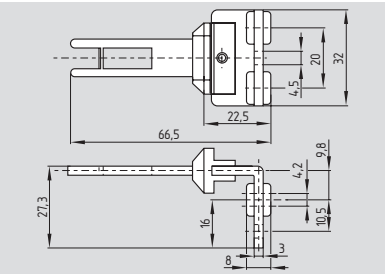
By turning the head in 4 x 90° steps, 4 actuating planes are possible. A Torx T15 screwdriver is needed for this purpose.

Safety switch with separate actuator

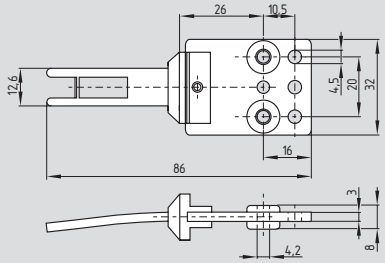
System components



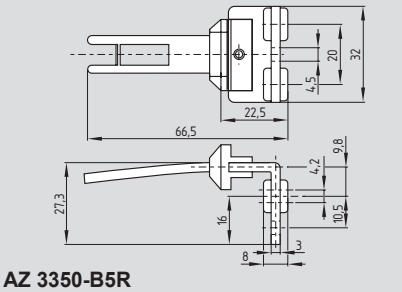
AZ 3350-B1



AZ 3350-B5



AZ 3350-B1R



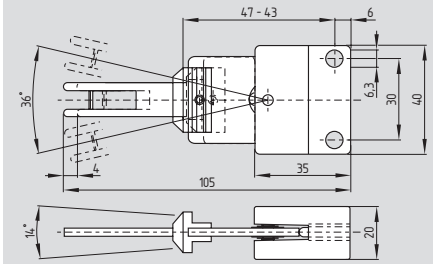
AZ 3350-B5R

Ordering details

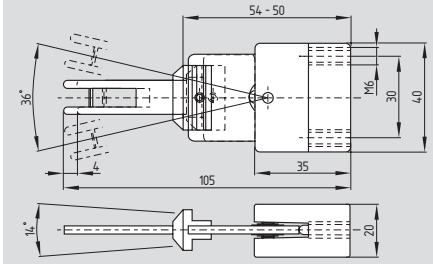
Actuator	**AZ 3350-B1**
Actuator	**AZ 3350-B5**
Actuator	**AZ 3350-B1R**
Actuator	**AZ 3350-B5R**

The actuators are not suitable for explosive areas.

System components



AZ 3350-B6



AZ 3350-B6H

Ordering details

Actuator	**AZ 3350-B6**
Actuator	**AZ 3350-B6H**

The actuators are not suitable for explosive areas.

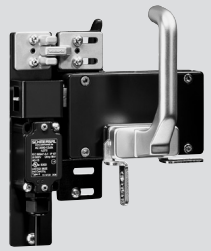
Centering device

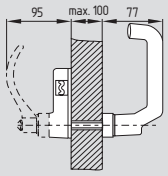
Mounting outside	**TFA-020**
Mounting inside	**TFI-020**

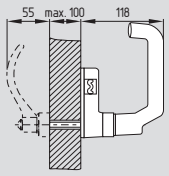
(Product information see page 1-52)

Safety switch with separate actuator

AZ 3350-STS30-…







Mounting inside **Mounting outside**

- Metal enclosure
- Long life
- High level of contact reliability with low voltages and currents
- 1 cable entry M20
- Shearing force 15,000 N
- Door handle latching
- Lockout tag against unintentional locking available
- Centering device available
- EX version available

Approvals

Technical data

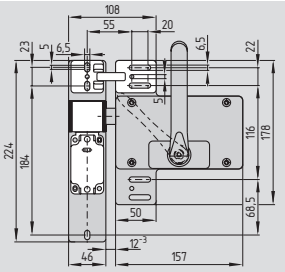
Standards:	IEC/EN 60947-5-1, EN ISO 13849-1, EN 1088, BG-GS-ET-15
Enclosure:	light-alloy diecast, paint finish
Protection class:	IP67
Contact material:	silver
Contact type:	change-over contact with double break Zb or 3 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1; slow action, NC contact with positive break
Connection:	screw terminals
Cable section (rigid/flexible):	min. 0.75 mm²; max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	M20
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC; 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse (DIN EN 60269-1)
Ambient temperature:	−30 °C … +90 °C
Mechanical life:	> 1 million operations
Actuating speed:	max. 0.2 m/s
Switching frequency:	1,200 operations / h
Positive break travel:	10.7 mm
Positive break force:	5 N for each NC contact fitted

Classification:

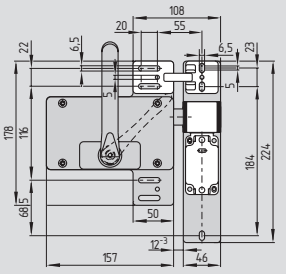
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000
	for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

System variants



AZ 3350 STS30-02/-04/-05/-07



AZ 3350 STS30-01/-03/-06/-08

Ordering details

AZ 3350-①-②-③

No.	Option	Description
①	03-ZK	3 NC
	12-ZUEK	1 NO/2 NC
②	1637	Gold-plated contacts
③	U90	Actuating head can be rotated 90° for door hinge left
	U270	can be rotated 270° for door hinge right

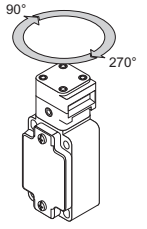
Note

Included in delivery
- Mounting plate for safety switch
- Actuator incl. mounting plate
- Emergency handle (for variant -05 and -06 incl. mounting plate)

Ordering example
To order, first choose the desired safety switch and then the door handle system:
for example AZ 3350-12-ZUEK-U90 and
AZ 3350-STS30-02

Note

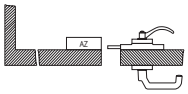
Actuator head:



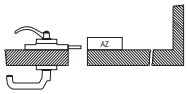
Safety switch with separate actuator

System variants

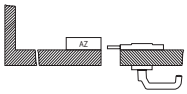
AZ 3350-STS30-01



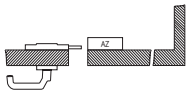
AZ 3350-STS30-02



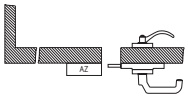
AZ 3350-STS30-03



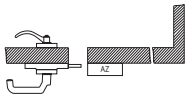
AZ 3350-STS30-04



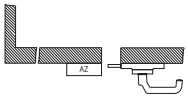
AZ 3350-STS30-05



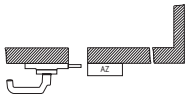
AZ 3350-STS30-06



AZ 3350-STS30-07

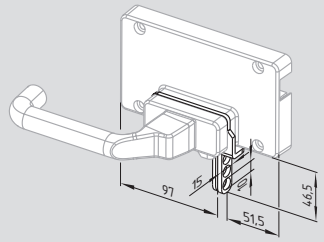


AZ 3350-STS30-08

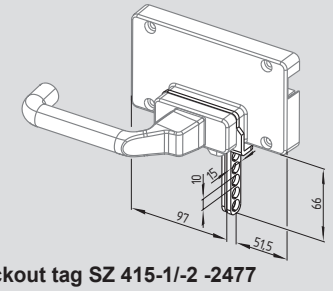


The drawings are always shown with a view to the switch.

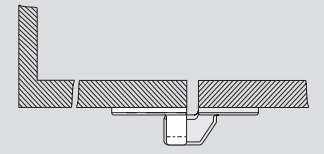
System components



Lockout tag SZ 415-1/-2



Lockout tag SZ 415-1/-2 -2477



Centering device TF.

Ordering details

Mounting inside
with emergency handle

door hinge right	**AZ 3350-STS30-01**
door hinge left	**AZ 3350-STS30-02**

without emergency handle

door hinge right	**AZ 3350-STS30-03**
door hinge left	**AZ 3350-STS30-04**

Mounting outside
with emergency handle

door hinge right	**AZ 3350-STS30-05**
door hinge left	**AZ 3350-STS30-06**

without emergency handle

door hinge right	**AZ 3350-STS30-07**
door hinge left	**AZ 3350-STS30-08**

Ordering details

Lockout tag

for …STS30-01/-03/-06/-08	**SZ 415-1**
for …STS30-02/-04/-05/-07	**SZ 415-2**

Lockout tag with 5 circular holes

for …STS30-01/-03/-06/-08	**SZ 415-1-2477**
for …STS30-02/-04/-05/-07	**SZ 415-2-2477**

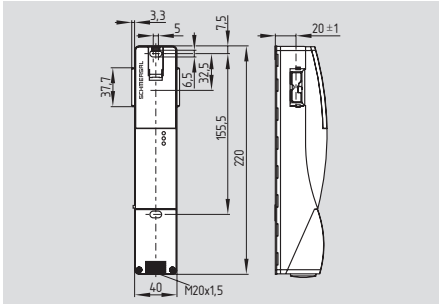
Centering device:

Mounting outside	**TFA-010**
Mounting inside	**TFI-010**

(Product information see page 1-52)

Safety switch with separate actuator

AZ 200



Safety switch
- Thermoplastic enclosure
- Sensor technology permits an offset of ± 5 mm between actuator and safety switch
- Intelligent diagnostic
- Accurate adjustment through slotted holes
- 3 LED's to show the operating status (refer to table)
- 2 safety outputs, 1 diagnostic output
- Holding force 30 N
- Available with AS-Interface Safety at Work

- **Suitable for applications** (without additional second switch)
  - up to PL e/category 4 to EN ISO 13849-1
  - suitable for SIL 3 applications to IEC 61508

- Series-wiring of max. 31 components, without detriment to the category

Approvals

TÜV cULus CE

Technical data

Standards:	EN 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations
Holding force:	30 N
Protection class:	IP67 to EN 60529
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	screw terminals or cage clamps or connector M12 or M23
Cable section:	min. 0.25 mm², max. 1.5 mm² (incl. conductor ferrules)
Cable entry:	M20
Series-wiring:	**max. 31 components**
Cable length:	max. 200m (Cable length and cable section alter the voltage drop depending on the output current)
Switching distances to EN 60947-5-3:	
S_n:	6.5 mm
S_{ao}:	4.0 mm
S_{ar}:	30 mm
Hysteresis:	max. 1.5 mm
Repeat accuracy:	< 0.5 mm
Switching frequency f:	1 Hz
Ambient conditions:	
Ambient temperature:	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30% … 95%, non-condensing
Resistance to vibration:	10 … 55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4 s
Actuating speed:	≤ 0.2 m/s

Technical data

Electrical data:	
U_e:	24 VDC −15%/+10% (stabilised PELV)
I_e:	0.7 A
I_0:	max. 0.1 A
U_{imp}:	800 V
U_i:	32 VDC
Fuse rating:	
- Screw terminals or cage clamps:	≤ 4 A when used to UL 508;
- Connector M12 or M23:	≤ 2 A
Safety inputs X1 and X2:	only for -1P2P and -SD2P
$U_{e3/Low}$:	− 3 V … 5 V
$U_{e3/High}$:	15 V … 30 V
I_{e3}:	typically 2 mA at 24 V
Safety outputs Y1 and Y2:	p-type, short-circuit proof
U_{e1}:	0 V up to 4 V under U_e
I_{e1}:	max. je 0.25 A
Utilization category:	DC-13
Leakage current Ir:	≤ 0.5 mA
Diagnostic output OUT:	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under U_e
I_{e2}:	max. 0.05 A
Utilization category:	DC-13
Wiring capacitance for serial diagnostic:	max. 50 nF
LED functions:	
Green	Supply voltage on
Yellow	Operating status
Red	Error (refer to flash codes)
Classification:	
Standards:	EN ISO 13849-1; IEC 61508
PL:	e
Category:	4
PFH value:	4.0 x 10^{-9} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Ordering details

AZ 200①-T-②

No.	Option	Description
①	SK	Screw terminals
	CC	Cage clamps
	ST1	Connector M23, (8+1)-pole
	ST2	Stecker M12, 8-polig
②	1P2P	1 diagnostic output and 2 safety outputs, all p-type
	SD2P	serial diagnostic output and 2 safety outputs, p-type

Note

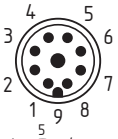
The safety switch and the actuator unit must be ordered separately!
(refer to page 1-56 – 1-59)

Actuator	Page 1-56
SD-Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Connector	Page 1-66
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

Connector

Integrated connector

M23, (8+1)-pole (Suffix -ST1)

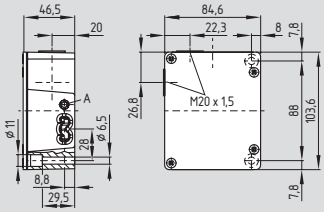


M12, 8-pole (Suffix -ST2)

A detailed product description can be found in the **Electronic Safety Sensors and Solenoid Interlocks** catalog

Safety switch with separate actuator

AZ 415



A: setting screw ball latch

- Metal enclosure
- 2 switches with different actuating functions in a single enclosure
- Long life
- High level of contact reliability with low voltages and currents
- 2 cable entries M20
- Adjustable ball latch to 400 N
- Spring-loaded actuators
- EX version available

Approvals

Technical data

Standards:	IEC/EN 60947-5-1
	BG-GS-ET-15
Enclosure:	light-alloy diecast, paint finish
Actuator:	zinc-plated brass/aluminum
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals
Cable section:	max. 1.5 mm², min. 0.75 mm² (incl. conductor ferrules)
Cable entry:	2 x M20
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	6 A
Utilization category:	AC-15; DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	3.8 mm
Positive break force:	min. 31 N
Ambient temperature:	−25 °C … +70 °C
Mechanical life:	> 1 million operations
Latching force:	30 … 400 N (adjustable)

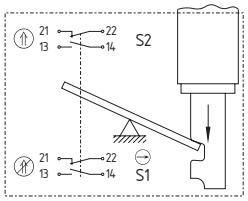
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000
	for max. 10% ohmic contact load
Mission time:	20 years

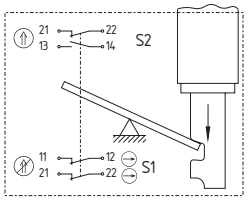
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

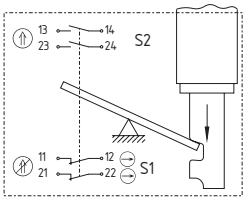
1 NO / 1 NC
1 NO / 1 NC



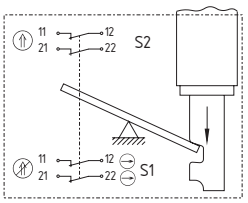
2 NC
1 NO / 1 NC



2 NO
2 NC



2 NC
2 NC



Ordering details

AZ 415-①ZPK-②

No.	Option	Description
①	02/11	2NC / 1NO 1NC
	02/02	2NC / 2NC
	02/20	2NC / 2NO
	11/11	1NO 1NC / 1NO 1NC
②	1637	Gold-plated contacts

Note

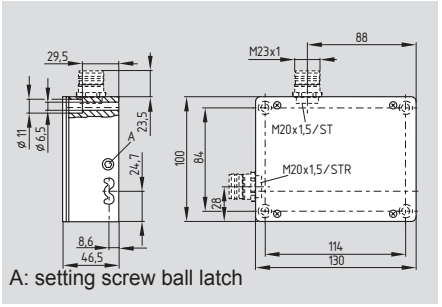
Actuators must be ordered separately (refer to page 1-24).

Note

Contact symbols shown for the closed condition of the guard device.

Safety switch with separate actuator

AZ 415-33



A: setting screw ball latch

- Metal enclosure
- 3 switches with different actuating functions in one enclosure
- Long life
- High level of contact reliability with low voltages and currents
- 2 cable entries M20
- Adjustable ball latch to 400 N
- Spring-loaded actuators

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	light-alloy diecast, paint finish
Actuator:	zinc-plated brass/aluminum
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals
Cable section:	max. 1.5 mm², min. 0.75 mm² (incl. conductor ferrules)
Cable entry:	2 x M20
Uimp:	4 kV
U_i:	250 V
I_{the}:	6 A
Utilization category:	AC-15; DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	5.5 mm
Positive break force:	min. 15 N
Ambient temperature:	−25 °C … +80 °C
Mechanical life:	> 1 million operations
Latching force:	30 … 400 N (adjustable)

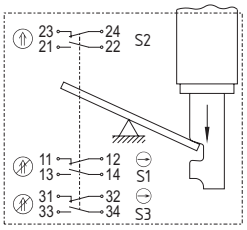
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

3 NO
3 NC



Approvals

Ordering details

AZ 415-33ZPK-①

No.	Option	Description
①	1637	Gold-plated contacts

Note

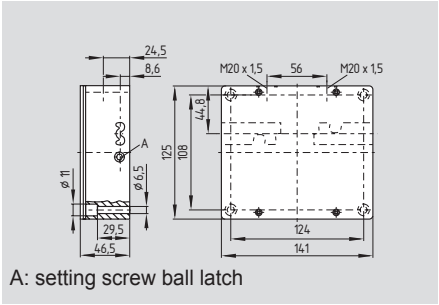
Actuators must be ordered separately (refer to page 1-24).

Note

Contact symbols shown for the closed condition of the guard device.

Safety switch with separate actuator

AZ 415-33 for double doors



A: setting screw ball latch

- Metal enclosure
- 3 switches with different actuating functions in one enclosure
- for double doors
- Long life
- High level of contact reliability with low voltages and currents
- 2 cable entries M20
- Ball latch for each door, individually adjustable up to 400 N
- Spring-loaded actuators

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	light-alloy diecast, paint finish
Actuator:	zinc-plated brass/aluminum
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals
Cable section:	max. 1.5 mm², min. 0.75 mm² (incl. conductor ferrules)
Cable entry:	2 x M20
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	6 A
Utilization category:	AC-15; DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	5.5 mm
Positive break force:	min. 15 N
Ambient temperature:	−25 °C … +80 °C
Mechanical life:	> 1 million operations
Latching force:	30 … 400 N (adjustable)

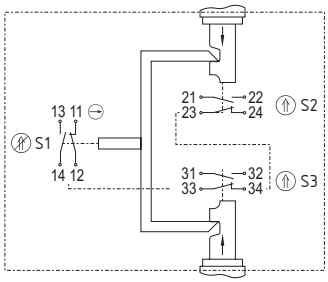
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

3 NO
3 NC



Approvals

Ordering details

AZ 415-33ZPDK-①

No.	Option	Description
①	1637	Gold-plated contacts

Note

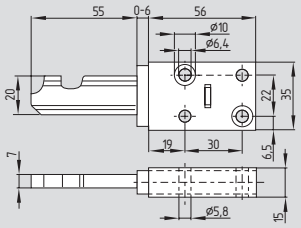
Actuators must be ordered separately (refer to page 1-24).

Note

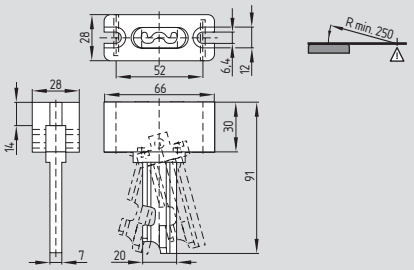
Contact symbols shown for the closed condition of the guard device.

Safety switch with separate actuator

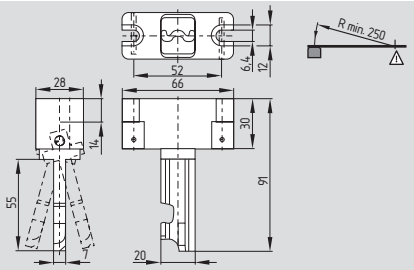
System components



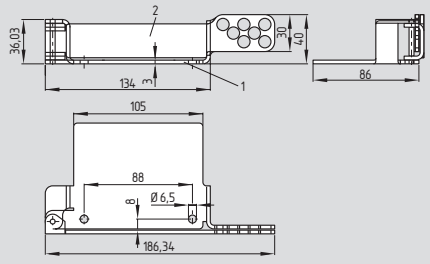
Straight actuator AZ/AZM 415-B1



Flexible actuator AZ/AZM 415-B2

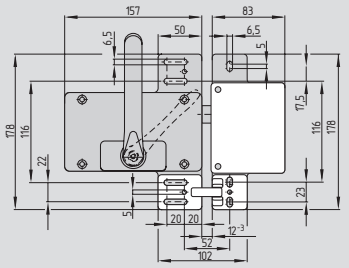


Flexible actuator AZ/AZM 415-B3



Lockout tag SZ 415-22-1/-2

System components



AZ 415-STS30

Ordering details

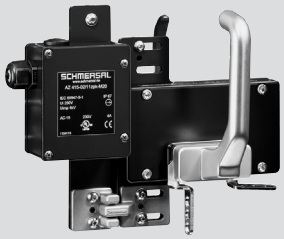
Straight actuator	**AZ/AZM 415-B1**
Flexible actuator	**AZ/AZM 415-B2**
Flexible actuator	**AZ/AZM 415-B3**
Lockout tag	**SZ 415-22-1/-2**

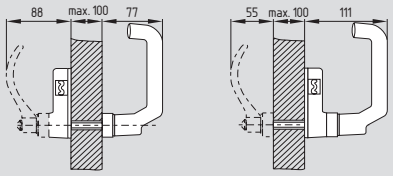
Ordering details

Safety door-handle system STS
Actuator with handle and without or with emergency handle and inclusive mounting plate **AZ 415-STS30**
(A detailed product description can be found on page 1-25)

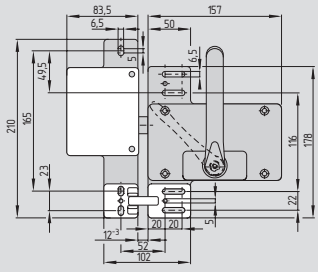
Safety switch with separate actuator

AZ 415-STS30-…

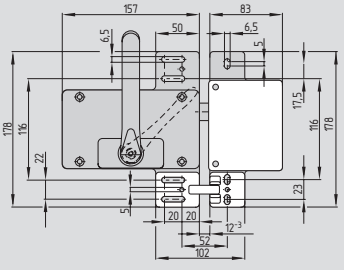




Mounting inside **Mounting outside**



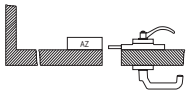
AZ 415 STS30-02/-04/-05/-07



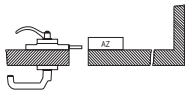
AZ 415 STS30-01/-03/-06/-08

System variants

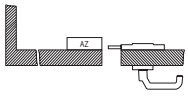
AZ 415-STS30-01



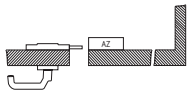
AZ 415-STS30-02



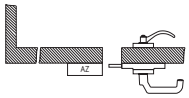
AZ 415-STS30-03



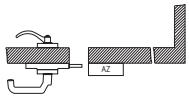
AZ 415-STS30-04



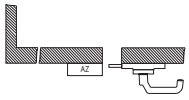
AZ 415-STS30-05



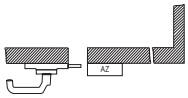
AZ 415-STS30-06



AZ 415-STS30-07

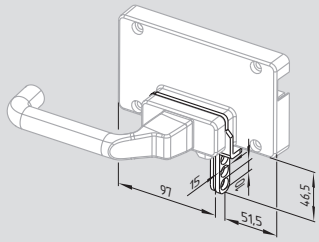


AZ 415-STS30-08

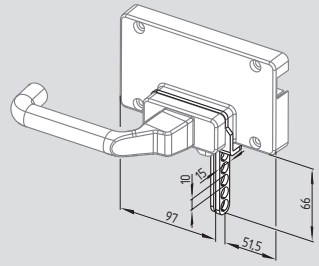


The drawings are always shown with a view to the switch.

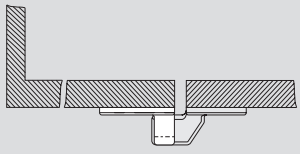
System components



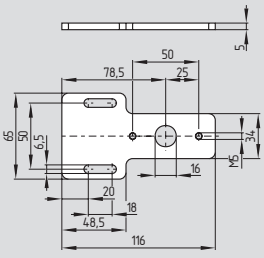
Lockout tag SZ 415-1/-2



Lockout tag SZ 415-1/-2-2477



Centering device TF.



Mounting plate MP TG-01

Ordering details

Included in delivery
- Mounting plate for safety switch
- Actuator incl. mounting plate
- Emergency handle (for variant -05 and -06 incl. mounting plate)

Ordering example
To order, first choose the desired safety switch and then the door handle system:
for example AZ 415-11/11ZPK and
AZ 415-STS30-05

Ordering details

Mounting inside	
with emergency handle	
door hinge right	**AZ 415-STS30-01**
door hinge left	**AZ 415-STS30-02**
without emergency handle	
door hinge right	**AZ 415-STS30-03**
door hinge left	**AZ 415-STS30-04**
Mounting outside	
with emergency handle	
door hinge right	**AZ 415-STS30-05**
door hinge left	**AZ 415-STS30-06**
without emergency handle	
door hinge right	**AZ 415-STS30-07**
door hinge left	**AZ 415-STS30-08**

Ordering details

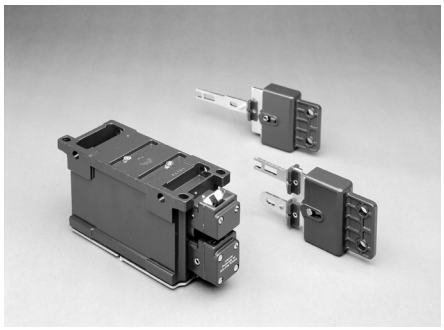
Lockout tag	
for …STS30-01/-03/-06/-08	**SZ 415-1**
for …STS30-02/-04/-05/-07	**SZ 415-2**
Lockout tag with 5 circular holes	
for …STS30-01/-03/-06/-08	**SZ 415-1-2477**
for …STS30-02/-04/-05/-07	**SZ 415-2-2477**
Lockout tag with 7 circular holes	
for …STS30-01/-03/-06/-08	**SZ AZ 415-1-2477**
for …STS30-02/-04/-05/-07	**SZ AZ 415-2-2477**
Centering device:	
Mounting outside	**TFA-010**
Mounting inside	**TFI-010**
(Product information see page 1-52)	
Mounting plate	**MP TG-01**

Further products and program extensions for guard door monitoring

SDG heavy duty keyed interlock

Similar to our AZ3350 designed for harsher industrial environments. The housing is a robust die cast aluminum with a larger wiring compartment, offering IP67 protection. The actuating head can be rotated into any of four positions (90 deg).

Further information can be found in the online product catalog

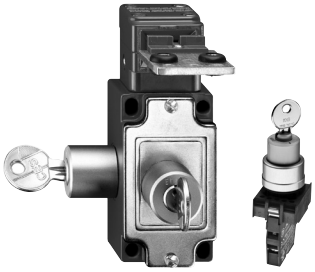


TKF/ TKM heavy duty solenoid latching keyed interlock

The switch features separate actuator heads with independent contacts for a keyed interlock and a solenoid interlock. The heads can be aligned in series, or facing the side in parallel. The housing is a robust die cast aluminum which offers IP67 protection.

Available in power to unlock (TKF) and power to lock (TKM) versions.

Further information can be found in the online product catalog



SHGV cablefree guard door monitoring system

The SHGV trapped key system conforms to EN 1088 and is particularly suitable for the monitoring of maintenance and service doors.

The trapped key system consists of a keyed selector switch for the control panel and a mechanical interlock switch for the guard door which use the same lock key. This system eliminates wiring or cabling between the guard and the control cabinet.

Further info can be found in the online product catalog.

SVE key operated selector switch interlocking device

For use with the SHGV system in applications where hazardous movement may run longer than the time to reach the area and transfer the key. Used instead of the SHGV/ESS keyed selector switch.

The SVE allows up to three keys to power off the machine, but uses a solenoid to keep the keys trapped for the duration of machine rundown.

Further info can be found in the online product catalog.

SVM multiple key distribution station

For use with SHGV System. The selector switch key is used to free either 6 or 10 additional keys for multiple SHGV switch units. The selector switch key is trapped until all additional keys have been returned.

Available in a surface mounted aluminum housing or on a stainless steel plate for flush mounting.

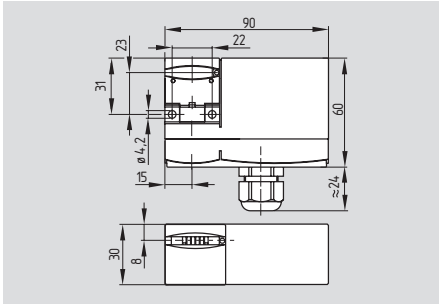
Further info can be found in the online product catalog.

Solenoid locking switches are used on sliding, hinged and removable guard doors that must be closed and locked for operator safety. It is a two part system consisting of a switch body, mounted to the guard frame, and a separate actuator key, mounted to the door.

Models are available in a several mounting profiles and housing materials. Each model has a variety of actuator key options: straight, right angle mounting, floating head, and keys integrated into door handle assemblies.

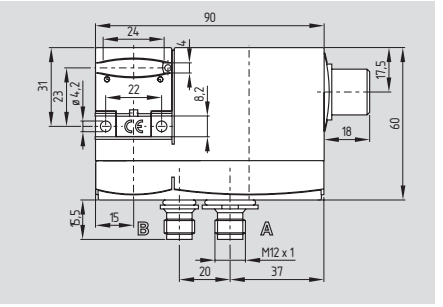
Solenoid interlocks

AZM 170 cut clamps



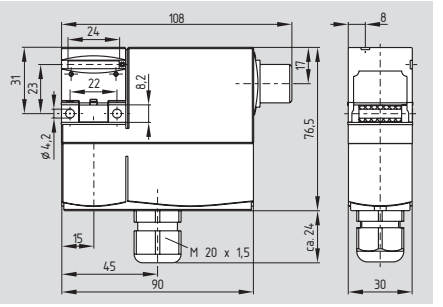
- **Cut clamps**
- Interlock with protection against incorrect locking
- Thermoplastic enclosure
- Compact design
- Manual release
- Long life
- Double insulated ⧈
- High holding force 1,000 N
- Power to unlock/power to lock principle
- 1 cable entry M20 cord grip

AZM 170 with connector



- **Connector**
- Interlock with protection against incorrect locking
- Thermoplastic enclosure
- Compact design
- Manual release
- Long life
- Double insulated ⧈
- High holding force 1,000 N
- Power to unlock/power to lock principle

AZM 170 screw terminals



- **Screw terminals**
- Interlock with protection against incorrect locking
- Thermoplastic enclosure
- Compact design
- Manual release
- Long life
- Double insulated ⧈
- High holding force 1,000 N
- Power to unlock/power to lock principle
- 1 cable entry M20 cord grip

Approvals

cULus CE

Ordering details

AZM 170①-②Z③K④-⑤-⑥⑦

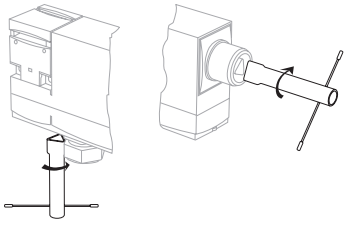
No.	Option	Description
①		Cut clamp
	SK	Screw terminals
②	11	1NO/1NC
	02	2NC
③		Latching force 5 N
	R	Latching force 30 N
④		Power to unlock
	A	Power to lock
⑤		Cable gland
	ST	Connector M12
	ST-2431	Connector M12, with individual solenoid monitoring

Ordering details

AZM 170①-②Z③K④-⑤-⑥⑦

No.	Option	Description
⑥		Manual release
	2197	Manual release from side (standard for connector and power to unlock principle)
⑦	1637	Gold-plated contacts
	24VAC/DC	Us 24 VAC/DC
	110VAC	Us 110 VAC
	230VAC	Us 230 VAC

Note



Manual release (left)
- Included on standard version
- For manual release using M5 triangular key, **Manual release from side (right)**
- Additional manual release on side, ordering suffix -2197
- Only available for power to unlock principle

Solenoid interlocks

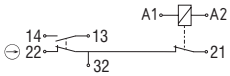
Technical data

Standards:	IEC/EN 60947-5-1, EN ISO 13849-1, BG-GS-ET-19
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator and locking bolt:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contacts with positive break
Cable type:	flexible with insulated conductor ferrules
Cable section:	
- cut clamp terminals:	0.75 … 1.0 mm²
- screw terminals:	0.25 … 1.5 mm²
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	6 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	11 mm
Positive break force:	8.5 N for each NC contact fitted
Magnet:	100% ED
Us:	24 VAC/DC 110 VAC, 50/60 Hz 230 VAC, 50/60 Hz
Power consumption:	max. 10 W
Ambient temperature:	−25 °C … +60 °C
Mechanical life:	> 1 million operations
F_{max}:	1,000 N
Latching force:	30 N for ordering suffix R
Actuating speed:	max. 2 m/s
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
Mission time:	20 years

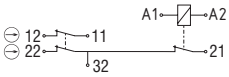
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

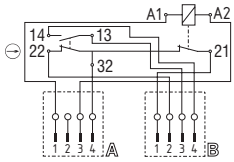
Power to unlock
1 NO / 1 NC



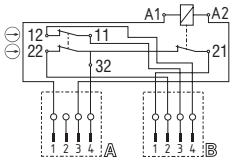
2 NC



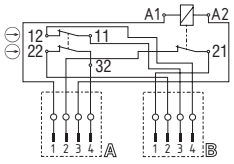
Connector
1 NO / 1 NC



2 NC

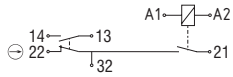


2 NC
with individual solenoid monitoring
(Ordering suffix -ST-2431)

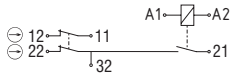


Contact variants

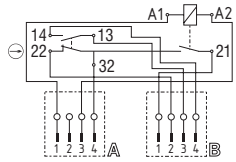
Power to lock
1 NO / 1 NC



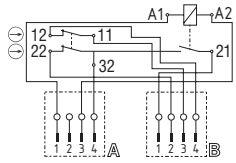
2 NC



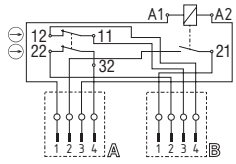
Connector
1 NO / 1 NC



2 NC



2 NC
with individual solenoid monitoring
(Ordering suffix -ST-2431)



Note

The contact 21-32 is actuated when A1-A2 is energized or de-energized.

At least one magnetic contact with positive break ⊖ must be integrated in the safety circuit.

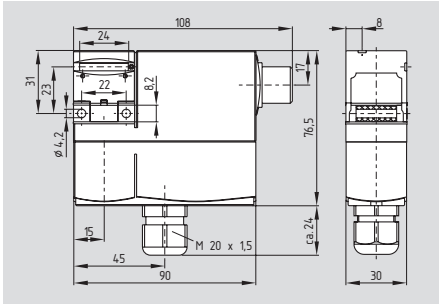
Circuit diagrams show de-energized condition with actuator inserted.

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

Note

Actuators and connector plugs must be ordered separately. (refer to page 1-34)

AZM 170SK-../..



- **Screw terminals**
- Interlock with protection against incorrect locking.
- Thermoplastic enclosure
- Compact design
- Manual release from side
- Long life
- Double-insulated ⧈
- High holding force 1,000 N
- With latching force 30 N or 5 N
- Power to unlock / power to lock principle
- 1 cable entry M20 cord grip
- EX version available

Approvals

* under preparation

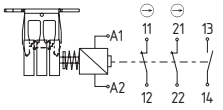
Technical data

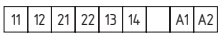
Standards:	IEC/EN 60947-5-1 EN ISO 13849-1 BG-GS-ET-19
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator and locking bolt:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contacts with positive break
Cable gland:	M20
Connection:	screw terminals
Cable type:	flexible with insulated conductor ferrules
Cable section:	min. 0.25 mm² max. 1.5 mm² (incl. conductor ferrules)
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	6 A
Utilization category:	DC-13
I_e/U_e:	4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	11 mm
Positive break force:	8.5 N for each NC contact fitted
Magnet:	100% ED
U_s:	24 VDC
Power consumption:	max. 10 W
Ambient temperature:	−25 °C … +60 °C
Mechanical life:	> 1 million operations
F_{max}:	1,000 N
Latching force:	30 N for ordering suffix R
Actuating speed:	max. 2 m/s
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

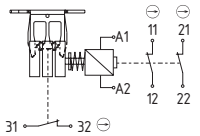
Contact variants

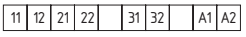
Power to unlock
1 NO 2 NC
(Ordering suffix -12/00)



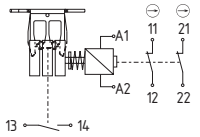


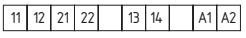
2 NC / 1 NC
(Ordering suffix -02/01)





2 NC / 1 NO
(Ordering suffix -02/10)



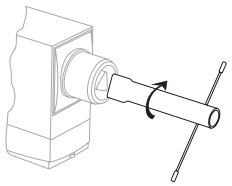


Ordering details

AZM 170SK-①Z②K③-④-⑤-024

No.	Option	Description
①	12/00	1NO 2NC / –
	11/11	1NO 1NC / 1NO 1NC
	11/02	1NO 1NC / 2NC
	02/01	2NC / 1NC
	02/10	2NC / 1NO
②		Latching force 5 N
	R	Latching force 30 N
③		Power to unlock
	A	Power to lock
④	1637	Gold-plated contacts
⑤	2197	Manual release for power to unlock principle

Note



Manual release from side
- For manual release using M5 triangular key, available as accessory
- Manual release available for power to unlock principle
- Ordering suffix -2197

Note

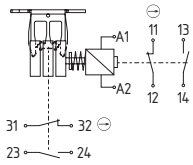
Circuit diagrams show de-energized condition with actuator inserted.

At least one magnetic contact with positive break ⊖ must be integrated in the safety circuit.

Solenoid interlocks

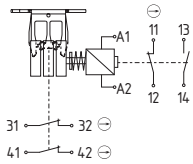
Contact variants

Power to unlock
1 NO 1 NC / 1 NO 1 NC
(Ordering suffix -11/11)



11	12	13	14		23	24	31	32		A1	A2

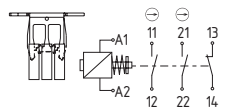
1 NO 1 NC / 2 NC
(Ordering suffix -11/02)



11	12	13	14		31	32	41	42		A1	A2

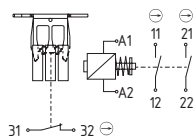
Contact variants

Power to lock
1 NO 2 NC
(Ordering suffix -12/00)



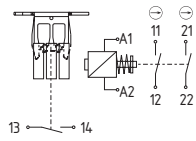
11	12	21	22	13	14		A1	A2

2 NC / 1 NC
(Ordering suffix -02/01)



11	12	21	22		31	32		A1	A2

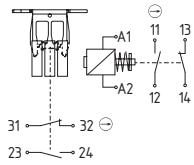
2 NC / 1 NO
(Ordering suffix -02/10)



11	12	21	22		13	14		A1	A2

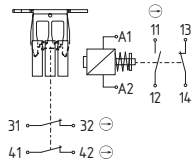
Contact variants

Power to lock
1 NO 1 NC / 1 NO 1 NC
(Ordering suffix -11/11)



11	12	13	14		23	24	31	32		A1	A2

1 NO 1 NC / 2 NC
(Ordering suffix -11/02)



11	12	13	14		31	32	41	42		A1	A2

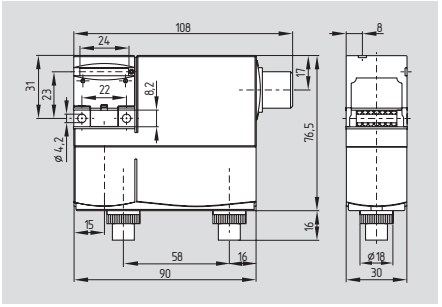
Note

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

Note

Actuators must be ordered separately.
(refer to page 1-34)

AZM 170ST-../..



- **Plug-in connector**
- Interlock with protection against incorrect locking.
- Thermoplastic enclosure
- Compact design
- Manual release from side
- Long life
- Double-insulated ⧈
- High holding force 1,000 N
- With latching force 30 N or 5 N
- Power to unlock / power to lock principle
- Plug-in connector can be rotated
- Plug-in connectors required: 4- and 8-poles
- EX version available

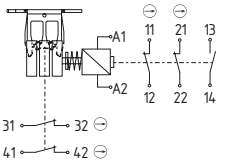
Technical data

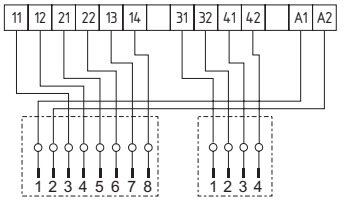
Standards:	IEC/EN 60947-5-1 EN ISO 13849-1 BG-GS-ET-19
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator and locking bolt:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contacts with positive break
Connection:	connector
U_{imp}:	0.8 kV
U_i:	60 V
I_{the}:	2 A
Utilization category:	DC-13
I_e/U_e:	2 A / 24 VDC
Max. fuse rating:	2 A gG D-fuse
Positive break travel:	11 mm
Positive break force:	8.5 N for each NC contact fitted
Magnet:	100% ED
U_s:	24 VDC
Power consumption:	max. 10 W
Ambient temperature:	−25 °C … +60 °C
Mechanical life:	> 1 million operations
F_{max}:	1,000 N
Latching force:	30 N for ordering suffix R
Actuating speed:	max. 2 m/s
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

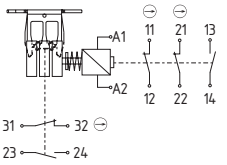
Contact variants

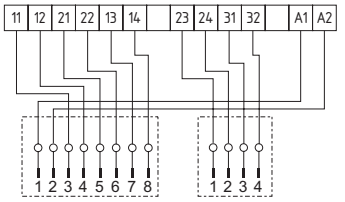
Power to unlock
1 NO 2 NC / 2 NC
(Ordering suffix -12/02)





1 NO 2 NC / 1 NO 1 NC
(Ordering suffix -12/11)





Approvals

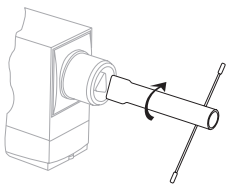
* under preparation

Ordering details

AZM 170ST-①Z②K③-④-⑤-024

No.	Option	Description
①	12/11	1NO 2NC / 1NO 1NC
	12/02	1NO 2NC / 2NC
	11/11	1NO 1NC / 1NO 1NC
	11/02	1NO 1NC / 2NC
②		Latching force 5 N
	R	Latching force 30 N
③		Power to unlock
	A	Power to lock
④	1637	Gold-plated contacts
⑤	2197	Manual release for power to unlock principle

Note



Manual release from side
- For manual release using M5 triangular key, available as accessory
- Manual release available for power to unlock principle
- Ordering suffix -2197

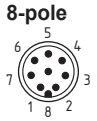
Note

Connector M12

4-pole

PIN 1: brown BN
PIN 2: white WH
PIN 3: blue BU
PIN 4: black BK

8-pole

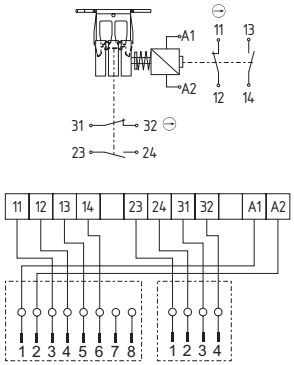


PIN 1: white WH
PIN 2: brown BN
PIN 3: green GN
PIN 4: yellow YW
PIN 5: grey GY
PIN 6: pink PK
PIN 7: blue BU
PIN 8: red RD

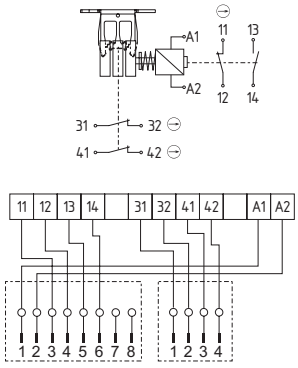
Solenoid interlocks

Contact variants

Power to unlock
1 NO 1 NC / 1 NO 1 NC
(Ordering suffix -11/11)

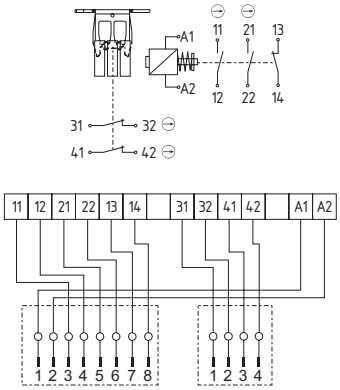


1 NO 1 NC / 2 NC
(Ordering suffix -11/02)

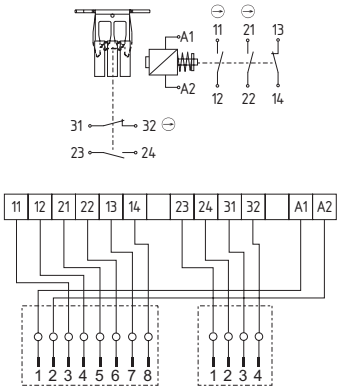


Contact variants

Power to lock
1 NO 2 NC / 2 NC
(Ordering suffix -12/02)

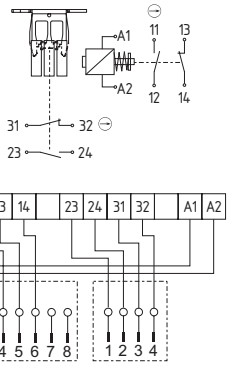


1 NO 2 NC / 1 NO 1 NC
(Ordering suffix -12/11)

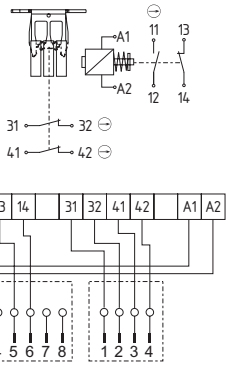


Contact variants

Power to lock
1 NO 1 NC / 1 NO 1 NC
(Ordering suffix -11/11)



1 NO 1 NC / 2 NC
(Ordering suffix -11/02)



Note

Circuit diagrams show de-energized condition with actuator inserted.

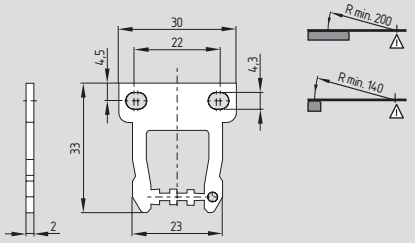
At least one magnetic contact with positive break ⊖ must be integrated in the safety circuit.

Actuators and connector plugs must be ordered separately. (refer to page 1-34)

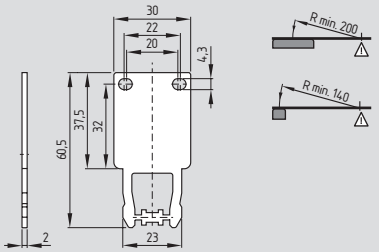
Note

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

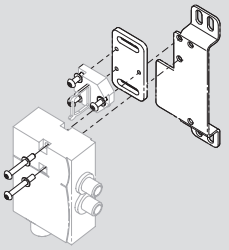
System components



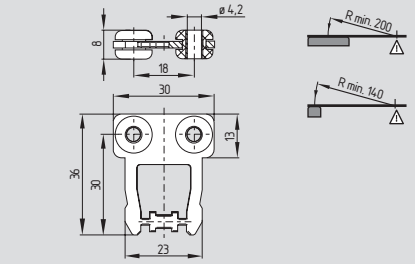
Straight actuator AZ 17/170-B1



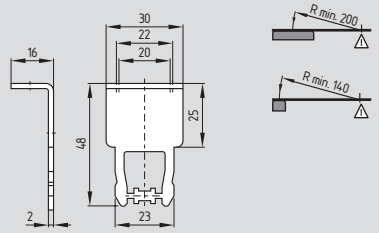
Long straight actuator AZ 17/170-B11



Mounting set MS AZM 170

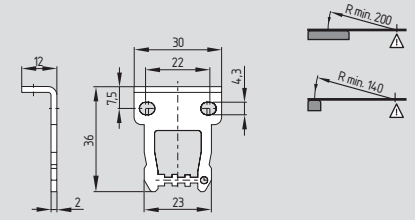


AZ 17/170-B1-2245 with rubber mounting

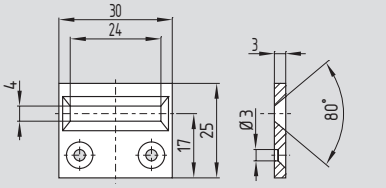


Long angled actuator AZ 17/170-B15

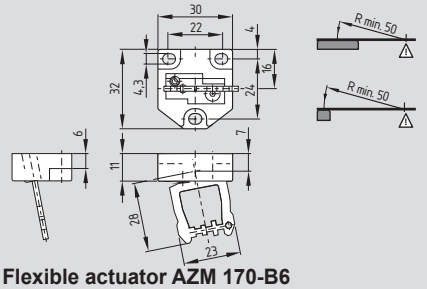
Connector plug



Angled actuator AZ 17/170-B5



Centering guide AZM 170-B



Flexible actuator AZM 170-B6

Ordering details

Straight actuator	**AZ 17/170-B1**
with rubber mounting	**AZ 17/170-B1-2245**
Angled actuator	**AZ 17/170-B5**
Flexible actuator	**AZM 170-B6**

Ordering details

Long straight actuator	**AZ 17/170-B11**
Long angled actuator	**AZ 17/170-B15**
Centering guide	**AZM 170-B**

Centering device

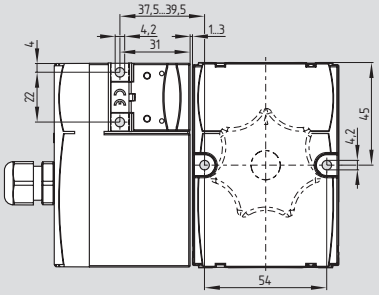
Mounting outside	**TFA-020**
Mounting inside	**TFI-020**

(Product information see page 1-52)

Ordering details

Mounting sets	**MS AZM 170 P**
	MS AZM 170 R/P
Connector plug M12	
without cable, 4-poles:	**101209950**
with 5m cable, 4-poles:	**101208523**
with 5m cable, 8-poles:	**101209964**
Without cable, 4-poles, B-code	**101209976**
With 5m cable, 4-poles, B-code	**101209938**
Tamperproof screws with unidirectional slots (without drawing)	
M4 x 8	**101147463**
(Quantity 2 pcs)	

Actuator AZM 170-B25



- Door-handle actuator for solenoid interlocks AZM 170-…ZRK (latching)
- Ergonomic operation
- No supplementary door-handle required
- No protruding actuator
- Simple mounting
- Several door-handles available
- Possibility to mount the own handles using a default square screw (8 mm)
- Mounting plate for fitting to standard profiles optionally available

Approvals

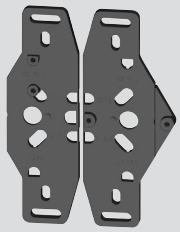
CE

Ordering details

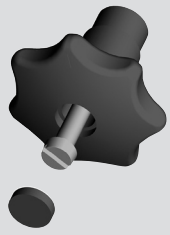
AZM 170-B25-①-②

No.	Option	Description
①	L	Door hinge left
	R	Door hinge right (View directed towards the inside of the hazardous area)
②	G0	Actuator without handle
	G1	Star grip
	G2	T-grip

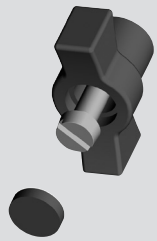
System components



Mounting plate



Star grip



T-grip

Ordering details

Mounting plate	**MP AZ 17/170-B25**
Star grip	**G1**
T-grip	**G2**

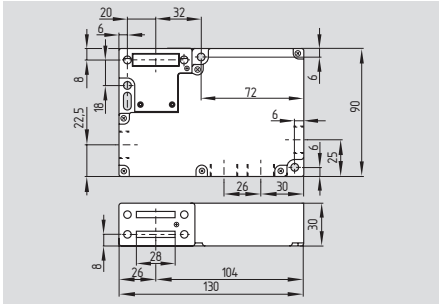
Note

The safety switch or solenoid interlock is not included in delivery and must be ordered separately.

Please note that you need a device with latching (R).

The technical data of the AZM 170-…ZRK solenoid interlock can be found in the main catalog page 1-28 or in the online catalog at www.usa.schmersal.net

AZM 161



- Interlock with protection against incorrect locking
- Thermoplastic enclosure
- 6 contacts
- Manual release, emergency exit or emergency release
- Long life
- Double insulated ⧈
- High holding force 2,000 N
- Large wiring compartment
- Power to unlock/power to lock principle
- Screw terminals or cage clamps or connector
- 4 cable entries M16
- EX version available
- AS-Interface Safety at Work available

Approvals

cULus CCC CE

Technical data

Standards:	IEC/EN 60947-5-1; EN ISO 13849-1; EN 1088; BG-GS-ET-19
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Actuator and locking bolt:	stainless steel 1.4301
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contacts with positive break
Connection:	screw terminals or cage clamps or connector
Cable type:	flexible
Cable section:	min. 0.25 mm² max. 1.5 mm² (incl. conductor ferrules)
Cable entry:	4 x M16
U_{imp}:	
- screw terminals or cage clamps:	4 kV
- connector, 4-pole:	2.5 kV
- connector, 8-pole:	0.8 kV
U_i:	
- screw terminals or cage clamps, connector, 4-pole:	250 V
- connector, 8-pole:	60 V
I_{the}:	
- screw terminals or cage clamps:	6 A
- connector, 4-pole:	4 A
- connector, 8-pole:	2 A
Utilization category:	AC-15, DC-13
I_e/U_e:	
- connector, 4-pole:	4 A / 230 VAC 2.5 A / 24 VDC
- connector, 8-pole:	2 A / 60 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	10 mm
Positive break force:	10 N for each NC contact fitted
U_s:	24 VAC/DC, 110/230 VAC, 50/60Hz
Magnet:	100% ED
Power consumption:	max. 10 W
Ambient temperature:	−25 °C … +60 °C
Mechanical life:	> 1 million operations
F_{max}:	2,000 N
Latching force:	30 N for ordering suffix R

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Ordering details

AZM 161 ①-②③**K**④-⑤-⑥

No.	Option	Description
①	CC	Cage clamp
	SK	Screw terminals
	ST	Connector M12
②	11/03 *	1NO/4NC with connector
	11/12 *	2NO/3NC with connector
	12/03 *	1NO/5NC
	12/11 *	2NO/3NC with connector
	12/12	2NO/4NC
③		Latching force 5 N
	R	Latching force 30 N
④		Power to unlock
	A	Power to lock

Ordering details

AZM 161 ①-②③**K**④-⑤-⑥

No.	Option	Description
⑤		Manual release lateral
	ED	on cover-side
	EU	at the rear
	T	Emergency exit lateral
	TD	on cover-side
	TU	at the rear
	N	Emergency release
⑥	024	U_s 24 VAC/DC
	110/230	U_s 110/230 VAC

* only available in 24V AC/DC models

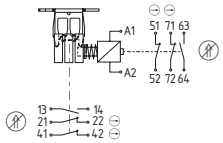
Actuators ordered separately
(refer to page 1-39)

Note: 24V AC/DC models available with integrated LED. Add suffix G

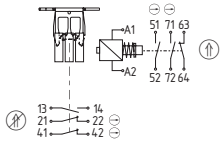
Solenoid interlocks

Contact variants

Power to unlock



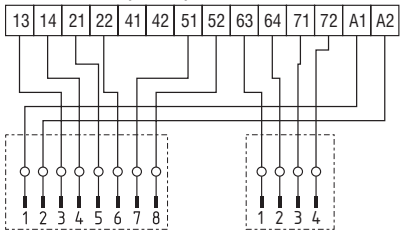
Power to lock



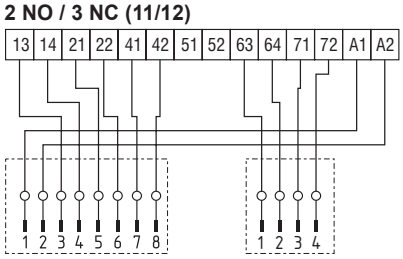
2 NO / 4 NC (12/12)

13	14	21	22	41	42	51	52	63	64	71	72	A1	A2

Connector
2 NO / 3 NC (12/11)

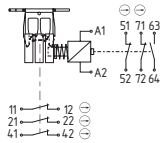


Connector
2 NO / 3 NC (11/12)

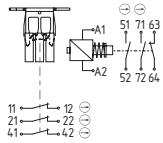


Contact variants

Power to unlock



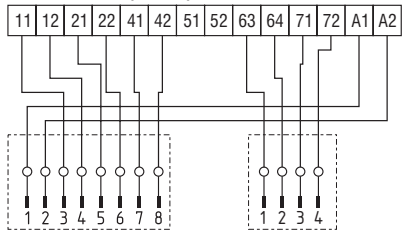
Power to lock



1 NO / 5 NC (12/03)

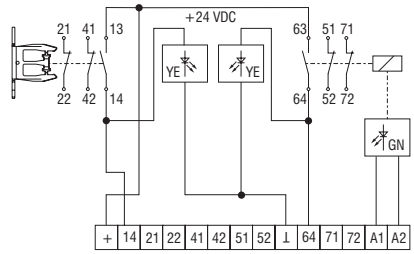
11	12	21	22	41	42	51	52	63	64	71	72	A1	A2

Connector
1 NO / 4 NC (11/03)



Contact variants with LED

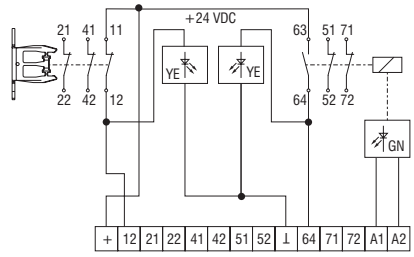
2 NO / 4 NC (12/12)



Legend

14	safety guard open / LED on
+	+24 VDC
⊥	0 VDC
64	unlocked / LED on

1 NO / 5 NC (12/03)



Legend

12	safety guard closed / LED on
+	+24 VDC
⊥	0 VDC
64	unlocked / LED on

Note

At least one magnetic contact with positive break ⊖ must be integrated in the safety circuit.

Contact variants show de-energized condition with actuator inserted.

Note

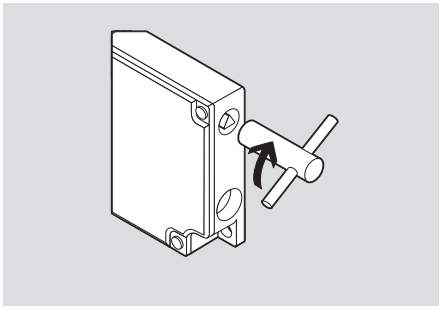
Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

Note

The contacts with LED are shown in closed and locked condition.

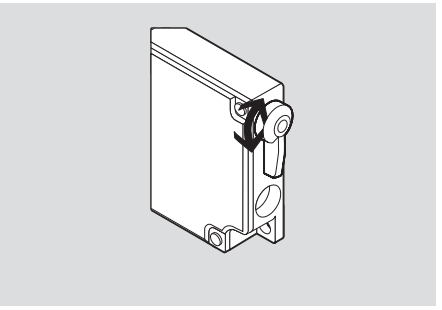
Solenoid interlocks

AZM 161..-12/12…



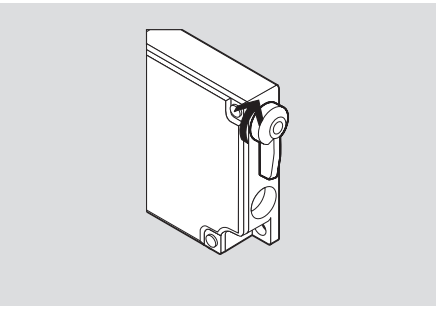
- **Manual release**
- For manual release using M5 triangular key, available as accessory
- For maintenance, setting-up, etc.

AZM 161..-12/12…T



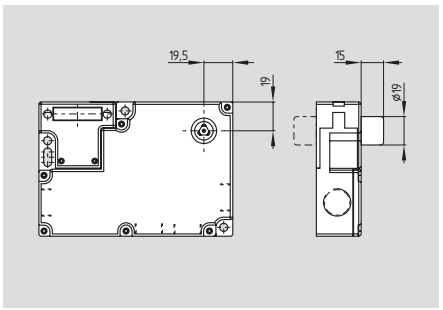
- **Emergency exit**
- For cases of danger
- Actuation from within the hazardous area

AZM 161..-12/12…N



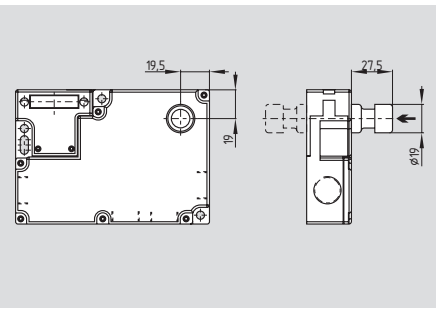
- **Emergency release**
- For cases of danger
- Mounting only outside the guarded area

AZM 161..-12/12…E.



- **Manual release**
- For manual release using M5 triangular key, available as accessory
- For maintenance, setting-up, etc.
- Cover-side fitting (ordering suffix **ED**) or rear fitting (ordering suffix **EU**) enabled

AZM 161..-12/12…T.



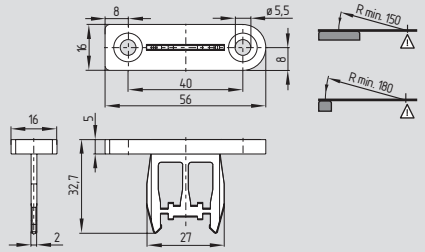
- **Emergency exit**
- The emergency exit is used if an already locked dangerous area needs to be evacuated
- Emergency exit by pressing the red push-button
- Reset by pulling on the red push-button
- Cover-side fitting (ordering suffix **TD**) or rear fitting (ordering suffix **TU**) enabled

Note

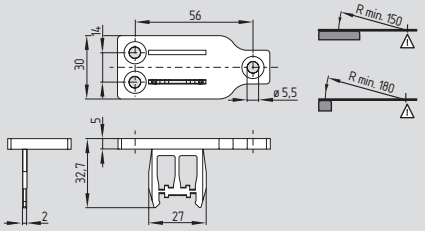
Combining the manual release and the emergency exit in different mounting directions is only possible with the following combination:
ED/TU and TD/EU

Solenoid interlocks

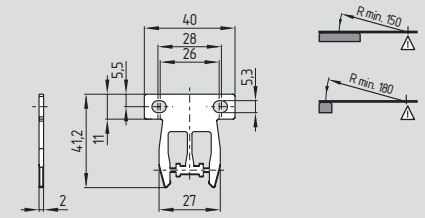
System components



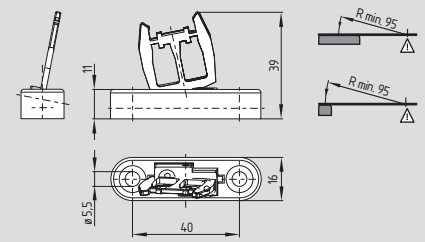
Straight actuator B1



Straight actuator B1E

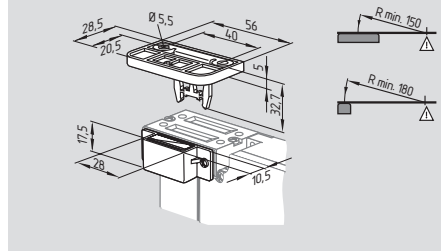


Straight actuator B1F

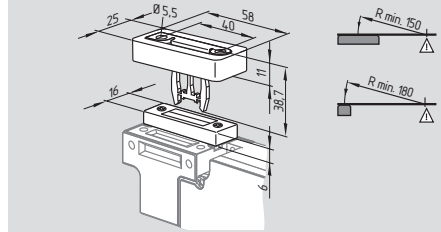


Flexible actuator B6

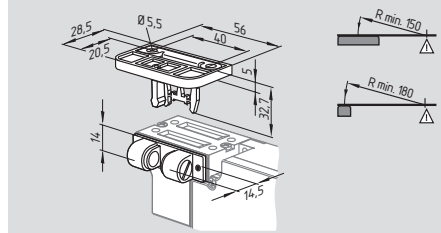
System components



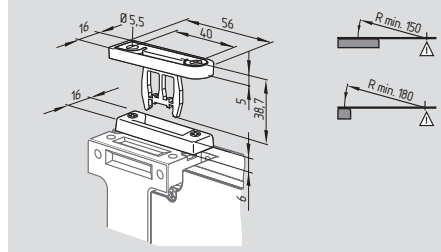
Actuator with magnetic latch B1-1747



Actuator with slot lip-seal B1-2024

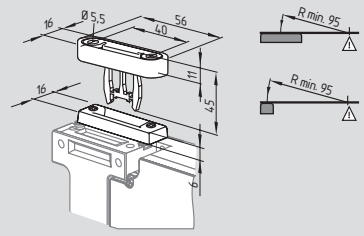


Actuator with ball latch B1-2053

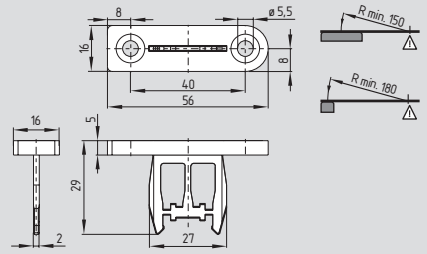


Actuator with centering guide B1-2177

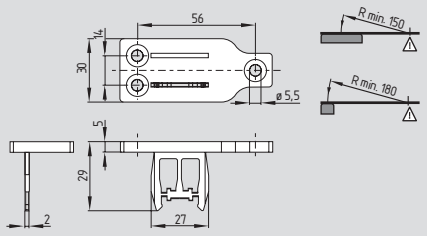
System components



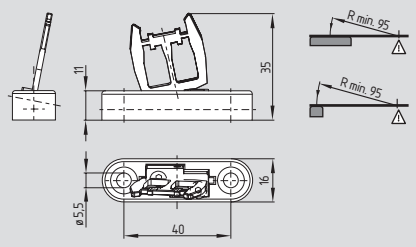
Actuator with centering guide B6-2177



Shortened straight actuator B1S



Shortened straight actuator B1ES



Shortened angled actuator B6S

Ordering details

Straight actuator	**AZM 161-B1**
Straight actuator	**AZM 161-B1E**
Straight actuator	**AZM 161-B1F**
Flexible actuator	**AZM 161-B6**

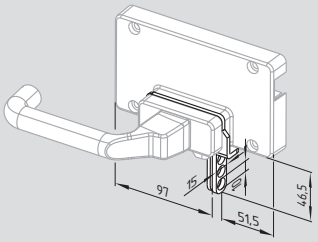
Ordering details

Straight actuator	
with magnetic latch	**AZM 161-B1-1747**
with slot lip-seal	**AZM 161-B1-2024**
with ball latch	**AZM 161-B1-2053**
with centering guide	**AZM 161-B1-2177**

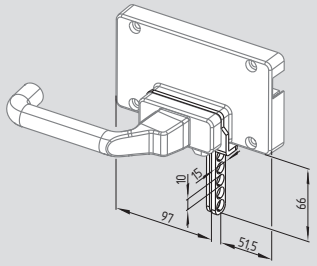
Ordering details

Flexible actuator	
with centering guide	**AZM 161-B6-2177**
Shortened straight actuator	**AZM 161-B1S**
Shortened straight actuator	**AZM 161-B1ES**
Shortened angled actuator	**AZM 161-B6S**

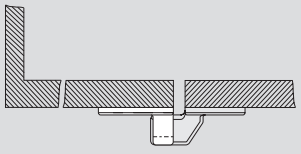
System components



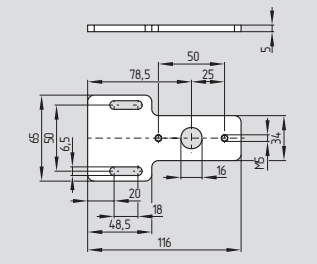
Lockout tag SZ 415-1/-2



Lockout tag SZ 415-1/-2 -2477

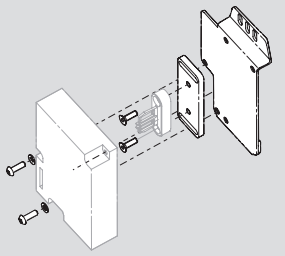


Centering device TF.

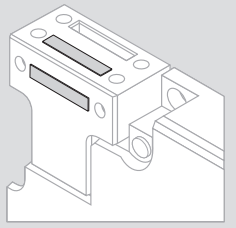


Mounting plate MP TG-01

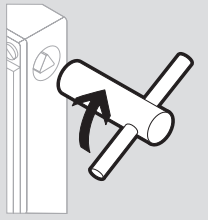
System components



Mounting set MS AZM 161



Slot sealing plug AZM 161



Triangular key AZM KEY

Connector plug

Ordering details

Lockout tag

for …STS30-01/-03/-06/-08	**SZ 415-1**
for …STS30-02/-04/-05/-07	**SZ 415-2**

Lockout tag with 5 circular holes

for …STS30-01/-03/-06/-08	**SZ 415-1-2477**
for …STS30-02/-04/-05/-07	**SZ 415-2-2477**

Centering device only for AZ 16-STS30… and AZM 161-STS30…:

Mounting outside	**TFA-020**
Mounting inside	**TFI-020**

(Product information see page 1-52)

Mounting plate	**MP TG-01**

Ordering details

Mounting sets	**MS AZM 161 P**
	MS AZM 161 R/P
Slot sealing plug AZM 161	**101145379**
Triangular key M5	AZM KEY
Connector	**plugs on request**

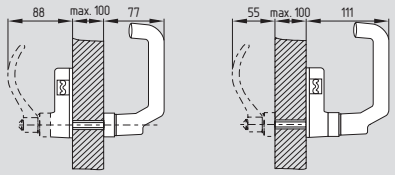
(with 8-pole connector only 24 VAC/DC variant possible!)

Tamperproof screws with unidirectional slots (without drawing)

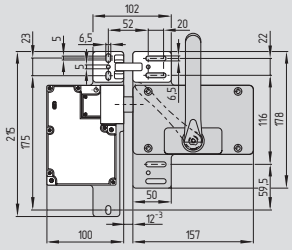
M5 x 12	**101135338**
M5 x 16	**101135339**
M5 x 20	**101135340**

(Quantity 2 pcs)

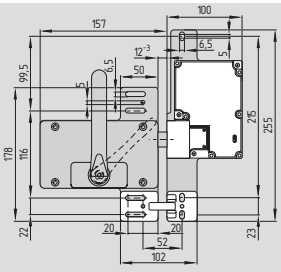
AZM 161-STS30-…



Mounting inside Mounting outside

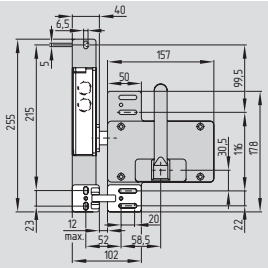


AZM 161 STS30-02/-04/-05/-07

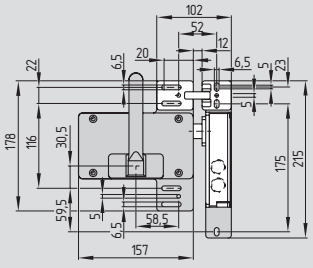


AZM 161 STS30-01/-03/-06/-08

Mounting right-angled



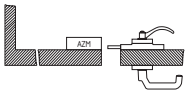
AZM 161 STS30-02/-07-R



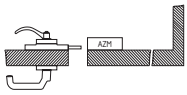
AZM 161 STS30-01/-08-R

System variants

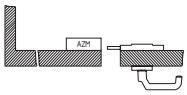
AZM 161-STS30-01



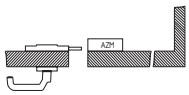
AZM 161-STS30-02



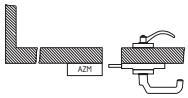
AZM 161-STS30-03



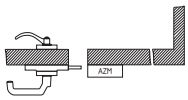
AZM 161-STS30-04



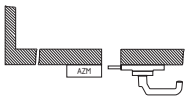
AZM 161-STS30-05*



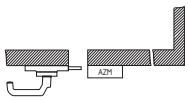
AZM 161-STS30-06*



AZM 161-STS30-07



AZM 161-STS30-08



The drawings are always shown with a view to the switch.

Note

Included in delivery

- Mounting plate for safety switch
- Actuator incl. mounting plate
- Emergency handle (for variant -05 and -06 incl. mounting plate)

Ordering example

To order, first choose the desired safety switch and then the door handle system:
for example AZM SK-12/12RK-T-024 and
AZM 161-STS30-01

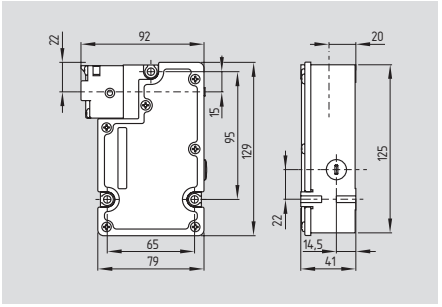
Ordering details

Mounting right-angled
to safety guard **Ordering suffix -R**
(only STS30-01, -02, -07, 08)

Ordering details

Mounting inside
with emergency handle
door hinge right **AZM 161-STS30-01**
door hinge left **AZM 161-STS30-02**
without emergency handle
door hinge right **AZM 161-STS30-03**
door hinge left **AZM 161-STS30-04**
Mounting outside
with emergency handle
door hinge right **AZM 161-STS30-05***
door hinge left **AZM 161-STS30-06***
(* only for power to lock)
without emergency handle
door hinge right **AZM 161-STS30-07**
door hinge left **AZM 161-STS30-08**

TZM/TZF



- Interlock with protection against incorrect locking
- Thermoplastic enclosure
- Manual release, emergency exit or emergency release
- Long life
- Double insulated ⧈
- Holding force 1500 N
- Wiring compartment
- Power to unlock/power to lock principle
- 1 cable entry M20
- Actuating play 11 mm in direction of actuation
- With LED on request

Approvals

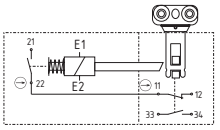
Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-19
Enclosure:	glass fiber reinforced thermo-plastic, self-extinguishing
Actuator and locking bolt:	zinc-plated steel / zinc diecast
Protection class:	IP67; Ordering suffix NF: IP65
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	self-opening screw terminals
Cable section:	max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	M20
U_{imp}:	2.5 kV
U_i:	320 V
I_{the}:	4 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	4 A gG D-fuse
Positive break travel:	2 x 3.5 mm
Positive break force:	20 N
Magnet:	100% ED
U_s:	24 VDC 110 VAC, 50/60 Hz 230 VAC, 50/60 Hz
Power consumption:	max. 8.5 W
Ambient temperature:	0 °C … + 50 °C
Mechanical life:	1 million operations
F_{max}:	1,500 N
Latching force:	20 N
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
Mission time:	20 years

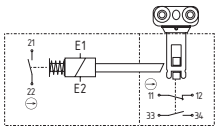
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

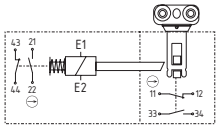
Magnet-operated
2 NC in series / 1 NO



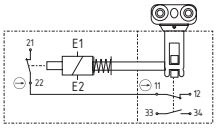
1 NO / 2 NC



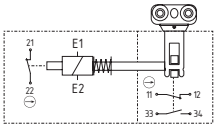
2 NO / 2 NC



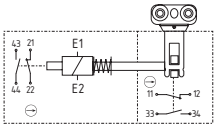
Spring-operated
2 NC in series / 1 NO



1 NO / 2 NC



2 NO / 2 NC

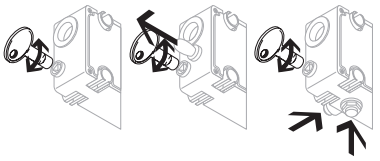


Ordering details

TZ ① ② ③ ④

No.	Option	Description
①	F	Spring-operated
	M	Magnet-operated
②		2 NC in series / 1 NO
	W	2 NC / 1 NO
	CW	2 NC / 2 NO
③	S	Manual release
	N	Emergency release
	NF	Emergency exit and manual release
④	24VDC	24 VDC
	110VAC	110 VAC
	230VAC	230 VAC

Note



Manual release (left)
- For manual unlocking using triangular key TZ-69 (included in delivery)
- For maintenance, setting-up, etc.

Emergency release (middle)
- For cases of danger
- Mounting only outside the guarded area

Emergency exit (right)
- For cases of danger
- Actuation from within the hazardous area

Note

Contact 21-22 must be integrated in the safety circuit. Contact symbols shown for the closed condition of the guard device.

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

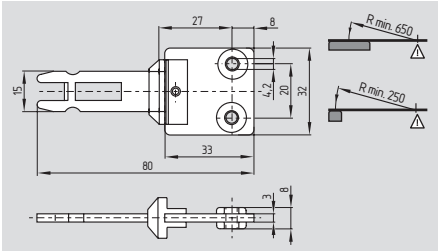
For the version with LED, the monitoring contacts are not potential-free

The actuator TZ/CO is included in delivery.

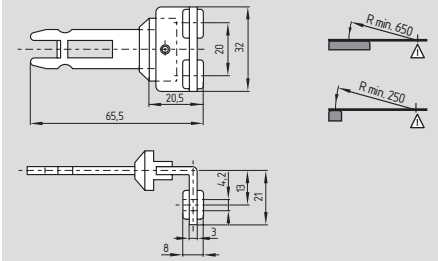
Other contacts variants on request

Solenoid interlocks

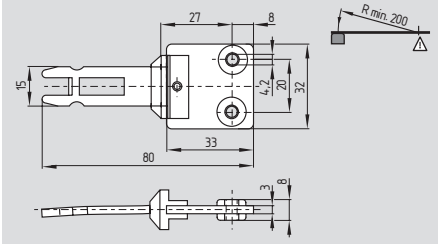
System components



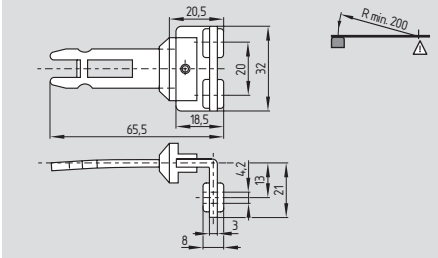
Straight actuator TZ/CO



Angled actuator TZ/CW

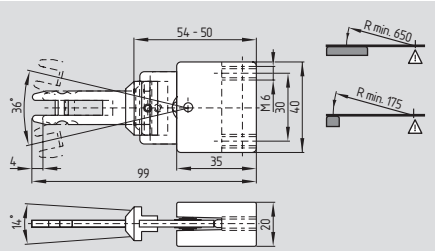


Straight radius actuator TZ/COR

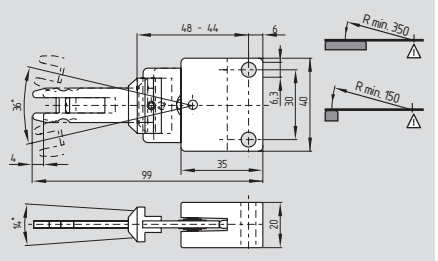


Angled radius actuator TZ/CWR

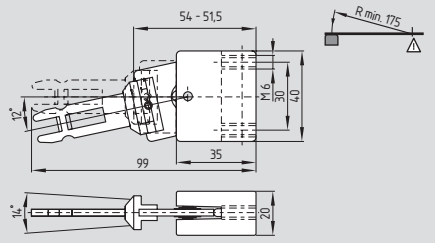
System components



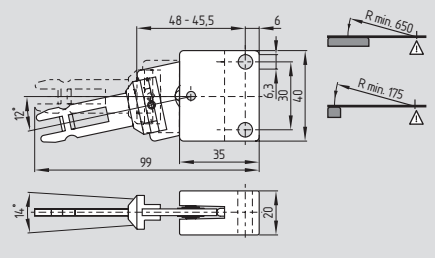
Flexible actuator TZ/COF/HIS.1



Flexible actuator TZ/COF/HIS.2

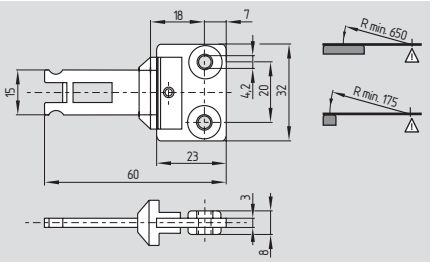


Flexible actuator TZ/CORF/HIS.1

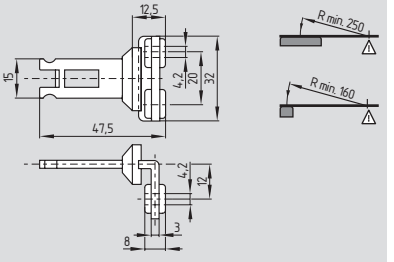


Flexible actuator TZ/CORF/HIS.2

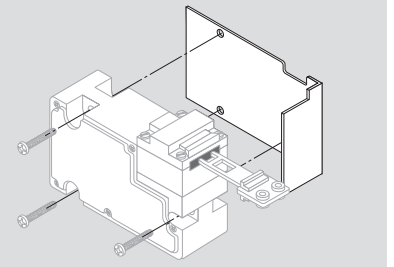
System components



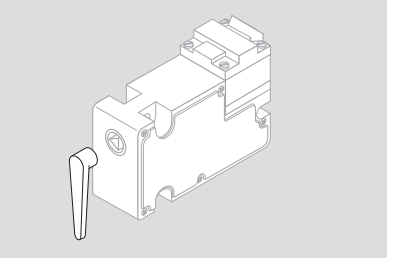
Shortened straight actuator TZ/CK



Shortened angled actuator TZ/CWK



Mounting plate TZ-44



Angled triangular key TZ-75

Ordering details

Straight actuator	**TZ/CO**
Angled actuator	**TZ/CW**
Straight radius actuator	**TZ/COR**
Angled radius actuator	**TZ/CWR**

Ordering details

Flexible actuator	**TZ/COF/HIS.1**
Flexible actuator	**TZ/COF/HIS.2**
Flexible actuator	**TZ/CORF/HIS.1**
Flexible actuator	**TZ/CORF/HIS.2**

Ordering details

Shortened straight actuator	**TZ/CK**
Shortened angled actuator	**TZ/CWK**
Mounting plate	**TZ-44**
Triangular key, angled	**TZ-75**

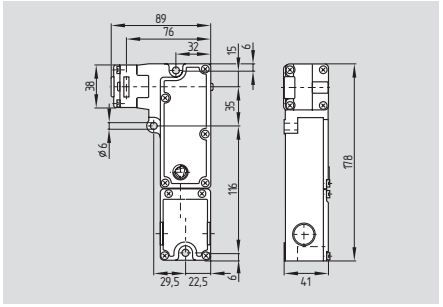
(TZ-69 triangular key is included in delivery for S and N executions)

Centering device

Mounting outside	**TFA-020**
Mounting inside	**TFI-020**

(Product information see page 1-52)

AZM 190 (TZKF/TZKM)



- Interlock with protection against incorrect locking
- Thermoplastic enclosure
- Manual or Emergency release
- Long life
- Power to unlock/power to lock principle
- Slim design, particularly suitable for fitting on hinged doors, aluminum profiles and fencing
- Actuating head can be repositioned by 4 x 90°
- Sealing mechanism to prevent the ingress of dirt
- 2 cable entries M20
- Wiring compartment
- Holding force 1950 N

Approvals

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-19
Enclosure:	glass fiber reinforced thermoplastic
Actuator and locking bolt:	zinc-plated steel / zinc diecast
Protection class:	IP67; Ordering suffix N: IP65
Contact material:	silver
Contact type:	change-over contact, double break, galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals, solid or multi-strand lead
Cable section:	min. 0.5 mm², max. 2.5 mm²; incl. conductor ferrules: max. 1.5 mm²
U_{imp}:	4 kV
Ui:	250 V
I_{the}:	4 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	4 A gG D-fuse (DIN EN 60269-1)
Positive break travel:	2 x 3.5 mm
Positive break force:	20 N
Magnet:	100% ED
Power consumption:	max. 8.5 W
Actuating speed:	max. 20 m/min
Max. actuating frequency:	1.200 s/h
Ambient temperature:	0 °C … +50 °C
Mechanical life:	1 million operations
F_{max}:	1950 N
Latching force:	20 N

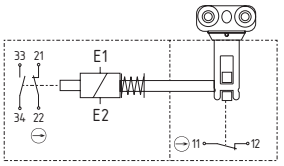
Classification:

Standards:	EN ISO 13849-1
B_{10d} NC (NC):	2.000.000
Mission time:	20 years

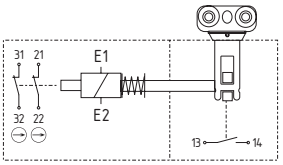
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

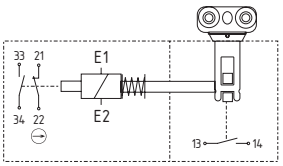
Power to unlock
1 NC
1 NO / 1 NC



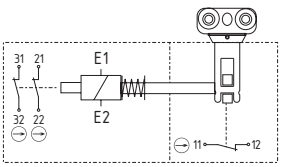
1 NO
2 NC



1 NO
1 NO / 1 NC



1 NC
2 NC

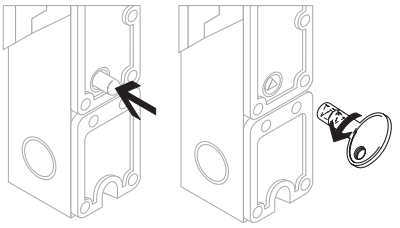


Ordering details

AZM 190-①RK②③-④

No.	Option	Description	
①		Magnet:	Actuator:
	11/01	1 NO / 1 NC	1 NC
	11/10	1 NO / 1 NC	1 NO
	02/10	2 NC	1 NO
	02/01	2 NC	1 NC
②		Power to unlock	
	A	Power to lock	
③		Manual release	
	N	Emergency release	
④	24VDC	U_s 24 VDC	
	24VAC	U_s 24 VAC	
	48VAC	U_s 48 VAC	
	110VAC	U_s 110 VAC	
	230VAC	U_s 230 VAC	

Note



Emergency release button (left), suffix N
- For cases of danger
- Mounting only within the guarded area

Manual release (right)
- For manual release using triangular key TZ-69
- For maintenance, setting-up, etc.

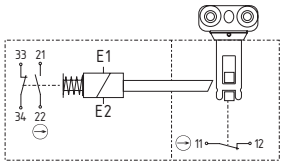
Note

Other product variants:
- for safety fences in aluminum profile systems
- actuator with reduced mounting depth
- preferably for inside mounting
- with emergency exit
- 4 monitoring contacts
- for left-hand and right-hand hinged guard doors
- Crosses from TZKF and TZKM part numbers available on request.

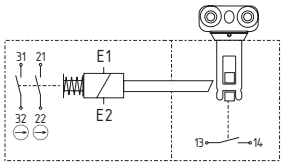
Solenoid interlocks

Contact variants

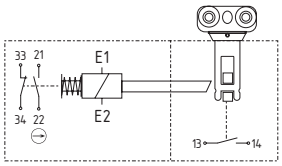
Power to lock
1 NC
1 NO / 1 NC



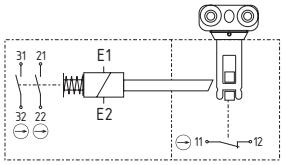
1 NO
2 NC



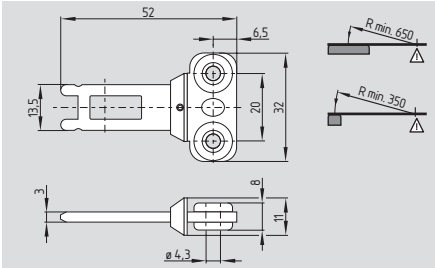
1 NO
1 NO / 1 NC



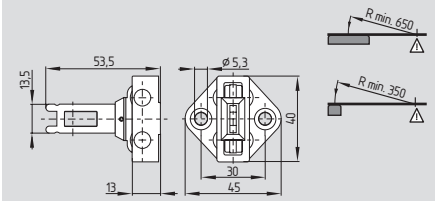
1 NC
2 NC



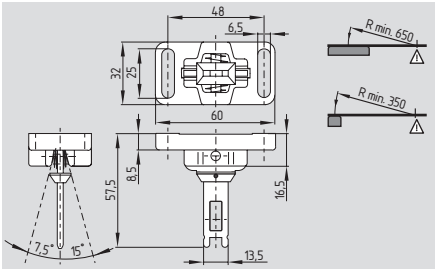
System components



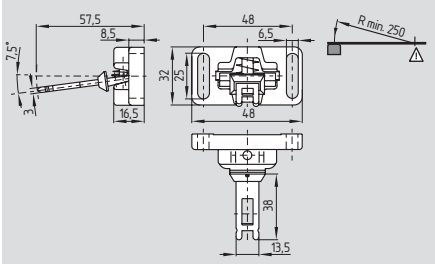
Straight actuator AZM 190-B1



Actuator to front mounting AZM 190-B5

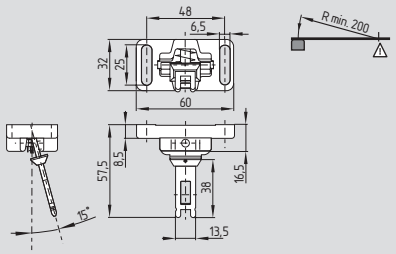


Flexible actuator AZM 190-B3/2x15

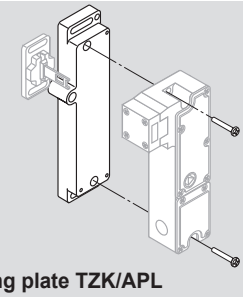


Flexible actuator AZM 190-B3/7,5

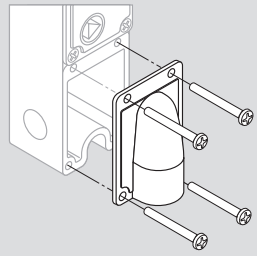
System components



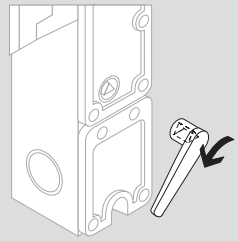
Flexible actuator AZM 190-B3/15



Mounting plate TZK/APL



Axial cable entry



Triangular key TZ-75

Note

Contact symbols shown for the closed and de-energized condition of the guard device.

At least one magnetic contact with positive break ⊖ must be integrated in the safety circuit.

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

Actuators and connector plugs must be ordered separately.

Ordering details

Straight actuator	**AZM 190-B1**
to front mounting	**AZM 190-B5**
Flexible actuator	**AZM 190-B3/2x15**
Flexible actuator	**AZM 190-B3/7,5**

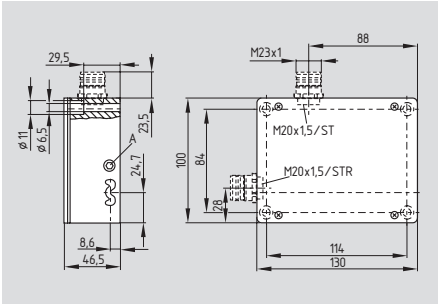
Ordering details

Flexible actuator	**AZM 190-B3/15**
Mounting plate	**TZK/APL**
Axial cable entry	**ZPG 190**
Triangular key TZ-75	**101028565**

(TZ-69 triangular key is included in delivery)

Centering device
Mounting outside **TFA-020**
Mounting inside **TFI-020**
(Product information see page 1-52)

AZM 415-../..



A: setting screw ball latch

- Interlock with protection against incorrect locking
- Metal enclosure
- Two switches in one enclosure
- Problem-free opening of stressed doors by means of bell-crank system
- Robust design
- Long life
- High holding force 3500 N
- Adjustable ball latch to 400 N
- Various manual and emergency releases available
- Power to unlock/power to lock principle
- 2 cable entries M20 or connector M23 (only for 24 VAC/DC)
- EX version available

Approvals

Technical data

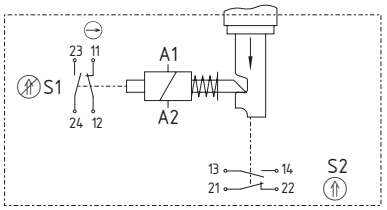
Standards:	IEC/EN 60947-5-1 BG-GS-ET-19
Enclosure:	light-alloy die-cast, enamel finish
Actuator and locking bolt:	zinc-plated metal / aluminum
Protection class:	IP67 Ordering suffix NS, RS: IP54
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals or connector M23
Cable section:	min. 0.75 mm² max. 2.5 mm² (incl. conductor ferrules)
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	6 A
Utilization category:	AC-15
I_e/U_e:	4 A / 230 VAC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	5 mm
Positive break force:	min. 15 N (depending on the setting of the ball latch)
Magnet:	100% ED
Power consumption:	max. 10 W
Ambient temperature:	−25 °C … +50 °C
Actuating speed:	max. 0.2 m/s
Switching frequency:	max. 2.000 / h
Mechanical life:	> 1 million operations
F_{max}:	3500 N
Holding force:	30 - 400 N (adjustable)
Classification:	
Standards:	EN ISO 13849-1
B_{10d} NC (NC):	2.000.000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

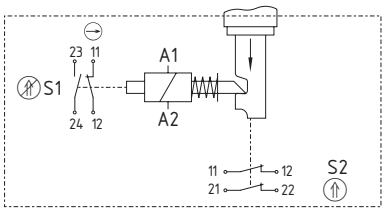
Contact variants

Power to unlock

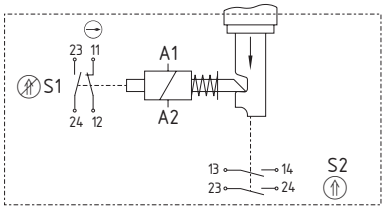
11/11 2 NC/2 NO



11/02 3 NC/1 NO



11/20 1 NC/3 NO



Ordering details

AZM 415-①②PK③④ ⑤-⑥-⑦

No.	Option	Description
①	11/11	2 NC / 2 NO
	11/02	3 NC / 1 NO
	11/20	1 NC / 3 NO
	02/11	3 NC / 1 NO
	02/20	2 NC / 2 NO
	02/02	4 NC
②	X	Protection class IP54
	Z	Protection class IP67
③	ST	Connector M23 bottom
	STR	Connector M23 right
④		Power to unlock
	A	Power to lock

Ordering details

AZM 415-①②PK③④ ⑤-⑥-⑦

No.	Option	Description
⑤		Without manual release
	E	Manual release using triangular key
	F	Manual release using triangular key (secured with locking screw)
	FE	Manual release using triangular key (cover-side fitting)
	RS	Manual release with key
	T *	Emergency exit using latched pushbutton

Ordering details

AZM 415-①②PK③④ ⑤-⑥-⑦

No.	Option	Description
	TE *	Emergency exit + manual release, mounting outside
	TEI *	Emergency exit + manual release, mounting inside
	NS	Emergency release using lock button
⑥	24 VAC/DC	U_s 24 VAC/DC
	110 VAC	U_s 110 VAC
	230 VAC	U_s 230 VAC
⑦	1637	Gold-plated contacts

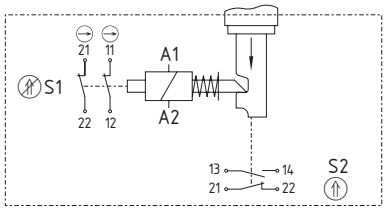
* only for power to unlock principle

Solenoid interlocks

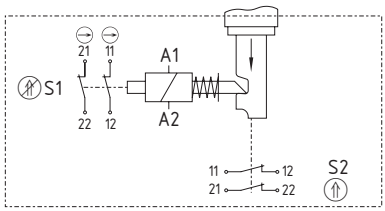
Contact variants

Power to unlock

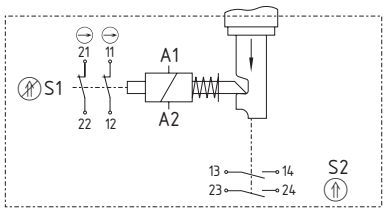
02/11 3 NC/1 NO



02/02 4 NC



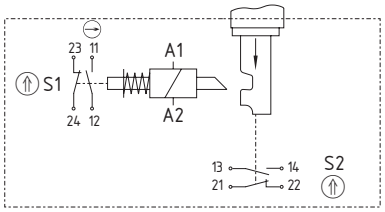
02/20 2 NC/2 NO



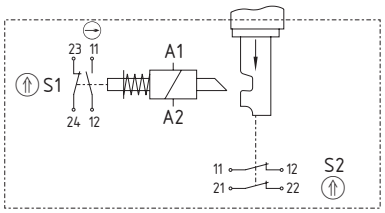
Contact variants

Power to lock

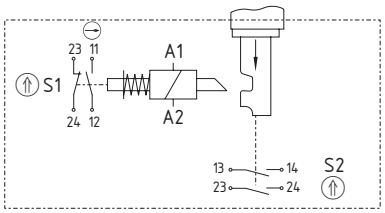
11/11 2 NC/2 NO



11/02 3 NC/1 NO



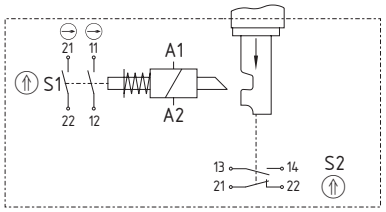
11/20 1 NC/3 NO



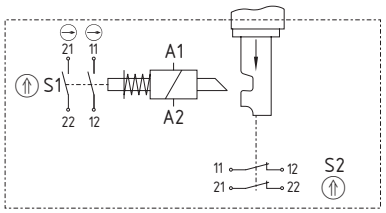
Contact variants

Power to lock

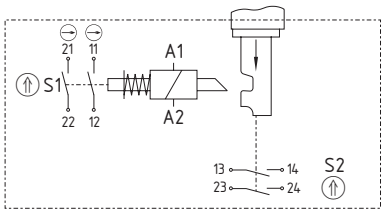
02/11 3 NC/1 NO



02/02 4 NC



02/20 2 NC/2 NO



Note

Contacts diagrams show de-energized condition with actuator inserted.

The magnetic contacts S1 are actuated when the solenoid A1-A2 is energized or de-energized.

At least one magnetic contact with positive break ⊖ must be integrated in the safety circuit.

Actuators must be ordered separately (refer to page 1-50).

Note

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

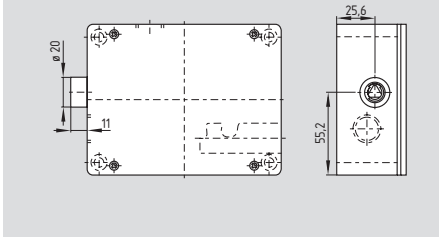
Note

PIN number of the connectors ST and STR

	Contacts					
PIN	**11/11**	**11/02**	**11/20**	**02/11**	**02/02**	**02/20**
1	A1	A1	A1	A1	A1	A1
2	A2	A2	A2	A2	A2	A2
3	11	11	11	11	11	11
4	12	12	12	12	12	12
5	23	23	23	21	21	21
6	24	24	24	22	22	22
7	13	11	13	13	11	13
8	14	12	14	14	12	14
9	21	21	23	21	21	23
10	22	22	24	22	22	24
11	–	–	–	–	–	–
12	GND	GND	GND	GND	GND	GND

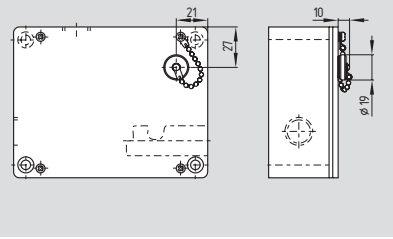
Solenoid interlocks

AZM 415-…ZPK E



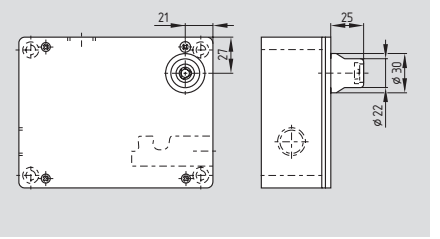
- **Manual release**
- Manual release by means of M5 triangular key
- M5 triangular key, available as accessory
- For maintenance, installation, etc.
- Only used on units with power to unlock principle

AZM 415-…ZPK F



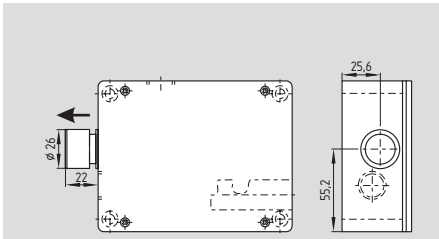
- **Manual release**
- Release by means of M5 triangular key After removing the sealing screw, manual release can be carried out using a M5 triangular key
- M5 triangular key, available as accessory
- A chain secures the sealing plug against loss
- Only used on units with power to unlock principle

AZM 415-…ZPK FE



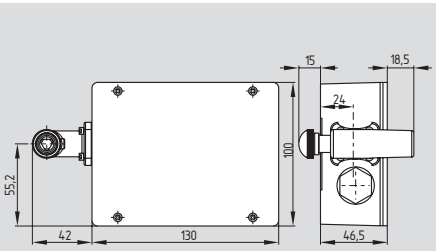
- **Manual release (cover-side fitting)**
- Release by means of M5 triangular key
- M5 triangular key, available as accessory
- Only used on units with power to unlock principle

AZM 415-…ZPK T



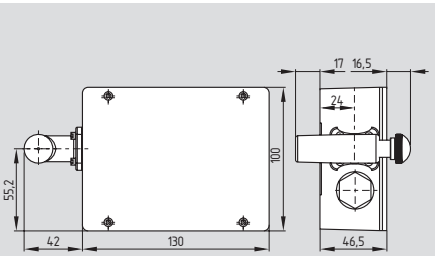
- **Emergency exit**
- Emergency exit is used where an „inadvertently locked-in“ person must leave a dangerous, already interlocked area
- Escape release by pressing the red push button
- Reset is carried out by pressing the latching pin
- In unlocked position the guard device is protected against unintented closing

AZM 415-…ZPK TE



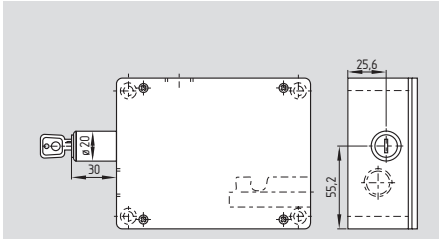
- **Manual release**
- Release and resetting using M5 triangular key
- Emergency exit by pressing the red push button
- Resetting by pulling on the red latched button
- In unlocked position the guard device is protected against unintented closing
- Interlock mounting **outside**

AZM 415-…ZPK TEI



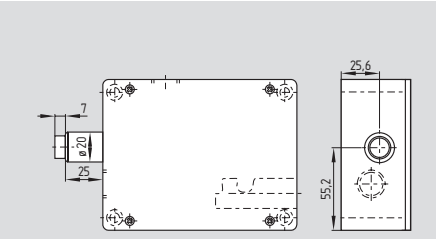
- **Manual release**
- Release and resetting using M5 triangular key
- Emergency exit by pressing the red push button
- Resetting by pulling on the red latched button
- In unlocked position the guard device is protected against unintented closing
- Interlock mounting **inside**

AZM 415-…XPK RS



- **Manual release**
- Release by means of cylinder lock
- Resetting can only be carried out by authorized personnel using key
- Only used on units with power to unlock principle
- In unlocked position the guard device is protected against unintented closing

AZM 415-…XPK NS



- **Emergency release**
- The emergency release is used where an intervention in an already locked hazardous area is required
- Release by pressing in the lock button
- Resetting can only be carried out by authorized personnel using key
- In unlocked position the guard device is protected against unintented closing

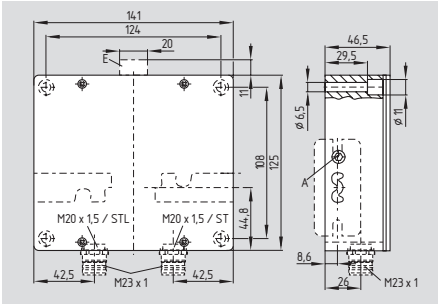
Note

The IP protection class depends on the type of release and is indicated by an X or Z in the ordering suffix.

Example:

Protection class IP54 AZM 415-11/11**X**PKNS
Protection class IP67 AZM 415-11/11**Z**PKF

AZM 415 for double doors



A: setting screw ball latch
E: manual release using triangular key

- Interlock with protection against incorrect locking for double doors
- Metal enclosure
- 3 switches in one enclosure
- Robust design
- Long life
- High holding force 2500 N per door
- Ball latch for each door, individually adjustable up to 400 N
- Manual release available
- Power to unlock/power to lock principle
- 2 cable entries M20 or connector M23 (only for 24 VAC/DC)
- Spring-loaded actuators

Approvals

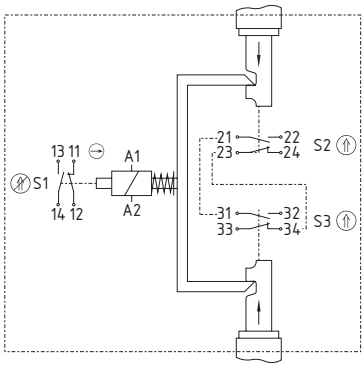
Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-19
Enclosure:	light-alloy die-cast, enamel finish
Actuator and locking bolt:	zinc-plated metal / aluminum
Protection class:	IP67
Contact material:	silver
Contact type:	change-over contact with double break, type Zb, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals or connector M23
Cable section:	min. 0.75 mm² max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	2x M20
U_{imp}:	4 kV
U_i:	250 V
I_{the}:	6 A
Utilization category:	AC-15
I_e/U_e:	4 A / 230 VAC
Max. fuse rating:	6 A gG D-fuse
Positive break travel:	4.5 mm
Positive break force:	min. 15 N (depending on the setting of the ball latch)
Magnet:	100% ED
U_s:	24 VAC/DC 110 VAC, 50/60 Hz 230 VAC, 50/60 Hz
Power consumption:	max. 10 W
Ambient temperature:	−25 °C … +50 °C
Actuating speed:	max. 0.2 m/s
Switching frequency:	max. 2.000 / h
Mechanical life:	> 1 million operations
F_{max}:	2500 N (for each guard)
Holding force:	30 - 400 N (adjustable)
Classification:	
Standards:	EN ISO 13849-1
B_{10d} NC (NC):	2.000.000
Mission time:	20 years

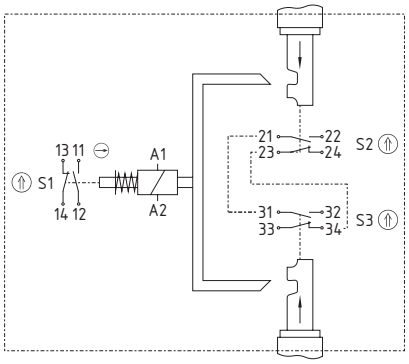
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

Power to unlock
3 NO
3 NC



Power to lock
3 NO
3 NC



Ordering details

AZM 415-33ZPDK①② ③④

No.	Option	Description
①		Power to unlock
	A	Power to lock
②	ST	Connector M23 bottom
	STR	Connector M23 right
③		Without manual release
	E	Manual release using triangular key (only with power to unlock)
④	1637	Gold-plated contacts

Note

Actuators must be ordered separately (refer to page 1-50).

Note

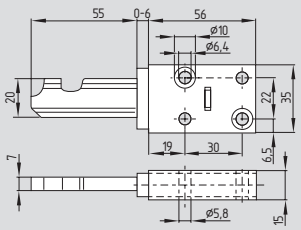
Contact symbols shown for the closed condition of the guard device.

The contacts 11-12 and 13-14 are actuated when the solenoid A1-A2 is energized or de-energized.

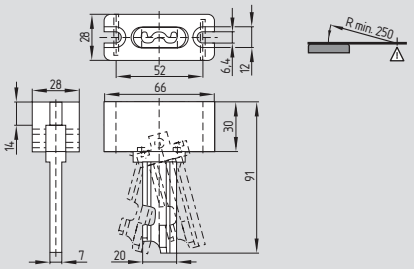
At least one magnetic contact with positive break ⊖ must be integrated in the safety circuit.

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

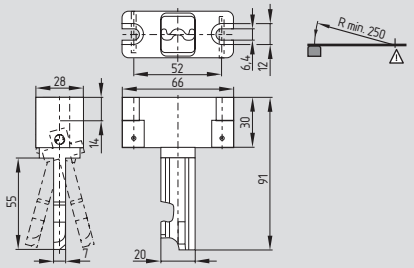
System components



Straight actuator B1

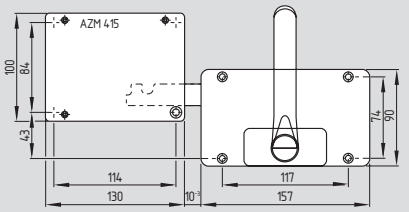


Flexible actuator B2

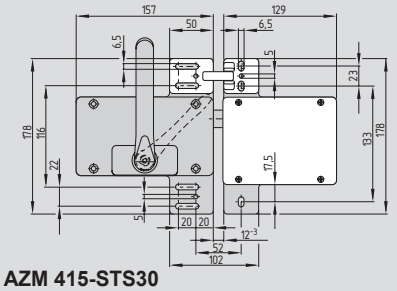


Flexible actuator B3

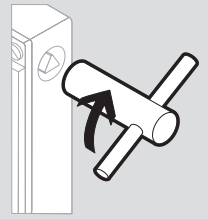
System components



AZM 415-B30



AZM 415-STS30



Triangular key M5

Ordering details

Straight actuator	**AZ/AZM 415-B1**
Flexible actuator	**AZ/AZM 415-B2**
Flexible actuator	**AZ/AZM 415-B3**

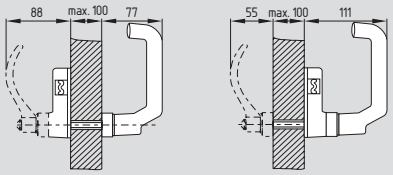
Ordering details

Actuator with handle **AZM 415-B30**
without or with emergency handle
(A detailed product description
can be found on page 1-69)

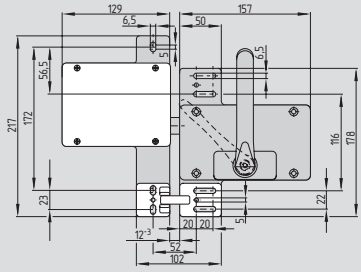
Safety door-handle system STS
Actuator with handle **AZM 415-STS30**
without or with emergency handle
inclusive mounting plate
(A detailed product description
can be found on page 1-51)

Triangular key M5 **AZM KEY**

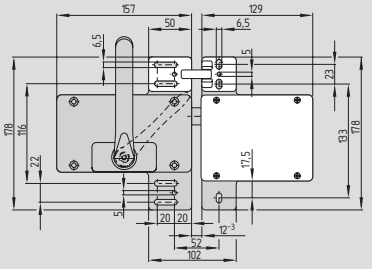
AZM 415-STS30-…



Mounting inside Mounting outside



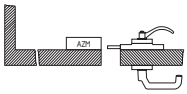
AZM 415 STS30-02/-04/-05/-07



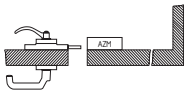
AZM 415 STS30-01/-03/-06/-08

System variants

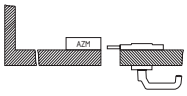
AZM 415-STS30-01



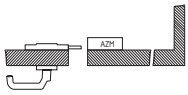
AZM 415-STS30-02



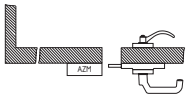
AZM 415-STS30-03



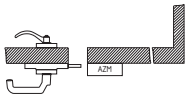
AZM 415-STS30-04



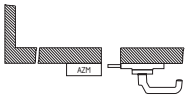
AZM 415-STS30-05



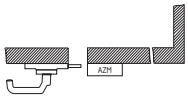
AZM 415-STS30-06



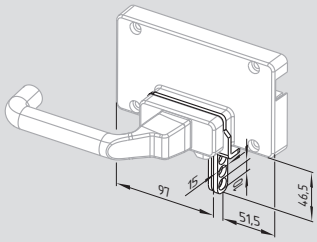
AZM 415-STS30-07



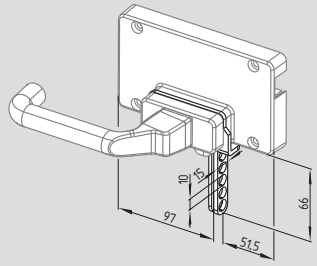
AZM 415-STS30-08



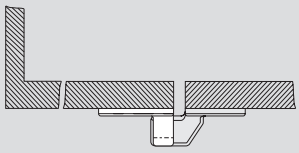
System components



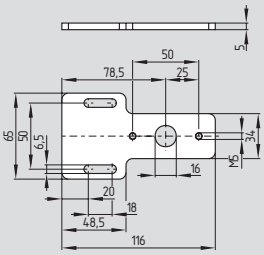
Lockout tag SZ 415-1/-2



Lockout tag SZ 415-1/-2 -2477



Centering device TF.



Mounting plate MP TG-01

Ordering details

Included in delivery
- Mounting plate for safety switch
- Actuator incl. mounting plate
- Emergency handle (for variant -05 and -06 incl. mounting plate)

Ordering example
To order, first choose the desired safety switch and then the door handle system:
for example AZM 415-02/02ZPK F-230VAC
and AZM 415-STS30-07

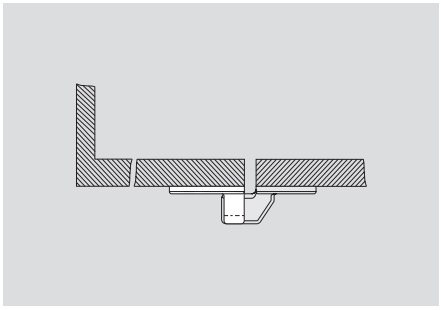
Ordering details

Mounting inside
with emergency handle
door hinge right **AZM 415-STS30-01**
door hinge left **AZM 415-STS30-02**
without emergency handle
door hinge right **AZM 415-STS30-03**
door hinge left **AZM 415-STS30-04**
Mounting outside
with emergency handle
door hinge right **AZM 415-STS30-05**
door hinge left **AZM 415-STS30-06**
without emergency handle
door hinge right **AZM 415-STS30-07**
door hinge left **AZM 415-STS30-08**

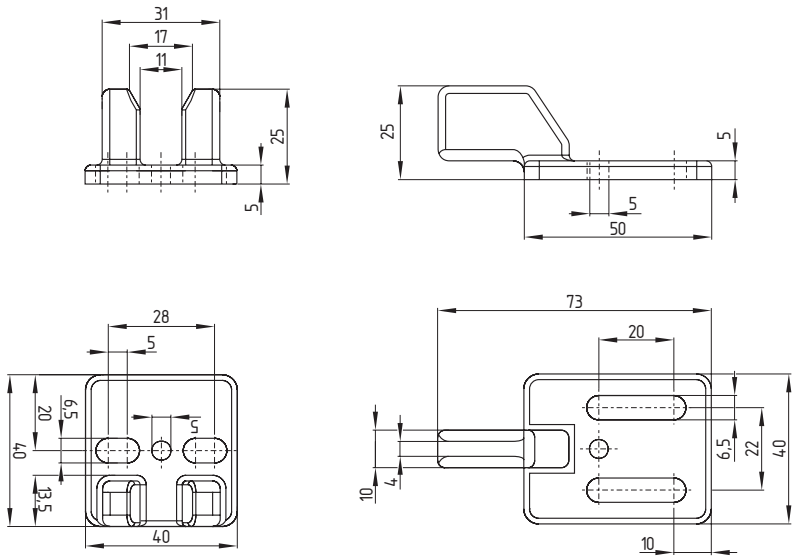
Ordering details

Lockout tag
for …STS30-01/-03/-06/-08 **SZ 415-1**
for …STS30-02/-04/-05/-07 **SZ 415-2**
Lockout tag with 5 circular holes
for …STS30-01/-03/-06/-08 **SZ 415-1-2477**
for …STS30-02/-04/-05/-07 **SZ 415-2-2477**
Centering device
Mounting outside **TFA-010**
Mounting inside **TFI-010**
(A detailed product description can be found on page 1-52)
Mounting plate **MP TG-01**

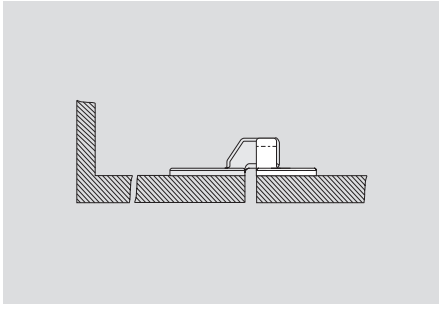
Centering device TFA



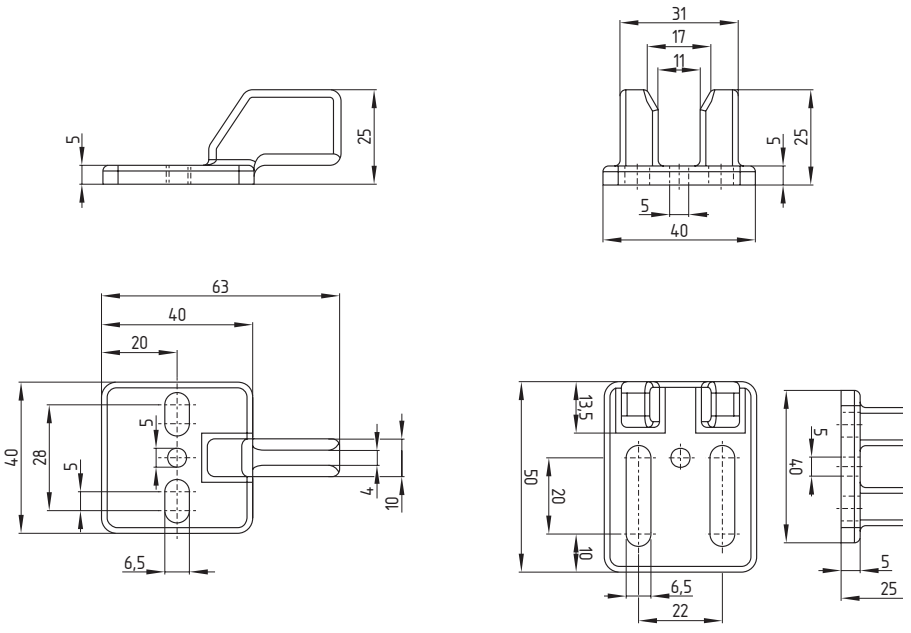
- **Mounting outside**
- Self-centering of the guard door
- End stop
- Suitable for all types of actuators
- Actuator can be easily inserted or extracted



Centering device TFI



- **Mounting inside**
- Self-centering of the guard door
- End stop
- Suitable for all types of actuators
- Actuator can be easily inserted or extracted



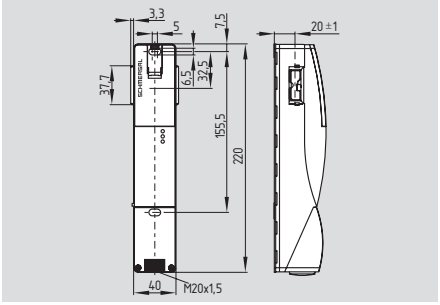
Safe switching and monitoring
Electronic Solenoid and electromagnetic interlocks

Solenoid locking switches are used on sliding, hinged and removable guard doors that must be closed and locked for operator safety. It is a two part system consisting of a switch body, mounted to the guard frame, and a separate actuator key, mounted to the door.

These models feature an integrated electronic safety sensor to detect guard door closure independently of the solenoid lock. These sensors use non-contact operating principles (pulse echo or RFID) that limits wear on components, and tolerates misalignment. A microprocessor provides continuous internal function tests and monitors the safety outputs, meeting PLe to ISO13849-1 and SIL 3 to IEC61508, even when wired in series. Three color LEDs on the sensor indicate status, various errors, and misalignment. For more advanced indication these models are also available with serial diagnostics to connect to commercial field bus systems.

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

AZM 200



Solenoid interlock
(Solenoid interlock monitoring)

- Thermoplastic enclosure
- Sensor technology permits an offset of ± 5 mm between actuator and interlock
- Intelligent diagnostic
- Accurate adjustment through slotted holes
- 3 LED's to show the operating status
- Manual release
- 2 safety outputs, 1 diagnostic output
- Latching force 30 N
- Available with AS-Interface Safety at Work
- **Suitable for applications**
  (without additional second switch)
  - up to PL e/category 4 to EN ISO 13849-1
  - suitable for SIL 3 applications to IEC 61508
- Series-wiring of max. 31 components, without detriment to the category

Approvals

TÜV cULus CE

Technical data

Standards:	IEC/EN 60947-5-1, EN ISO 13849-1, IEC 61508, IEC 60947-5-3
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations
F_{max}:	2000 N
Latching force:	30 N
Protection class:	IP67 to EN 60529
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	screw terminals or cage clamps or connector M12 or M23
Cable section:	min. 0.25 mm² max. 1.5 mm² (incl. conductor ferrules)
Cable entry:	M20
Series-wiring:	**max. 31 components**
Cable length:	max. 200m (Cable length and cable section alter the voltage drop depending on the output current)

Ambient conditions:

Ambient temperature:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30% … 95%, non-condensing
Resistance to vibration:	10…55 Hz, amplitude 1mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4 s
Actuating speed:	≤ 0.2 m/s

Technical data

Electrical data:

U_e:	24 VDC −15% / +10% (stabilised PELV)
I_e:	1.2 A
I_0:	max. 0.5 A
U_{imp}:	800 V
U_i:	32 VDC
Fuse rating:	
- Screw terminals or cage clamps:	≤ 4 A
when used to UL 508;	
- Connector M12 or M23:	≤ 2 A

Safety inputs X1 and X2:

$U_{e3/Low}$:	−3 V … 5 V
$U_{e3/High}$:	15 V … 30 V
I_{e3}:	typically 2 mA at 24 V

Safety outputs Y1 and Y2:

	p-type, short-circuit proof
U_{e1}:	0 V up to 4 V under U_e
I_{e1}:	max. je 0.25 A
Utilization category:	DC-13
Leakage current I_r:	≤ 0.5 mA

Diagnostic output OUT:

	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under U_e
I_{e2}:	max. 0.05 A
Utilization category:	DC-13
Wiring capacitance for serial diagnostic:	max. 50 nF

Solenoid control IN:

$U_{e4/Low}$:	−3 V … 5 V
$U_{e4/High}$:	15 V … 30 V
I_{e4}:	typically 10 mA at 24 V, dynamically 20 mA
Solenoid:	100% ED

LED functions:

Green	Supply voltage on
Yellow	Operating status
Red	Error (refer to flash codes)

Classification:

Standards:	EN ISO 13849-1; IEC 61508
PL:	e
Category:	4
PFH value:	4.0 x 10^{-9} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Ordering details

AZM 200①-T-②③

No.	Option	Description
①	SK	Screw terminals
	CC	Cage clamps
	ST1	Connector M23, (8+1)-pole
	ST2	Connector M12, 8-pole
②	1P2PW	1 diagnostic output and 2 safety outputs, all p-type and combined diagnostic signal: safety guard closed AND solenoid interlock locked
	SD2P	Serial diagnostic output and 2 safety outputs, p-type
③		Power to unlock
	A	Power to lock

Note

The solenoid interlocks and the actuator unit must be ordered separately!

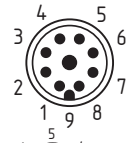
As long as the actuator unit is inserted in the solenoid interlock, the unlocked safety guard can be relocked. In this case, the safety outputs are re-enabled; **opening the safety guard is not required.**

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

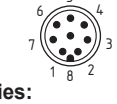
Connection

Integrated connectors

M23, (8+1)-pole (Suffix -ST1)



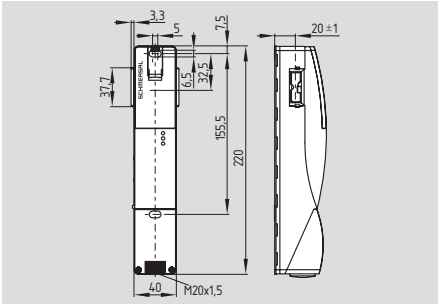
M12, 8-pole (Suffix -ST2)



Additional Accessories:

SD Gateway	Page1-90
UNIVERSAL Gateway	Page 1-91
Series-wiring accessories	Page 1-92
Connector	Page 1-66
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

AZM 200 B



Safety switch with interlocking function (Actuator monitoring)

- Thermoplastic enclosure
- Sensor technology permits an offset of ± 5 mm between actuator and interlock
- Intelligent diagnostic
- Accurate adjustment through slotted holes
- 3 LED's to show the operating status
- Manual release
- 2 safety outputs, 1 diagnostic output
- Latching force 30 N
- Available with AS-Interface Safety at Work
- **Suitable for applications** (without additional second switch)
  - up to PL e/category 4 to EN ISO 13849-1
  - suitable for SIL 3 applications to IEC 61508
- Series-wiring of max. 31 components, without detriment to the category

Approvals

TÜV cULus CE

Technical data

Standards:	IEC/EN 60947-5-1, EN ISO 13849-1, IEC 61508, IEC 60947-5-3
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations
F_{max}:	2000 N
Latching force:	30 N
Protection class:	IP67 to EN 60529
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	screw terminals or cage clamps or connector M12 or M23
Cable section:	min. 0.25 mm² max. 1.5 mm² (incl. conductor ferrules)
Cable entry:	M20
Series-wiring:	**max. 31 components**
Cable length:	max. 200m (Cable length and cable section alter the voltage drop depending on the output current)

Ambient conditions:

Ambient temperature:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30% … 95%, non-condensing
Resistance to vibration:	10…55 Hz, amplitude 1mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4 s
Actuating speed:	≤ 0.2 m/s

Technical data

Electrical data:

U_e:	24 VDC −15% / +10% (stabilised PELV)
I_e:	1.2 A
I_0:	max. 0.5 A
U_{imp}:	800 V
U_i:	32 VDC
Fuse rating:	
- Screw terminals or cage clamps:	≤ 4 A
when used to UL 508;	
- Connector M12 or M23:	≤ 2 A

Safety inputs X1 and X2:

$U_{e3/Low}$:	−3 V … 5 V
$U_{e3/High}$:	15 V … 30 V
I_{e3}:	typically 2 mA at 24 V

Safety outputs Y1 and Y2:

	p-type, short-circuit proof
U_{e1}:	0 V up to 4 V under U_e
I_{e1}:	max. je 0.25 A
Utilization category:	DC-13
Leakage current I_r:	≤ 0.5 mA

Diagnostic output OUT:

	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under U_e
I_{e2}:	max. 0.05 A
Utilization category:	DC-13
Wiring capacitance for serial diagnostic:	max. 50 nF

Solenoid control IN:

$U_{e4/Low}$:	−3 V … 5 V
$U_{e4/High}$:	15 V … 30 V
I_{e4}:	typically 10 mA at 24 V, dynamically 20 mA
Solenoid:	100% ED

LED functions:

Green	Supply voltage on
Yellow	Operating status
Red	Error (refer to flash codes)

Classification:

Standards:	EN ISO 13849-1; IEC 61508
PL:	e
Category:	4
PFH value:	4.0 x 10^{-9} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Ordering details

AZM 200 B ①-T-②③

No.	Option	Description
①	SK	Screw terminals
	CC	Cage clamps
	ST1	Connector M23, (8+1)-pole
	ST2	Connector M12, 8-pole
②	1P2PW	1 diagnostic output and 2 safety outputs, all p-type and combined diagnostic signal: safety guard closed AND solenoid interlock locked
	SD2P	Serial diagnostic output and 2 safety outputs, p-type
③		Power to unlock
	A	Power to lock

Note

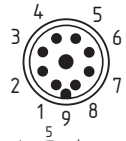
The safety switch with interlocking function and the actuator must be ordered separately!

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Connection

Integrated connectors

M23, (8+1)-pole (Suffix -ST1)

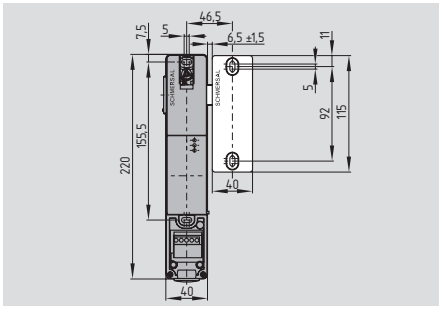


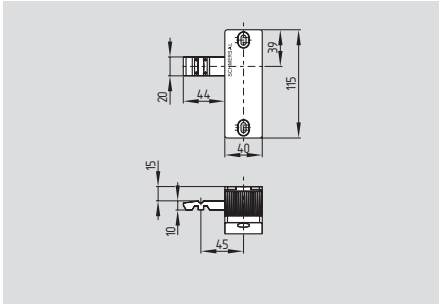
M12, 8-pole (Suffix -ST2)

Additional Accessories:

SD Gateway	Page 1-90
UNIVERSAL Gateway	Page 1-91
Series-wiring accessories	Page 1-92
Connector	Page 1-66
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

AZ/AZM 200-B1-…





- **Actuator for sliding guards**
- Actuator with return spring
- Tolerates overtravel of up to max. 5 mm
- With door detection sensor T
- Available with or without emergency exit (P0)

Approvals

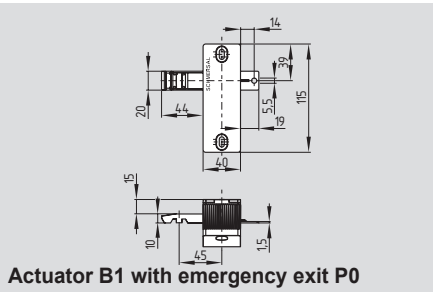
TÜV — Approvals only in combination with switches AZ/AZM 200

Technical data

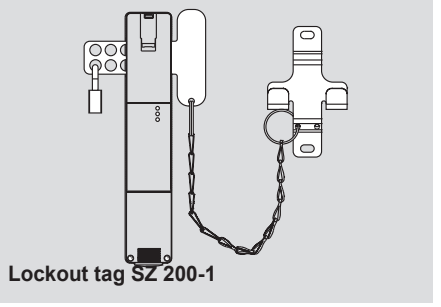
Material:

B1-housing:	Grivory
Actuator:	zinc die-cast
Mechanical life:	≥ 1 million operations
F_{max} AZM 200:	2000 N

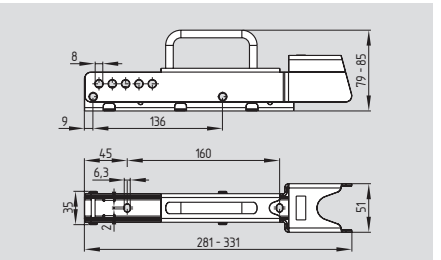
System components



Actuator B1 with emergency exit P0



Lockout tag SZ 200-1



Lockout tag SZ 200

Ordering details

AZ/AZM 200-B1-①T②

No.	Option	Description
①	L	Actuating direction left
	R	Actuating direction right
②		Without emergency exit
	P0	With emergency exit

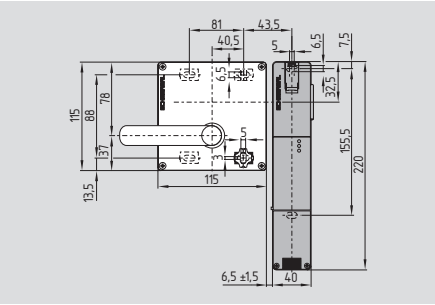
Note

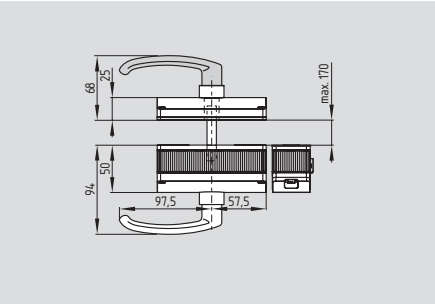
The safety switches/solenoid interlocks and the actuator unit must be ordered separately!

Ordering details

Actuator B1 with emergency exit	**AZ/AZM 200-B1-..-P0**
Lockout tag	**SZ 200-1**
Lockout tag	**SZ 200**

AZ/AZM 200-B30-…





- **Actuator for hinged guards**
- One-hand emergency exit, even in de-energized condition
- With door detection sensor T
- Easy and intuitive operation
- NO risk of injury from protruding actuator
- No supplementary door handles required
- Does not protrude into the door opening
- Various handles available
- Can be fitted with or without emergency exit

Approvals

TÜV — Approvals only in combination with switches AZ/AZM 200

Technical data

Material:

Actuator unit B30:
glass fiber reinforced thermoplastic, self-extinguishing, fixing holes with metal washer

Emergency exit P1:
glass fiber reinforced thermoplastic, self-extinguishing, fixing holes with metal washer

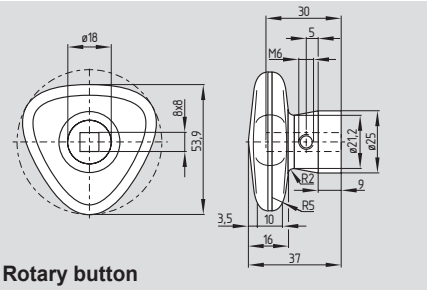
Door handle G1, G2:
plastic coated aluminum

Panic handle P1, P20, P25:
plastic coated aluminum

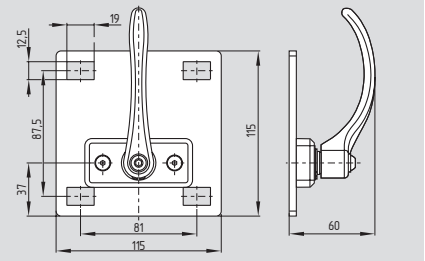
Actuator:
zinc die-cast

Mechanical life:	≥ 1 million operations
F_{max} AZM 200:	2000 N

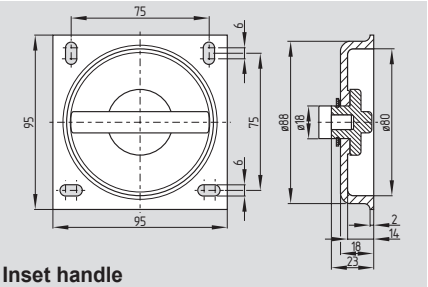
System components



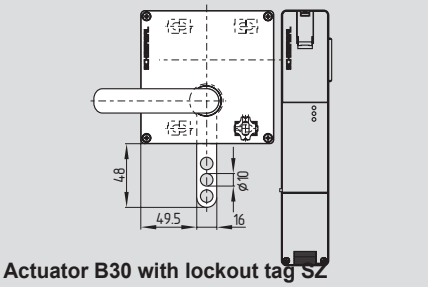
Rotary button



Emergency exit metal



Inset handle



Actuator B30 with lockout tag SZ

Ordering details

AZ/AZM 200-B30-①TA②③-④

No.	Option	Description
①	L	Door hinge on left-hand side
	R	Door hinge on right-hand side
②	G1	With door handle
	G2	With rotary button
③	P1	With emergency exit
	P20	With emergency exit metal
	P25	With emergency exit with inset handle
④		Without lockout tag
	SZ	With lockout tag

Note

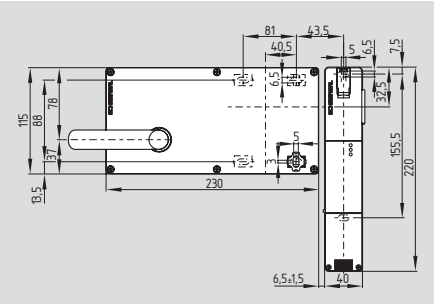
The safety switches/solenoid interlocks and the actuator unit must be ordered separately!

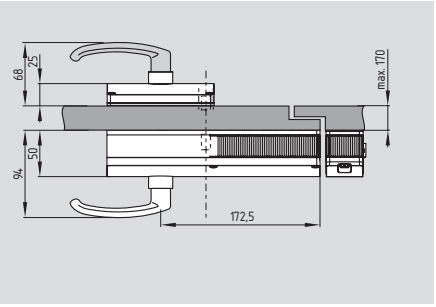
The actuator can be combined with a three-point locking rod to increase the stability of large and especially double-leaf safety guards.

Ordering details

Actuator with rotary button	**AZ/AZM 200-…-G2**
Emergency exit metal	**AZ/AZM 200-…-P20**
with inset handle	**AZ/AZM 200-…-P25**
Actuator B30 with	
lockout tag SZ	**AZ/AZM 200-B30-.-SZ**
Lockout tag	**SZ 200-1**
Lockout tag	**SZ 200**

AZ/AZM 200-B40-…





- **Actuator for hinged and movable safety guards, especially for hinged doors with overlapping hinge**
- One-hand emergency exit, even in de-energized condition
- With door detection sensor T
- Easy and intuitive operation
- NO risk of injury from protruding actuator
- No supplementary door handles required
- Does not protrude into the door opening
- Various handles available
- Can be fitted with or without emergency exit

Approvals

TÜV Approvals only in combination with switches AZ/AZM 200

Technical data

Material:

Actuator unit B40:
glass fiber reinforced thermoplastic, self-extinguishing, fixing holes with metal washer

Emergency exit P1:
glass fiber reinforced thermoplastic, self-extinguishing, fixing holes with metal washer

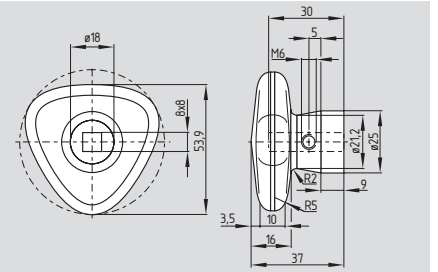
Door handle G1, G2:
plastic coated aluminum

Panic handle P1, P20, P25:
plastic coated aluminum

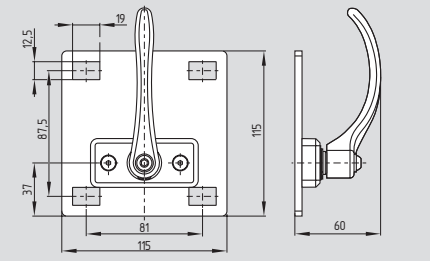
Actuator:
zinc die-cast

Mechanical life:	≥ 1 million operations
F_{max} AZM 200:	2000 N

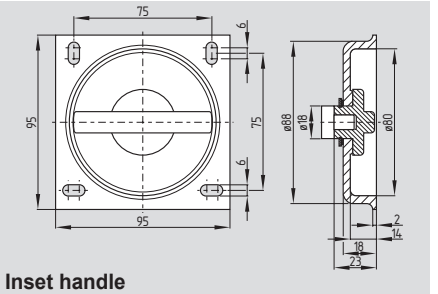
System components



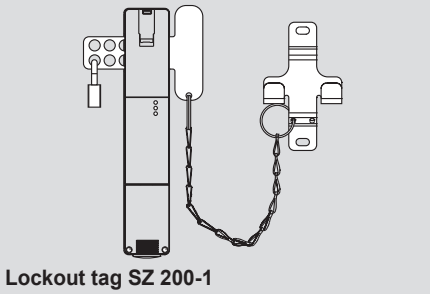
Rotary button



Emergency exit metal



Inset handle



Lockout tag SZ 200-1

Ordering details

AZ/AZM 200-B40-①TA②③

No.	Option	Description
①	L	Door hinge on left-hand side
	R	Door hinge on right-hand side
②	G1	With door handle
	G2	With rotary button
③	P1	With emergency exit
	P20	With emergency exit metal
	P25	With emergency exit with inset handle

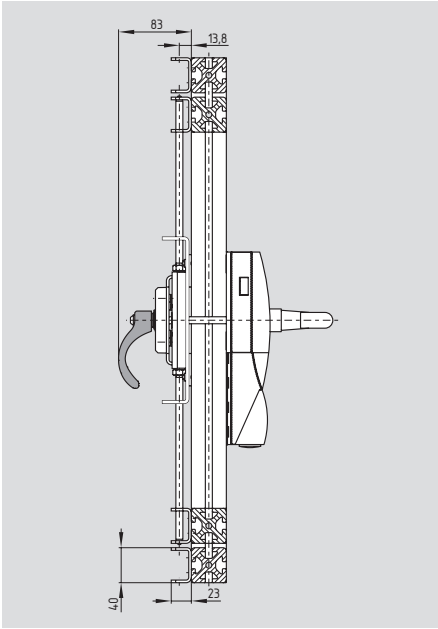
Note

The safety switches/solenoid interlocks and the actuator unit must be ordered separately!

Ordering details

Actuator with rotary button	**AZ/AZM 200-…-G2**
Emergency exit metal	**AZ/AZM 200-…-P20**
with inset handle	**AZ/AZM 200-…-P25**
Lockout tag	**SZ 200-1**
Lockout tag	**SZ 200**

AZ/AZM 200-B30-…-P30/P31



- **Actuator for hinged and sliding guards, especially for double-leaf doors**
- **Three-point locking bar for applications with higher mechanical stability requirements (7,000 N)**
- Door height max. 230 cm
- One-hand emergency exit, even in de-energized condition
- With door detection sensor T
- Easy and intuitive operation
- No risk of injury from protruding actuator
- No supplementary door handles required
- Does not protrude into the door opening
- Various handles available
- Can be fitted with or without emergency exit

Approvals

Technical data

Material:

Actuator unit B30:
glass fiber reinforced thermoplastic, self-extinguishing, fixing holes with metal washer

Locking bar:
zinc-plated metal

Emergency exit:
metal

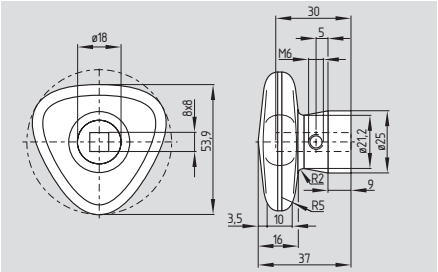
Door handle G1, G2:
plastic coated aluminum

Panic handle:
plastic coated aluminum

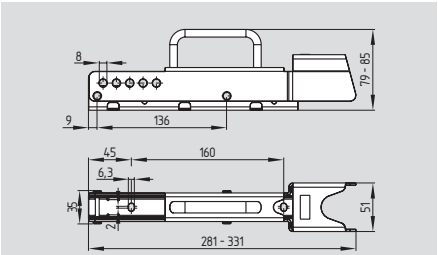
Actuator:
zinc die-cast

Mechanical life:	≥ 1 million operations
F_{max} AZM 200:	2000 N

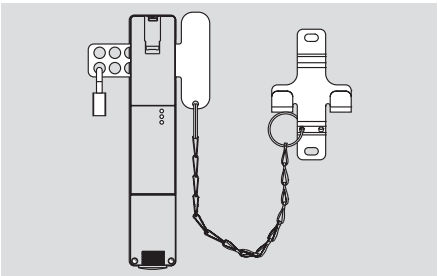
System components



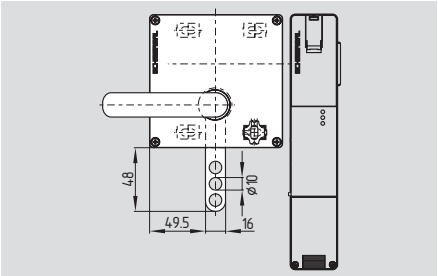
Rotary button



Lockout tag SZ 200



Lockout tag SZ 200-1



Actuator B30 with lockout tag SZ

Ordering details

AZ/AZM 200-B30-①-②TA③-④

No.	Option	Description
①	L	Door hinge on left-hand side
	R	Door hinge on right-hand side
②	G1	With door handle
	G2	With rotary button
③	P30	Without emergency exit
	P31	With emergency exit
④		Without lockout tag
	SZ	With lockout tag

Note

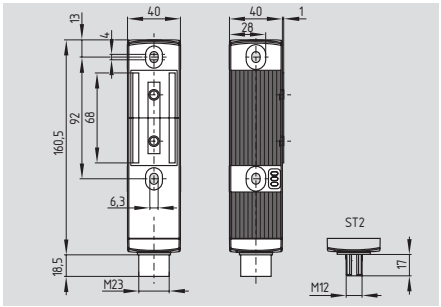
The safety switches/solenoid interlocks and the actuator unit must be ordered separately!

Retrofitting kit (only for AZ/AZM 200-B30-… **-P1 with emergency exit**) on request

Ordering details

Actuator with rotary button	**AZ/AZM 200-…-G2**
Lockout tag	**SZ 200**
Lockout tag	**SZ 200-1**
Actuator B30 with lockout tag SZ	**AZ/AZM 200-B30-.-SZ**

MZM 100



Solenoid interlock
(Solenoid interlock monitoring)

- Innovating and unique operating principle
- Accurate adjustment through slotted holes
- Power to lock principle
- Solenoid interlock must be used as end stop.
- Automatic latching with variable adjustment
- Latching force through permanent magnet approx. 30 N, also in de-energized condition
- Sensor technology permits an offset between actuator and interlock of ± 5 mm vertically and ± 3 mm horizontally
- Intelligent diagnostic signalling of failures
- 3 LED's to show the operating status
- Series-wiring of max. 31 components, without detriment to the category
- AS-Interface Safety at Work available

Approvals

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations (for guards ≤ 5 kg; actuating speed ≤ 0.5 m/s)
Electrically ajdustable latching force (RE):	30 N … 100 N
Permanent magnet (M):	30 N
Holding force F_{max} typically:	750 N
Holding force F guaranteed:	500 N
Protection class:	IP65 / IP67
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	connector M12 or M23
Series-wiring:	**max. 31 components**
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)
Ambient conditions:	
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30% … 95%, non-condensing, no icing
Resistance to vibration:	10…150 Hz (0.35 mm/5 g)
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 150 ms
Duration of risk:	< 150 ms
Time to readiness:	< 4 s
Electrical data:	
U_e:	24 VDC −15% / +10% (stabilised PELV)
Operating current:	max. 0.6 A plus current through the safety outputs
I_e:	1 A
U_{imp}:	800 V
U_i:	32 VDC
Device insulation:	≤ 2 A to UL 508; depending on the number of components and loads (Y1, Y2 and OUT)

Technical data

Safety inputs X1 and X2:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 4 mA at 24 V
Safety outputs Y1 and Y2:	p-type, short-circuit proof
U_{e1}:	24 V
I_{e1}:	0.25 A
Voltage drop:	< 1 V
Utilization category:	DC-13
Leakage current I_r:	≤ 0.5 mA
Diagnostic output OUT:	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under U_e
I_{e2}:	max. 0.05A
Utilization category:	DC-13
Wiring capacitance for serial diagnostic:	max. 50 nF
Solenoid control IN:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 10 mA at 24 V, dynamically 20 mA
Solenoid:	100% ED
LED functions	
Green:	Supply voltage on
Yellow:	Operating status
Red:	Error
Classification:	
Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	3,5 x 10^{-9} / h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

The latching force of the MZM 100 can be set in steps of approx. 10 N each within a range of approx. 30 N (factory setting) to approx. 100 N. To this end, the adjustment target MZM 100 TARGET is used directly on the fitted MZM 100.

Ordering details

MZM 100 ①-②③④-A

No.	Option	Description
①	ST	Connector M23, (8+1)-pole
	ST2	Connector M12, 8-pole
②	1P2PW	1 diagnostic output and 2 safety outputs, all p-type with combined diagnostic signal: safety guard closed and magnetic interlock locked
	SD2P	Serial diagnostic output and 2 safety outputs, p-type

Ordering details

MZM 100 ①-②③④-A

No.	Option	Description
③		Without latching
	R	Latching force (35 N)
	RE	Adjustable latching force approx. 30 … 100 N
④	M	Permanent magnet approx. 30 N

The solenoid interlock, the actuating unit and the adjustment target must be ordered separately!

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Connection

Integrated connectors

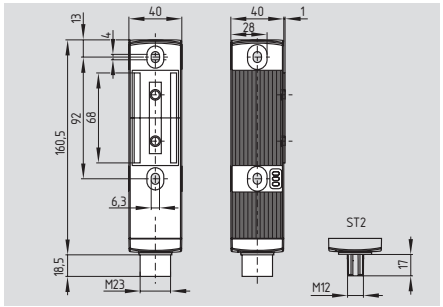
M23, (8+1)-pole
(Suffix -ST)

M12, 8-pole
(Suffix -ST2)

Additional Accessories:

SD Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Connector	Page 1-66
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

MZM 100 B



Safety sensor with interlocking function (Actuator monitoring)

- Innovating and unique operating principle
- Accurate adjustment through slotted holes
- Power to lock principle
- Safety sensor must be used as end stop.
- Automatic latching with variable adjustment
- Latching force through permanent magnet approx. 30 N, also in de-energized condition
- Sensor technology permits an offset between actuator and sensor of ± 5 mm vertically and ± 3 mm horizontally
- Intelligent diagnostic signalling of failures
- 3 LED's to show the operating status
- Series-wiring of max. 31 components, without detriment to the category
- AS-Interface Safety at Work available

Approvals

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations (for guards ≤ 5 kg; actuating speed ≤ 0.5 m/s)
Electrically ajdustable latching force (RE):	30 N … 100 N
Permanent magnet (M):	30 N
Holding force F_{max} typically:	750 N
Holding force F guaranteed:	500 N
Protection class:	IP65 / IP67
Protection class:	II, ⧈
Overvoltage category:	III
Degree of pollution:	3
Connection:	connector M12 or M23
Series-wiring:	**max. 31 components**
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)
Ambient conditions:	
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative humidity:	30% … 95%, non-condensing, no icing
Resistance to vibration:	10…150 Hz (0.35 mm/5 g)
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	< 150 ms
Duration of risk:	< 150 ms
Time to readiness:	< 4 s
Electrical data:	
U_e:	24 VDC −15% / +10% (stabilised PELV)
Operating current:	max. 0.6 A plus current through the safety outputs
I_e:	1 A
U_{imp}:	800 V
U_i:	32 VDC
Device insulation:	≤ 2 A to UL 508; depending on the number of components and loads (Y1, Y2 and OUT)

Technical data

Safety inputs X1 and X2:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 4 mA at 24 V
Safety outputs Y1 and Y2:	p-type, short-circuit proof
U_{e1}:	24 V
I_{e1}:	0.25 A
Voltage drop:	< 1 V
Utilization category:	DC-13
Leakage current I_r:	≤ 0.5 mA
Diagnostic output OUT:	p-type, short-circuit proof
U_{e2}:	0 V up to 4 V under U_e
I_{e2}:	max. 0.05A
Utilization category:	DC-13
Wiring capacitance for serial diagnostic:	max. 50 nF
Solenoid control IN:	
Voltage range – 3V … 5V:	Low
Voltage range 15V … 30V:	High, typically 10 mA at 24 V, dynamically 20 mA
Solenoid:	100% ED
LED functions	
Green:	Supply voltage on
Yellow:	Operating status
Red:	Error
Classification:	
Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	3,5 x 10^{-9} / h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

The latching force of the MZM 100 B can be set in steps of approx. 10 N each within a range of approx. 30 N (factory setting) to approx. 100 N. To this end, the adjustment target MZM 100 TARGET is used directly on the fitted MZM 100 B.

Ordering details

MZM 100 B ①-②RE③-A

No.	Option	Description
①	ST	Connector M23, (8+1)-pole
	ST2	Connector M12, 8-pole
②	1P2PW2	1 diagnostic output and 2 safety outputs, all p-type with combined diagnostic signal: safety guard closed **and** can be locked
	SD2P	Serial diagnostic output and 2 safety outputs, p-type
③	M	Permanent magnet approx. 30 N

Ordering details

The safety sensor with interlocking function, the actuating unit and the adjustment target must be ordered separately!

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Connection

Integrated connectors

M23, (8+1)-pole (Suffix -ST)

M12, 8-pole (Suffix -ST2)

Additional Accessories:

SD Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Connector	Page 1-66
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

Safety monitoring module

Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the guarding device can immediately be opened on failure of the electrical power supply or when the main switch is opened.

Diagnostic

Depending on the component variant, the following diagnostic signals are transmitted:

MZM 100 ..-1P2PW variant:
OUT Combined diagnostic signal: safety guard closed **and** magnetic interlock locked

MZM 100 B ..-1P2PW2 variant:
OUT Combined diagnostic signal: safety guard closed **and** can be locked

Operating principle of the diagnostic output
The short-circuit proof diagnostic output OUT can be used for central indicating or control functions, for instance in a PLC.

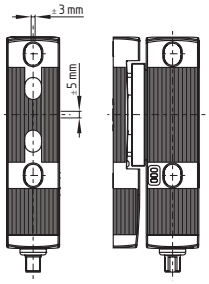
The diagnostic output is not a safety-relevant output!

Serial diagnostic

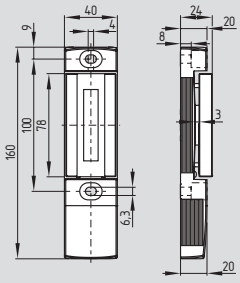
Detailed information about the use of the serial diagnostics can be found in the operating instructions of the PROFIBUS-Gateway SD-I-DPV0-2 and the Universal-Gateway SD-I-U-…. and in the instructions for the integration of the SD-Gateway.

Misalignment

Misalignment



Actuator MZM 100-B1.1



- The magnetic interlocks and the actuator unit must be ordered separately!
- Actuator free from play, i.e. neutralization of undesired noises

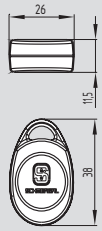
Approvals

Approvals only in combination with switches MZM 100

Ordering details

Actuator **MZM 100-B1.1**

MZM 100 TARGET

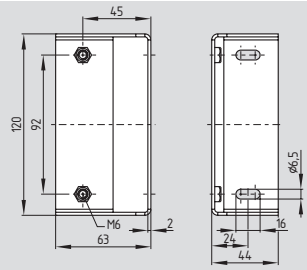


- Adjustment target for variable adjustment of the latching force of the MZM 100
- Gradually adjustable by steps of approx. 10 N each within the range from approx. 30 N to 100 N
- The adjustment target must be ordered separately

Ordering details

Adjustment target **MZM 100 TARGET**

System components

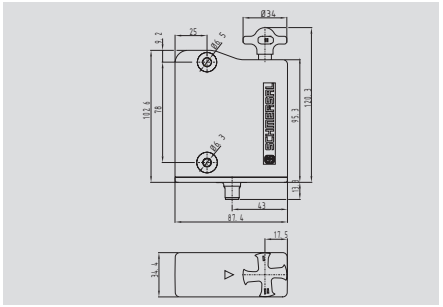


Mounting kit MS MZM 100-W

Ordering details

Mounting kit (screws included in delivery) **MS MZM 100-W**

Sensor AZM300

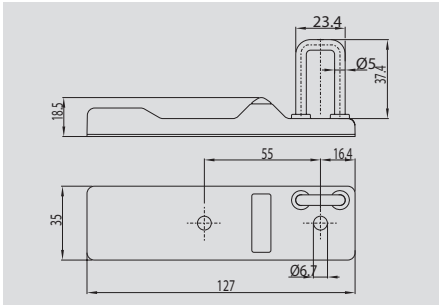


- Thermoplastic enclosure
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Increased protection against tampering by optional individual coding of safety sensor and actuator
- Adjustable latching from 25N to 50N
- Safety and diagnostic signals can be wired in series
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet
- LED status indication
- Robust design using cleaning agent-resistant materials achieving protection class IP69K

Approvals

TÜV cULus ECOLAB CE

Actuator AZM300



- Thermoplastic
- Solenoid actuator key
- Dampener for end stop
- RFID tag

Approvals Certification in combination with safety sensor

TÜV ECOLAB

Technical data

Standards:	IEC 60947-5-3, IEC 60947-5-1, IEC 61508, EN ISO 13849-1
Enclosure:	glass-fibre reinforced thermoplastic
Mode of operation:	RFID
Actuator:	AZ/AZM300-B1
Series-wiring:	unlimited number of components, up to 200 M; max. 31 components for serial diagnosis
Connection:	Integrated connector M12
- Integrated connector:	M12, 8-pole, A-coded
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	2 mm
Assured switch-on point S_{ao}:	1 mm
Assured switch-off point S_{ar}:	20 mm
Minimum distance between two sensors:	100 mm
Ambient conditions:	
Ambient temperature Tu:	0 °C … +60 °C
Storage and transport temperature:	-10 °C … +90 °C
Protection class:	IP66 / IP67 to EN 60529; IP69K to DIN 40050-9
Mechanical Data:	
Mechanical life	>= 1,000,000 operations
Clamping force	1,000 N
Latching force	25 N / 50 N
End stop:	5 kg guard door, 0.5 m/s >= 50,000 operations
Actuator misalignment	<= 2
Emergency unlocking device (Y/N)	No
Manual release (Y/N)	Yes
Emergency release (Y/N)	No
Resistance to vibration:	10…150 Hz, amplitude 0.35 mm
Resistance to shock:	30 g / 11 ms
Electrical data:	
Switching frequency f:	0.5 Hz
Response time:	120 ms
Duration of risk:	< 200 ms
Standby delay:	≤ 5 s
Rated Supply voltage U_s:	24 VDC -15% / +10% (PELV)
Power consumption with solenoid enabled:	0.25 A
Power consumption without load:	0.1 A
Required rated short-circuit current:	100 A

Ordering details

AZM300 ① - ② -ST- ③ - ④

No.	Option	Description
①	Z	Guard locking monitored
	B	Actuator (RFID) monitored
②		Standard version
	I1	Individual coding (Irreversible)
	I2	Individual coding (re-teachable)
③	1P2P	Diagnostic output
	SD2P	Serial Diagnostic
④		Power to unlock (spring lock)
	A	Power to lock

Ordering details

Actuator	**AZ/AZM300-B1**

Additional Accessories:

SD Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

Electronic Solenoid interlocks

Technical data

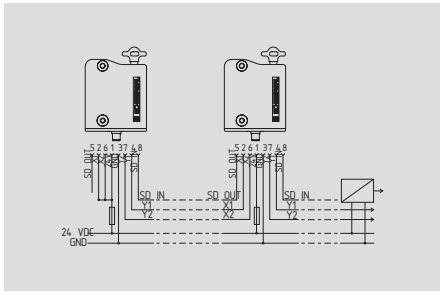
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	800 V
No-load current I_0:	35 mA
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
Safety inputs X1/X2:	
Rated operating voltage U_{e1}:	24 VDC -15% / +10% (PELV to IEC 60204-1)
Current consumption per input:	5 mA
Safety outputs Y1/Y2:	p-type, short-circuit proof
Rated operating current I_{e1}:	max. 0.25 A
Utilization category:	AC-12: U_e/I_e: 24V AC/0.25 A DC-13: U_e/I_e: 24V DC/0.25 A
Voltage drop:	< 1 V
Diagnostic output:	p-type, short-circuit proof
Rated operating current I_{e2}:	max. 0.05 A
Utilization category:	AC-12: U_e/I_e: 24V AC/0.05 A DC-13: U_e/I_e: 24V DC/0.05 A
Voltage drop:	< 2 V
Serial diagnostic:	short-circuit proof
Operating current:	150 mA
Wiring capacitance for serial diagnostic:	max. 50 nF
External cable protection:	Fuse
- Integrated connector:	2.0 A
- Connecting cable:	4.0 A
	Please observe the cable section of the lead-on cable
LED functions:	
Green	Supply voltage on
Yellow	Operating status
Red	Error
Classification:	
Standards:	EN ISO 13849-1, IEC 61508, IEC 62061
PL:	e
Category:	4
PFH :	5.2 x 10^{-10}/h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Misalignment

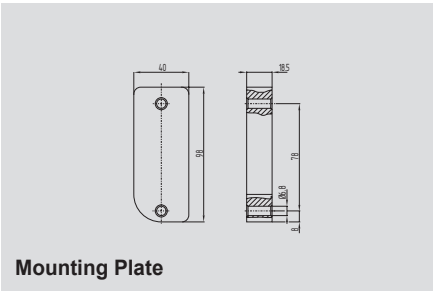
Lateral actuation

The axial misalignment (Y) is max. ± 3.5 mm.
The height misalignment (X) is max. ± 2 mm.

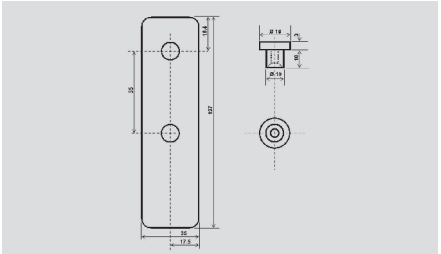
Wiring example



System components



Mounting Plate



Mounting Set

1 A1 Supply voltage UB
2 X1 Safety input 1
3 A2 GND
4 Y1 Safety output 1
5 OUT Diagnostic output
6 X2 Safety input 2
7 Y2 Safety output 2
8 IN Solenoid control

Connector

Note

Requirements for the safety controller
Dual-channel safety input, suitable for p-type sensors with normally-open (NO) function. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 0.25 ms, this must be tolerated by the safety controller. The safety controller must not be equipped with cross-wire detection.

Detailed information about the use of the serial diagnostics can be found in the operating instructions of the PROFIBUS-Gateway SD-I-DPV0-2 and the Universal-Gateway SD-I-U-…. and in the instructions for the integration of the SD-Gateway.

Coding procedure

Ordering option -I1:
During the individual coding, an actuator is taught by a simple routine during the start-up procedure, so that every form of tampering by means of a replacement or substitute actuator is permanently excluded.

Ordering option -I2:
Teaching the individual coding of an actuator by a simple routine during the start-up procedure (as -I1). A protected coding process enables the teaching of a new actuator for service purposes.

Ordering details

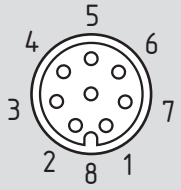
Mounting

Spacer plate	**MP-AZ/AZM300-1**
Actuator mounting kit	**MS-AZ/AZM300-B1**

Connector Cables

IP69K cable, 5 meter length	**101210560**
IP69K cable, 10 meter length	**103001389**
IP67 cable, 5 meter length	**101209964**
IP67 cable, 10 meter length	**101209960**

Connectors M12, 8-pole for AZ/AZM 200, MZM 100, MZM 120



Function of the safety switchgear			Pin configuration of the integrated connector	Color code of the Schmersal connectors	Possible color codes of other customary connector	
	with conventional diagnostic output	with serial diagnostics			according to EN 60947-5-2: 2007	to DIN 47100
A1	U_e		1	BN	BN	WH
X1	Safety input 1		2	WH	WH	BN
A2	GND		3	BU	BU	GN
Y1	Safety output 1		4	BK	BK	YE
OUT	Diagnostic output	SD output	5	GY	GY	GY
X2	Safety input 2		6	VT	PK	PK
Y2	Safety output 2		7	RD	VT	BU
IN	Solenoid control	SD input	8	PK	OR	RD

Ordering details

Connecting cables with female connector
IP67, M12, 8-pole - 8 x 0.23 mm²

Cable length 2.5 m	**101209963**
Cable length 5 m	**101209964**
Cable length 10 m	**101209960**

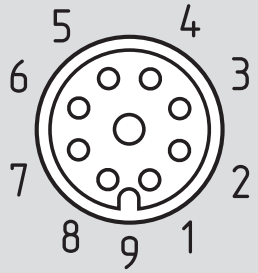
IP69K, M12, 8-pole - 8 x 0.21 mm²

Cable length 5 m	**101210560**
Cable length 5 m, angled	**101210561**

Legend: Color code

Code	Color	Code	Color	Code	Color	Code	Color
BK	black	GN	green	PK	pink	WH	white
BN	brown	GY	grey	RD	red	YE	yellow
BU	blue	OR	orange	VT	purple		

Connectors M23, (8+1)-pole for AZ/AZM 200, MZM 100, MZM 120



Function of the safety switchgear			Pin configuration of the integrated connector	Wire number of the Schmersal connectors	Possible color codes of other customary connector	
	with conventional diagnostic output	with serial diagnostics			according to EN 60947-5-2: 2007	to DIN 47100
A1	U_e		1	1	BN	WH
X1	Safety input 1		2	2	WH	BN
A2	GND		3	3	BU	GN
Y1	Safety output 1		4	4	BK	YE
OUT	Diagnostic output	SD output	5	5	GY	GY
X2	Safety input 2		6	6	PK	PK
Y2	Safety output 2		7	7	VT	BU
IN	Solenoid control	SD input	8	8	OR	RD
-	without function		9			

Ordering details

Connecting cables with female connector
IP67, M23, 8+1-pole - (LIYY) 8 x 0.75 mm²

Cable length 5 m	**101209959**
Cable length 10 m	**101209958**

Connectors without cable
IP67, M23, 8+1-pole

with soldering terminal	**101209970**
with crimp terminal	**101209994**

Legend: Color code

Code	Color	Code	Color	Code	Color	Code	Color
BK	black	GN	green	PK	pink	WH	white
BN	brown	GY	grey	RD	red	YE	yellow
BU	blue	OR	orange	VT	purple		

Safe switching and monitoring
Non-Contact Safety Sensors

Electronic safety sensors are used to detect guard door closure. These sensors use non-contact operating principles (pulse echo or RFID) that limits wear on components, and tolerates misalignment. A microprocessor provides continuous internal function tests and monitors the safety outputs, meeting PLe to ISO13849-1 and SIL 3 to IEC61508, even when wired in series. Three color LEDs on the sensor indicate status, various errors, and misalignment. For more advanced indication these models are also available with serial diagnostics to connect to commercial field bus systems.

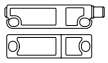
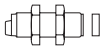
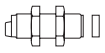
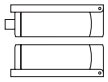
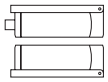
Magnetic safety sensors are of particular advantage in cases where extremely dirty conditions can occur or high hygienic standards need to be maintained. This is provided by the simplicity of cleaning the units.

A further advantage is the facility for concealed mounting under non-magnetic materials. Working surfaces and storage areas can be arranged without the need for dust-collecting edges or other functionally required cut-outs or projections.

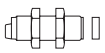
These switches are available in a variety of profiles and housing materials, including IP69K rated models.

Selection tables: safety sensors

Electronic Safety Sensors

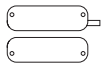
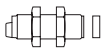
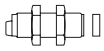
Design	Sensor type	Contacts	Connecting options	Actuator type	Coded	Distance s_{ao} / s_{ar} [mm]	Integrated monitoring
	**RSS 36**	-2P+D -2P+SD	Ltg, ST Ltg, ST	RST 36-1 RST 36-1-R	●	10 / 16	
	**CSS 16**	-2P -2P+D	Ltg, ST Ltg, ST	CST 16-1	●	7 / 10	
	**CSS 30**	-2P+D	Ltg	CST 30-1	●	12 / 19	
	**CSS 30S / CSS 300**	-2P+D -2P+SD	ST ST	CST 30S-1	●	8 / 15	
	**CSS 34**	-2P+D -2P+SD	Ltg, ST	refer to table page 1-83	●	refer to table page 1-83	● (CSS 34F.)
	**CSP 34**	-2P+D	ST	CSP 34-S-1	● (paired coding)	8 / 15	
	**CSS 180**	-2P -2P+D	Ltg, ST Ltg, ST	CST 180-1 CST 180-2	●	7 / 10	

Coded Magnet Safety Sensors

Design	Sensor type	Contacts	Connecting options	Actuator type	Coded	Distance s_{ao} / s_{ar} [mm]	Integrated monitoring
	**BNS 260**	-02Z(G) -11Z(G) -02/01Z(G) -11/01Z(G)	Ltg, ST Ltg, ST Ltg, ST	BPS 260-1 BPS 260-2	●	5 / 15	
	**BNS 36**	-02Z(G) -11Z(G) -02/01Z(G) -11/01Z(G)	Ltg, ST Ltg, ST Ltg, ST	BPS 36-1 BPS 36-2	●	7 / 17	
	**BNS 333**	-01Y	SK	BPS 300 BPS 303	●	4 / 14	●
	**BNS 303**	-11Z(G) -12Z(G) -12Z(G)-2187	Ltg, ST Ltg, ST Ltg	BPS 300 BPS 303	●	5 / 15	
	**BNS 30** **BNS 300**	-01ZG	Ltg, ST	BPS 300 BPS 303	●	5 / 15	●

Selection tables: safety sensors

Increased switching distance

Design	Sensor type	Contacts	Connecting options	Actuator type	Coded	Distance s_{ao} /s_{ar} [mm]	Integrated monitoring
	**BNS 40S / BNS 40S-..-C**	-12Z(G)	Ltg	BPS 40S-1 BPS 40S-2 BPS 40S-1-C BPS 40S-2-C	●	8 / 18	
	**BNS 16**	-12Z	SK	BPS 16	●	8 / 18	
	**BNS 303** **-2211**	-11Z(G) -12Z(G)	Ltg, ST Ltg, ST	BPS 300 BPS 303	●	8 / 18	
	**BNS 30** **-2211**	-01ZG	Ltg, ST	BPS 300 BPS 303	●	8 / 18	●
	**BNS 300** **-2211**	-01Z(G)	Ltg, ST	BPS 300 BPS 303	●	8 / 18	●

Door-handle with integrated safety switch

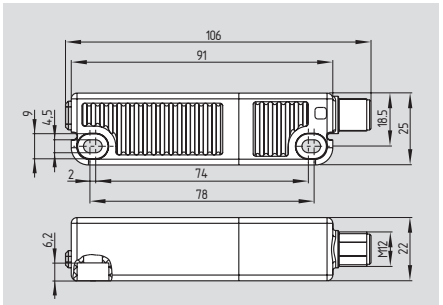
Design	Sensor type	Contacts	Connecting options	Actuator type	Coded	Distance s_{ao} /s_{ar} [mm]	Integrated monitoring
	**BNS-B20**	-12ZG	ST	BNS-B20-B01	●	0 / 22	

G = with LED (option)

Ltg = Cable
ST = Plug-in connector
SK = Screw terminals

Technical data and ordering details can be obtained from the following pages.

Sensor RSS 36



- Thermoplastic enclosure
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Increased protection against tampering by optional individual coding of safety sensor and actuator
- Optional version with latching available
- Safety and diagnostic signals can be wired in series
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet
- LED status indication
- Sensor with connecting cable or with integrated connector
- Robust due to the used cleaning agent-resistant materials and protection class up to IP69K
- AS-Interface Safety at Work available

Approvals

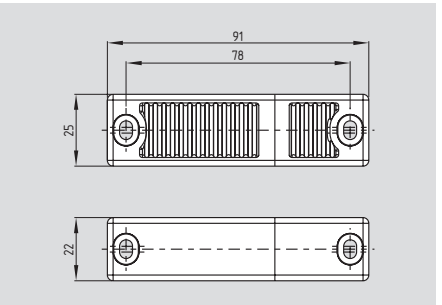
TÜV cULus ECOLAB CE

Ordering details

RSS 36 ①-②-③-④

No.	Option	Description
①		Standard coding
	I1	Individual coding
	I2	Individual coding, unlimited
②	D	With diagnostic output
	SD	With serial diagnostic
③		Without latching
	R	with latching, latching force approx. 18 N
④		With connecting cable 2 m
	ST	With integrated connector M12

Actuator RST 36-1



- Thermoplastic enclosure
- Flexible fitting through universal mounting holes

Approvals

TÜV ECOLAB

Certification in combination with safety sensor

Ordering details

Actuator	**RST 36-1**
Actuator, with latching magnet	**RST 36-1-R**

(The latching function is only active when RSS 36-…R is combined with RST 36-1-R.)

Actuator, sealing kit and tamper-proof screws must be ordered separately.

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Technical data

Standards:	IEC 60947-5-3, IEC 61508, EN ISO 13849-1
Enclosure:	glass fiber reinforced thermoplastic
Mode of operation:	RFID
Actuator:	RST 36-1, RST 36-1-R
Series-wiring:	unlimited number of components, however safety-dependent; max. 31 components for serial diagnosis
Connection:	Integrated connector M12 or connecting cable
- Integrated connector:	M12, 8-pole, A-coded
- Connecting cable:	Y-UL 2517 / 8 x AWG 22 / 8 x 0.35 mm², 2 m
Temperature resistance of the cable:	
- At rest:	−30 °C … +105 °C
- In movement:	−10 °C … +105 °C
Cable length:	max. 30 m (Cable length and cable section alter the voltage drop depending on the output current)
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	12 mm
Assured switch-on point S_{ao}:	10 mm
Assured switch-off point S_{ar}:	16 mm
Hysteresis:	< 2.0 mm
Repeat accuracy:	< 0.5 mm
Minimum distance between two sensors:	100 mm
Ambient conditions:	
Ambient temperature Tu:	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +85 °C
Protection class:	IP65 / IP67 to EN 60529;
- Connector:	IP69K to DIN 40050-9
Resistance to vibration:	10…55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	1 Hz
Response time:	≤ 100 ms
Duration of risk:	≤ 200 ms
Standby delay:	≤ 5 s
Electrical data:	
Rated operating voltage U_e:	24 VDC -15% / +10% (PELV)
Rated operating current I_e:	0.6 A
Lowest operating current I_m:	0.5 mA
Required rated short-circuit current:	100 A

Note

Additional information:

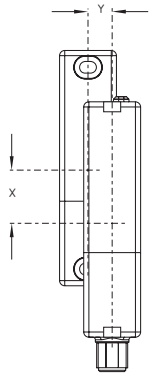
SD Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Connector	Page 1-89
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

Technical data

Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	800 V
No-load current I_0:	35 mA
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
Safety inputs X1/X2:	
Rated operating voltage U_{e1}:	24 VDC -15% / +10% (PELV to IEC 60204-1)
Current consumption per input:	5 mA
Safety outputs Y1/Y2:	p-type, short-circuit proof
Rated operating current I_{e1}:	max. 0.25 A
Utilization category:	AC-12: U_e/I_e: 24V AC/0.25 A DC-13: U_e/I_e: 24V DC/0.25 A
Voltage drop:	< 1 V
Diagnostic output:	p-type, short-circuit proof
Rated operating current I_{e2}:	max. 0.05 A
Utilization category:	AC-12: U_e/I_e: 24V AC/0.05 A DC-13: U_e/I_e: 24V DC/0.05 A
Voltage drop:	< 2 V
Serial diagnostic:	short-circuit proof
Operating current:	150 mA
Wiring capacitance for serial diagnostic:	max. 50 nF
External cable protection:	Fuse
- Integrated connector:	2.0 A
- Connecting cable:	4.0 A Please observe the cable section of the lead-on cable
LED functions:	
Green	Supply voltage on
Yellow	Operating status
Red	Error
Classification:	
Standards:	EN ISO 13849-1, IEC 61508, IEC 62061
PL:	e
Category:	4
PFH :	2.7 x 10^{-10}/h
PFD:	2.1 x 10^{-5}
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Misalignment

Lateral actuation

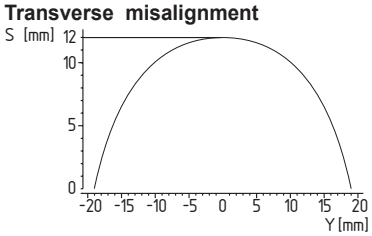


The axial misalignment (Y) is max. ± 18 mm.
The height misalignment (X) is max. ± 8 mm.

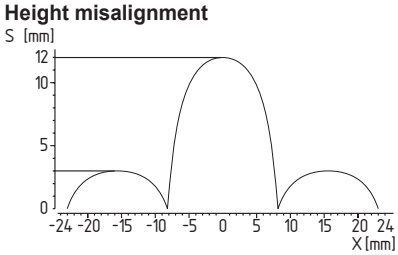
Latching versions X ± 5 mm, Y ± 3 mm.
The latching force is reduced by misalignment.

Actuating curves
The actuating curves (S) represent the typical switching distance of the safety sensor during the approach of the actuator subject to the actuating direction.

Transverse misalignment

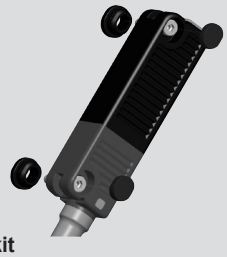


Height misalignment



Preferred actuating directions:
from front or from side

System components



Sealing kit

Note

Requirements for the safety controller
Dual-channel safety input, suitable for p-type sensors with normally-open (NO) function. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 0.25 ms, this must be tolerated by the safety controller. The safety controller must not be equipped with cross-wire detection. Detailed information about the use of the serial diagnostics can be found in the operating instructions of the PROFIBUS-Gateway SD-I-DPV0-2 and the Universal-Gateway SD-I-U-…. and in the instructions for the integration of the SD-Gateway.

Coding procedure

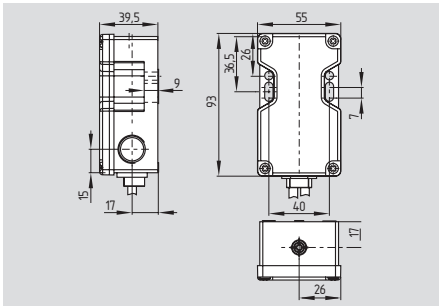
Ordering option -I1:
During the individual coding, a RST actuator is taught by a simple routine during the start-up procedure, so that every form of tampering by means of a replacement or substitute actuator is permanently excluded.

Ordering option -I2:
Teaching the individual coding of a RST actuator by a simple routine during the start-up procedure (as -I1). A protected coding process enables the teaching of a new actuator for service purposes.

Ordering details

Sealing kit ACC RSS 36-SK **101215048**
for sealing the mounting holes and as spacer (approx. 3 mm) to facilitate the cleaning below the mounting surface (also suitable as tampering protection for the screw fastening)

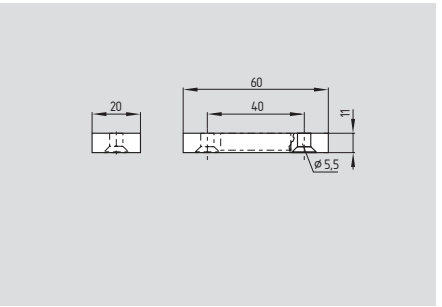
Sensor CSS 16



- Thermoplastic enclosure
- Electronic, non-contact, coded system
- Large switching distance
- Misaligned actuation possible
- High repeat accuracy of the switching points
- Self-monitored series-wiring of max. 16 sensors
- Max. length of the sensor chain 200 m
- Comfortable diagnose through sensor LED and diagnostic output
- Early warning when operating near the limit of the sensor's hysteresis range
- 2 short-circuit proof, p-type safety outputs (24 VDC per 500 mA)

Approvals

Actuator CST 16-1



- Thermoplastic enclosure

Approvals

Certification in combination with safety sensor

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass fiber reinforced thermoplastic
Mode of operation:	inductive
Actuator:	CST 16-1
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	8 mm
Assured switch-on distance S_{ao}:	6 mm
Assured switch-off distance S_{ar}:	11 mm
Hysteresis:	max. 1.0 mm
Repeat accuracy R:	< 0.5 mm
Switching frequency f:	3 Hz
Series-wiring:	max. 16 components
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)
Connection:	cable or cable with connector M12
Cable:	PVC / LIYY / UL-Style Y-UL 2464 / 2 m
Cable section:	according to execution: 4 x 0.5 mm², 5 x 0.34 mm², 7 x 0.25 mm²
Ambient conditions:	
Ambient temperature T_U: for output current	
≤ 500 mA /output	−25 °C … +55 °C
≤ 200 mA /output	−25 °C … +65 °C
Storage and transport temperature:	−25 °C … +85 °C
Resistance to vibration:	10…55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Protection class:	IP65 / IP67
Electrical data:	
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	1.1 A
Required ratedshort-circuit current:	100 A
Short-circuit protection:	
External fuse:	1.0 A for output current ≤ 200 mA 1.6 A for output current > 200 mA
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	800 V
No-load current I_0:	0.05 A

Ordering details

CSS 8-16-①-②-③

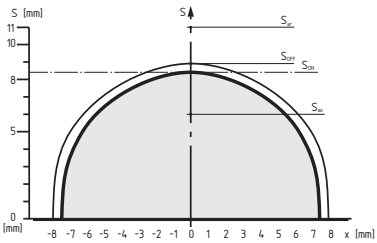
No.	Option	Description
①	2P	2 p-type safety outputs
	2P+D	2 p-type safety outputs and 1 p-type signal contact (diagnostic)
②	E	End or single device
	Y	Device for series-wiring
	M	Multifunction device
③	L	Connecting cable
	LST	Connecting cable and connector

Ordering details

Actuator **CST 16-1**

Sensor and actuator must be ordered separately!

Note



Legend

S_{on} Switch-on distance
S_{off} Switch-off distance
S_{ao} Assured switch-on distance
S_{ar} Assured switch-off distance

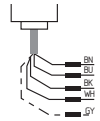
Technical data

Response time:	≤ 30 ms
Duration of risk:	≤ 30 ms
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
EMC rating:	to EN 61000-6-2
EMC interfering radiation:	to EN 61000-6-4
Safety inputs X1/X2:	
Rated operating voltage U_e:	24 VDC −15% / +10% PELV (to IEC 60204-1)
Rated operating current I_e:	1 A
Safety outputs Y1/Y2:	NO function, 2-channel, p-type, short-circuit proof
Voltage drop:	0.5 V
Rated operating voltage U_{e1}:	min. U_e - 0.5 V
Leakage current I_r:	≤ 0.5 mA
Rated operating current I_{e1}:	max. 0.5 A ambient temperature-dependent
Minimum operating current I_m:	0.5 mA
Utilization category:	DC-12 U_e/I_e 24 VDC/0.5 A DC-13 U_e/I_e 24 VDC/0.5 A
Diagnostic output:	p-type, short-circuit proof
Rated operating voltage U_{e2}:	min. U_e - 4 V
Rated operating current I_{e2}:	max. 0.05 A
Utilization category:	DC-12 U_e/I_e 24 VDC/0.05 A DC-13 U_e/I_e 24 VDC/0.05 A
Classification:	
Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	2.5 x 10^{-9}/h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

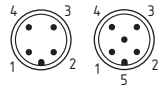
Connection

End or single device: CSS- 8-16-2P+…-**E**-L…

Connecting cable (2 m)
Cable section
4-pole: 4 x 0.5 mm²
5-pole: 5 x 0.35 mm²



Connecting cable (2 m)
with connector:
Connector male M12, 4-pole
Connector male M12, 5-pole



Color of the connecting cable	Wiring	Pin configuration
BN (brown)	A1 U_e	Pin 1
BU (blue)	A2 GND	Pin 3
BK (black)	Y1 Safety output 1	Pin 4
WH (white)	Y2 Safety output 2	Pin 2
GY (grey)	Only 5-pole version: Diagnostic output (option)	Pin 5

Series-wiring device: CSS-8-16-2P-**Y**-LST

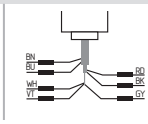
Inputs (IN):
Connecting cable (0.25 m)
with connector:
Connector female M12, 4-pole

Outputs (OUT):
Connecting cable (2 m)
with connector:
Connector male M12, 4-pole,

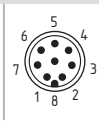
Wiring grey cable (IN)	black cable (OUT)	Pin configuration
A1 U_e	A1 U_e	Pin 1
A2 GND	A2 GND	Pin 3
X1 Safety input 1	Y1 Safety output 1	Pin 4
X2 Safety input 2	Y2 Safety output 2	Pin 2

Multifunction device: CSS-8-16-2P+D-**M**-L…

Connecting cable (2 m)
Cable section
7-pole: 7 x 0.25 mm²



Connecting cable (2 m)
with connector:
Connector male M12, 8-pole



Color of the connecting cable	Wiring	Pin configuration
BN (brown)	A1 U_e	Pin 1
BU (blue)	A2 GND	Pin 3
VT (violet)	X1 Safety input 1	Pin 6
WH (white)	X2 Safety input 2	Pin 2
BK (black)	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Pin 7
GY (grey)	Diagnostic output	Pin 5
–	Spare	Pin 8

Note

Requirements for the safety controller
Dual-channel p-type safety input. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 2 ms, this must be tolerated by the safety controller.

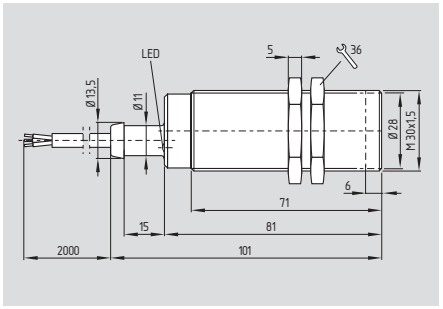
Additional Accessories:

SD Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Connector	Page 1-89
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

Note

- Series-wiring of sensors:
  A chain of 16 self-monitored CSS 16 safety sensors can be wired in series without loss of PL e or category 4 to EN ISO 13849-1. In this configuration, the redundant output of the first sensor is wired to the input of the next sensor.
- The voltage drop over a long sensor chain should be taken into account when planning cable routing. It depends on several factors, which are operating voltage, cable length and section, ambient temperature, number of series-wired sensors and the input load of the safety controller.

Sensor CSS 30



- Metal enclosure M30
- 2 short-circuit proof, p-type safety outputs (24 VDC per 500 mA)
- Self-monitored series-wiring of max. 16 sensors for PLe and category 4 to EN ISO 13849-1
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety outputs

Approvals

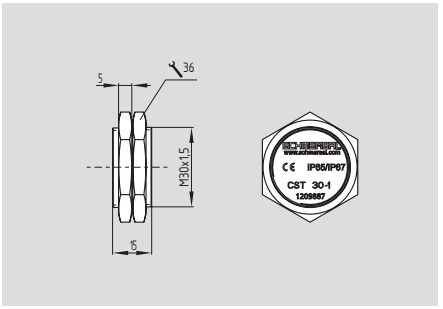
cULus under preparation CE

Ordering details

CSS 15-30-2P+D-M-L

Sensor and actuator must be ordered separately!

Actuator CST 30-1



- Thermoplastic enclosure

Approvals

Certification in combination with safety sensor under preparation

Ordering details

Actuator	**CST 30-1**

Technical data

Standards:	IEC 60947-5-3; EN ISO 13849-1; IEC 61508
Enclosure:	nickel-plated brass
Mode of operation:	inductive
Actuator:	CST 30-1, CST 34-S-3
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	
- CST 30-1:	15 mm
- CST 34-S-3:	12 mm
Assured switch-on distance S_{ao}:	
CST 30-1:	12 mm (s_{ao} min: 1 mm)
CST 34-S-3:	10 mm
Assured switch-off distance S_{ar}:	
CST 30-1:	19 mm
CST 34-S-3:	16 mm
Hysteresis:	max. 2.0 mm
Repeat accuracy R:	< 1 mm
Switching frequency f:	3 Hz
Series-wiring:	max. 16 components
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)
Cable:	PVC / LIYY / 7 x 0.25 mm² / UL-Style 2464 / AWG 24 / 2 m
Ambient conditions:	
Ambient temperature T_u:	
- for output current	
≤ 500 mA /output	−25 °C … +55 °C
≤ 200 mA /output	−25 °C … +65 °C
≤ 100 mA /output	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +85 °C
Resistance to vibration:	10 … 55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Protection class:	IP65 / IP67
Electrical data:	
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	1.1 A
Required rated short-circuit current:	100 A
Short-circuit protection:	external fuse
- for output current ≤ 200 mA:	1.0 A
- for output current > 200 mA:	1.6 A

Note

Requirements for the safety controller
The safety monitoring module must tolerate internal functional tests of the safety outputs for 250 µs …1500 µs.

The 250 µs switch-off time of the safety sensor additionally will be extended depending on the cable length and the capacity of the cable used. Typically, a switch-off time of 500 µs is reached with a 100 m connecting cable. The safety monitoring module does not need to have a cross-wire short monitoring function.

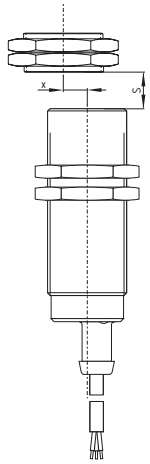
Technical data

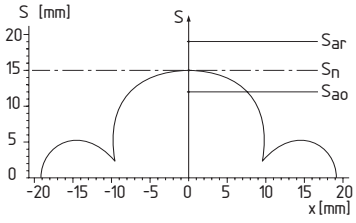
U_i:	32 V
U_{imp}:	800 V
No-load current I_0:	0.05 A
Response time:	< 30 ms
Duration of risk:	≤ 30 ms
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
Safety inputs X1/X2:	
Rated operating voltage U_e:	24 VDC -15% / +10% (PELV gem. IEC 60204-1)
Rated operating current I_e:	1 A
Safety outputs Y1/Y2:	
	NO function, 2-channel, p-type, short-circuit proof
Voltage drop:	0.5 V
Rated operating voltage U_{e1}:	min. U_e - 0.5 V
Leakage current I_r:	≤ 0.5 mA
Rated operating current I_e:	max. 0.5 A ambient temperature-dependent
Minimum operating current I_m:	0.5 mA
Utilization category:	DC-12 U_e/I_e 24 VDC/0.5 A DC-13 U_e/I_e 24 VDC/0.5 A
Diagnostic output:	p-type, short-circuit proof
U_{e2}:	min. U_e - 4 V
Rated operating current I_{e2}:	max. 0.05 A
Utilization category:	DC-12 U_e/I_e 24 VDC/0.05 A DC-13 U_e/I_e 24 VDC/0.05 A
Classification:	
Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	2.5 x 10^{-9}/h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Misalignment

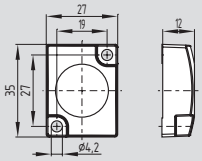
The actuating curves represent the switch-on and switch-off distances of the CSS 30 safety sensor by the approach of the CST 30-1 actuator.

In case of concealed mounting, the switching distance varies.

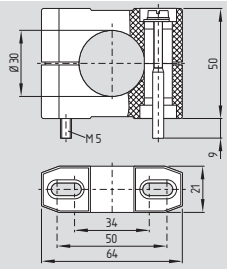




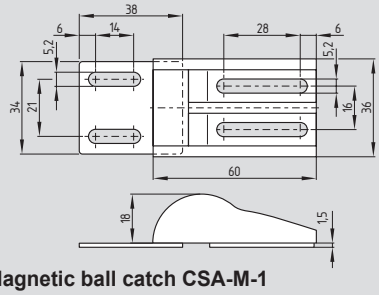
System components



Actuator CST 34-S-3



Terminal mounting H 30



Magnetic ball catch CSA-M-1

Note

Additional Accessories:

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Suitable safety monitoring modules	Page 5-2

Note

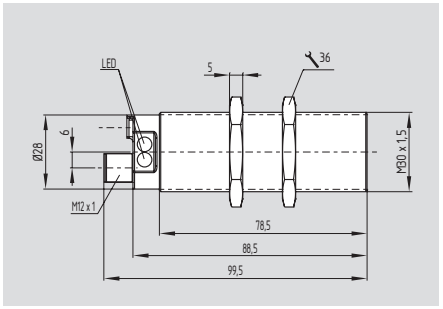
Legend

S	Switching distance
x	Misalignment
S_n	Switching distance
S_{ao}	Assured switch-on distance
S_{ar}	Assured switch-off distance

Ordering details

Actuator	**CST 34-S-3**
Terminal mounting	**H 30**
Magnetic ball catch	**CSA-M-1**

Sensor CSS 30S

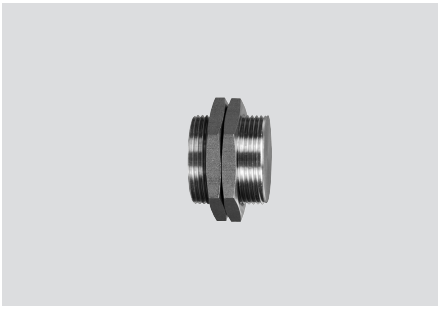


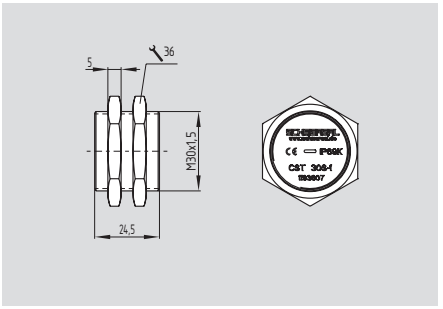
- Stainless steel enclosure M30
- **suitable for concealed mounting behind stainless steel**
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Self-monitored series-wiring of max. 31 sensors
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety outputs
- With integrated connector

Approvals

TÜV cULus CE

Actuator CST 30S-1





- Stainless steel enclosure M30

Approvals

TÜV

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	stainless steel, 1.4404 to EN 10088
Mode of operation:	inductive
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	11 mm
Assured switch-on distance S_{ao}:	8 mm
Assured switch-off distance S_{ar}:	15 mm
Hysteresis:	< 2 mm
Repeat accuracy:	< 1 mm
Switching frequency f:	3 Hz
Design of electrical connection:	M12, 8-pole
Series-wiring:	max. 31 components
Fuse:	external, 2 A
Cable length:	max. 200 m
Ambient conditions:	
Ambient temperature T_u:	−25 °C … +65 °C
Storage and transport temperature:	−25 °C … +85 °C
Resistance to vibration:	10 … 55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Protection class:	IP69K, to DIN 40050-9 IP65, IP67, IP68 to EN 60529
Electrical data:	
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	0.6 A
No-load current I_0:	max. 0.1 A; average 50 mA
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
U_{imp}:	0.8 kV
U_i:	32 V
Response time:	< 60 ms
Duration of risk:	< 60 ms
Safety inputs X1/X2:	
Rated operating voltage U_e:	24 VDC −15% / +10% PELV gem. IEC 60204-1
Rated operating current I_e:	1 A

Ordering details

CSS 11-30S-①-M-ST

No.	Option	Description
①	D	with diagnostic output
	SD	with serial diagnostic function

Sensor and actuator must be ordered separately!

Ordering details

Actuator	**CST 30S-1**

Note

Requirements for the safety controller
The safety monitoring module must tolerate internal functional tests of the safety outputs for 250 µs …1500 µs.

The 250 µs switch-off time of the safety sensor additionally will be extended depending on the cable length and the capacity of the cable used. Typically, a switch-off time of 500 µs is reached with a 100 m connecting cable. The safety monitoring module does not need to have a cross-wire short monitoring function.

Technical data

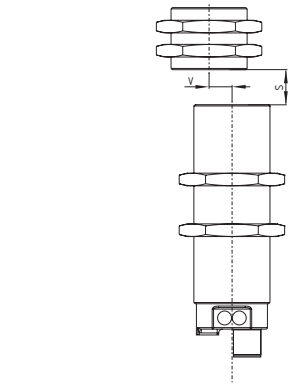
Safety outputs Y1/Y2:

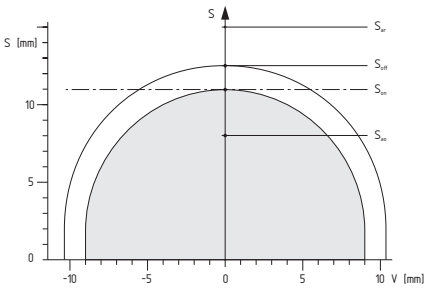
	NO function, 2-channel, p-type, short-circuit proof
Rated operating voltage U_{e1}:	24 VDC −15% / +10%
Voltage drop:	< 1 V
Leakage current I_r:	< 0.5 mA
Rated operating current I_{e1}:	max. 0.25 A
Minimum operating current I_m:	0.5 mA
Utilization category:	DC-12, DC-13
U_{e1}/I_{e1}:	24 VDC / 0.25 A
Required rated short-circuit current:	100 A
Diagnostic output:	p-type, short-circuit proof
Rated operating voltage U_{e2}:	24 VDC −15% / +10%
Voltage drop:	< 5 V
Rated operating current I_{e2}:	max. 0.05 A
Utilization category:	DC-12, DC-13
U_{e2}/I_{e2}:	24 VDC / 0.05 A
Serial diagnostic:	
Operating current:	150 mA short-circuit proof
Wiring capacitance for serial diagnostic:	max. 50 nF
Classification:	
Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	3.6 x 10^{-9}/h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Misalignment

The actuating curves represent the switch-on and switch-off distances of the safety sensor by the approach of the CST 30S-1 actuator.

When the safety sensor is fitted under non-magnetic stainless steel (V4A) or in case of concealed mounting, the switching distance varies.

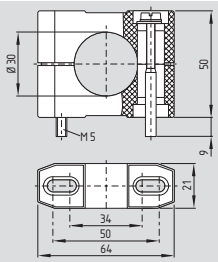




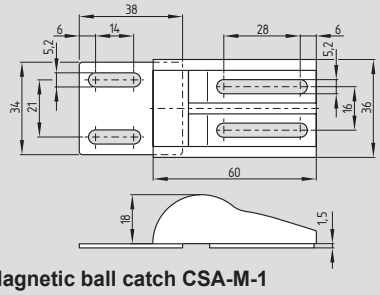
Legend

S	Switching distance
V	Misalignment
S_{on}	Switch-on distance
S_{off}	Switch-off distance **($S_{on} < S_h < S_{off}$)**
S_h	Hysteresis area
S_{ao}	Assured switch-on distance
S_{ar}	Assured switch-off distance

System components



Terminal mounting H 30



Magnetic ball catch CSA-M-1

Note

Additional Accessories:

SD Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Connector	Page 1-89
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

Note

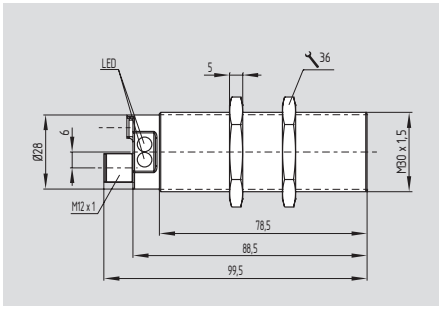
Detailed information about the use of the serial diagnostics can be found in the operating instructions of the PROFIBUS-Gateway SD-I-DPV0-2 and the Universal-Gateway SD-I-U-…. and in the instructions for the integration of the SD-Gateway.

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Ordering details

Terminal mounting	**H 30**
Magnetic ball catch	**CSA-M-1**

Sensor CSS 300

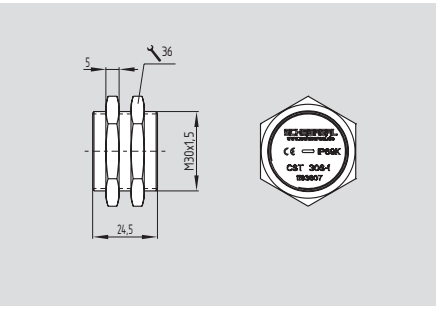


- Thermoplastic enclosure
- Ø M30
- **suitable for concealed mounting behind stainless steel**
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Self-monitored series-wiring of max. 31 sensors
- Comfortable diagnose through sensor LED and diagnostic output
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety outputs
- With integrated connector

Approvals

TÜV cULus CE

Betätiger CST 30S-1



- Stainless steel enclosure
- Ø M30

Approvals

TÜV

Certification in combination with safety sensor

Ordering details

CSS 11-300-①-M-ST

No.	Option	Description
①	D	with diagnostic output
	SD	with serial diagnostic function

Sensor and actuator must be ordered separately!

Ordering details

Actuator	**CST 30S-1**

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	thermoplastic
Mode of operation:	inductive
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	11 mm
Assured switch-on point S_{ao}:	8 mm
Assured switch-off point S_{ar}:	15 mm
Hysteresis:	< 2 mm
Repeat accuracy:	< 1 mm
Switching frequency f:	3 Hz
Integrated connector:	M12, 8-pole
Series-wiring:	max. 31 components
Fuse:	external, 2 A
Cable length:	max. 200 m
Ambient conditions:	
Ambient temperature T_u:	−25 °C … +60 °C
Storage and transport temperature:	−25 °C … +85 °C
Resistance to vibration:	10…55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Protection class:	IP65, IP67 to EN 60529
Electrical data:	
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	0.6 A
No-load current I_0:	max. 0.1 A; average 50 mA
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
Rated impulse withstand voltage U_{imp}:	0.8 kV
Rated insulation voltage U_i:	32 V
Response time:	< 60 ms
Duration of risk:	< 60 ms
Safety inputs X1/X2:	
Rated operating voltage U_e:	24 VDC −15% / +10% PELV gem. IEC 60204-1
Rated operating current I_e:	1 A

Note

Requirements for the safety controller
The safety monitoring module must tolerate internal functional tests of the safety outputs for 250 µs –1500 µs.

The 250 µs switch-off time of the safety sensor additionally will be extended depending on the cable length and the capacity of the cable used. Typically, a switch-off time of 500 µs is reached with a 100 m connecting cable. The safety monitoring module does not need to have a cross-wire short monitoring function

Technical data

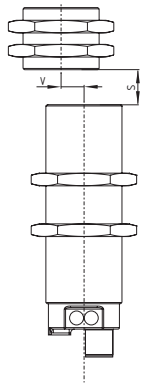
Safety outputs Y1/Y2:

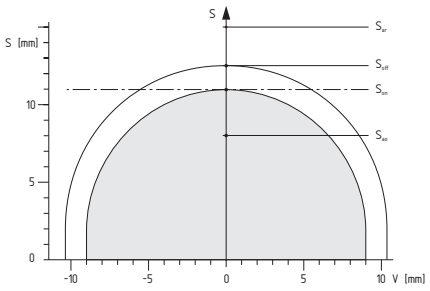
	NO function, 2-channel, p-type, short-circuit proof
Rated operating voltage U_{e1}:	24 VDC −15% / +10%
Voltage drop:	< 1 V
Leakage current I_r:	< 0.5 mA
Rated operating current I_{e1}:	max. 0.25 A
Minimum operating current I_m:	0.5 mA
Utilization category:	DC-12, DC-13
U_{e1}/I_{e1}:	24 VDC / 0.25 A
Required rated short-circuit current:	100 A
Diagnostic output:	p-type, short-circuit proof
Rated operating voltage U_{e2}:	24 VDC −15% / +10%
Voltage drop:	< 5 V
Rated operating current I_{e2}:	max. 0.05 A
Utilization category:	DC-12, DC-13
U_{e2}/I_{e2}:	24 VDC / 0.05 A
Serial diagnostic:	
Operating current:	150 mA short-circuit proof
Wiring capacitance for serial diagnostic:	max. 50 nF
Classification:	
Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	3,6 x 10^{-9} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Misalignment

The actuating curves represent the switch-on and switch-off distances of the safety sensor by the approach of the CST 30S-1 actuator.

If the safety sensor is mounted behind non-ferromagnetic stainless steel (V4A) either flush-mounted, the switching distance is reduced.

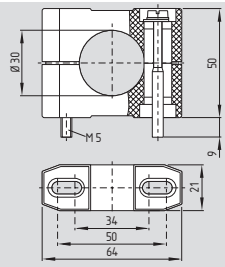




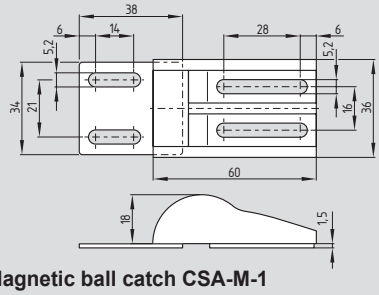
Legend

S	Switching distance
V	Misalignment
S_{on}	Switch-on distance
S_{off}	Switch-off distance
S_h	Hysteresis area $s_h = s_{on} - s_{off}$
S_{ao}	Assured switch-on distance
S_{ar}	Assured switch-off distance

System components



Terminal mounting H 30



Magnetic ball catch CSA-M-1

Note

Additional Accessories:

SD Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Connector	Page 1-89
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

Note

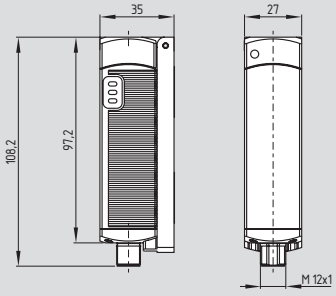
Detailed information about the use of the serial diagnostics can be found in the operating instructions of the PROFIBUS-Gateway SD-I-DPV0-2 and the Universal-Gateway SD-I-U-…. and in the instructions for the integration of the SD-Gateway.

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Ordering details

Terminal mounting	**H 30**
Magnetic ball catch	**CSA-M-1**

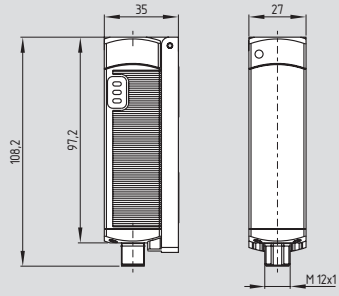
Sensor CSS 34



- Thermoplastic enclosure
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Self-monitored series-wiring of max. 31 sensors
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet
- Sensor with connecting cable or with integrated connector

Approvals

Sensor CSS 34F0/F1



Additional functions of the CSS 34F0/F1:

- To control positive-guided relays without downstream safety controller
- Suitable as individual or end device in series-wired chains of standard sensors to replace the safety controller
- Self-monitored series-wiring of up to 30 CSS 34 sensors and one CSS 34F. sensor
- CSS 34F. sensor with integrated connector

- **CSS 34F0:** without edge monitoring of the enabling button, suitable for automatic start
- **CSS 34F1:** with edge monitoring of the reset button

Approvals

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1; IEC 61508
Enclosure:	glass fiber reinforced thermoplastic
Mode of operation:	inductive
Actuator and switching distances (IEC 60947-5-3):	refer to table „Actuator / switching distances“
Series-wiring:	max. 31 components
Cable length:	max. 200 m
Hysteresis:	max. 1.5 mm
Repeat accuracy:	< 0.5 mm
Switching frequency f:	3 Hz
Cable:	Y-UL 2517 / 8 x AWG 22 8 x 0.35 mm², 2 m long
Temperature resistance of the cable:	
- At rest:	−30 °C … +105 °C
- In movement:	−10 °C … +105 °C
Integrated connector:	M12, 8-pole in the enclosure
Ambient conditions:	
Ambient temperature T_u:	
for output current	
≤ 0.1 A/output	−25 °C … +70 °C
≤ 0.25 A/output	−25 °C … +65 °C
Storage and transport temperature:	−25 °C … +85 °C
Resistance to vibration:	10 … 55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Protection class:	IP65, IP67 to EN 60529
Electrical data:	
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	0.6 A
Required rated short-circuit current:	100 A
Fuse (circuit breaker):	for cables
Up to 45°C:	4.0 A
Up to 60°C:	3.15 A
At 65°C:	2.5 A
At 70°C:	2.0 A
For connectors:	2.0 A

The cable section of the interconnecting cable must be observed for both wiring variants!

Ordering details

CSS ①-34-②-③-M-④

No.	Option	Description
①	12	Head actuation
	14	Sideways actuation
②	S	Lateral actuating surface
	V	Frontal actuating surface
③	D	With diagnostic output
	SD	With serial diagnostic function
④	L	With connecting cable
	ST	With integrated connector

Ordering details

CSS ①-34②-③-D-M-ST

No.	Option	Description
①	12	Head actuation
	14	Sideways actuation
②		Standard version
	F0	Input for enabling button, suitable for automatic start
	F1	Input for reset button, with edge monitoring
③	S	Lateral actuating surface
	V	Frontal actuating surface

Note

Requirements for the safety controller

Dual-channel safety input, suitable for p-type sensors with normally-open (NO) function. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 0.5 ms, this must be tolerated by the safety controller. The safety controller must not be equipped with cross-wire detection.

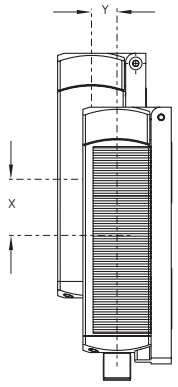
Sensor and actuator must be ordered separately!

Technical data

U_i:	32 V
U_{imp}:	800 V
I_0:	0.1 A
Response time:	< 30 ms
Duration of risk:	< 60 ms
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
Safety inputs X1/X2:	
Rated operating voltage U_e:	24 VDC −15% / +10% PELV gem. IEC 60204-1
Rated operating current I_e:	1 A
Safety outputs Y1/Y2:	NO function, 2-channel, p-type, short-circuit proof
Voltage drop:	< 1 V
Rated operating voltage U_{e1}:	min. (U_e −1 V)
Leakage current I_r:	< 0.5 mA
Rated operating current I_{e1}:	max. 0.25 A, ambient temperature-dependent
Minimum operating current I_m:	0.5 mA
Utilization category:	DC-12, DC-13
U_{e1}/I_{e1}:	24 VDC / 0.25A
Diagnostic output:	p-type, short-circuit proof
Voltage drop:	< 5 V
Rated operating voltage U_{e2}:	min. (U_e −5 V)
Rated operating current I_{e2}:	max. 0.05 A
Utilization category:	DC-12, DC-13
U_{e2}/I_{e2}:	24 VDC / 0.05A
Wiring capacitance for serial diagnostic:	max. 50 nF
Classification:	
Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	1,3 x 10^{-10} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

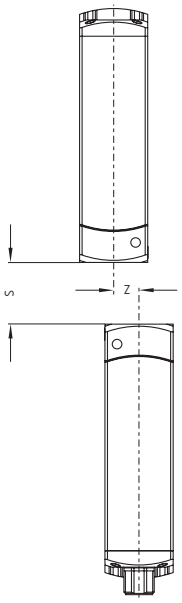
Misalignment

Sideways actuation



The long side allows for a max. height misalignment (X) of sensor and actuator of 36 mm (e.g. mounting tolerance or due to guard door sagging).
Increased misalignment, max. 53 mm, possible when the CST 34-S-2 actuator is used. The axial misalignment (Y) is max. ± 10 mm.

Head actuation



The front side allows for a maximum transverse misalignment (Z) of approx. 8 mm.

Note

Additional Accessories:

Actuator	Page 1-84
SD Gateway	Page 1-90
Series-wiring accessories	Page 1-92
Connector	Page 1-89
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

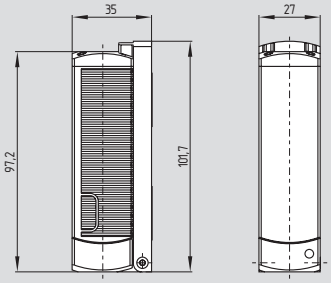
Note

Detailed information about the use of the serial diagnostics can be found in the operating instructions of the PROFIBUS-Gateway SD-I-DPV0-2 and the Universal-Gateway SD-I-U-…. and in the instructions for the integration of the SD-Gateway.

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Actuator

Actuator CST-34-.-1 and CST-34-S-2*



- Sensor CSS 34 and actuator are isometric
- Head and sideways actuation of the sensor possible

Approvals

Ordering details

CST 34-①-1

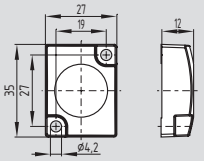
No.	Option	Description
①	V	Head actuating surface
	S	Sideways actuating surface

Actuator with double solenoid, for increased misalignment, lateral actuating surface **CST 34-S-2***

Sensor and actuator must be ordered separately!

Actuator

Actuator CST-34-S-3*



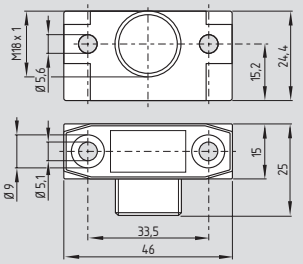
- Small design
- Head and sideways actuation of the sensor possible

Approvals

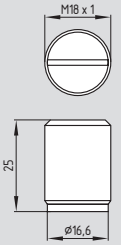
Ordering details

Small actuator (enables head and sideways actuation of the sensor) **CST-34-S-3***

Actuator



Actuator CST 180-1*



Actuator CST 180-2*

- Actuators are isometric, but CST 180-1 incl. H18 clamp
- Head and sideways actuation of the sensor possible

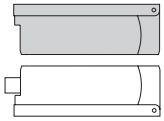
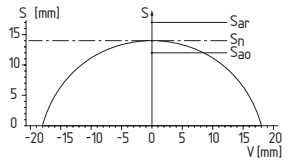
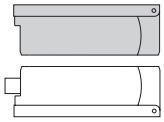
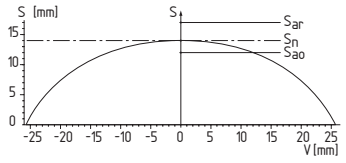
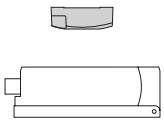
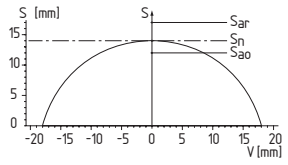
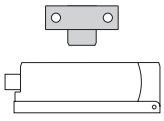
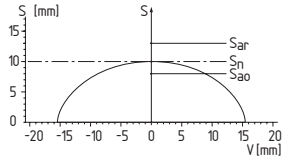
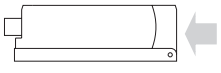
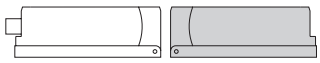
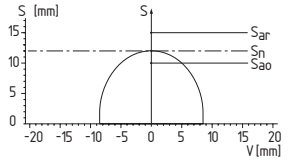
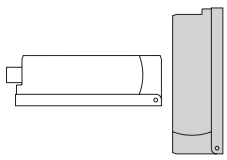
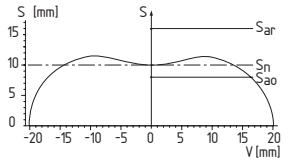
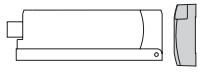
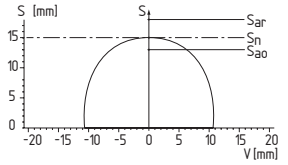
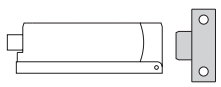
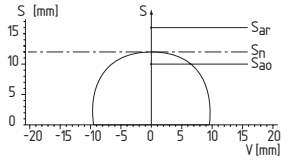
Approvals

Ordering details

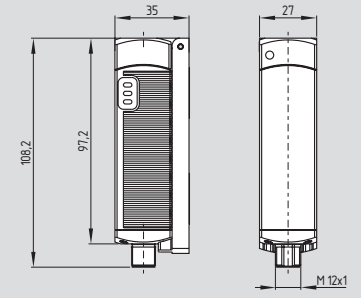
Also suitable:
Actuator CSS 180
with terminal mounting **CST 180-1***
without terminal mounting **CST 180-2***

* Certification in combination with safety sensor under preparation

Selection table: Actuator

Safety sensor	Actuator	Actuation	Switching distances to IEC 60947-5-3		
Sideways actuation  CSS 14-34-S …	**CST 34-S-1** 		S_n S_{ao} S_{ar}	14 mm 12 mm 17 mm	
	CST 34-S-2 		S_n S_{ao} S_{ar}	14 mm 12 mm 17 mm	
	CST 34-S-3 		S_n S_{ao} S_{ar}	14 mm 12 mm 17 mm	
	CST 180-1 / CST 180-2 		S_n S_{ao} S_{ar}	10 mm 8 mm 13 mm	
Head actuation  CSS 12-34-V …	**CST 34-V-1** 		S_n S_{ao} S_{ar}	12 mm 10 mm 15 mm	
	CST 34-S-2 		S_n S_{ao} S_{ar}	10 mm 8 mm 16 mm	
	CST 34-S-3 		S_n S_{ao} S_{ar}	15 mm 13 mm 18 mm	
	CST 180-1 / CST 180-2 		S_n S_{ao} S_{ar}	12 mm 10 mm 16 mm	

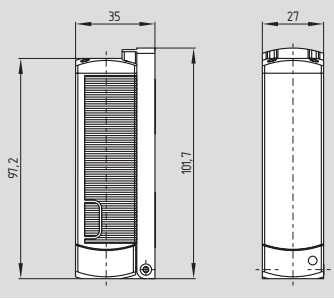
Sensor CSP 34



- Tampering protection by paired coding of safety sensor and actuator
- On-site acknowledgment (ordering suffix F2)
- 2 short-circuit proof, p-type safety outputs (24 VDC per 250 mA)
- Self-monitored series-wiring of up to 31 sensors
- Max. length of the sensor chain 200 m
- Integral cross-wire, wire breakage and external voltage monitoring of the safety cables up to the control cabinet
- With integrated connector:
- Thermoplastic enclosure

Approvals

Actuator CSP 34-S-1



- CSP 34 safety sensor and CSP 34-S-1 actuator are isometric
- Sensor and actuator must be ordered separately
- 20 different actuator codes available
- Sideways actuation only

Approvals

Certification in combination with safety sensor

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass fiber reinforced thermoplastic
Mode of operation:	inductive
Actuator:	coded CSP 34-S-1
Series-wiring:	max. 31 components
Cable length:	max. 200 m
Switching distances to IEC 60947-5-3:	
Rates switching distance S_n:	11 mm
Assured switch-on distance S_{ao}:	8 mm
Assured switch-off distance S_{ar}:	15 mm
Hysteresis:	max. 1.5 mm
Repeat accuracy:	< 0.5 mm
Switching frequency f:	3 Hz
Integrated connector:	M12, 8-pole in the enclosure
Ambient conditions:	
Ambient temperature T_u:	
For output current	
≤ 0.1 A/output	−25 °C … +70 °C
≤ 0.25 A/output	−25 °C … +65 °C
Storage and transport temperature:	−25 °C … +85 °C
Resistance to vibration:	10…55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Protection class:	IP65, IP67 to EN 60529
Electrical data:	
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	0.6 A
Required rated short-circuit current:	100 A
Fuse:	2.0 A
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	800 V
No-load current I_0:	0.1 A
Response time:	< 30 ms
Duration of risk:	< 60 ms
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3

Ordering details

CSP 11-34①-D-M-ST

No.	Option	Description
①		without on-site acknowledgment
	F2	with on-site acknowledgment

Sensor and actuator must be ordered separately!

Ordering details

CSP 34-S-1-①

No.	Option	Description
①	1 … 20	Coding 1-20

Note

Requirements for the safety controller

Dual-channel safety input, suitable for p-type sensors with normally-open (NO) function. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 0.5 ms, this must be tolerated by the safety controller. The safety controller must not be equipped with cross-wire detection.

Technical data

Safety inputs X1/X2:

Rated operating voltage U_e:	24 VDC −15% / +10% PELV gem. IEC 60204-1
Rated operating current I_e:	1 A

Safety outputs Y1/Y2: NO function, 2-channel, p-type, short-circuit proof

Utilization category:	DC-12, DC-13
Rated operating voltage U_{e1}:	min. (U_e - 1 V)
Voltage drop:	< 1 V
Rated operating current I_{e1}:	max. 0.25 A, ambient temperature-dependent
Leakage current I_r:	< 0.5 mA
Minimum operating current I_m:	0.5 mA

Diagnostic output: p-type, short-circuit proof

Utilization category:	DC-12, DC-13
Rated operating voltage U_{e2}:	min. (U_e - 5 V)
Voltage drop:	< 5 V
Rated operating current I_{e2}:	max. 0.05 A

Classification:

Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	1,3 x 10^{-10} /h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

Note

Coding of safety sensor and actuator

In order to activate the safety function (coding) of the CSP 34 for the first time, the actuator to be assigned first must be brought into the detection area of the activated safety sensor. The automatic teaching cycle of the actuator code will be signalled by the red LED on the safety sensor being activated and the yellow LED simultaneously flashing. After 10 seconds, brief cyclic flashing signals signal that the operating voltage of the safety sensor must be shut off for a few seconds, in order to save the code.
When the operating voltage is switched back on, the actuator must be redetected in order to definitively assign safety sensor and actuator. Now, the safety sensor no longer can be activated by another coding.
In order to protect the coding, the ordering details of the actuator are hidden by the mounting bracket.

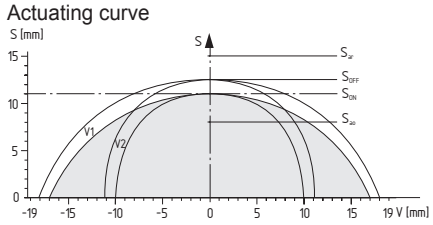
On-site acknowledgment (ordering suffix F2)

For the guard door monitoring using a CSP 34F2 safety sensor, a reset/acknowledgment button for instance must be positioned at the safety guard in such manner that the operator has an overview of the hazardous area. When the button is pushed, a 24 VDC signal is generated at the reset input of the CSP 34F2. When the safety guard is closed, the safety outputs are enabled with the trailing edge of the reset signal. After opening of the safety guard, a new acknowledgment is required prior to the next enabling.

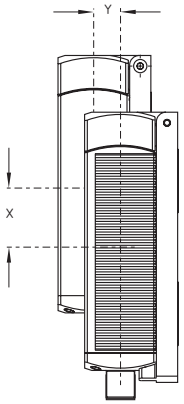
Misalignment

Actuation through the revolving side of sensor and actuator

Actuating curve



Possible misalignment



The actuating curves show the switch-on and switch-off distances of the CSP 34 sensor by the approach of the actuator.

Legend

S	Switching distance
X	Possible misalignment through the long side with identification plate
Y	Possible misalignment through the small side with identification plate
S_{on}	Switch-on distance
S_{off}	Switch-off distance
S_h	Hysteresis area $\mathbf{s_h = s_{on} - s_{off}}$
S_{ao}	Assured switch-on distance
S_{ar}	Assured switch-off distance

Note

Additional Accessories:

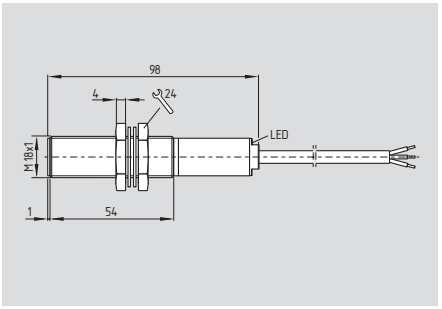
Note

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Misalignment

The long side allows for a max. displacement of sensor and actuator of 30 mm (e.g. mounting tolerance or due to guard door sagging).
The long side allows for a maximum transverse misalignment of approx. 8 mm.

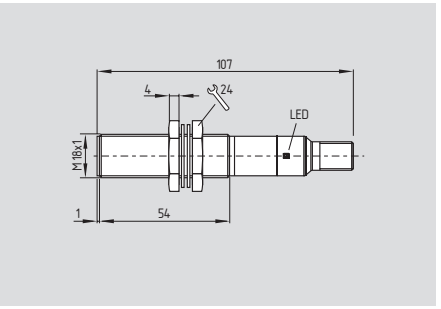
CSS 180



- **Connecting cable or connecting cable and connector**
- Thermoplastic enclosure
- Electronic, non-contact, coded system
- Large switching distance
- Misaligned actuation possible
- High repeat accuracy of the switching points
- Self-monitored series-wiring of max. 16 sensors
- Max. length of the sensor chain 200 m
- Comfortable diagnose through sensor LED and diagnostic output
- Early warning when operating near the limit of the sensor's hysteresis range
- 2 short-circuit proof, p-type safety outputs (24 VDC per 500 mA)
- EX version available

Approvals

CSS 180 ST



- **Integrated connector**
- Multifunction device
- Available: **CSS 8-180-2P+D-M-ST**

Technical data

Standards:	IEC 60947-5-3, EN ISO 13849-1, IEC 61508
Enclosure:	glass fiber reinforced thermoplastic
Mode of operation:	inductive
Actuator:	CST 180-1, CST 180-2
Series-wiring:	max. 16 components
Connection:	cable or cable with connector M12 or integrated connector M12
Cable section:	according to execution: 4 x 0.5 mm², 5 x 0.34 mm², 7 x 0.25 mm²

Switching distances to IEC 60947-5-3:

Rates switching distance S_n:	8 mm
Assured switch-on distance S_{ao}:	7 mm
Assured switch-off distance S_{ar}:	10 mm
Hysteresis:	≤ 0.7 mm
Repeat accuracy:	≤ 0.2 mm
Cable length:	max. 200 m

(Cable length and cable section alter the voltage drop depending on the output current)

Ambient conditions:

Ambient temperature T_u:	
- For max. output current	
≤ 500 mA /output	−25 °C … +55 °C
≤ 200 mA /output	−25 °C … +65 °C
≤ 100 mA /output	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +85 °C
Protection class:	IP65, IP67 to EN 60529
Resistance to vibration:	10…55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Switching frequency f:	3 Hz
Response time:	< 30 ms
Duration of risk:	≤ 30 ms

Electrical data:

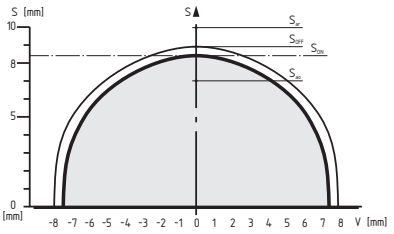
Rated operating voltage U_e:	24 VDC −15% / +10% (stabilised PELV)
Rated operating current I_e:	1 A
Minimum operating current I_m:	0.5 mA
Required rated short-circuit current:	100 A
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	800 V
No-load current I_0:	0.05 A

Ordering details

CSS 8-180-①-②-③

No.	Option	Description
①	2P	2 p-type safety outputs
	2P+D	2 p-type safety outputs and 1 p-type signal contact (diagnostic)
②	E	End or single device
	Y	Device for series-wiring
	M	Multifunction device
③	L	Connecting cable
	LST	Connecting cable and connector
	ST	Integrated connector

Note



Legend

S_{on}	Switch-on distance
S_{off}	Switch-off distance
S_{ao}	Assured switch-on distance
S_{ar}	Assured switch-off distance

Note

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Sensor and actuator must be ordered separately!

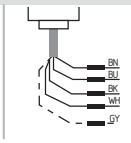
Technical data

Leakage current I_r:	≤ 0.5 mA
Protection class:	II
Overvoltage category:	III
Degree of pollution:	3
Safety inputs X1/X2:	
Rated operating voltage U_e:	24 VDC −15% / +10% PELV gem. IEC 60204-1
Rated operating current I_e:	1 A
Safety outputs Y1/Y2:	p-type, short-circuit proof
Rated operating current I_{e1}:	max. 0.5 A, ambient temperature-dependent
Utilization category:	DC-12 U_e/I_e 24 VDC/0.5 A DC-13 U_e/I_e 24 VDC/0.5 A
Voltage drop:	0.5 V
Diagnostic output:	p-type, short-circuit proof
Rated operating voltage U_{e2}:	min. U_e - 4 V
Rated operating current I_{e2}:	max. 0.05 A
Utilization category:	DC-12 U_e/I_e 24 VDC/0.05 A DC-13 U_e/I_e 24 VDC/0.05 A
External short-circuit protection:	fuse
- for output current ≤ 200 mA:	1.0 A
- for output current > 200 mA:	1.6 A
Classification:	
Standards:	EN ISO 13849-1, IEC 61508
PL:	e
Category:	4
PFH value:	2,5 x 10^{-9} / h
SIL:	suitable for SIL 3 applications
Mission time:	20 years

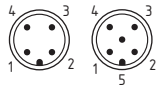
Connection

End or single device: CSS-8-180-2P+…-**E**-L…

Connecting cable (2 m):
Cable section
4-pole: 4 x 0.5 mm²
5-pole: 5 x 0.35 mm²



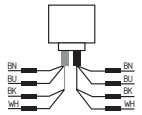
Connecting cable (2 m) with connector male:
M12, 4-pole
M12, 5-pole



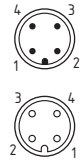
Color of the connecting cable	Wiring	Pin configuration
BN (brown)	A1 U_e	Pin 1
BU (blue)	A2 GND	Pin 3
BK (black)	Y1 Safety output 1	Pin 4
WH (white)	Y2 Safety output 2	Pin 2
GY (grey)	Only 5-pole version: diagnostic output (option)	Pin 5

Series-wiring device: CSS-8-180-2P-**Y**-L..

Inputs (IN):
(0.25 m) grey cable
4-pole, 4 x 0.5 mm²
Outputs (OUT): (2 m)
black cable
4-pole, 4 x 0.5 mm²



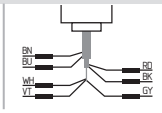
Inputs (IN): (0.25 m)
Connecting cable with connector female M12, 4-pole
Outputs (OUT):(2 m)
Connecting cable with connector male M12, 4-pole



Color of the connecting cable	Wiring grey cable (IN)	black cable (OUT)	Pin configuration
BN (brown)	A1 U_e	A1 U_e	Pin 1
BU (blue)	A2 GND	A2 GND	Pin 3
BK (black)	X1 Safety input 1	Y1 Safety output 1	Pin 4
WH (white)	X2 Safety input 2	Y2 Safety output 2	Pin 2

Multifunctional Device: CSS-8-180-2P+D-**M**-...

Connecting cable (2 m)
Cable section 7-pole:
7 x 0.25 mm²



Connecting cable (2 m) with connector male M12, 8-pole or integrated connector male M12, 8-pole

Color of the connecting cable	Wiring	Pin configuration
BN (brown)	A1 U_e	Pin 1
BU (blue)	A2 GND	Pin 3
VT (violet)	X1 Safety input 1	Pin 6
WH (white)	X2 Safety input 2	Pin 2
BK (black)	Y1 Safety output 1	Pin 4
RD (red)	Y2 Safety output 2	Pin 7
GY (grey)	Diagnostic output	Pin 5
–	Spare	Pin 8

Ordering details

Requirements for the safety controller
Dual-channel p-type safety input. The internal function tests of the sensors cause the outputs to cyclically switch off for max. 2 ms, this must be tolerated by the safety controller.

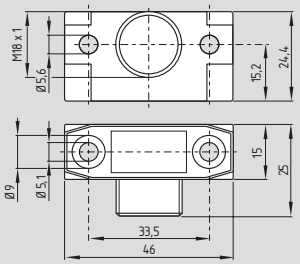
Additional Accessories:

Series-wiring accessories	Page 1-92
Connector	Page 1-89
Diagnostic tables	Online
Suitable safety monitoring modules	Page 5-2

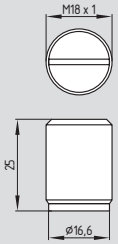
Note

- Series-wiring of sensors:
  A chain of 16 self-monitored CSS 180 safety sensors can be wired in series without loss of PL e and category 4 to EN ISO 13849-1. In this configuration, the redundant output of the first sensor is wired into the input of the next sensor.
- The voltage drop over a long sensor chain should be taken into account when planning cable routing. It depends on several factors, which are operating voltage, cable length and section, ambient temperature, number of series-wired sensors and the input load of the safety controller.

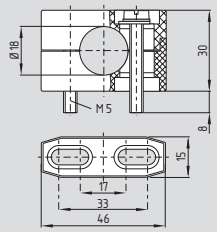
System components



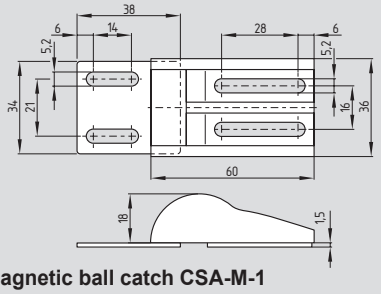
Actuator CST 180-1



Actuator CST 180-2



Terminal mounting H 18



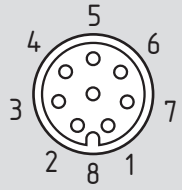
Magnetic ball catch CSA-M-1

Ordering details

Actuator	**CST 180-1**
Actuator	**CST 180-2**
Terminal mounting	**H 18**
Magnetic ball catch	**CSA-M-1**

Sensor and actuator must be ordered separately!

Connectors M12, 8-pole for CSS 34, CSP 34, CSS 30S, CSS 300, RSS 36



Ordering details

Connecting cables with female connector
IP67, M12, 8-pole - 8 x 0.23 mm²

Cable length 2.5 m	**101209963**
Cable length 5 m	**101209964**
Cable length 10 m	**101209960**

IP69K, M12, 8-pole - 8 x 0.21 mm²

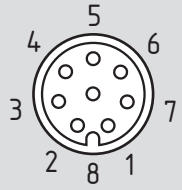
Cable length 5 m	**101210560**
Cable length 5 m, angled	**101210561**

Function of the safety switchgear			Pin configuration of the integrated connector	Color code of the Schmersal connectors or of the integrated cable	Possible color codes of other customary connector	
	with conventional diagnostic output	with serial diagnostics			according to EN 60947-5-2: 2008	to DIN 47100
A1	U_e		1	BN	BN	WH
X1	Safety input 1		2	WH	WH	BN
A2	GND		3	BU	BU	GN
Y1	Safety output 1		4	BK	BK	YE
OUT	Diagnostic output	SD output	5	GY	GY	GY
X2	Safety input 2		6	VT	PK	PK
Y2	Safety output 2		7	RD	VT	BU
IN	CSP 34F2: On-site acknowledgment; others: without function	SD input	8	PK	OR	RD

Legend: Color code

Code	Color	Code	Color	Code	Color	Code	Color
BK	black	GN	green	PK	pink	WH	white
BN	brown	GY	grey	RD	red	YE	yellow
BU	blue	OR	orange	VT	purple		

Connectors M12, 8-pole for CSS 16, CSS 30, CSS 180



Function of the safety switchgear			Pin configuration of the integrated connector	Color code of the Schmersal connectors or of the integrated cable	Possible color codes of other customary connector	
	with conventional diagnostic output	with serial diagnostics			according to EN 60947-5-2: 2008	to DIN 47100
A1	U_e		1	BN	BN	WH
X1	Safety input 1		2	WH	WH	BN
A2	GND		3	BU	BU	GN
Y1	Safety output 1		4	BK	BK	YE
OUT	Diagnostic output		5	GY	GY	GY
X2	Safety input 2		6	VT	PK	PK
Y2	Safety output 2		7	RD	VT	BU
IN	without function		8	PK / -	OR	RD

Ordering details

Connecting cables with female connector
IP67, M12, 8-pole - 8 x 0.23 mm²

Cable length 2.5 m	**101209963**
Cable length 5 m	**101209964**
Cable length 10 m	**101209960**

IP69K, M12, 8-pole - 8 x 0.21 mm²

Cable length 5 m	**101210560**
Cable length 5 m, angled	**101210561**

[1)] integrated cable of CSS 16 and CSS 180: 7-wire

Legend: Color code

Code	Color	Code	Color	Code	Color	Code	Color
BK	black	GN	green	PK	pink	WH	white
BN	brown	GY	grey	RD	red	YE	yellow
BU	blue	OR	orange	VT	purple		

SD-I-DP-V0-2

- **PROFIBUS-Gateway** for the series-wiring of the diagnostic signals of safety switchgear with integrated SD interface. The status and diagnostic information of the SD devices is transmitted to the control system through the PROFIBUS DP-V0 interface.
- Diagnostic lines of max. 31 safety switching components can be wired in series
- Series-wiring of different components enabled (CSS 34, RSS 36, AZM 200, MZM 100 etc.)
- Reduced wiring expenditure through the series-wiring of the safety channels and the diagnostic lines in the field
- Automatic addressing of the safety switching components in the SD interface
- IP10 component for quick-fix mounting onto standard DIN rails in the control cabinet

Technical data

PROFIBUS interface:	9-pole D-SUB connector standard PROFIBUS connection (DP-A, DP-B, 5V, GND)
Protocol:	PROFIBUS-DP –V0 upwards compatible
Transmission rate:	9.6 kilo baud … 12 mega baud
GSD file:	KAS_0b13.GSD
Short-circuit protection:	internal fuse to EN 60127 PolySwitch 0.5 A / 60 V
LED indications:	refer to table below
DIP-switch 8-pole:	S1 … S7: addressing as PROFIBUS slave; S8: automatic addressing of the serial participants
Rated operating voltage U_e:	24 VDC, –15 % / +20 %
Rated operating current I_e:	typically 180 mA, max. 250 mA
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U:	0.5 kV
Overvoltage category:	II
Degree of pollution:	2
Storage temperature range:	−25 °C … +85 °C, non-condensing
Operating temperature range:	−5 °C … +55 °C, non-condensing
Relative humidity:	5% - 95%, non-condensing
Protection class:	IP10
Resistance to vibration:	5 … 9 Hz / 3.5 mm (to IEC 60068-2-6) 9 … 150 Hz / 1 g
Resistance to shock:	15 g / 11 ms (to IEC 60068-2-27)
EMC rating:	to EN 61000-6-2 (2002)
to EN 61000-4-2 (ESD):	4 kV / 8 kV
to EN 61000-4-3:	10 V/m / 80% AM
to EN 61000-4-4 (burst):	2 kV DC supply / 1 kV PROFIBUS & SD-Interface
to EN 61000-4-5 (surge):	500 V DC supply / 1 kV PROFIBUS & SD-Interface
to EN 61000-4-6:	10 V / 80 % AM
EMC interfering radiation:	to EN 61000-6-4 (2002)
Industrial interfering radiation:	37 dBÌV/m
Electrical connection:	
- SD:	connection for max. 31 devices in the serial diagnostic
- 24 V:	+ 24 VDC voltage supply
- 0 V:	GND of the voltage supply and GND of the diagnostic cable and 24 VDC supply, approx. 300 mA, PELV power supply

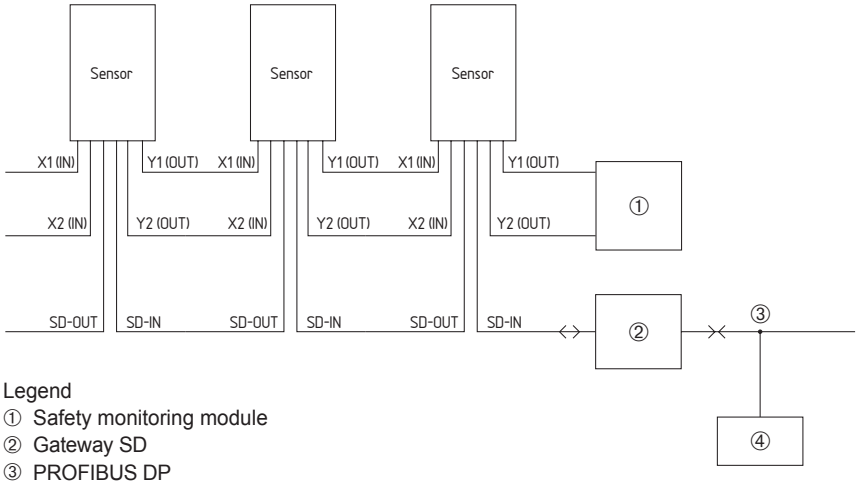
Approvals

CE

Ordering details

SD-I-DP-V0-2

Wiring diagram



Legend
① Safety monitoring module
② Gateway SD
③ PROFIBUS DP
④ PLC with PROFIBUS DP interface

SD-I-U- …

- **UNIVERSAL-Gateway** for the series-wiring of the diagnostic signals from safety switching components with integrated SD interface. Comprehensive status and diagnostic data from the SD components are transmitted to the control system through the field bus interface.
- Diagnostic lines of max. 31 safety switching components can be wired in series
- Series-wiring of different components enabled (CSS 34, RSS 36, AZM 200, MZM 100 etc.)
- Reduced wiring expenditure through the series-wiring of the safety channels and the diagnostic lines in the field
- Automatic addressing of the safety switching components in the SD interface
- IP20 component for quick-fix mounting onto standard DIN rails in the control cabinet

Available FIELD BUS interfaces:
- PROFINET IO
- EtherNet IP
- DeviceNet
- CC-Link
- CANopen
- Modbus/TCP

Approvals

Technical data

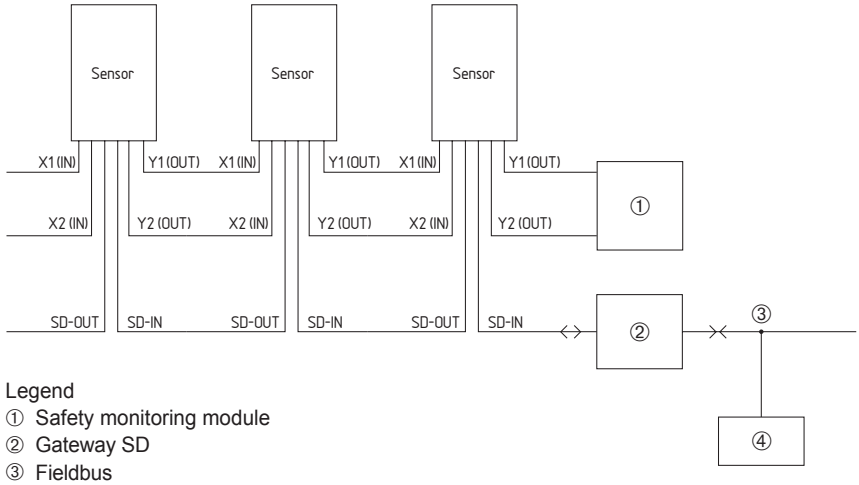
Operating voltage:	24 VDC −15 %/+20 % (stabilised PELV)
Fuse rating:	external fuse 1 A slow-blow
Operating current at 24 VDC:	max. 500 mA, internally protected
Operating temperature range:	0 … 55 °C, in case of vertical positioning
Storage temperature range:	−25 °C … +70 °C
Climatic stress:	relative humidity 30 % … 85 %, non-condensing
Protection class:	IP20
Mounting location:	earthed lockable control cabinet with at least IP54 protection class
Resistance to vibrations: to IEC 60068-2-6	if fitted between two lateral clamping blocks on the rail 10 … 57 Hz / 0.35 mm and 57 … 150 Hz / 5 g
Restistance to shock to IEC 60068-2-29:	10 g
EMC rating:	
to EN 61000-4-2 (ESD)	±6 kV contact discharge / ±8 kV Air discharge
to EN 61000-4-3 (HF field)	10 V/m / 80 % AM
to EN 61000-4-4 (Burst)	±1 kV all connections
to EN 61000-4-5 (Surge)	±1 kV all connections
to EN 61000-4-6 (HF cables)	10 V all connections
EMC interfering radiation: to EN 61000-6-4 (2002)	industrial interfering radiation
Rated insulation voltage U_i:	32 V
Rated impulse withstand voltage U_{imp}:	0.5 kV
Overvoltage category:	II
Degree of pollution:	2
Dimensions (W x H x D):	50 x 100 x 80 mm (= mounting height starting from rail)

Ordering details

SD-I-U-①

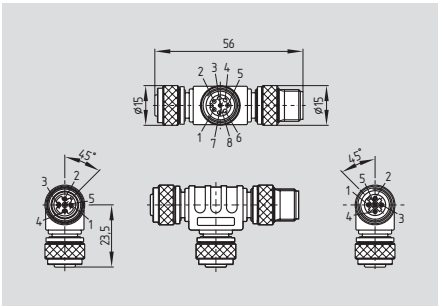
No.	Option	Description
①	PN	PROFINET IO
	EIP	EtherNet IP
	DN	DeviceNet
	CCL	CC-Link
	CAN	CANopen
	MT	Modbus/TCP

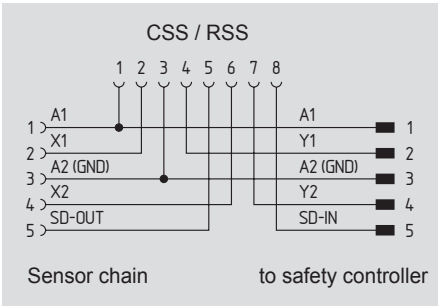
Wiring diagram



Legend
① Safety monitoring module
② Gateway SD
③ Fieldbus
④ PLC with fieldbus interface

T-adapter CSS-T





- Enables the series-wiring of safety sensors. To this end, both the safety channels and the serial diagnostic cable are wired in series.
- For the wiring, M12 cable extensions can be used. The voltage drop (due to the cable length, cable section, voltage drop per sensor) should be taken into account, as it reduces the maximum number of safety sensors that can be wired in series.

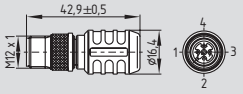
Approvals

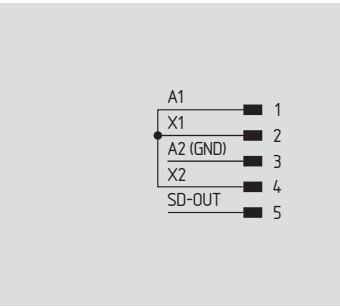
CE

Ordering details

T-adapter **CSS-T**

Terminal connector





- Supplies the safety channels with operating voltage

Approvals

CE

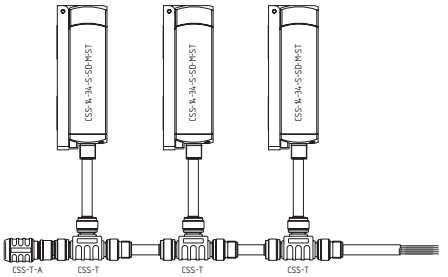
Ordering details

Terminal connector **CSS-T-A**

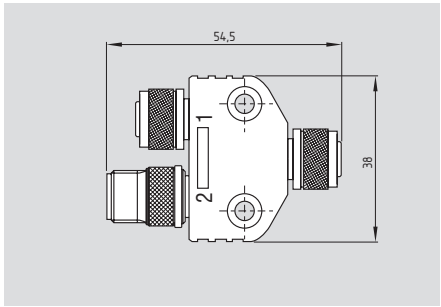
Technical data

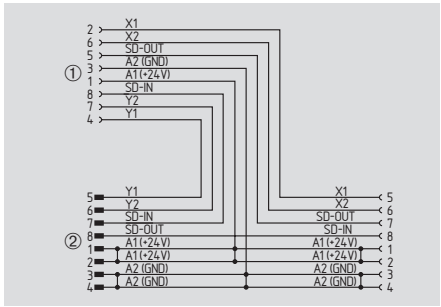
Rated operating voltage of the SD devices to be connected:	24 V (–15%/+10%)
Rated operating current of the SD devices to be connected:	0.6 A
Fuse of the connecting cables (circuit breaker):	2 A
Ambient temperature T_u:	−25 °C … +70 °C

Wiring diagram



Y-adapter CSS-Y-8P





- Enables the series-wiring of sensors and solenoid interlocks with SD interface. To that effect, both the safety channels and the serial diagnostic lines are wired in series.
- For the wiring, M12 cable extensions can be used. The voltage drop (due to the cable length, cable section, voltage drop per sensor) should be taken into account, as it reduces the maximum number of safety sensors and interlocks with SD interface that can be wired in series.

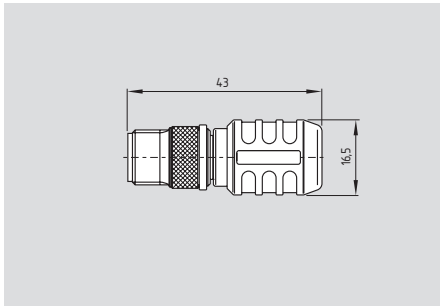
Approvals

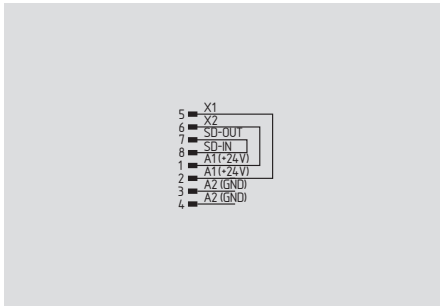
CE

Ordering details

Y-adapter	**CSS-Y-8P**

Terminal connector





- Supplies the safety channels with operating voltage
- Leads the SD interface back to the control cabinet to connect further SD participants of other safety circuits

Approvals

CE

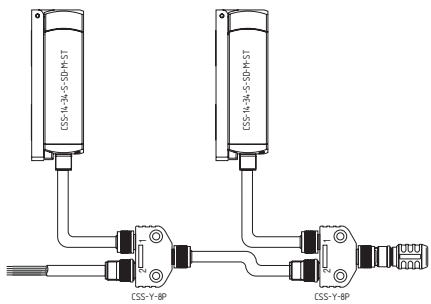
Ordering details

Terminal connector	**CSS-Y-A-8P**
Connection cables M12, 8-poles	
With 0.5m cable	**101217786**
With 1m cable	**101217787**
With 1.5m cable	**101217788**
With 2.5m cable	**101217789**
With 5m cable	**101217790**

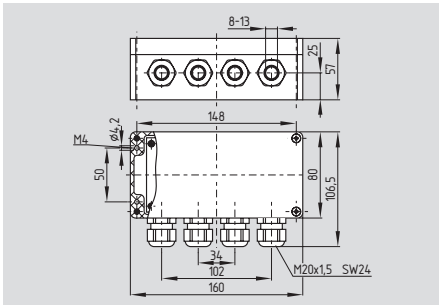
Technical data

Rated operating voltage of the SD devices:	24 VDC (−15%/+10%)
Rated operating voltage of the adapter:	30 VDC
Max. operating current of the device to be connected:	1 A
Fuse of the connecting cables (circuit breaker):	4 A
Ambient temperature T_u:	−25 °C … +75 °C

Wiring diagram



SD-2V-F-SK



- For field applications, junction box for 2 components, with screw terminals
- The terminals of the junction box are located in a closed enclosure

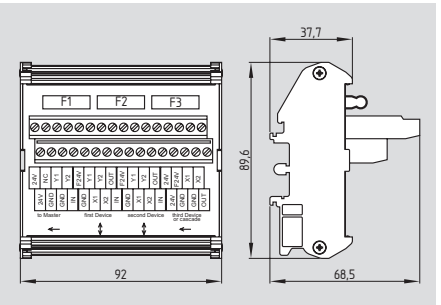
Approvals

CE

Ordering details

SD junction box
for field applications **SD-2V-F-SK**

SD-2V-S-SK



- For control cabinet mounting, junction box for 2 components, with screw terminals
- Enables wiring in the control cabinet onto standard DIN rails

Approvals

CE

Ordering details

SD junction box for
control cabinet mounting **SD-2V-S-SK**

Technical data

Standards:	VDE 0100
Enclosure:	thermoplastic, self-extinguishing
Protection class:	SD-2V-F-SK: IP65 SD-2V-S-SK: IP00 to EN 60529
Insulation protection class:	SD-2V-F-SK: II, ⧈ SD-2V-S-SK: II
Overvoltage category:	III
Degree of pollution:	SD-2V-F-SK: 3 SD-2V-S-SK: 2
Connection:	Screw terminals
Cable section:	min. 0.25 mm², max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	SD-2V-F-SK: 4 x M20, for cladding diameter 8 … 13 mm
Number of connections:	to each SD junction box, 2 (optionally 3) components can be connected
Fuse rating:	3 internal fine fuses, 2 A slow blow, 5 x 20

Ambient conditions:

Ambient temperature:	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +85 °C
Relative air humidity:	30% … 95%, non-condensing

Electrical data:

Rated operating voltage U_e:	24 VDC -15% / +10% (stabilised PELV)
Rated operating current I_e:	16 A
Rated impulse withstand voltage U_{imp}:	800 V
Rated insulation voltage U_i:	32 VDC
Fuse rating:	16 A

Note

More detailed product information can be found in the Electronic Safety Sensors and Solenoid Interlocks catalog.

Help is available in your area.

Schmersal Website

www.schmersalusa.com

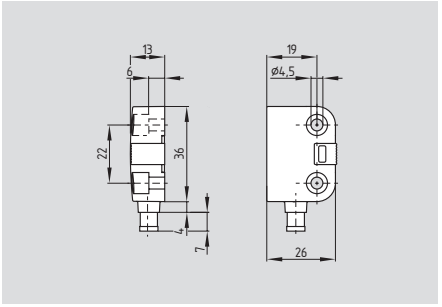
Locate Distributors

In the United States and Canada, Schmersal has a network of Regional Managers, Sales Representative groups, and more than 130 Stocking Distributors which are available to provide technical support, training and product solutions.

Visit our site to locate your nearest representative or local authorized stocking distributor in the USA, Canada - or in 22 other countries around the world.

Coded magnet safety sensors

BNS 260



- Thermoplastic enclosure
- Coded
- Actuation only possible with BPS 260
- Small design
- Long life, no mechanical wear
- Protection class IP67
- Insensitive to lateral misalignment
- Concealed mounting possible
- Insensitive to soiling
- AS-Interface Safety at Work available

Approvals

Technical data

Standards:	IEC 60947-5-3, BG-GS-ET-14
Design:	rectangular
Enclosure:	glass fiber reinforced thermoplastic
Protection class:	IP67 to EN 60529
Connection:	Boflex cable or connector M8
Cable section of cable:	4 x 0.25 mm²
- with signalling contact:	6 x 0.25 mm²
Cable section of connector:	M8, 4-pole
- with signalling contact:	M8, 6-pole
Mode of operation:	magnetic
Actuating magnet:	BPS 260, coded
S_{ao}:	5 mm
S_{ar}:	15 mm
Switching conditions indicator:	LED only for ordering suffix G
Switching voltage	
- without LED:	max. 75 VDC
- with LED:	max. 24 VDC
- with connector, 6 poles:	max. 30 VDC
Switching current	
- without LED:	max. 400 mA
- with LED:	max. 10 mA
Switching capacity	
- without LED:	max. 10 VA
- with LED:	max. 240 mW
Signalling contact:	S31-S32
Safety contacts:	S21-S22; S11-S12 bzw. S13-S14
Ambient temperature:	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +70 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55Hz, amplitude 1 mm

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	25.000.000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

BNS 260-02Z(G)

(3) BK S11 — S12 BU (4)
(1) WH S21 — S22 BN (2)

BNS 260-11Z(G)

(3) BK S13 — S14 BU (4)
(1) WH S21 — S22 BN (2)

BNS 260-02/01Z(G)

(3) GY S11 — S12 PK (4)
(1) GN S21 — S22 YE (2)
(5) WH S31 — S32 BN (6)

BNS 260-11/01Z(G)

(3) GY S13 — S14 PK (4)
(1) GN S21 — S22 YE (2)
(5) WH S31 — S32 BN (6)

Ordering details

BNS 260-①②Z③-④-⑤

No.	Option	Description
①		**Safety contacts:**
	11	1 NO / 1 NC
	02	2 NC
②		**Signalling contact:**
		No signalling contact
	/01	1 NC
③		without LED
	G	with LED
④		Cable
	ST	Integrated connector
⑤	L	Left hand door
	R	Right hand door

Note

The actuating magnet must be ordered separately.

Important Note:
Series BNS sensors are only for use in safety applications when used with an electrically compatible safety controller or safety PLC (See section 5 for appropriate safety controllers)

Note

Contact symbols shown for the closed condition of the guard device.

The number in brackets indicate the pin number of the connector.

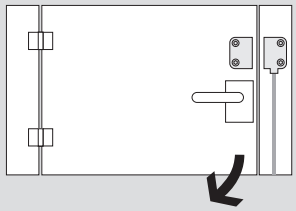
The contact configuration for versions with or without LED is identical.

Contacts S21-S22 must be integrated in the safety circuit.

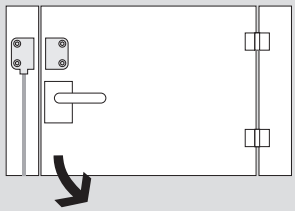
The LED is illuminated when the guard door is closed.

Coded magnet safety sensors

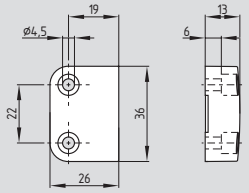
System components



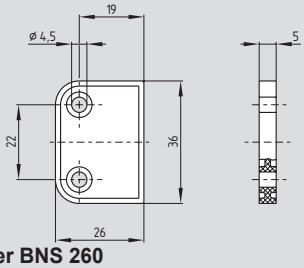
Left hand door



Right hand door



BPS 260



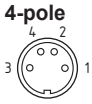
Spacer BNS 260

System components

Cable with connector

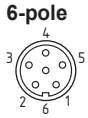
Connector M8

4-pole



PIN 1: BN
PIN 2: WH
PIN 3: BU
PIN 4: BK

6-pole

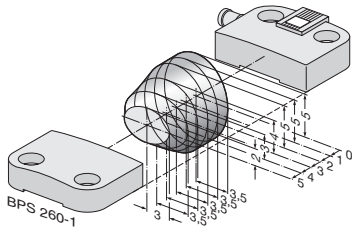


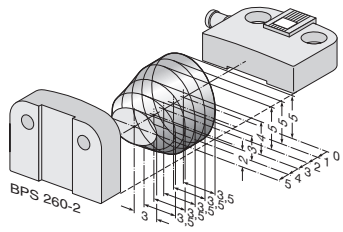
PIN 1: GN
PIN 2: YE
PIN 3: GY
PIN 4: PK
PIN 5: WH
PIN 6: BN

System components

Y-adapter

Enabling zone





Ordering details

Left hand door	**Ordering suffix -L**
Right hand door	**Ordering suffix -R**

Actuating magnet

Actuator and sensor mounted on same fixing plane	**BPS 260-1**
Actuator for 90° fixing	**BPS 260-2**

Spacer BNS 260	**101184643**

Ordering details

Cable with connector M8, 6-pole

with snap fitting, PVC	
with cable 2 m	**101206010**
with cable 5 m	**101206011**
with cable 10 m	**101206012**
with cable 2 m (angled)	**101206013**
with cable 5 m (angled)	**101206014**
with cable 10 m (angled)	**101206015**

Cable with connector M8, 4-pole

with screw terminal, PUR	
with cable 2 m	**101209947**
with cable 5 m	**101209981**
with cable 2 m (angled)	**101210557**
with cable 5 m (angled)	**101210559**

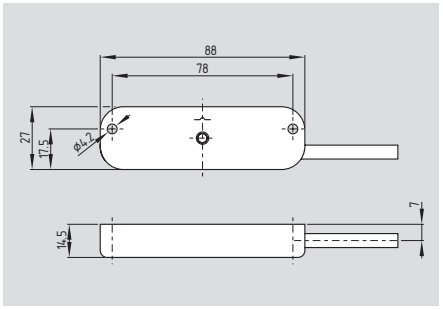
Ordering details

Y-adapter for BNS

with 1 NC/1 NO	**BNS-Y-11**
with 2 NC	**BNS-Y-02**

Coded magnet safety sensors

BNS 40S



- Fully encapsulated stainless steel enclosure
- Coded
- Rectangular design
- Long life, no mechanical wear
- Protection class IP69K
- Actuation only possible with BPS 40S-…
- Insensitive to lateral misalignment
- Concealed mounting possible
- Insensitive to soiling
- Suitable for food-processing industry
- Food-safe connecting cable

Approvals

* under preparation

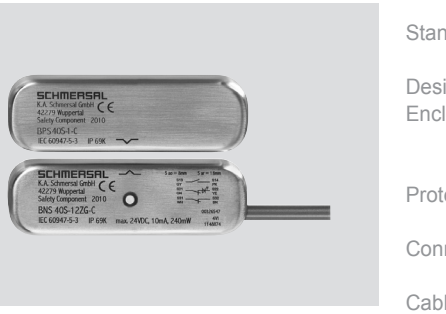
Ordering details

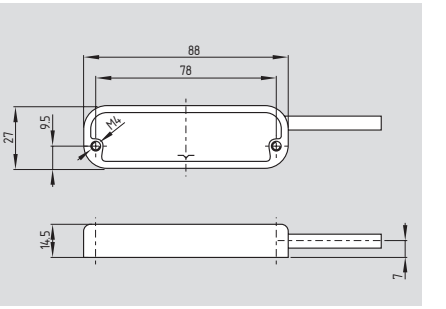
BNS 40S-12Z①

No.	Option	Description
①		without LED
	G	with LED

The actuating magnet must be ordered separately.

BNS 40S-…-C





- Concealed threaded holes on the rear-side provide for smooth cleaning

Approvals

* under preparation

Ordering details

BNS 40S-12Z①-C

No.	Option	Description
①		without LED
	G	with LED

The actuating magnet must be ordered separately.

Technical data

Standards:	IEC 60947-5-3, BG-GS-ET-14
Design:	rectangular
Enclosure:	Stainless steel V4A (Material designation to DIN 1.3960)
Protection class:	IP69K to IEC/EN 60529
Connection:	cable LiYY, 1 m (suitable for the food industry)
Cable section:	6 x 0.25 mm²
Mode of operation:	magnetic
Actuating magnet:	BPS 40S-1, BPS 40S-2, BPS 40S-1-C, BPS 40S-2-C, coded
S_{ao}:	8 mm
S_{ar}:	18 mm
Switching conditions indicator:	LED only for ordering suffix G
Max. switching voltage	
- without LED:	max. 100 VAC/DC
- with LED:	max. 24 VDC
Max. switching current	
- without LED:	max. 250 mA
- with LED:	max. 10 mA
Max. switching capacity	
without LED:	max. 3 W
with LED:	max. 240 mW
Ambient temperature:	−25 °C … +80 °C
Storage and transport temperature:	−25 °C … +80 °C
Max. switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 … 55 Hz, amplitude 1 mm

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	25,000,000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

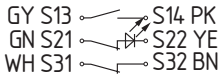
Note

Important Note:
Series BNS sensors are only for use in safety applications when used with an electrically compatible safety controller or safety PLC (See section 5 for appropriate safety controllers)

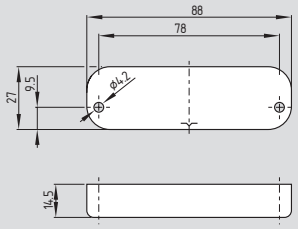
Coded magnet safety sensors

Contact variants

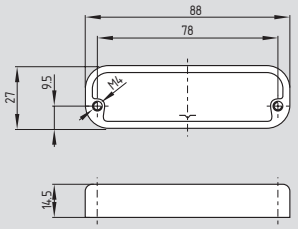
1 NO / 2 NC



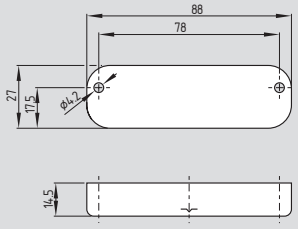
System components



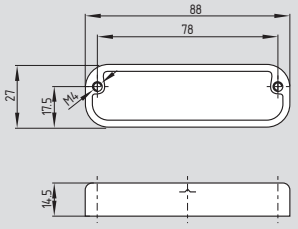
BPS 40S-1



BPS 40S-1-C



BPS 40S-2



BPS 40S-2-C

Note

Contact symbols shown for the closed condition of the guard device.

The contact configuration for versions with or without LED is identical.

Contacts S21-S22 must be integrated in the safety circuit.

The LED is illuminated when the guard door is closed.

Ordering details

Fully encapsulated stainless steel enclosure:

Actuator and sensor mounted on same fixing plane	**BPS 40S-1**
Actuator for 90° fixing	**BPS 40S-2**

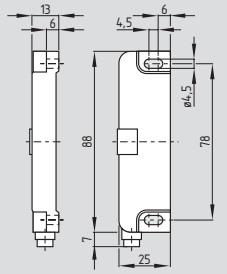
Ordering details

Fully encapsulated stainless steel enclosure:

Actuator and sensor mounted on same fixing plane, rear-side threaded holes	**BPS 40S-1-C**
Actuator for 90° fixing, rear-side threaded holes	**BPS 40S-2-C**

Coded magnet safety sensors

BNS 36



- Thermoplastic enclosure
- Coded
- Actuation only possible with BPS 36
- Long life, no mechanical wear
- Protection class IP67
- Insensitive to lateral misalignment
- Concealed mounting possible
- Insensitive to soiling
- AS-Interface Safety at Work available

Approvals

Technical data

Standards:	IEC 60947-5-3; BG-GS-ET-14
Design:	rectangular
Enclosure:	glass fiber reinforced thermoplastic
Protection class:	IP67 to EN 60529
Connection:	cable LiYY or connector M8
Cable section of cable:	4 x 0.25 mm²
- with signalling contact:	6 x 0.25 mm²
Cable section of connector:	M8, 4-pole
- with signalling contact:	M8, 6-pole
Mode of operation:	magnetic
Actuating magnet:	BPS 36, coded
S_{ao}:	7 mm
S_{ar}:	17 mm
Switching conditions indicator:	LED only for ordering suffix G
Switching voltage	
- without LED:	max. 75 VDC
- with LED:	max. 24 VDC
- with connector, 6 poles:	max. 30 VDC
Switching current	
- without LED:	max. 400 mA
- with LED:	max. 10 mA
Switching capacity	
- without LED:	max. 10 VA
- with LED:	max. 240 mW
Signalling contact:	S31-S32
Safety contacts:	S21-S22; S11-S12 bzw. S13-S14
Ambient temperature:	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +70 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55 Hz, amplitude 1 mm

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	25.000.000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

BNS 36-02Z(G)

(3) BK S11 — S12 BU (4)
(1) WH S21 — S22 BN (2)

BNS 36-11Z(G)

(3) BK S13 — S14 BU (4)
(1) WH S21 — S22 BN (2)

BNS 36-02/01Z(G)

(3) GY S11 — S12 PK (4)
(1) GN S21 — S22 YE (2)
(5) WH S31 — S32 BN (6)

BNS 36-11/01Z(G)

(3) GY S13 — S14 PK (4)
(1) GN S21 — S22 YE (2)
(5) WH S31 — S32 BN (6)

Ordering details

BNS 36-①②Z③-④-⑤

No.	Option	Description
①		**Safety contacts:**
	11	1 NO / 1 NC
	02	2 NC
②		**Signalling contact:**
		No signalling contact
	/01	1 NC
	/10	1 NO
③		Without LED
	G	With LED
④		With cable
	ST	With integrated connector
⑤	L	Left hand door
	R	Right hand door

Note

The actuating magnet must be ordered separately.

Important Note:
Series BNS sensors are only for use in safety applications when used with an electrically compatible safety controller or safety PLC (See section 5 for appropriate safety controllers)

Note

Contact symbols shown for the closed condition of the guard device.

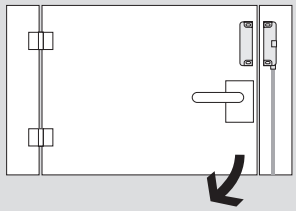
The number in brackets indicate the pin number of the connector.

The contact configuration for versions with or without LED is identical.

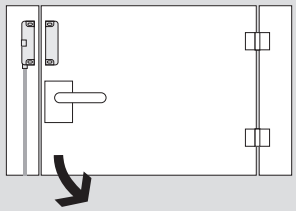
The LED is illuminated when the guard door is closed.

Contacts S21-S22 must be integrated in the safety circuit.

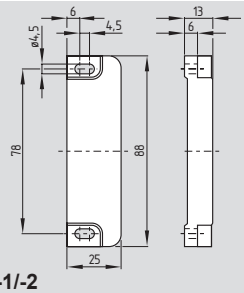
System components



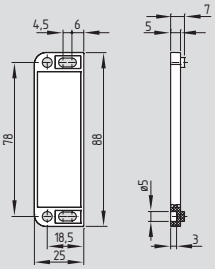
Left hand door



Right hand door



BPS 36-1/-2



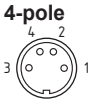
Spacer BNS 36

System components

Cable with connector M8

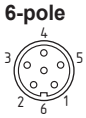
Connector M8

4-pole



PIN 1: BN
PIN 2: WH
PIN 3: BU
PIN 4: BK

6-pole

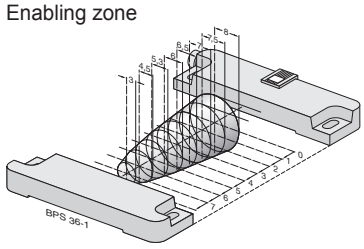


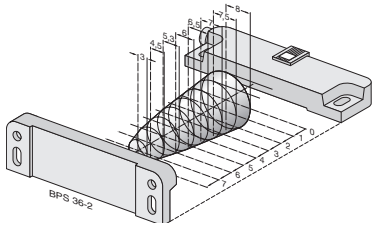
PIN 1: GN
PIN 2: YE
PIN 3: GY
PIN 4: PK
PIN 5: WH
PIN 6: BN

System components

Y-adapter

Enabling zone





Ordering details

Left hand door	**Ordering suffix -L**
Right hand door	**Ordering suffix -R**

Actuating magnet

Actuator and sensor mounted on same fixing plane	**BPS 36-1**
Actuator for 90° fixing	**BPS 36-2**
Spacer BNS 36	**101188624**

Ordering details

Cable with connector M8, 6-pole

with snap fitting, PVC	
with cable 2 m	**101206010**
with cable 5 m	**101206011**
with cable 10 m	**101206012**
with cable 2 m (angled)	**101206013**
with cable 5 m (angled)	**101206014**
with cable 10 m (angled)	**101206015**

Cable with connector M8, 4-pole

with screw terminal, PUR	
with cable 2 m	**101209947**
with cable 5 m	**101209981**
with cable 2 m (angled)	**101210557**
with cable 5 m (angled)	**101210559**

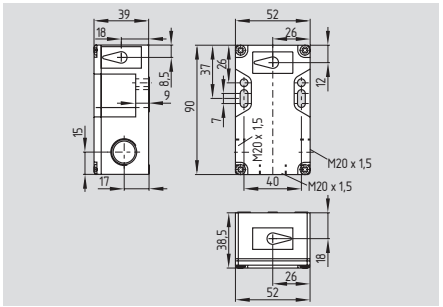
Ordering details

Y-adapter for BNS

with 1 NC/1 NO	**BNS-Y-11**
with 2 NC	**BNS-Y-02**

Coded magnet safety sensors

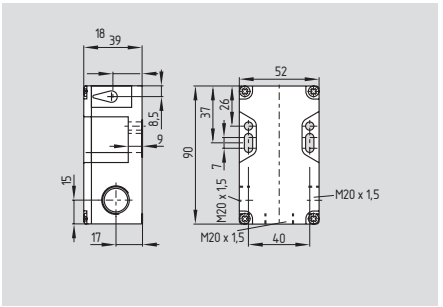
BNS 16



- Thermoplastic enclosure
- Coded
- Long life, no mechanical wear
- Protection class IP67
- Insensitive to lateral misalignment
- Concealed mounting possible
- Insensitive to soiling
- Wiring compartment
- Suitable for food processing industry
- Mounting dimensions identical to AZ 16
- 3 cable entries M20
- Screw terminals or connector
- AS-Interface Safety at Work available

Approvals

BNS 16 LR



- Actuation from both sides
- Fit for double guards
- Protection against defeat
- Suitable for use with SRB / AES safety monitoring modules
- Screw terminals

Approvals

Technical data

Standards:	IEC 60947-5-3, BG-GS-ET-14
Design:	rectangular
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Protection class:	IP67 to EN 60529
Connection:	Screw terminals or connector M12, 4- or 8-pole
Cable section:	max. 2 x 1.5 mm² (incl. conductor ferrules)
Cable entry:	3 x M20
Mode of operation:	magnetic
Actuating magnet:	BPS 16, coded
S_{ao}:	8 mm
S_{ar}:	18 mm
Switching voltage:	max. 100 VAC/DC
Switching current:	max. 400 mA
Switching capacity:	max. 10 W
Ambient temperature:	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +70 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55Hz, amplitude 1 mm

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	25.000.000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Ordering details

BNS 16-①Z②-③

No.	Option	Description
①	11	1 NO / 1 NC (only for connector type)
	12	1 NO / 2 NC
②		Actuating plane:
	V	axial
	R	right
	L	left
	D	front (cover)
	U	rear
③	ST1	Connector middle
	ST2	Connector right
	ST3	Connector left

The actuating magnet must be ordered separately.

Ordering details

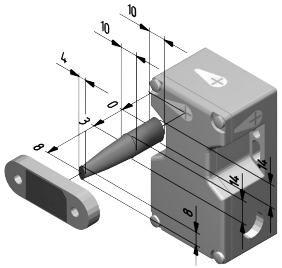
BNS 16-12Z-LR

No.	Option	Description
	12	1 NO / 2 NC
		Actuating plane:
	LR	left / right

The actuating magnets must be ordered separately.

Requires 2 actuators **BPS 16**

Note



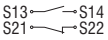
Enabling zone

Important Note:
Series BNS sensors are only for use in safety applications when used with an electrically compatible safety controller or safety PLC
See section 5 for appropriate safety controllers)

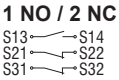
Coded magnet safety sensors

Contact variants

1 NO / 1 NC

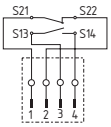


1 NO / 2 NC

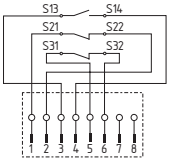


Connector

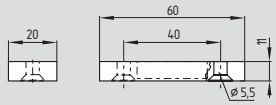
1 NO / 1 NC



1 NO / 2 NC



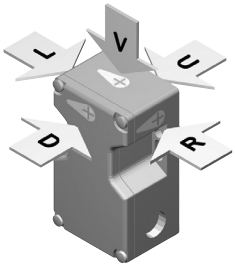
System components



BPS 16

Connector

Note



5 different directions of actuation:
cover, front and below, right and left

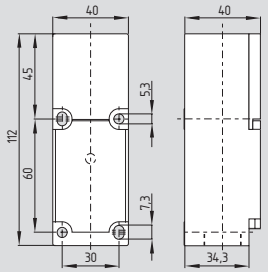
Contact symbols shown for the closed condition of the guard device.

Ordering details

Actuating magnet	**BPS 16**
Connector M12, 4-pole	
without cable	**101209950**
with cable 5 m	**101208523**
Connector M12, 8-pole	
with cable 5 m	**101209967**

Coded magnet safety sensors

BNS 333



- With integral evaluation
- Thermoplastic enclosure
- Coded
- Long life, no mechanical wear
- Protection class IP65
- Insensitive to lateral misalignment
- Insensitive to soiling
- With wiring compartment
- With LED
- With actuator BPS 303 SS suitable for food processing industry

Approvals

Technical data

Standards:	IEC 60947-5-3, BG-GS-ET-14
Design:	rectangular
Enclosure:	glass fiber reinforced thermoplastic
Protection class:	IP65 to EN 60529
Connection:	screw terminals
Cable section:	max. 2 x 1.5 mm² (incl. conductor ferrules)
Cable entry:	1 x M20
Mode of operation:	magnetic
Actuating magnet:	BPS 300, BPS 303, BPS 303 SS, coded
S_{ao}:	4 mm
S_{ar}:	14 mm
Switching conditions indicator:	LED
Switching voltage:	max. 250 VAC
Switching current:	max. 5 A
Switching capacity:	max. 1250 W
Output:	1 enabling circuit
U_e:	24 VDC
I_e:	max. 40 mA
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +70 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55Hz, amplitude 1 mm

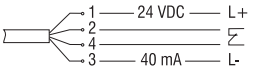
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	20.000.000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NC



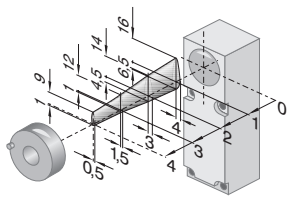
Ordering details

BNS 333-01Y①-M20

No.	Option	Description
①		Actuating plane:
	V	axial
	R	right
	L	left
	D	front (cover)
	U	rear

The actuating magnet must be ordered separately. Refer fo page 1-110.

Note

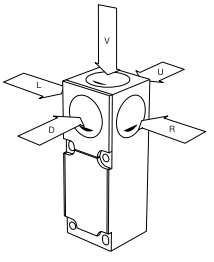


Enabling zone

Important Note:

The BNS333 is a 4-wire sensor designed to satisfy PLc per EN ISO 13849-1, or control Category 1 per EN 954-1. They are not designed for use with a separate safety controller.

Note



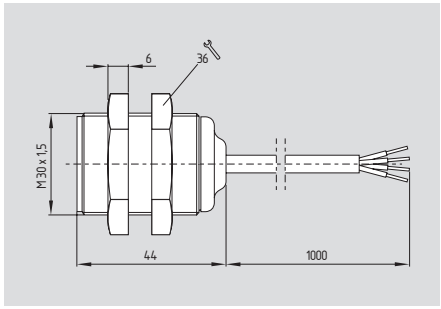
different directions of actuation: cover, front and below, right and left

Contact symbols shown for the closed condition of the guard device.

The LED is illuminated when the guard door is closed.

Coded magnet safety sensors

BNS 303



- Thermoplastic enclosure
- Coded
- Long life, no mechanical wear
- Protection class IP67
- Insensitive to lateral misalignment
- Insensitive to soiling
- With actuator BPS 303 SS suitable for food processing industry
- With LED available
- EX version available

Approvals

Technical data

Standards:	IEC 60947-5-3; BG-GS-ET-14
Design:	cylindrical
Enclosure:	glass fiber reinforced thermoplastic, 2 nuts thermoplastic, tightening force A/F 36: max. 300 Ncm
Protection class:	IP67 to EN 60529
Connection:	Boflex cable,
- Ordering suffix -ST:	connector M12
Cable section:	4 x 0.25 mm²
Mode of operation:	magnetic
Actuating magnet:	BPS 300, BPS 303, BPS 303 SS, coded
S_{ao}:	5 mm
- Ordering suffix -2211:	8 mm
S_{ar}:	15 mm
- Ordering suffix -2211:	18 mm
Switching conditions indicator:	LED only for ordering suffix G
Switching voltage	
- without LED:	max. 100 VAC/DC
- with LED:	max. 24 VDC
- with connector:	max. 100 VAC/DC
Switching current	
- without LED:	max. 400 mA
- 03Z:	max. 250 mA
- with LED:	max. 10 mA
Switching capacity	
- without LED:	max. 10 W
- with LED:	max. 240 mW
Ambient temperature:	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +70 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55Hz, amplitude 1 mm

Classification:

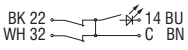
Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	25.000.000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

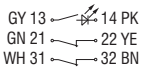
1 NO / 1 NC

1 NO / 2 NC

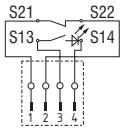


3 NC

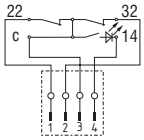
1 NO / 2 NC
(Ordering suffix -2187)



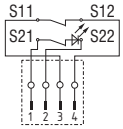
Connector
1 NO / 1 NC



1 NO / 2 NC



2 NC
(Ordering suffix -2211)



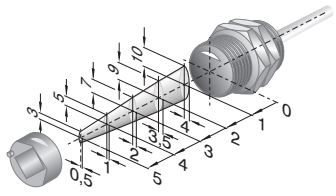
Ordering details

BNS 303-①Z②-③-④

No.	Option	Description
①	11	1 NO / 1 NC
	12	1 NO / 1 NC
	02	2 NC
	03	3 NC
②		Without LED
	G	With LED
③		With cable
	ST	With connector M12
④	2187	Individual contact outlet
	2211	Increased switching distance

The actuating magnet must be ordered separately. Refer fo page 1-110.

Note



Enabling zone
Important Note:
Series BNS sensors are only for use in safety applications when used with an electrically compatible safety controller or safety PLC
(See section 5 for appropriate safety controllers)

Note

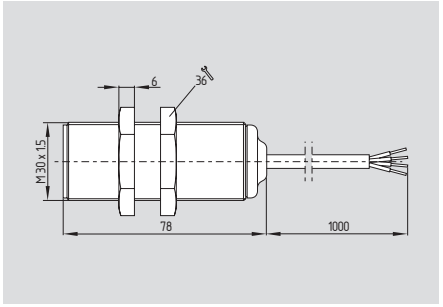
Contact symbols shown for the closed condition of the guard device.

The contact configuration for versions with or without LED is identical.

The LED is illuminated when the guard door is closed.

Coded magnet safety sensors

BNS 300



- With integral evaluation
- Thermoplastic enclosure
- Coded
- Long life, no mechanical wear
- Protection class IP67
- Insensitive to lateral misalignment
- Concealed mounting possible
- Insensitive to soiling
- With LED
- With actuator BPS 303 SS suitable for food processing industry

Technical data

Standards:	IEC 60947-5-3, BG-GS-ET-14
Design:	cylindrical
Enclosure:	glass fiber reinforced thermoplastic, 2 nuts thermoplastic, tightening force A/F 36: max. 300 Ncm
Protection class:	IP67 to EN 60529
Connection:	Boflex cable,
- Ordering suffix -ST:	connector M12
Cable section:	4 x 0.75 mm²
Mode of operation:	magnetic
Actuating magnet:	BPS 300, BPS 303, BPS 303 SS, coded
S_{ao}:	5 mm
- Ordering suffix -2211	8 mm
S_{ar}:	15 mm
- Ordering suffix -2211	18 mm
Switching conditions indicator:	LED
Switching voltage:	max. 250 VAC
Switching current:	max. 3 A
Switching capacity:	max. 750 W
Output:	1 enabling circuit
U_e:	24 VDC
I_e:	30 mA
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +70 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55Hz, amplitude 1 mm

Classification:

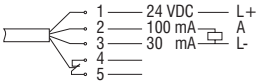
Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	20.000.000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

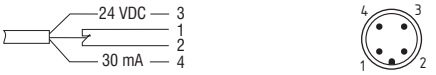
Contact variants

1 NC

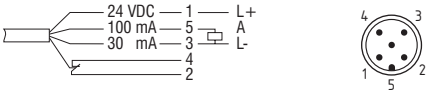
1 NC
Supplementary signal output
(Ordering suffix -2230)



Connector
1 NC



1 NC
Supplementary signal output
(Ordering suffix -2230)



Approvals

cULus CE

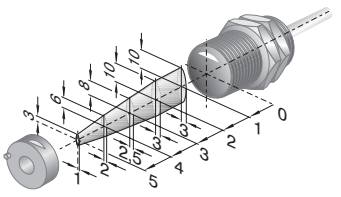
Ordering details

BNS 300-01ZG-①-②

No.	Option	Description
①		With cable
	ST	With connector M12
②	2211	Increased switching distance
	2230	Supplementary signal output
	2246	U_e 42 VAC

The actuating magnet must be ordered separately. Refer fo page 1-110
.

Note



Enabling zone

Note

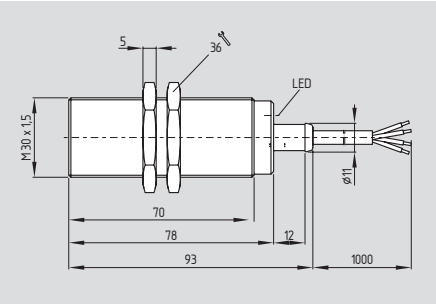
Contact symbols shown for the closed condition of the guard device.

The LED is illuminated when the guard door is closed.

Important Note:
The BNS300 is a 4-wire sensor designed to satisfy PLc per EN ISO 13849-1, or control Category 1 per EN 954-1. They are not designed for use with a separate safety controller.

Coded magnet safety sensors

BNS 30



- With integral evaluation
- Metal enclosure
- Coded
- Long life, no mechanical wear
- Protection class IP67
- Insensitive to lateral misalignment
- Concealed mounting possible
- Insensitive to soiling
- With LED possible
- With actuator BPS 303 SS suitable for food processing industry

Approvals

Technical data

Standards:	IEC 60947-5-3, BG-GS-ET-14
Design:	cylindrical
Enclosure:	nickel-plated brass
Protection class:	IP67 to EN 60529
Connection:	Boflex cable,
- Ordering suffix -ST:	connector M12
Cable section:	4 x 0.75 mm²
Mode of operation:	magnetic
Actuating magnet:	BPS 300, BPS 303, BPS 303 SS, coded
S_{ao}:	5 mm
- Ordering suffix -2211, -2334	8 mm
S_{ar}:	15 mm
- Ordering suffix -2211, -2334	18 mm
Switching conditions indicator:	LED
Switching voltage:	max. 250 VAC
Switching current:	max. 3 A
Switching capacity:	max. 750 W
Output:	1 enabling circuit
U_e:	24 VDC
I_e:	30 mA
Ambient temperature:	−25 °C … +55 °C
Storage and transport temperature:	−25 °C … +70 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55Hz, amplitude 1 mm

Classification:

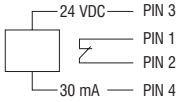
Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	20.000.000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

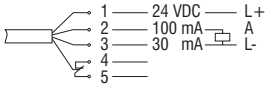
Contact variants

1 NC

Connector -ST



1 NC
Supplementary signal output
Ordering suffix -2230 and -2334



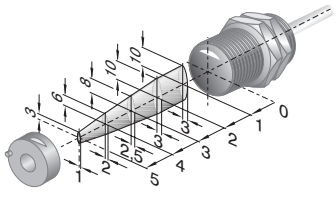
Ordering details

BNS 30-01Z①-②-③

No.	Option	Description
①		Without LED
	G	With LED (only for cable)
②		With cable
	ST	With connector M12
③	2211	Increased switching distance
	2230	Supplementary signal output
	2334	Increased switching distance and supplementary signal output
	2246	U_e 42 VAC

The actuating magnet must be ordered separately. Refer fo page 1-110.

Note



Enabling zone

Note

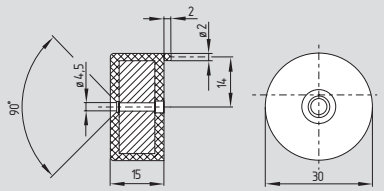
Contact symbols shown for the closed condition of the guard device.

The LED is illuminated when the guard door is closed.

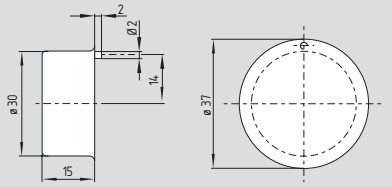
Important Note:
The BNS30 is a 4-wire sensor designed to satisfy PLc per EN ISO 13849-1, or control Category 1 per EN 954-1. They are not designed for use with a separate safety controller.

Coded magnet safety sensors

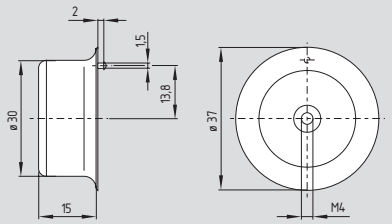
System components



BPS 300



BPS 303



BPS 303 SS

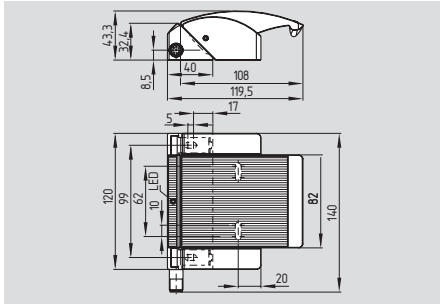
Ordering details

Actuating magnet:

thermoplastic enclosure	**BPS 300**
For food processing industry rear mounted:	
thermoplastic enclosure	**BPS 303**
stainless steel enclosure	**BPS 303 SS**

Coded magnet safety sensors

BNS-B20



- Thermoplastic enclosure
- Non-contact safety switch
- No protruding actuator, no risk of injury
- Does not protrude into the door opening
- Substitutes door-handle and safety switch, no further door fittings required
- Modern and symmetric design
- Fitted with four screws only
- Latching force of approx. 100 N
- Tamper-proof because of integral coded safety sensor
- LED indication
- Ergonomic operation
- Suitable for hinged and sliding guards
- AS-Interface Safety at Work available

Approvals

Technical data

Standards:	IEC 60947-5-3; BG-GS-ET-14
Enclosure:	glass fiber reinforced thermoplastic
Protection class:	IP67 to EN 60529
Connection:	connector M12, 8-pole or cable LiYY 6 x 0.25 mm²
Mode of operation:	magnetic
S_{ao}:	0 mm
S_{ar}:	22 mm
Switching conditions indicator:	LED only for ordering suffix G
Switching voltage	
- with connector:	max. 24 VDC
- with connector and LED:	max. 24 VDC
- with cable:	max. 110 VAC/DC
- with cable and LED:	max. 24 VDC
Switching current	
- with LED:	max. 10 mA
- without LED:	max. 250 mA
Switching capacity	
- with LED:	max. 240 mW
- without LED:	max. 3 W
Signalling contact	
- NO/NC connection:	S31-S32
- NC/NC connection:	S13-S14
Safety contacts	
- NO/NC connection:	S13-S14; S21-S22
- NC/NC connection:	S21-S22; S31-S32
Ambient temperature:	−25 °C … +70 °C
Storage and transport temperature:	−25 °C … +70 °C
Switching frequency:	max. 5 Hz
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 ... 55 Hz, amplitude 1 mm
Max. door weight:	hinged guard: 5 kg sliding guard: 3 kg

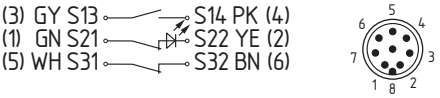
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC/NO):	25.000.000 for 20% contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NO / 2 NC



1 NO / 1 NC

2 NC

Important Note:
Series BNS sensors are only for use in safety applications when used with an electrically compatible safety controller or safety PLC (See section 5 for appropriate safety controllers)

Ordering details

BNS-B20-①Z②-③-④ Sensor

No.	Option	Description
①	12	1 NO / 2 NC
	11	1 NO / 1 NC
	02	2 NC
②		Without LED
	G	With LED
③		With bottom cable
	H	With rear cable
	ST	With bottom M12 connector
④	L	Left hand door *
	R	Right hand door *

* Only for bottom cable or connector version

Note

The safety sensor and the actuator must be ordered separately.

Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

The BNS-B20 can be connected to:
- safety monitoring relays with NO/NC inputs, the remaining NC contact can be used as signalling contact
- safety monitoring relays with NC/NC inputs, the remaining NO contact can be used as signalling contact.

Note

Contact S21-S22 must always be integrated in the safety circuit.

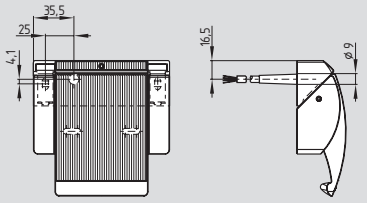
Contact symbols shown for the closed condition of the guard device.

The contact configuration for versions with or without LED is identical.

The LED is illuminated when the guard door is closed.

Coded magnet safety sensors

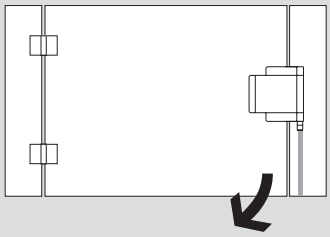
System components



Rear cable

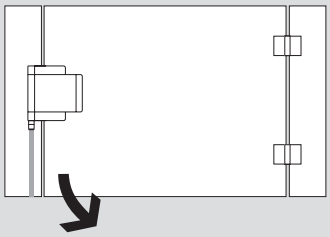
System components

BNS-B20-B01



Left hand door

Connector



Right hand door

Ordering details

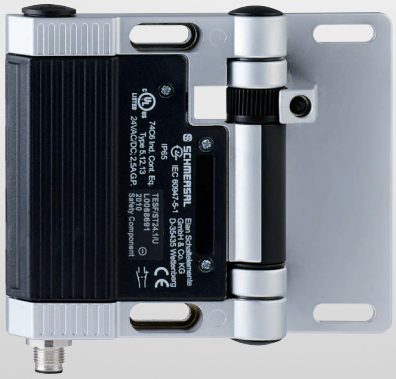
Rear cable	**Ordering suffix -H**
Left hand door	**Ordering suffix -L**
Right hand door	**Ordering suffix -R**

Ordering details

Actuator	**BNS-B20-B01**

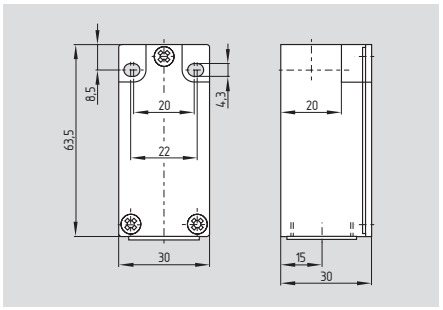
The safety sensor and the actuator must be ordered separately.

Connector M12, 4-pole	
without cable	**101209950**
with cable 5 m	**101208523**
Connector M12, 8-pole	
with cable 5 m	**101209967**



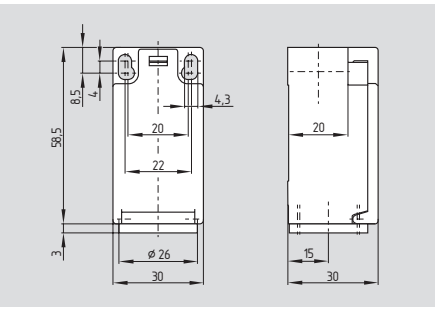
Position or limit switches are used with movable machine guards or detect the presence of materials. These switches feature positive break contacts which make them suitable for safety applications.	Position Switches	1-112
Hinged switches are used to monitor the position of hinged safety guards. They prevent machine operation while the door is ajar.	Hinged Switches	1-116

Z/T 235



- Metal enclosure
- Available with 2 positive break NC contacts
- Snap action with constant contact pressure up to switching point
- Slow action available with overlapping or staggered contacts
- Wiring compartment
- 1 cable entry M20
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- Metal roller available on request
- EX version available
- AS-Interface Safety at Work available

Z/T 236



- Thermoplastic enclosure
- Double insulated ⧈
- Available with 2 positive break NC contacts
- Snap action with constant contact pressure up to switching point
- Slow action available with overlapping or staggered contacts
- 1 cable entry M20
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- AS-Interface Safety at Work available

Approvals

cULus CCC CE

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Design:	fixings to EN 50047
Enclosure:	Z/T 235: zinc die-cast, enamel finish Z/T 236: Glass fiber reinforced thermoplastic
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow or snap action, NC contacts with positive break
Connection:	screw terminals
Cable section:	max. 2.5 mm², min. 0.75 mm² (incl. conductor ferrules)
Cable entry:	1 x M20
U_{imp}:	6 kV connector: 0.8 kV
U_i:	500 V connector: 50 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 1 A / 24 VDC connector: 4 A / 50 V
Max. fuse rating:	6 A gG D-fuse
Ambient temperature:	−30 °C … +80 °C
Mechanical life:	20 million operations
Switching frequency:	max. 5,000/h
Bounce duration:	snap action: < 3 ms; slow action: in accordance with actuating speed
Switchover time:	snap action: > 5.5 ms; slow action: in accordance with actuating speed

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	20,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Ordering details

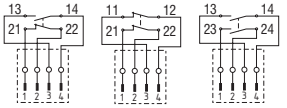
①② **23**③-④**Z**⑤-⑥-⑦-⑧-⑨

No.	Option	Description
①	Z	Snap action ⊖
	T	Slow action ⊖
②	For the appropriate actuator: see page 1-115	
③	5	Metal housing
	6	Plastic housing
④	02	2 NC
	11	1 NO / 1 NC
	20	2 NO *
⑤	H	Slow action with staggered contacts
	UE	with overlapping contacts

Ordering details

No.	Option	Description
⑥		Cable entry M20
	NPT	Cable entry NPT 1/2“
	ST	Connector M12 (A-Coding)
	2310	(B-Coding)
⑦	1297	Enclosure with transversely slotted mounting holes
⑧	2138	Roller lever 7H for safety duties
⑨	1637	Gold-plated contacts

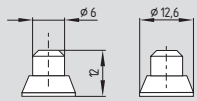
Note



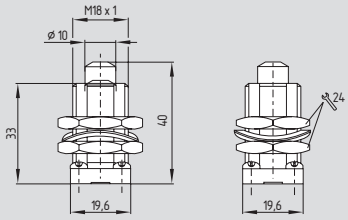
Caution! The versions with connector may only be used in PELV circuits to EN 60204-1.

* Switches with 2 NO contacts (20) are only available for T (Slow Action) versions and are only suitable for positioning tasks.

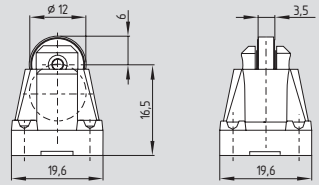
Plunger / lever options



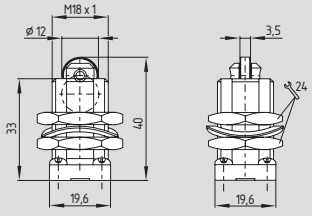
Plunger S



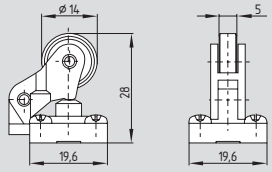
Plunger 4S



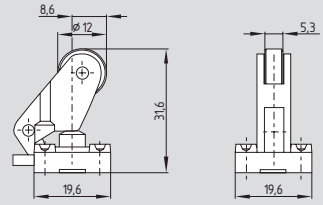
Plunger R



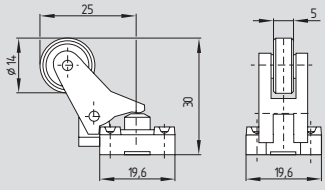
Plunger 4R



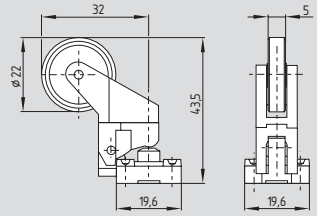
Offset Roller Lever 1R



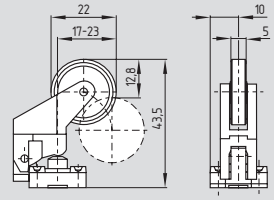
Offset Roller K



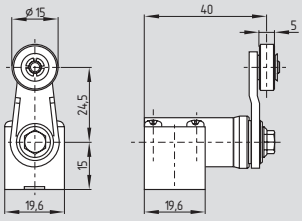
Angle Roller Lever 3K



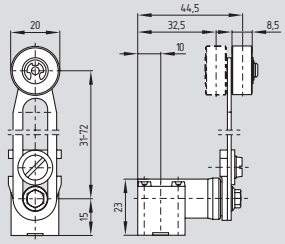
Angle Roller Lever 4K



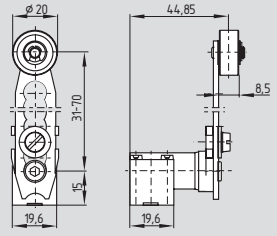
Angle Roller Lever K4



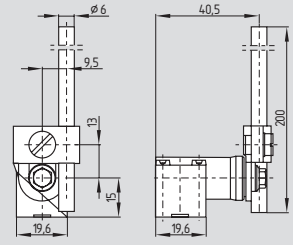
Roller Lever 1H



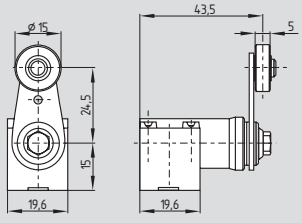
Roller Lever 7H



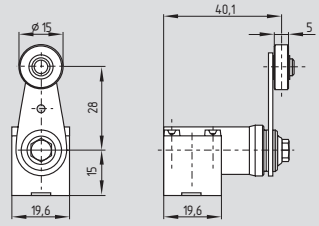
Roller Lever 7H-2138



Roller Lever 10H

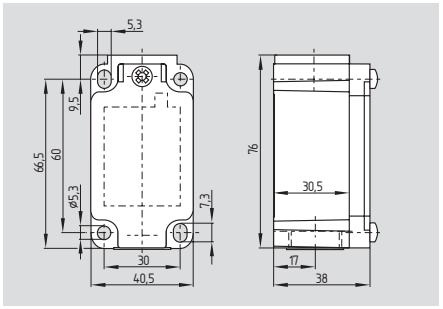


Roller Lever 12H



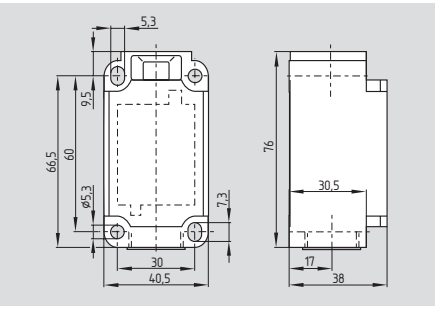
Roller Lever 14H

Z/T 335



- Metal enclosure
- Snap action with constant contact pressure up to switching point
- Slow or snap action available with 2 positive break NC contacts to EN 60947-5-1
- Slow action available with overlapping or staggered contacts
- 1 cable entry M20
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- Metal roller available on request
- EX version available
- AS-Interface Safety at Work available

Z/T 336



- Thermoplastic enclosure
- Double insulated ⧈
- Slow action or snap action available with 2 positive break NC contacts to EN 60947-5-1
- Snap action with constant contact pressure up to switching point
- Slow action available with overlapping or staggered contacts
- 1 cable entry M20
- Wide range of alternative actuators
- Actuator heads can be repositioned by 4 x 90°
- Angle of roller lever adjustable in 10° steps
- Good resistance to oil and petroleum spirit
- Metal roller available on request
- AS-Interface Safety at Work available

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Design:	DIN EN 50041
Enclosure:	335: light-alloy die cast, paint finish 336: Glass fiber reinforced thermoplastic
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow or snap action, NC contacts with positive break
Connection:	screw terminals
Cable section:	max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	1 x M20
U_{imp}:	6 kV -03z, -12z: 4kV connector: 0.8 kV
U_i:	500 V -03z, -12z: 250 V connector: 50 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC connector: 4 A / 50 V
Max. fuse rating:	6 A gG D-fuse
Ambient temperature:	−30 °C … +80 °C
Mechanical life:	30 million operations
Switching frequency:	max. 5,000/h
Bounce duration:	snap action: in accordance with actuating speed; slow action: < 2ms
Switchover time:	snap action: < 2 ms; slow action: in accordance with actuating speed

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	20,000,000
B_{10d} (NO):	1,000,000 for max. 10% ohmic contact load
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Approvals

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Ordering details

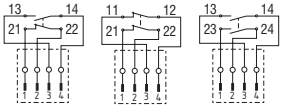
①② **33**③-④**Z**⑤-⑥-⑦-⑧-⑨

No.	Option	Description
①	Z	Snap action ⊖
	T	Slow action ⊖
②		For the appropriate actuator: see page 1-117
③	5	Metal housing
	6	Plastic housing
④	11	1 NO / 1 NC
	02	2 NC
	20	2 NO *
	01/01	1 NC left / 1 NC right
	12	1 NO / 2 NC**
	03	3 NC**
⑤	H	Slow action with staggered contacts
	UE	with overlapping contacts

Ordering details

No.	Option	Description
⑥	G24	With LED
⑦		Cable entry M20
	NPT	Cable entry NPT 1/2“
	ST	Connector M12 (A-Coding)
	2310	(B-Coding)
⑧	2138	Roller lever 7H for safety duties
⑨	1637	Gold-plated contacts

Note

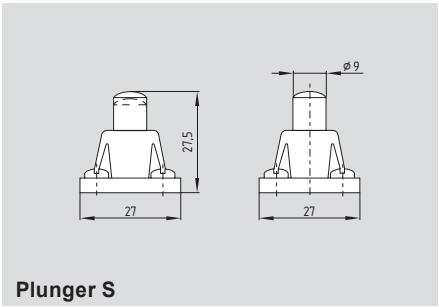


Caution! The versions with connector may only be used in PELV circuits to EN 60204-1.

* Switches with 2 NO contacts (20) are only available for T (Slow Action) versions and are only suitable for positioning tasks.

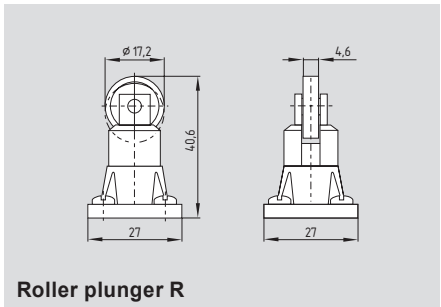
** Switches with 1 NO & 2 NC contacts (12) or 3 NC contacts (03) are only available for 335 (metal) housings with T (Slow Action) contacts.

Plunger / Lever options



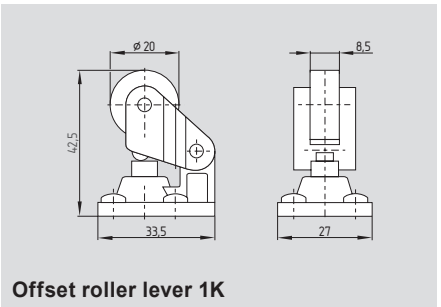
Plunger S

- Actuator type B to EN 50041
- Required actuating force:
  12 N for snap action,
  17 N for slow action
- Actuating speed with actuating angle 0° to switch axis, max. 0.5 m/s



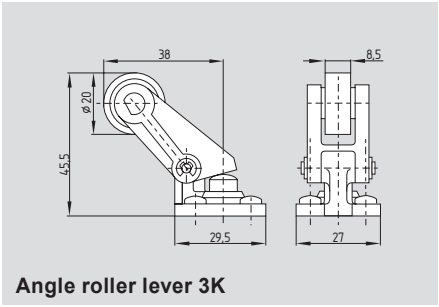
Roller plunger R

- Actuator type C to EN 50041
- Required actuating force:
  12 N for snap action,
  17 N for slow action
- Actuating speed with actuating angle 30° to switch axis: max. 0.5 m/s



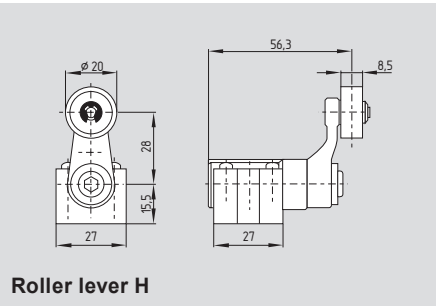
Offset roller lever 1K

- Required actuating force:
  12 N for snap action,
  17 N for slow action
- Actuating speed with actuating angle 30° to switch axis: max. 0.5 m/s



Angle roller lever 3K

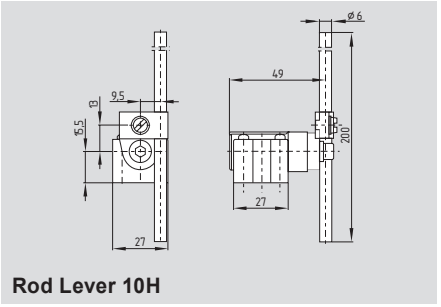
- Required actuating force:
  12 N for snap action,
  17 N for slow action
- Actuating speed with actuating angle 30° to switch axis: max. 0.5 m/s
- Actuation parallel to axis of switch from below



Roller lever H

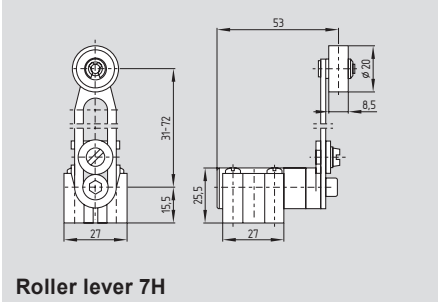
- Actuator type A to EN 50041
- Required actuating torque:
  26 Ncm for snap action,
  31 Ncm for slow action
- Actuating speed with actuating angle 30° to switch axis: max. 2.5 m/s

On version TVH ...-01/01z positive break only to one side.



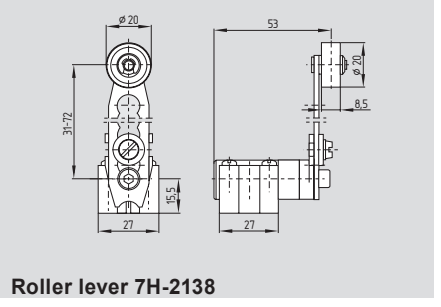
Rod Lever 10H

- **Only for positioning tasks**
- Actuator type D to EN 50041
- Plastic rod
- Required actuating torque:
  26 Ncm for snap action,
  31 Ncm for slow action
- Actuating speed with actuating angle 30° to switch axis: max. 2.5 m/s
- Aluminum rod, ordering suffix -1183



Roller lever 7H

- **Only for positioning tasks**
- Required actuating torque:
  26 Ncm for snap action,
  31 Ncm for slow action
- Actuating speed with actuating angle 30° to switch axis: max. 2.5 m/s

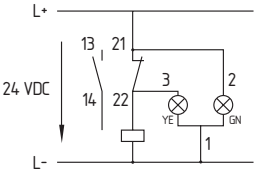


Roller lever 7H-2138

- For safety tasks ⊖, positive break
- Required actuating torque:
  26 Ncm for snap action,
  31 Ncm for slow action
- Actuating speed with actuating angle 30° to switch axis: max. 2.5 m/s

On version TV7H ...-01/01z-2138 positive break only to one side.

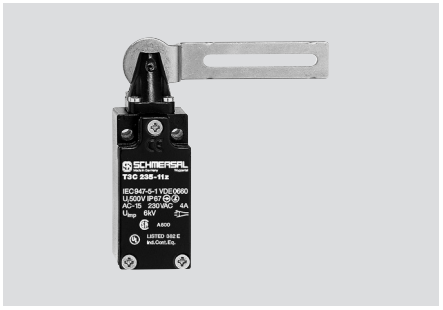
Note

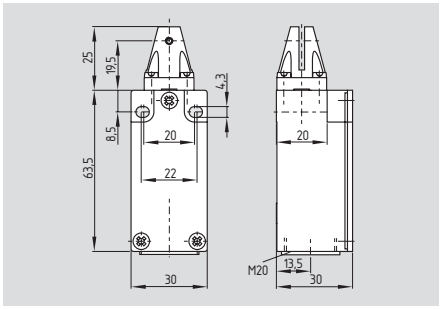


LED version
Ordering suffix G24, Protected against incorrect polarity and voltage spikes.

Safety switch for hinged guards

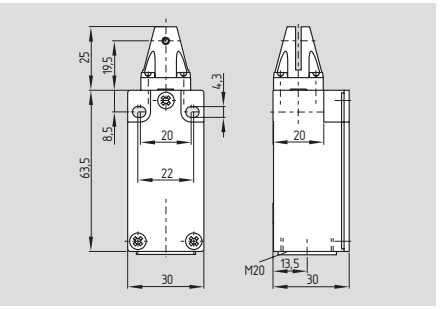
T.C 235





- Metal enclosure
- Versions available for left-hand (T3C 235), right-hand (T5C 235) and swing-doors (T4C 235)
- 1 cable entry M20
- Good resistance to oil and petroleum spirit
- Actuator heads can be repositioned in steps 4 x 90°
- Opening angle 180°
- Stainless steel actuator
- EX version available

T.C 236



- Thermoplastic enclosure
- Versions available for left-hand (T3C 236), right-hand (T5C 236) and swing-doors (T4C 236)
- Double insulated ⧈
- 1 cable entry M20
- Good resistance to oil and petroleum spirit
- Actuator heads can be repositioned in steps 4 x 90°
- Opening angle 180°
- Stainless steel actuator

Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Design:	fixings to EN 50047
Enclosure:	235: light-alloy diecast, paint finish 236: Glass fiber reinforced thermoplastic
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break Zb or 1 NC or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals
Cable section:	max. 2.5 mm², min. 0.75 mm² (incl. conductor ferrules)
Cable entry:	1 x M20
U_{imp}:	6 kV connector: 0.8 kV
U_i:	500 V connector: 50 V
I_{the}:	10 A
Utilization category:	AC-15
I_e/U_e:	4 A / 230 VAC 1 A / 24 VDC connector: 4 A / 50 V
Max. fuse rating:	6 A gG D-fuse
Ambient temperature:	−30 °C … +80 °C
Mechanical life:	> 1 million operations
Switching frequency:	max. 5,000/h
Positive break angle:	12.5°
Positive break torque:	0.185 Nm
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	20,000,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Approvals

Ordering details

T①C 235-②Z-③

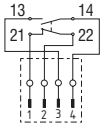
No.	Option	Description
①	3	Left-hand version
	4	Swing-door version
	5	Right-hand version
②	01	1 NC
	02	2 NC
	11	1 NO / 1 NC
③		Cable entry M20
	ST	Connector M12 (A-Coding)
	2310	(B-Coding)

Note

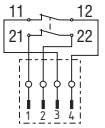
Caution! The versions with connector may only be used in PELV circuits to EN 60204-1.

Connector

1 NO
1 NC



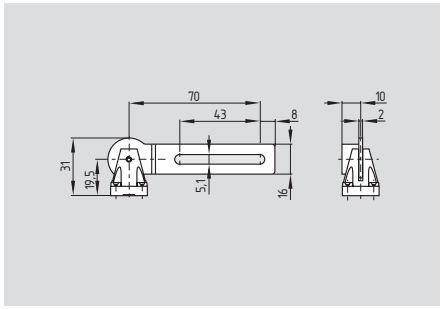
2 NC



For more information, see our online product catalog: www.usa.schmersal.net

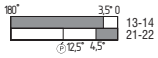
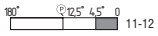
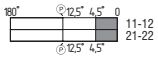
Safety switch for hinged guards

Left-hand version (3)

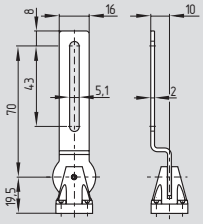


- Good resistance to oil and petroleum spirit
- Actuator heads can be repositioned by 4 x 90°
- Opening angle 180°

Closed guard device = 0° in contact switch travel diagrams.
This is the rest position of the switch

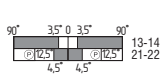
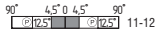
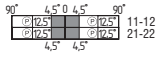
Contacts/ Switch travel	Slow action
1 NO **1 NC**	**T3C 235-11Z** **T3C 236-11Z** 
1 NC	**T3C 235-01Z** **T3C 236-01Z** 
2 NC	**T3C 235-02Z** **T3C 236-02Z** 

Swing-door version (4)

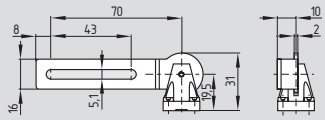


- Good resistance to oil and petroleum spirit
- Actuator heads can be repositioned in steps 4 x 90°
- Opening angle 2 x 90°

Closed guard device = 0° in contact switch travel diagrams.
This is the rest position of the switch

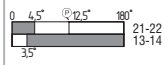
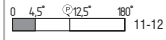
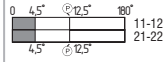
Contacts/ Switch travel	Slow action
1 NO **1 NC**	**T4C 235-11Z** **T4C 236-11Z** 
1 NC	**T4C 235-01Z** **T4C 236-01Z** 
2 NC	**T4C 235-02Z** **T4C 236-02Z** 

Right-hand version (5)



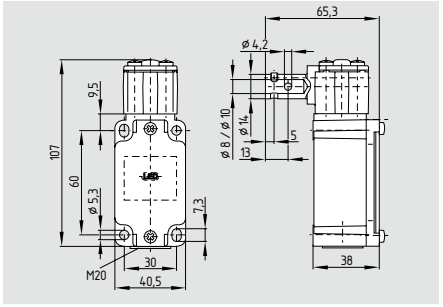
- Good resistance to oil and petroleum spirit
- Actuator heads can be repositioned by 4 x 90°
- Opening angle 180°

Closed guard device = 0° in contact switch travel diagrams.
This is the rest position of the switch

Contacts/Switch travel	Slow action
1 NO **1 NC**	**T5C 235-11Z** **T5C 236-11Z** 
1 NC	**T5C 235-01Z** **T5C 236-01Z** 
2 NC	**T5C 235-02Z** **T5C 236-02Z** 

Safety switch for hinged guards

TV.S 335



- Metal enclosure
- Good resistance to oil and petroleum spirit
- Actuator heads can be repositioned in steps 4 x 90° using Torx T 20 srewdriver and pin
- Actuator shaft can be turned 360°
- 1 cable entry M20
- LED version available
- Shaft bore Ø 8 mm or 10 mm

Approvals

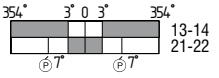
Technical data

Standards:	IEC/EN 60947-5-1 EN ISO 13849-1 BG-GS-ET-15
Design:	fixings to EN 50041
Enclosure:	light-alloy diecast, paint finish
Protection class:	IP67 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break Zb or 1 NC or 2 NC contacts, with galvanically separated contact bridges
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals or connector
Cable section: (rigid/flexible):	min. 0.75 mm² max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	1 x M20
U_{imp}:	6 kV connector: 0.8 kV
U_i:	500 V connector: 50 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC connector: 4 A / 50 V
Max. fuse rating:	6 A gG D-fuse (DIN EN 60269-1)
Ambient temperature:	−25 °C … +70 °C
Mechanical life:	> 1 million operations
Switching frequency:	max. 1,000/h
Shaft bore:	Ø 8 mm / 10 mm
Positive break angle:	7°
Positive break torque:	0.6 Nm
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	20,000,000
Mission time:	20 years

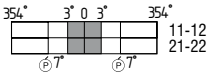
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

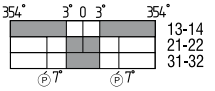
1 NO
1 NC



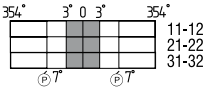
2 NC



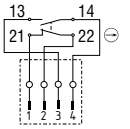
1 NO
2 NC



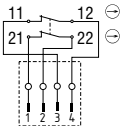
3 NC



Connector
1 NO
1 NC



2 NC

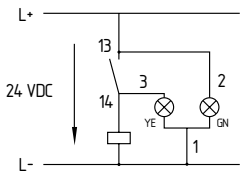


Ordering details

TV①S 335-②Z-③

No.	Option	Description
①	8	Shaft bore Ø 8 mm
	10	Shaft bore Ø 10 mm
②	02	2 NC
	03	3 NC
	11	1 NO / 1 NC
	12	1 NO / 2 NC
③		Cable entry M20
	NPT	Cable entry NPT 1/2“
	ST	Connector M12 (A-Coding)
	2310	(B-Coding)

Note



LED version:
Ordering suffix G24, only available for version with one NO and one NC contact.
Protected against incorrect polarity and voltage spikes.

Note

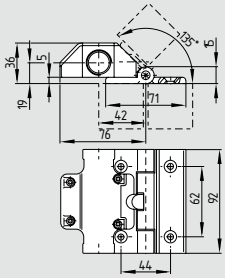
Closed guard device = 0° in contact switch travel diagrams. This is the rest position of switch.

Caution! The versions with connector may only be used in PELV circuits to EN 60204-1.

- Setting assistance: Grub screw for location, shaft pre-drilled for pin
- Universal joint available to compensate for axial displacement (only for shaft bore 10 mm), see the following pages 1-127.

Safety switch for hinged guards

TESZ



- Thermoplastic enclosure
- Double insulated ⧈
- Simple mounting, especially on 40 mm profiles
- Good resistance to oil and petroleum spirit
- 2 cable entries M20
- For left or right hinged doors
- Fixing holes for M6 countersunk screws to DIN 965
- The additional hinge including mounting accessories is also available separately,

Technical data

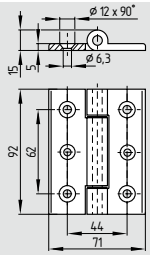
Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	glass fiber reinforced thermoplastic, self-extinguishing
Hinge:	aluminum
Protection class:	IP65 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, type Zb or 3 NC contacts
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals
Cable section:	max. 1 mm² (incl. conductor ferrules)
Cable entry:	2 x M20
U_{imp}:	2.5 kV
U_i:	250 V
I_{the}:	2.5 A
Utilization category:	AC-15, DC-13
I_e/U_e:	2 A / 230 VAC 1 A / 24 VDC
Max. fuse rating:	2 A gG D-fuse
Ambient temperature:	−25 °C … +65 °C
Mechanical life:	> 1 million operations
Switching frequency:	max. 120/h
Positive break angle:	10°

Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

System components



Additional hinge

Part numbers for extra hinges:
(no switch)

TESZ/S/30	for 30 mm profiles
TESZ/S/35	for 35 mm profiles
TES/S	for 40 mm profiles
TES/S/45	for 45 mm profiles

Approvals

BG cULus cCC CE

Ordering details

TESZ ①②③

No.	Option	Description
①	1102	1 NO/2 NC
	1110	3 NC
②		with extra hinge
	S	without extra hinge
③	30	30 mm profiles
	35	35 mm profiles
		40 mm profiles
	45	45 mm profiles

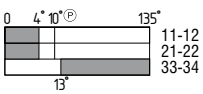
Note

The opening angle has been set to 4° in factory.

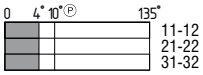
Until the limit of the mechanical life has been reached the angle can increase up to 10° under normal wear-out conditions.

Contact variants

1 NO
2 NC

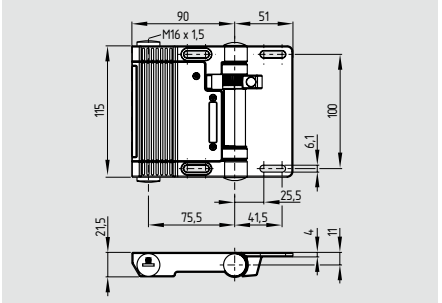


3 NC



Safety switch for hinged guards

TESF



- Metal enclosure
- Adjustable switching angle
- Opening angle 180°
- Mountable on the inside and the outside of the safety guard
- Screw terminals, cage clamps or connector
- Simple mounting, for all common profile systems (30 … 60 mm)
- Oil and petroleum resistant
- 2 cable entries M16
- For left or right hinged doors

Approvals

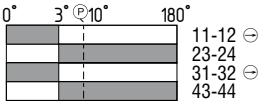
Technical data

Standards:	IEC/EN 60947-5-1 BG-GS-ET-15
Enclosure:	light-alloy diecast
Protection class:	IP65 to EN 60529
Contact material:	AgNi10
Contact type:	2x change-over contact with double break, type Zb
Switching principle:	⊖ IEC 60947-5-1 slow action, NC contact with positive break
Connection:	screw terminals or cage clamps or connector
Cable section:	max. 1 mm² (incl. conductor ferrules)
Cable entry:	2 x M16
U_{imp}:	2.5 kV; ordering suffix ST1 and ST2: 0.8 kV
U_i:	250 V
I_{the}:	2.5 A
Utilization category:	AC-15; DC-13
I_e/U_e:	2 A / 230 VAC; 1 A / 24 VDC
Max. fuse rating:	2 A gG D-fuse to DIN EN 60269-1
Ambient temperature:	−25 °C … +65 °C
Mechanical life:	> 1 million operations
Switching frequency:	120/h
Positive break angle:	10°
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	2,000,000
Mission time:	20 years

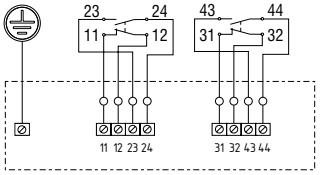
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

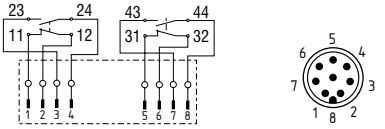
2 NO/2 NC



Screw terminals



Connector ST24.1 or ST24.2



Ordering details

TESF ①-②③④

No.	Option	Description
①		no alignment aid
	A	with alignment aid
②		with extra hinge
	S	without extra hinge
③		Screw Terminals
	ST24.1	connector on bottom
	ST24.2	connector on top
④	0	for inside mounting
	180	for outside mounting
	U	Adjustable switch point

Ordering details

Note

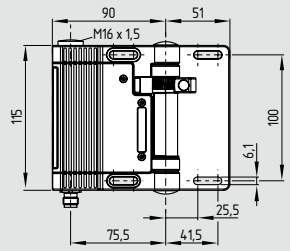
Contact switch travel diagrams: 0° = safety guard closed.

Caution! The versions ST1 and ST2 11/11 may only be used in PELV circuits to EN 60204-1.

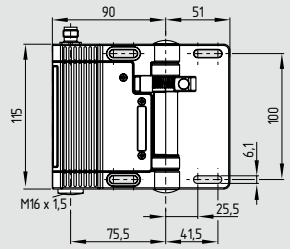
* The factory-set switching angle is 3°. The positive break angle is 5°. Until the limit of the mechanical life has been reached the angle can increase up to 8° under normal wear-out conditions.

Safety switch for hinged guards

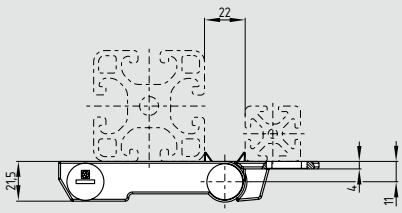
System components



Bottom connector ST24.1

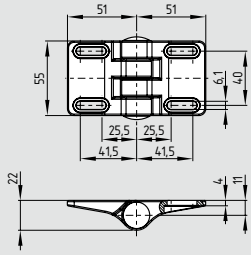


Top connector ST24.2

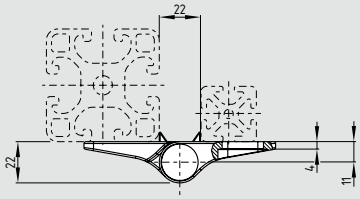


With alignment aid order version A

System components



Additional hinge TESF/S



Additional hinge TESFA/S

Adjustment tool TESF-14

Ordering details

Connector M12, 8 pins, 24 VDC,	
bottom	**ST24.1**
top	**ST24.2**
With alignment aid	**order version A**

Ordering details

Additional hinge	
without alignment aid	**TESF/S**
with alignment aid	**TESFA/S**
Adjustment tool	**TESF-14**

Online Product Catalog

www.usa.schmersal.net

Images available online
Every part number page has an **Image** tab where you can view or download JPG or EPS images of the product, dimensional drawings, switch travel diagrams, or contact diagrams.

The **CAD** tab also has links to download CAD drawings of the part in many popular program formats, so they can be directly incorporated into CAD systems designs.

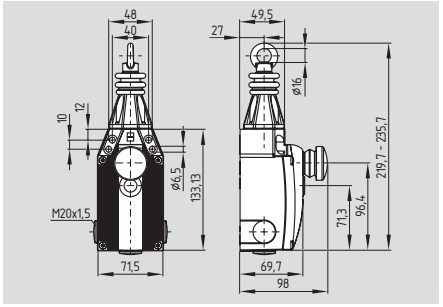
Safe switching and monitoring
Command devices with safety function

The control devices of the Schmersal Group always ensure a safe and reliable transmission of the operator's commands, regardless if safe stopping from dangerous movements or start-up of critical machine functions are concerned.

Apart from many special constructive features, these devices have a long life and an intelligent ergonomic construction.

Pull-wire Emergency-Stop switches

ZQ 900



- To EN ISO 13850 / IEC 60947-5-5
- Metal enclosure
- 4 contacts
- Position indicator
- Robust design
- Large wiring compartment
- 3 cable entries M20
- One tension force for wire lengths from 5 to 50 m
- Wire up to 50 m long
- Reset pushbutton
- Twisting of connection ring not possible
- Optional signaling lamp
- External watertight collar
- Wire pull and breakage function
- EX version available
- AS-Interface Safety at Work available

Approvals

TÜV cULus

CE

Technical data

Standards:	IEC/EN 60947-5-1 IEC/EN 60947-5-5 EN ISO 13850
Enclosure:	zinc die-cast, enameled
Cover:	thermoplastic
Protection class:	IP65, IP67 suffix N: IP65 to IEC/EN 60529
Contact material:	silver
Contact type:	1 NC/1 NO or 2 NC/2 NO or 3 NC/1 NO or 2 NC or 4 NC
Switching principle:	⊖ IEC 60947-5-1 snap action with positive break NC contacts
Connection:	screw terminals
Cable section:	max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	3 x M20
U_{imp}:	6 kV
U_i:	500 V
I_{the}:	6 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 1 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse to DIN EN 60269-1
Ambient temperature:	−25 °C … +70 °C
Mechanical life:	> 1 million operations
Indicator lamp:	optionally
Maximum cable length:	50 m (please observe ambient temperature range and wire supports)
Features:	wire pull and breakage detection

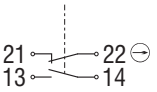
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	100,000
Mission time:	20 years

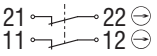
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

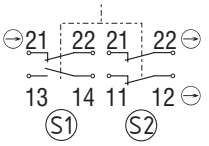
1 NO/1 NC



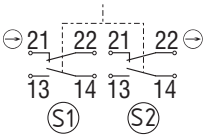
2 NC



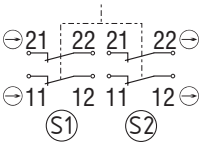
1 NO/3 NC



2 NO/2 NC



4 NC



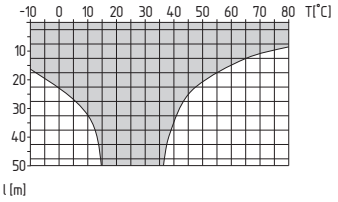
Ordering details

ZQ 900-①②

No.	Replace	Description
①	11	1 NO/1 NC
	13	1 NO/3 NC
	22	2 NO/2 NC
	02	2 NC
	04	4 NC
②		Without emergency-stop pushbutton
	N	Without emergency-stop pushbutton

Note

Recommended cable lengths for pull-wire Emergency-Stop switches in relation to the range of ambient temperature.
At 5 m distance intermediate wire supports are required, see accessories.



Note

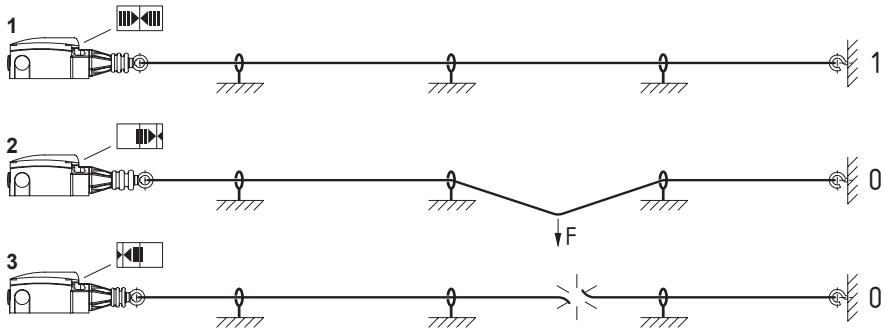
The screwed PL-M20-24V indicator lamp must be ordered separately, see accessories.

The protection class for ordering suffix N is IP65 to IEC/EN 60529.

Mode of operation

Legend
1 Not actuated
2 Wire pull detection
3 Wire breakage detection

Wire pull and breakage detection

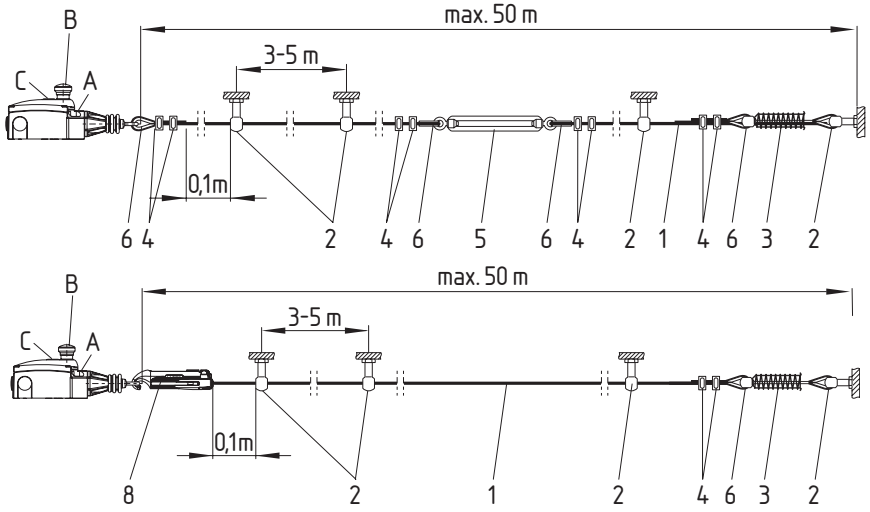


Mounting instructions

Legend
1 Wire rope (STQ441-SC)
2 Eyebolt (STQ441-EB)
3 Spring (STQ441-SS)
4 Wire clamp (STQ441-CC)
5 Tensioner (STQ441-TB)
6 Wire thimble (STQ441-TH)
7 Shackle (S900-SH)
8 Rope tensioner (S900)

A Position indicator
B Emergency-stop pushbutton
C Reset button

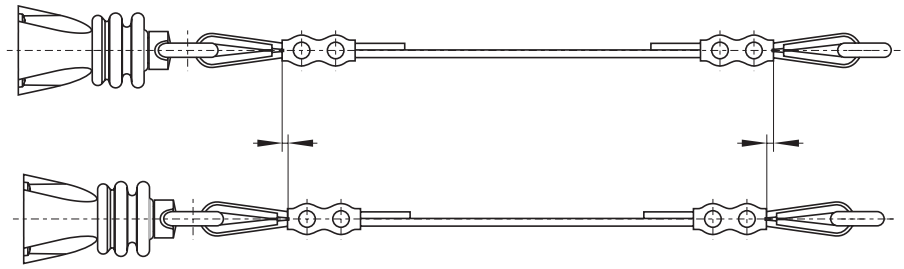
One-side operation



Mounting instructions

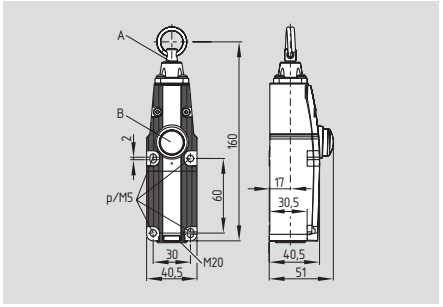
As the thimbles are subject to deformation in case of wire pull, the wire should be pulled several times after fitting.
After that, the wire must be re-tensioned using the eyebolt or the tensioner.

Thimble deformation



Pull-wire Emergency-Stop switches

ZQ 700



- To EN ISO 13850 / IEC 60947-5-5
- Thermoplastic enclosure
- Double insulated ⧈
- 2 contacts
- Position indicator
- Large wiring compartment
- 1 cable entry M20
- One tension force for wire lengths up to 10 m
- Wire up to 10 m long
- Reset button
- Twisting of connection ring not possible
- Wire pull and breakage function
- AS-Interface Safety at Work available

Approvals

TÜV cULus CCC CE

Technical data

Standards:	IEC/EN 60947-5-1 IEC/EN 60947-5-5 EN ISO 13850
Enclosure:	thermoplastic
Cover:	thermoplastic
Protection class:	IP67 to IEC/EN 60529
Contact material:	silver
Contact type:	1 NC/1 NO or 2 NC
Switching principle:	⊖ IEC 60947-5-1 snap action with positive break NC contacts
Connection:	screw terminals
Cable section:	max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	1 x M20
U_{imp}:	6 kV
U_i:	500 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	4 A / 230 VAC 4 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse to DIN EN 60269-1
Ambient temperature:	−25 °C … +70 °C
Mechanical life:	> 1 million operations
Maximum cable length:	10 m (please observe ambient temperature range and wire supports)
Features:	wire pull and breakage detection

Classification:

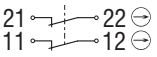
Standards:	EN ISO 13849-1
B_{10d} (NC):	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NO/1 NC

2 NC



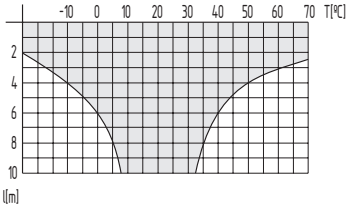
Ordering details

ZQ 700-①

No.	Replace	Description
①	11	1 NO/1 NC
	02	2 NC

Note

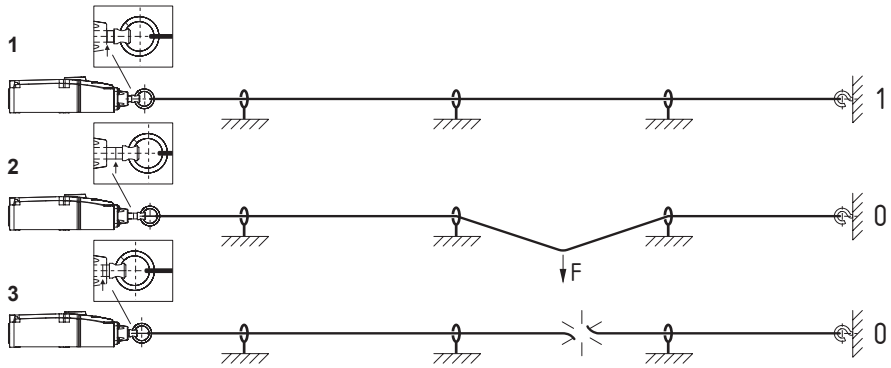
Recommended cable lengths for pull-wire Emergency-Stop switches in relation to the range of ambient temperature.
At 2 to 5 m distance intermediate wire supports are required, see accessories.



Mode of operation

Legend
1 Not actuated
2 Wire pull detection
3 Wire breakage detection

Wire pull and breakage detection

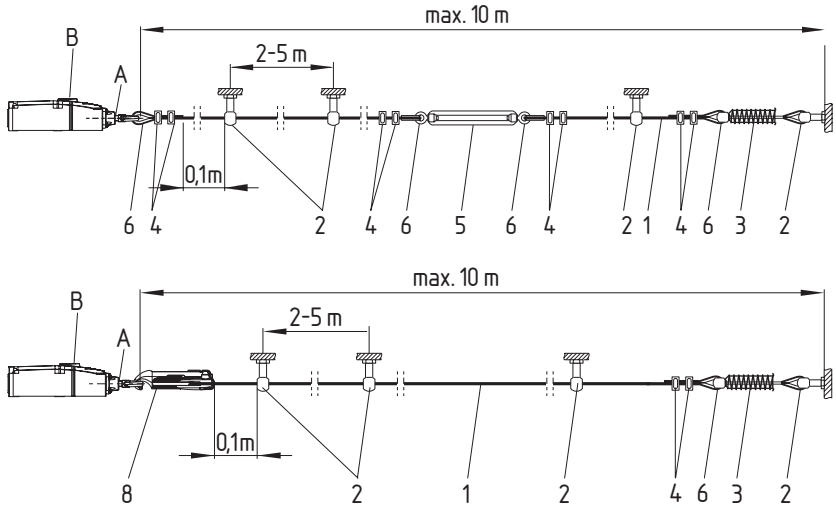


Mounting instructions

Legend
1 Wire rope (STQ441-SC)
2 Eyebolt (STQ441-EB)
3 Spring (STQ441-SS)
4 Wire clamp (STQ441-CC)
5 Tensioner (STQ441-TB)
6 Wire thimble (STQ441-TH)
7 Shackle (S900-SH)
8 Rope tensioner (S900)

A Position indicator
B Reset button

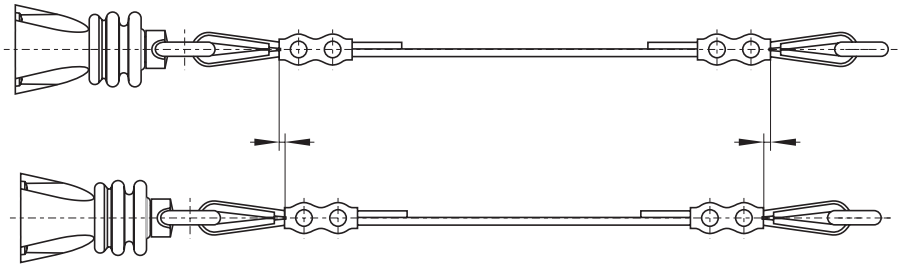
One-side operation



Mounting instructions

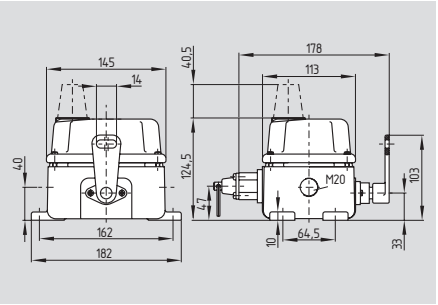
As the thimbles are subject to deformation in case of wire pull, the wire should be pulled several times after fitting.
After that, the wire must be re-tensioned using the eyebolt or the tensioner.

Thimble deformation



Pull-wire Emergency-Stop switches

T3Z 068



- To EN ISO 13850 / IEC 60947-5-5
- Metal enclosure
- Up to 6 contacts
- Robust design
- 2 cable entries M20
- Low actuating force
- Bi-directional actuation
- Wire up to 2 x 50 m long
- Reset by pull-ring or key possible
- Signalling lamp available on request for various voltage

Approvals

Technical data

Standards:	IEC/EN 60947-5-1 IEC/EN 60947-5-5 EN ISO 13850
Enclosure:	cast iron, enamel finsish
Cover:	cast iron, enamel finsish
Protection class:	IP65 to EN 60529
Contact material:	silver
Contact type:	change-over contact with double break, max. 3 NO and 3 NC contacts
Switching principle:	⊖ IEC 60947-5-1 snap action with positive break NC contacts
Connection:	screw terminals
Cable section:	max. 1.5 mm² min. 0.75 mm² (incl. conductor ferrules)
Cable entry:	2 x M20
U_{imp}:	4 kV
U_i:	250 VAC
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	2.5 A / 230 VAC 6 A / 24 VDC
Max. fuse rating:	6 A gG D-fuse
Positive break torque:	1.8 Nm
Angle for positive break travel:	32°
Positive break force:	50 N
Actuating force:	max. 50 N (30 N in direction of rope)
Ambient temperature:	−30 °C … +90 °C
Mechanical life:	50,000 operations
Indicator lamp:	yellow 230 VAC/5 W, BA 15D screw socket
Maximum cable length:	2 x 50 m
Features:	wire pull and breakage detection

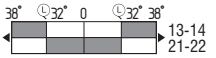
Classification:

Standards:	EN ISO 13849-1
B_{10d} (NC):	100,000
Mission time:	20 years

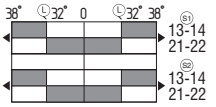
$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

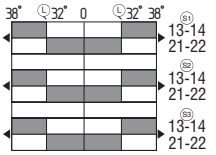
1 NO / 1 NC



2 NO / 2 NC



3 NO / 3 NC



Ordering details

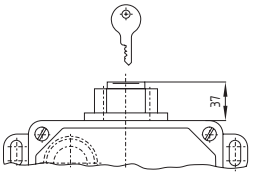
T3Z 068-①YR② ③

No.	Replace	Description
①	11	1NO/1NC
	22	2NO/2NC
	33	3NO/3NC
②		Pull-ring reset
	S	Key reset
③		Without indicator lamp
	G	With indicator lamp

Note

At 3 m distance intermediate wire supports are required, see accessories

Note



Reset by key

Pull-wire Emergency-Stop switches

System components

Eyebolt

System components

Wire thimble

System components

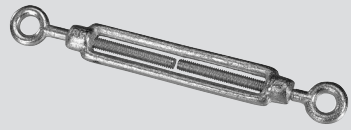
Wire rope

Wire clamp

Pulley

Wire unit complete

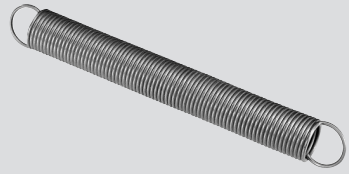
Duplex wire clamp



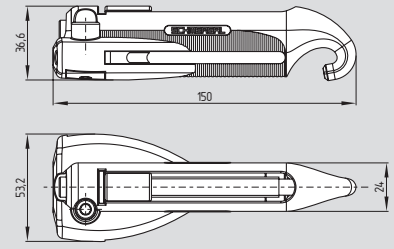
Tensioner

Shackle

Egg-shaped wire clamp



Tension spring



Rope tensioner S 900

Ordering details

Eyebolt with Nut (STQ441-EB)	
BM 10 x 40	**101084928**
BM 8 x 70 (stainless steel)	**101192471**
Wire clamp (STQ441-CC)	
5 mm (stainless steel)	**101203478**
Duplex wire clamp	
3 mm (stainless steel)	**101190917**
Egg-shaped wire clamp	**101077072**

Components identical to image. The dimensions and the design could vary!

Ordering details

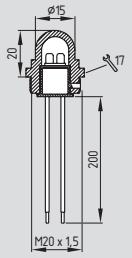
Wire thimble (STQ441-TH)	
5 mm (stainless steel)	**101203476**
Pulley (STQ441-PU)	
(stainless steel)	**101144547**
Tensioner M6 (STQ441-TB)	**101087930**
Tension spring (STQ441-SS)	
RZ-136E (only for T3Z 068)	**101087931**
RZ-2041 (only for TQ/ZQ 900)	**101186696**

Ordering details

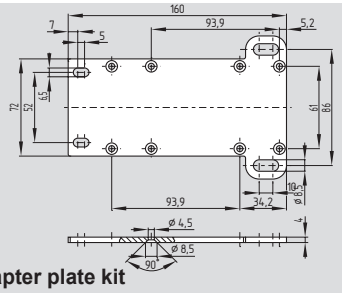
Wire rope (per foot) (STQ441-SC)	**on request**
Wire unit complete	**on request**
Shackle (stainless steel) (S900-SH)	**101186490**
Rope tensioner S 900	**101186704**

Pull-wire Emergency-Stop switches

System components



Signaling lamp



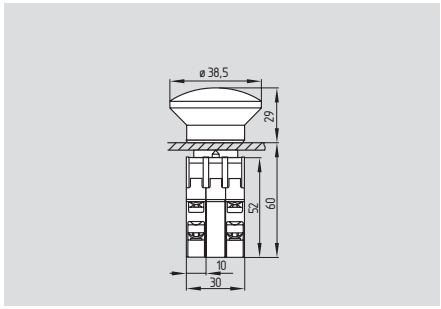
Adapter plate kit

Ordering details

Signaling lamp PL-M20-24V (LED 24 VDC)	**101150877**
Signaling lamp PL-M20-120V (LED 120 VDC)	**801000432**
Adapter plate kit	**101193805**

Emergency-Stop push button

EDRRZ 40 RT



- Metal operator head
- To EN ISO 13850 / IEC 60947-5-5
- Max. 2 NC and 2 NO or 4 NC contacts
- Projection from front of panel 29 mm
- For mounting holes Ø 22.3 mm
- Selection of terminal designations available
- Pull to reset

Approvals

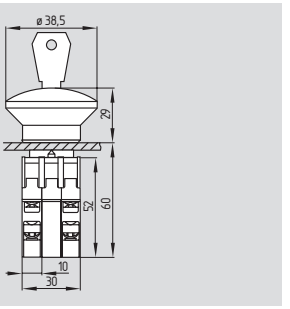
cULus CE

Ordering details

EDRR① 40 RT/②/②/③

No.	Option	Description
①	Z	Pull reset
	S	Key reset
②	EF 303.1	1 NO / 1 NC
	EF 303.2	1 NO / 1 NC
	EF 220.1	2 NC
	EF 220.2	2 NC
	Contact labelling, see contact variants on next page	
③	EFR	Spring element (always to be ordered)

EDRRS 40 RT



- Reset by key
- To EN ISO 13850 / IEC 60947-5-5

Approvals

cULus CE

Note

Other product variants:
- Diameter 16.2 mm and 30.5 mm
- Different diameters for the actuating heads
- Contact elements with push-on spades and (WAGO cage clamps)
- Optionally also completely mounted

Technical data

Standards:	IEC/EN 60947-5-5, EN ISO 13850
Operators:	aluminum
Protection class:	IP65 to EN 60529
Contact material:	silver
Switching principle:	⊖ IEC 60947-5-1 slow action
Contact type:	change-over contact, 2 NC contacts combined as desired
Connection:	screw terminals
	WAGO clip-in terminals on request
Cable section:	max. 2.5 mm²
I_{the}:	10 A
U_i:	400 V
I_e/U_e:	8 A / 230 VAC
	5 A / 24 VDC
Utilization category:	AC-15, DC-13
Max. fuse rating:	10 A gG D-fuse
Contact opening:	> 2 x 1.25 mm
Bounce duration:	< 5 ms at 100 mm/s
Ambient temperature:	−25 °C … +80 °C (−40 °C on request)
Mechanical life:	
- operators:	> 100,000 operations
- contact blocks:	10 million operations
Switching frequency:	600/h
Resistance to shock:	max. 70 g / 4 ms,
- contact block:	110 g / 4 ms
Push button Ø:	38.5 mm
Mounting hole Ø:	22.3 mm
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

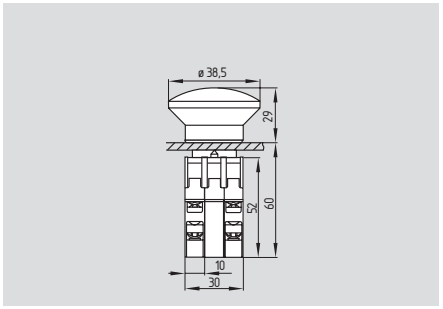
Note

In order to avoid repeating of the same terminal designations in wiring diagrams, contact blocks with the same contact configuration are available with different terminal designations.

Max. 2 NC and 2 NO or 4 NC contacts

Emergency-Stop push button

KDRRKZ 40 RT



- Thermoplastic operator head
- To EN ISO 13850 / IEC 60947-5-5
- Max. 2 NC and 2 NO or 4 NC contacts
- Projection from front of panel 29 mm
- For mounting holes Ø 22.3 mm
- Selection of terminal designations available
- Pull to reset

Technical data

Standards:	IEC/EN 60947-5-5 EN ISO 13850
Operators:	glass fiber reinforced thermoplastic, self-extinguishing
Protection class:	IP65 to EN 60529
Contact material:	silver
Switching principle:	⊖ IEC 60947-5-1 slow action
Contact type:	change-over contact, 2 NC contacts combined as desired
Connection:	screw terminals WAGO clip-in terminals on request
Cable section:	max. 2.5 mm²
U_{imp}:	–
U_i:	400 V
I_e/U_e:	8 A / 230 VAC 5 A / 24 VDC
Utilization category:	AC-15, DC-13
Max. fuse rating:	10 A gG D-fuse
Switching capacity:	–
Contact opening:	> 2 x 1.25 mm
Switchover time:	–
Bounce duration:	< 5 ms at 100 mm/s
Ambient temperature:	−25 °C … +80 °C (−40 °C on request)
Mechanical life:	
- operators:	> 100,000 operations /
- contact blocks:	10 million operations
Switching frequency:	600/h
Resistance to shock:	max. 70 g / 4 ms,
- contact block:	110 g / 4 ms
Push button Ø:	38.5 mm
Mounting hole Ø:	22.3 mm
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Contact variants

1 NO / 1 NC

EF 303.1

EF 303.2

2 NC

EF 220.1

EF 220.2

Approvals

Ordering details

KDRRKZ 40 RT/①/①/②

No.	Option	Description
①	EF 303.1	1 NO / 1 NC
	EF 303.2	1 NO / 1 NC
	EF 220.1	2 NC
	EF 220.2	2 NC
		Contact labelling, see contact variants
②	EFR	Spring element (always to be ordered)

Note

Other product variants:
- Diameter 16.2 mm and 30.5 mm
- Different diameters for the actuating heads
- Contact elements with push-on spades and (WAGO cage clamps)
- Optionally also completely mounted

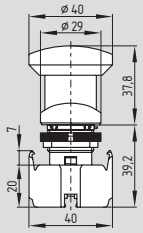
Note

In order to avoid repeating of the same terminal designations in wiring diagrams, contact blocks with the same contact configuration are available with different terminal designations.

Max. 2 NC and 2 NO or 4 NC contacts

Emergency-Stop push button

ADRR 40 RT



- Thermoplastic operator head
- To EN ISO 13850 / IEC 60947-5-5
- Max. 6 contacts in tandem arrangement
- For mounting holes Ø 22.3 mm
- Pull to reset

Technical data

Standards:	IEC/EN 60947-5-5 EN ISO 13850
Operators:	glass fiber reinforced thermoplastic, self-extinguishing
Protection class:	IP65 to EN 60529
Contact material:	silver
Switching principle:	⊖ IEC 60947-5-1 slow action
Contact type:	NO and NC contacts, combined as desired
Connection:	screw terminals
Cable section:	max. 2.5 mm² (incl. conductor ferrules)
U_{imp}:	6 kV
U_i:	400 V
I_{the}:	10 A
I_e/U_e:	8 A / 230 VAC 5 A / 24 VDC
Utilization category:	AC-15, DC-13
Max. fuse rating:	10 A gG D-fuse
Switching capacity:	–
Contact opening:	2 x 1.75 mm
Switchover time:	–
Bounce duration:	–
Ambient temperature:	−25 °C … +60 °C
Mechanical life:	500,000 operations
Switching frequency:	600/h
Resistance to shock:	50 g / 20 ms
Push button Ø:	40 mm
Mounting hole Ø:	22.3 mm
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

System components

Empty enclosure MBK 311/GB

Empty enclosure MBG 311/GB

Emergency-Stop plate MDP-8

Approvals

Ordering details

ADRR 40 RT/①/①

No.	Option	Description
①	AF 02	1 NO
	AF 10	1 NC

Please indicate the number of desired contact elements

Note

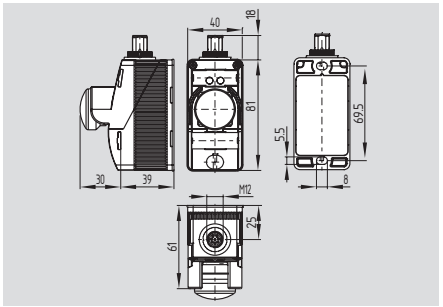
Max. 6 contacts in tandem arrangement

Terminal labelling:
NC contact: 1-2
NO contact: 3-4

Ordering details

Empty enclosure	
thermoplastic:	**MBK 311/GB**
metal:	**MBG 311/GB**
Emergency-Stop plate (yellow)	
aluminum:	**MDP-8**
thermoplastic:	**MDP-8.1**

BDF 100 …-NH



- **Yellow enclosure cover**
- Slim, shock-resistant plastic enclosure
- Can be fitted onto customary aluminum profile systems
- Can be installed in the most favorable ergonomic position
- Emergency stop function with or without protective collar
- Two-layer plastic identification labels can be used (engravements on request)

Approvals

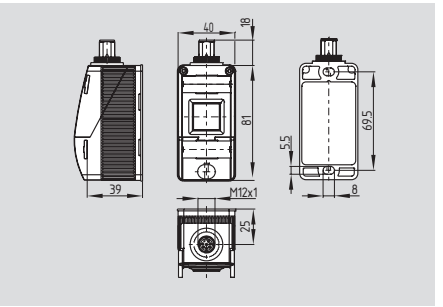
cULus CE

Ordering details

BDF 100-①-G-ST with emergency stop

No.	Option	Description
①	NH	Emergency stop latching pushbutton without protective collar
	NHK	with protective collar

BDF 100



- **Black enclosure cover**
- Comprehensive selection of illuminated pushbuttons, selector switches, signalling devices with LED and key-operated switches
- Start/stop and reset functions available

Approvals

cULus CE

Ordering details

BDF 100-①-②-③-ST

No.	Option	Description
①	20	2 NO contacts
	11	1 NO contact / 1 NC contact
②	…	Selection of the actuator
③		without indicator lamp
	G/RD	Red indicator lamp *
	G/GN	Green indicator lamp *
	G/YE	Yellow indicator lamp *
	G/BU	Blue indicator lamp *
	G/WH	White indicator lamp *

* not for -LT, -LM

Technical data

Standards:	EN 60947-5-1, EN 60947-5-5
Enclosure:	
Enclosure material:	glass fiber reinforced thermoplastic, self-extinguishing
Enclosure protection class:	IP65
Connection:	connector M12, 8-pole
Ambient conditions:	
Ambient temperature:	−25 °C … +65 °C
Climatic resistance:	to DIN EN 60068, Part 2 - 30
Overvoltage category:	III
Degree of pollution:	3
Contact elements:	
Contact material:	AgNi 10, gold-plated
Control elements - protection class:	IP65
Rated operating voltage U_r:	max. 24 V
Utilization category:	AC-15/DC-13
Rated operating current/voltage I_e/U_e:	AC-15: 2 A / 24 VAC DC-13: 1 A / 24 VDC
Thermal test current I_{the}:	2 A
Fuse rating:	2 A slow-blow
Contact system:	cross-point system
Contact force:	0.5 N per contact point = 1 N per contact
Switching of low voltages:	min. 5 V / 1 mA
Switching frequency:	1,200 s/h
Rated insulation voltage U_i:	60 V
Bounce time:	< 2 ms at 100 mm/s operating speed
Mech. lifetime:	1 million operations;
- emergency stop:	100,000 operations
Switch travel:	approx. 3 mm
Resistance to shocks:	100 g / 6 ms
Resistance to vibrations:	20 g, 10 … 100 Hz
Wiring labels:	to EN 60947-1
Actuating force at end of travel (1NC/1NO):	8 N

Note

Example: **BDF 100-NHK-G-ST**
BDF 100-11-LTWH-ST

The description of the suitable control elements can be found on page 2-14

BDF control panel

Technical data

Illuminated pushbuttons:

Enclosure material:	glass fiber reinforced thermoplastic, self-extinguishing
Illuminated pushbutton material:	all-insulated
Front collar material:	plastic
Calotte material:	plastic
Illuminated pushbutton - protection class:	IP65
Rated operating voltage U_r:	max. 24 V
Fuse rating:	2.5 A slow-blow
Rated insulation voltage U_i:	60 V

Lamp values illuminated pushbutton:

Lamp fitting:	Ba5S
LED replacement:	from front
LED power consumption (actuators):	16 mA
Power consumption indicator lamp, red:	20 mA

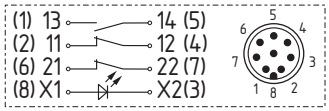
Safety classification emergency stop:

Standards:	EN ISO 13849-1
B_{10d}:	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

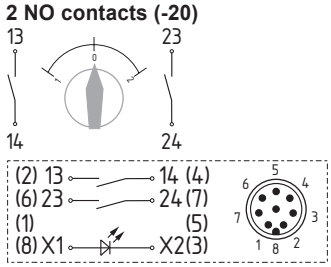
Contact variants

Emergency stop -
1 NO / 2 NC contacts

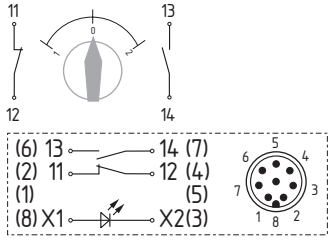


Contact variants

2 NO contacts (-20)



1 NO / 1 NC contact (-11)



Note

Contact symbols shown in non-actuated condition

Note

Pin configuration of the connector indicated between brackets

BDF control panel

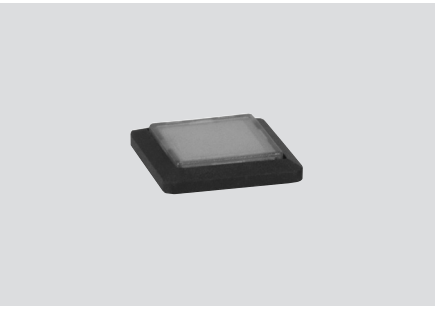
NH / NHK

- **Emergency stop latching pushbutton**
- Mushroom-shaped plastic pushbutton, Ø 30 mm
- Pull to reset
- 1 NO contact / 2 NC contacts
- Without protective collar: ordering suffix **NH**
- With protective collar: ordering suffix **NHK**

DT..

- **Pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 2 NO contacts or 1 NO/1 NC contact
- Available in 6 different colors
- Prints on device on request
- Ordering suffix, refer to table below

LM..



- **Signaling device**
- Illuminated surface 19 x 19 mm
- Lamp replacement from front
- Available in 5 different colors
- Prints on device on request
- Ordering suffix, refer to table below

LT..

- **Illuminated pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 2 NO contacts or 1 NO/1 NC contact
- Lamp replacement from front
- Available in 5 different colors
- Prints on device on request
- Ordering suffix, refer to table below

Suffix	yellow	red	green	blue	black	white
 **Pushbutton DT..**	DT**YE**	DT**RD**	DT**GN**	DT**BU**	DT**BK**	DT**WH**
 **Illuminated pushbutton LT..**	LT**YE**	LT**RD**	LT**GN**	LT**BU**		LT**WH**
 **Signaling device LM..**	LM**YE**	LM**RD**	LM**GN**	LM**BU**		LM**WH**

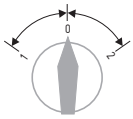
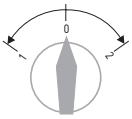
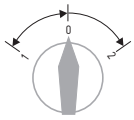
BDF control panel

W..0

- **Selector switch / Spring-return selector switch**
- Version with standard knob, anthracite grey
- Ordering suffix, refer to table below

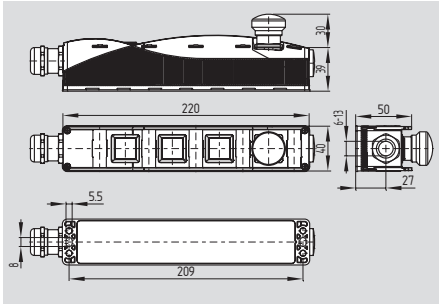
SW.20

- **Key-operated selector switch / Spring-return selector switch**
- Version with high-grade cylinder lock, therefore IP65 as well
- Ordering suffix, refer to table below

Ordering suffix	Selector switch	Selector switch	Spring-return	Spring-return	Selector switch
					
	1 latching position	2 latching positions left and right of the zero position	1 touch position and automatic return to the zero position	2 touch positions left and right of the zero position and automatic return to the zero position	1 touch position right and automatic return to the zero position + 1 latching position left of the zero position
	2 NO contacts or 1 NO/1 NC contact	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)	2 NO contacts or 1 NO/1 NC contact	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)
 Standard knob	**WS20**	**WS30**	**WT20**	**WT30**	**WTS30**
 Key-operated switch	**SWS20**		**SWT20**		

BDF control panel

BDF 200



- Slim, shock-resistant plastic enclosure
- Can be fitted onto customary aluminum profile systems
- Can be installed in the most favorable ergonomic position
- Comprehensive selection of illuminated pushbuttons, selector switches, signalling devices with LED, key-operated switches and emergency stop switches/pushbuttons
- Emergency stop, start/stop and reset functions available
- The position of the switch/pushbutton on the control panel can be chosen
- Two-layer plastic identification labels can be used (engravements on request)
- AS-Interface Safety at Work available

Approvals

c UL us CE

Technical data

Standards:	EN 60947-5-1, EN 60947-5-5
Enclosure:	
Enclosure material:	glass fiber reinforced thermoplastic, self-extinguishing
Enclosure protection class:	IP65
Cable entry:	1x M20 for cable Ø 6…13 mm
Ambient conditions:	
Ambient temperature:	−25 °C … +65 °C
Climatic resistance:	to DIN EN 60068, Part 2 - 30
Overvoltage category:	III
Degree of pollution:	3
Contact elements:	
Contact material:	AgNi 10, gold-plated
Control elements - protection class:	IP65
Rated operating voltage U_r:	max. 24 V
Utilization category:	AC-15/DC-13
Rated operating current/voltage I_e/U_e:	AC-15: 2 A / 24 VAC DC-13: 1 A / 24 VDC
Thermal test current I_{the}:	2.5 A
Fuse rating:	2.5 A slow-blow
Contact system:	cross-point system
Contact force:	0.5 N per contact point = 1 N per contact
Switching of low voltages:	min. 5 V / 1 mA
Switching frequency:	1,200 s/h
Rated insulation voltage U_i:	60 V
Bounce time:	< 2 ms at 100 mm/s operating speed
Mech. lifetime:	1 million operations
Switch travel:	approx. 3 mm
Resistance to shocks:	100 g / 6 ms
Resistance to vibrations:	20 g, 10 … 200 Hz
Wiring labels:	to EN 60947-1
Actuating force at end of travel (1NC/1NO):	8 N
Power consumption:	
- LED (operating elements):	16 mA
- indicator lamp, red:	20 mA

Technical data

Illuminated pushbuttons:	
Enclosure material:	glass fiber reinforced thermoplastic, self-extinguishing
Illuminated pushbutton material:	all-insulated
Front collar material:	plastic
Calotte material:	plastic
Illuminated pushbutton - protection class:	IP65
Rated operating voltage U_r:	max. 24 V
Fuse rating:	2.5 A slow-blow
Rated insulation voltage U_i:	60 V
Wiring labels:	to DIN EN 50005 or DIN EN 50013: X1/X2
Lamp values illuminated pushbutton:	
Lamp fitting:	Ba5S
LED replacement:	from front
LED power consumption of (operating elements):	16 mA
Power consumption of indicator lamp, red:	20 mA
Safety classification emergency stop:	
Standards:	EN ISO 13849-1
B_{10d}:	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Ordering details

BDF 200-①-②-③-④-⑤

No.	Option	Description
	NH	Emergency stop
①		latching pushbutton
		without protective collar
	NHK	with protective collar
	…	Operating element pos. 1
②	20 *	2 NO contacts
	11 *	1 NO / 1 NC contact
	10 *	1 NO contact
③	…	Operating element pos. 2
④	…	Operating element pos. 3
⑤	…	Operating element pos. 4
⑥		Without indicator lamp
	G24	With indicator lamp, red (only for −10)

Note

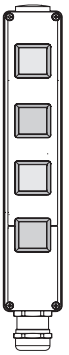
Unused positions are labelled „B“ and are sealed with a blanking plug in factory.

* Contact variant -20, -11 or -10 continuous for all positions (exception: emergency stop with 1 NO / 2 NC contacts)
  Contact variants -20, -11 or -10 cannot be combined to each other

Example:
BDF 200-NH-20-DTYE-B-LMGN

The description of the suitable control elements can be found as of page **2-18**.

Note



Control panel

Pos. 1

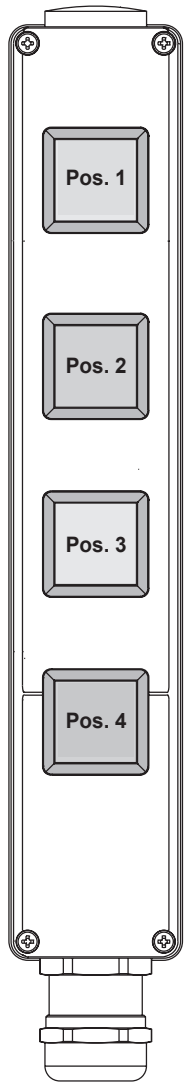
Pos. 2

Pos. 3

Pos. 4

Possible equipment of the positions 1 to 4, refer to table page **2-17**.

BDF control panel

Control elements		Pos. 1	Pos. 2	Pos. 3	Pos. 4	Control panel
	NH	●				
	NHK	●				
	PT..	●	●	●	●	
	DT..	●	●	●	●	
	LT..	●	●	●	●	
	LM..	●	●	●	●	
	SWS20 SWT20		●	●		
	WS20 WS30 WT20 WT30 WTS30		●	●		
	WS21 WS31 WT21 WT31 WTS31		●	●		

Description of the control elements, as of page **2-18**.

Note

The color of the upper enclosure cap basically is yellow when the emergency stop command devices NH and NHK are used.
If there is no control element in position 1, the control panel is supplied with a black enclosure cap.

BDF control panel

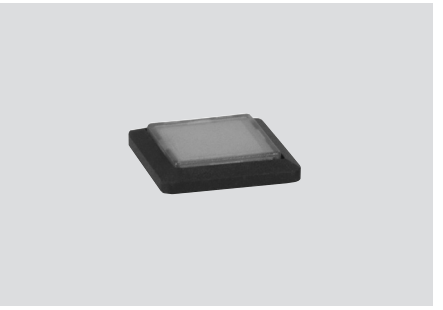
NH / NHK

- **Emergency stop latching pushbutton**
- Mushroom-shaped plastic pushbutton, Ø 30 mm
- Pull to reset
- 1 NO contact / 2 NC contacts
- Without protective collar: ordering suffix **NH**
- With protective collar: ordering suffix **NHK**

DT..

- **Pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 2 NO contacts or 1 NO/1 NC contact
- Available in 6 different colors
- Prints on device on request
- Ordering suffix, refer to table below

LM..



- **Signaling device**
- Illuminated surface 19 x 19 mm
- Lamp replacement from front
- Available in 5 different colors
- Prints on device on request
- Ordering suffix, refer to table below

PT..

- **Mushroom-shaped pushbutton**
- Contact surface 25 x 25 mm with rounded sides
- Not latching
- 2 NO contacts or 1 NO/1 NC contact
- Available in 6 different colors
- Prints on device on request
- Ordering suffix, refer to table below

LT..

- **Illuminated pushbutton**
- With concave button
- Contact surface 19 x 19 mm
- 2 NO contacts or 1 NO/1 NC contact
- Lamp replacement from front
- Available in 5 different colors
- Prints on device on request
- Ordering suffix, refer to table below

Suffix	yellow	red	green	blue	black	white
 **Mushroom-shaped pushbutton PT..**	PT**YE**	PT**RD**	PT**GN**	PT**BU**	PT**BK**	PT**WH**
 **Pushbutton DT..**	DT**YE**	DT**RD**	DT**GN**	DT**BU**	DT**BK**	DT**WH**
 **Illuminated pushbutton LT..**	LT**YE**	LT**RD**	LT**GN**	LT**BU**		LT**WH**
 **Signaling device LM..**	LM**YE**	LM**RD**	LM**GN**	LM**BU**		LM**WH**

BDF control panel

W..0

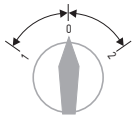
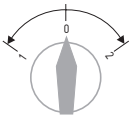
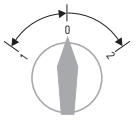
- **Selector switch / Spring-return selector switch**
- Version with standard knob, anthracite grey
- Ordering suffix, refer to table below

W..1

- **Selector switch / Spring-return selector switch**
- Version with long knob, anthracite grey
- Ordering suffix, refer to table below

SW.20

- **Key-operated selector switch / Spring-return selector switch**
- Version with high-grade cylinder lock, therefore IP65 as well
- Ordering suffix, refer to table below

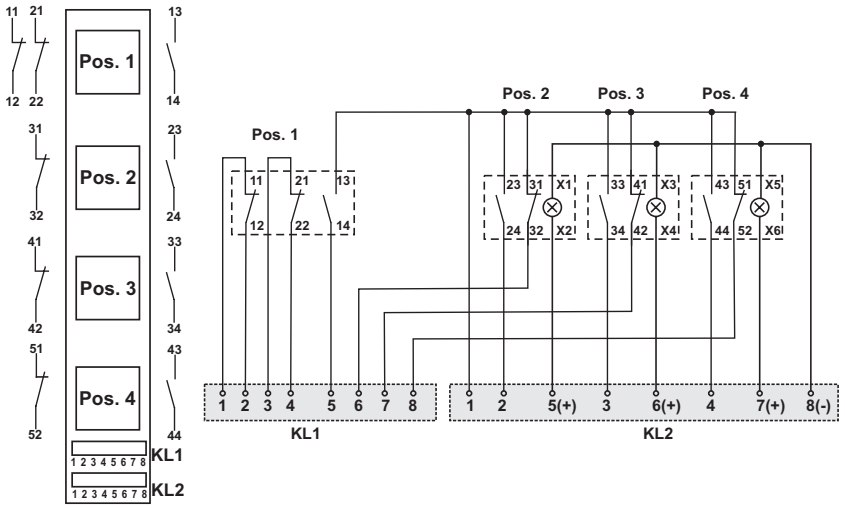
Ordering suffix	Selector switch	Selector switch	Spring-return	Spring-return	Selector switch
					
	1 latching position	2 latching positions left and right of the zero position	1 touch position and automatic return to the zero position	2 touch positions left and right of the zero position and automatic return to the zero position	1 touch position right and automatic return to the zero position + 1 latching position left of the zero position
	2 NO contacts or 1 NO/1 NC contact	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)	2 NO contacts or 1 NO/1 NC contact	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)	1 NO contact for each switching position or 1 NC contact (position 1) and 1 NO contact (position 2)
 Standard knob	**WS20**	**WS30**	**WT20**	**WT30**	**WTS30**
 Long knob	**WS21**	**WS31**	**WT21**	**WT31**	**WTS31**
 Key-operated switch	**SWS20**		**SWT20**		

BDF 200-NH-11-…

1 NO / 2 NC contacts
for emergency stop at Pos. 1

1 NO / 1 NC contact
for operating elements at Pos. 2 - 4

Terminal configuration

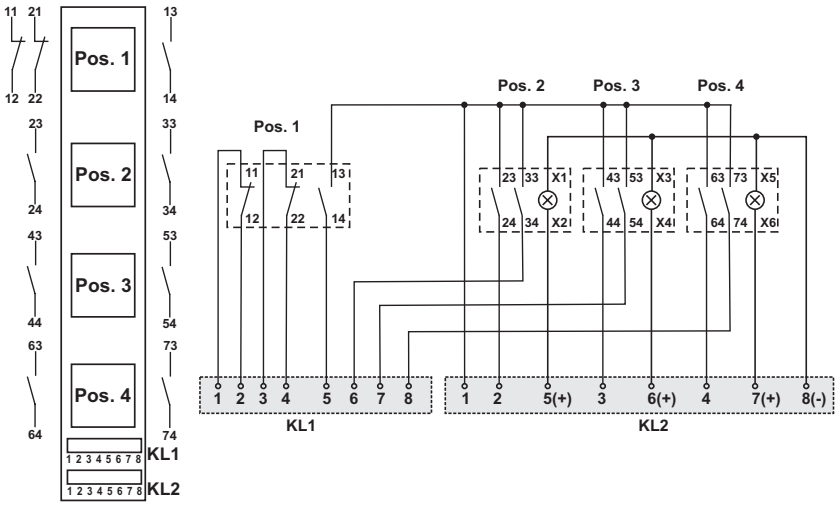


BDF 200-NH-20-…

1 NO / 2 NC contacts
for emergency stop at Pos. 1

2 NO contacts
for operating elements at Pos. 2 - 4

Terminal configuration

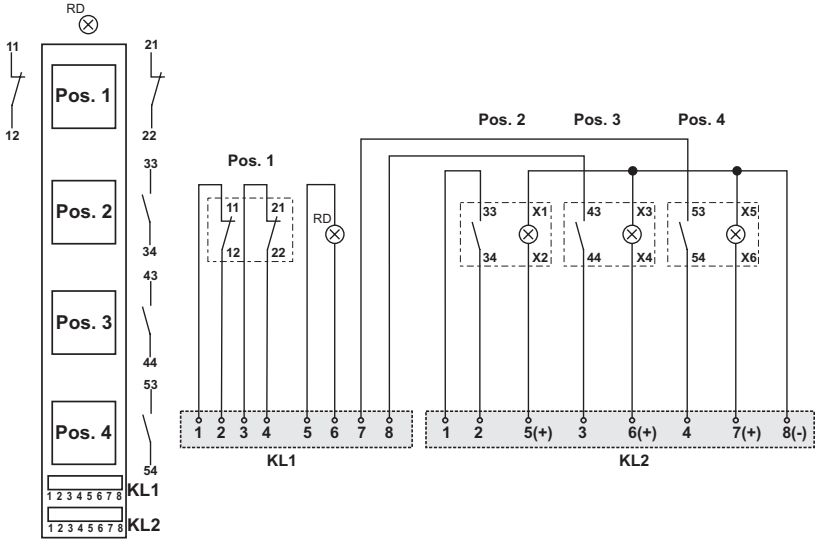


BDF 200-NH-10-…

2 NC contacts
for emergency stop at Pos. 1
and indicator lamp (red)

1 NO contact
for operating elements at Pos. 2 - 4
and indicator lamp (red)

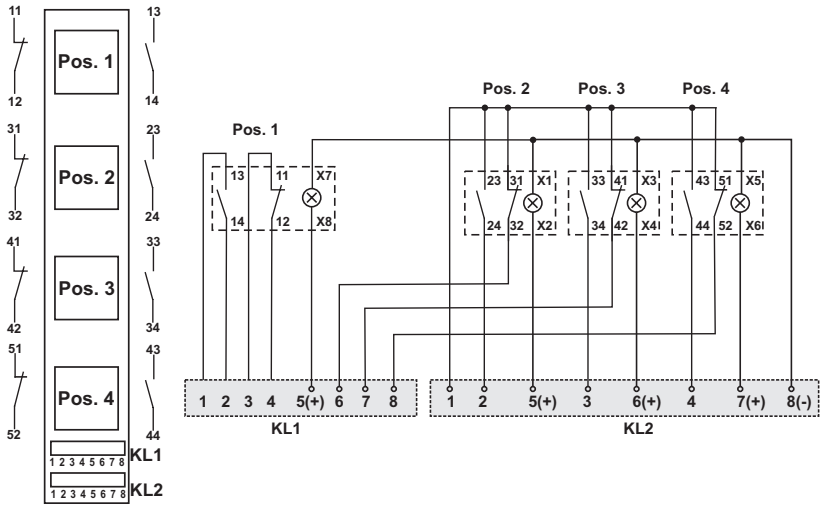
Terminal configuration



BDF 200-..-11-...

1 NO / 1 NC contact
for operating elements at Pos. 1 - 4

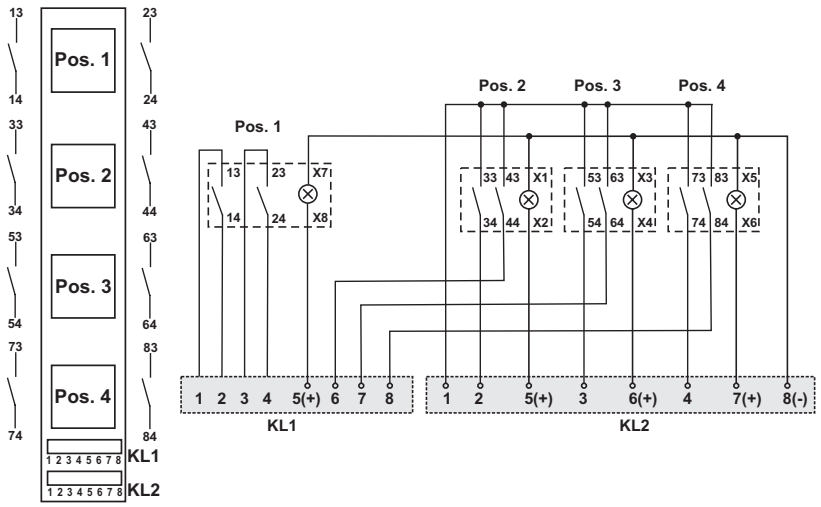
Terminal configuration



BDF 200-..-20-...

2 NO contacts
for operating elements at Pos. 1 - 4

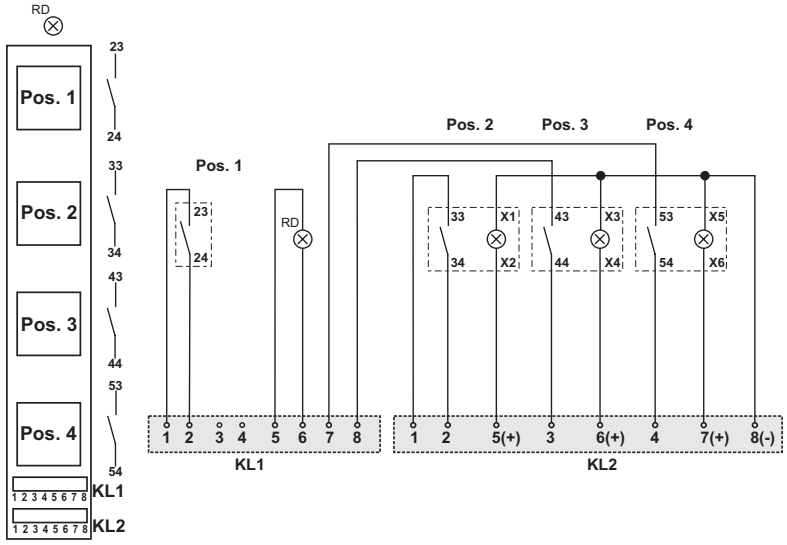
Terminal configuration



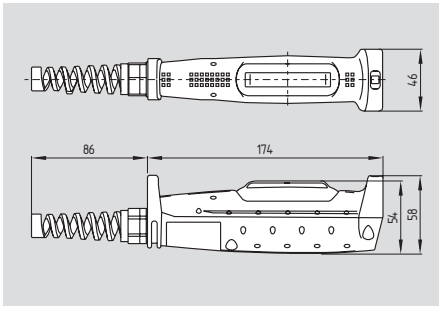
BDF 200-..-10-...

1 NO contact
for operating elements at Pos. 1 - 4
and indicator lamp (red)

Terminal configuration

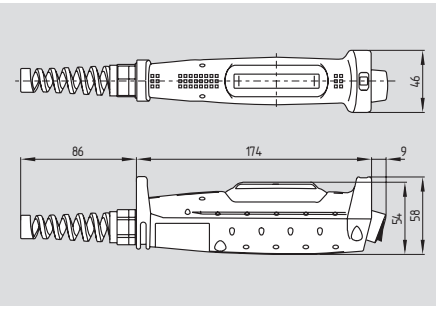


ZSD 5



- Thermoplastic enclosure
- 3 levels OFF-ON-OFF
- Good resistance to petroleum spirit and oil
- 2 NO contacts
  1 auxiliary contact (NC contact)
  (level 2 -> level 1)
- Contacts do not close upon reset
  (level 3 -> level 1)
- Positive break (level 2-> level 3)
- The redundant contact configuration enable signal evaluation with common safety relay modules
- Particularly fit for robot applications in accordance with the ANSI Robotics Standard

ZSD 6



- Supplementary push-button in device head
  1 NO contact (ZSD 6)

- Other product variants and details can be found on the end of this chapter.

Technical data

Standards:	IEC/EN 60947-5-1; IEC/EN 60204-1; EN 292; ISO 12100; ISO 11161; ISO 10218; EN 775
Enclosure:	thermoplastic, self-extinguishing
Protection class:	IP65 to EN 60529
Contact material:	silver
Contact type:	2 NO / 1 NC (ZSD 6: + 1 NO)
Switching principle:	⊖ IEC 60947-5-1; slow action, NC contacts with positive break
Connection:	screw terminals
Cable section:	min. 0.14 mm² max. 1.5 mm² (incl. conductor ferrules)
Cable entry:	1 x M20
U_{imp}:	2.5 kV
U_i:	125 V
Utilization category:	AC-12, DC-12
I_e/U_e:	0.5 A / 24 VAC 1 A / 24 VDC
Max. fuse rating:	3 A gG D-fuse
Positive break travel:	7.4 mm
Ambient temperature:	−10 °C … +60 °C
Mechanical life:	> 100,000 operations
Switching frequency:	max. 1200/h
Classification:	
Standards:	EN ISO 13849-1
B_{10d} (NC):	100,000
Mission time:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Approvals

Ordering details

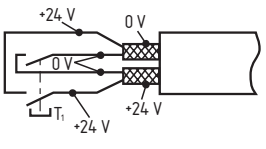
ZSD ①

No.	Replace	Description
①	5	3-stage door handle
	6	3-stage door handle switch with additional push button in the device head

Note

Customer-specific designs, with pre-wired cable, or other signalling and command devices in the device head available on request

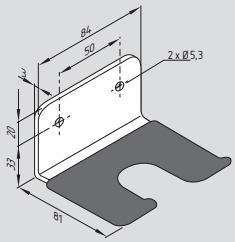
Note



The monitoring module must offer the possibility of cross-wire monitoring.
To connect, only use shielded pre-wired cables (see drawing).

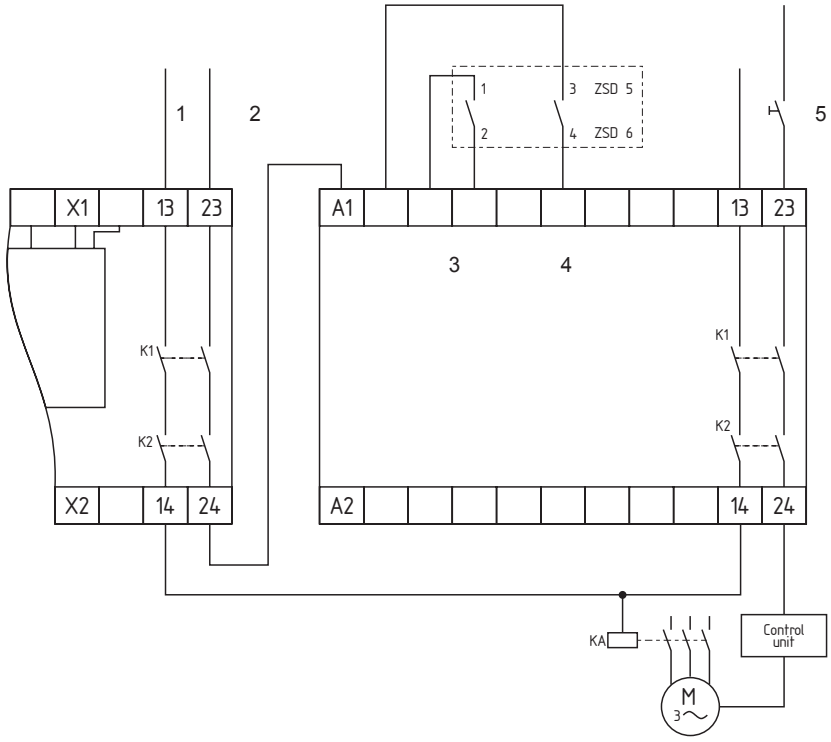
Enabling switch

System components



Mounting angle ZSD-H

Wiring diagram



Legend for the wiring diagram

1 Automatic mode
2 Set-up mode
3 Channel 1
4 Channel 2
5 Jog key

Ordering details

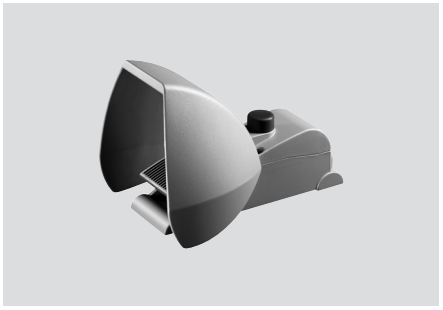
Mounting angle	**ZSD-H**

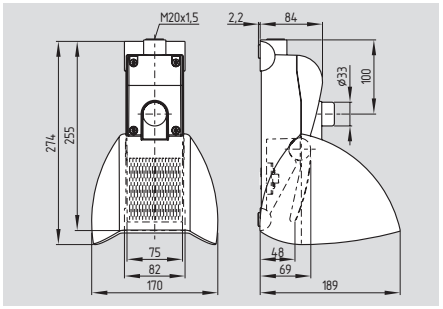
Note

Evaluation of an enabling switch of the ZSD 5/ZSD 6 series by means of a safety-monitoring module of the SRB series, 2-channel with cross-wire detection.

- Jog key control (optional) to start the machine in jog mode
- Superposed evaluating module monitors the emergency stop position of the push-button
- External switch-over from automatic to set-up mode required

TFH 232-..UEDR

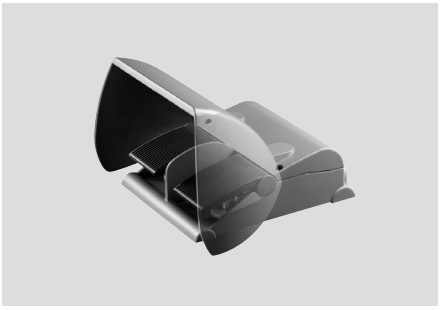


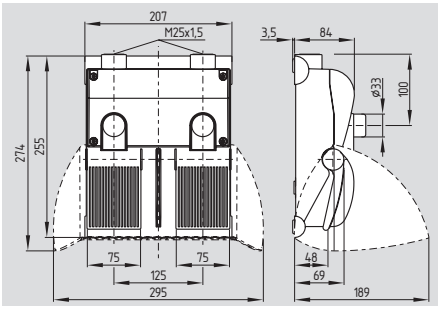


- Safety-related function with overlapping contacts, pressure point and latching
- 2 or 4 contacts
- Metal enclosure
- Protective shield with wide opening
- Low pedal height
- High level of stability
- Cable entry M20

Approvals

T2FH 232-..UEDR





- 4, 6 or 8 contacts
- 2 cable entries M25

Approvals

Technical data

Standards:	IEC/EN 60947-5-1 DIN VDE 0660-200 BG-GS-ET-15
Material of the enclosure, cover and protective shield:	aluminum die-cast
Housing coating:	powder-coated
Material of the pedal:	glass fiber reinforced thermoplastic

Mechanical data

Design of electrical connection:	screw terminals
- Max. cable section	max. 2.5 mm² (incl. conductor ferrules)
Cable entry:	1-pedal: 1 x M20; 2-pedal: 2 x M25
Mechanical life:	> 1 million operations
Switching frequency:	max. 1 /s
Resistance to shock:	30 g / 11 ms
Resistance to vibration:	10 … 150 Hz (0.35 mm / 5 g)

Ambient conditions

Ambient temperature:	−25 °C…+60 °C
Storage and transport temp.:	−25 °C…+85 °C
Relative humidity:	30% … 95% - non-condensing - non-icing
Protection class:	IP65 to IEC/EN 60529
Overvoltage category:	III
Degree of pollution:	3

Electrical data

Design of the switching element :	NC, NO
Switching principle:	slow action
Rated impulse withstand voltage U_{imp}:	800 V
Rated insulation voltage U_i:	32 VDC
Thermal test current I_{the}:	10 A
Utilization category:	DC-13: 24 V / 1 A AC-15: 230 V / 4 A
Required rated short-circuit current:	1000 A
Max. fuse rating:	6 A gG D-Sicherung
Dimensions:	1-pedal: 170 x 189 x 274 mm; 2-pedal: 295 x 189 x 274 mm

Safety classification

Standards:	EN ISO 13849-1
B_{10d} (NC contact):	100,000
Service life:	20 years

$$MTTF_d = \frac{B_{10d}}{0{,}1 \times n_{op}} \qquad n_{op} = \frac{d_{op} \times h_{op} \times 3600\ s/h}{t_{cycle}}$$

Ordering details

TFH 232-①

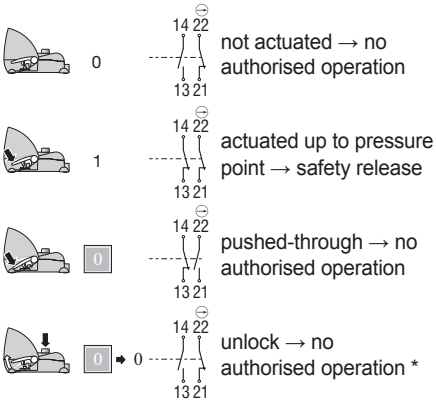
No.	Replace	Description
①	11UEDR	1 NO/1 NC contact
	22UEDR	2 NO/2 NC contact

Ordering details

T2FH 232-①

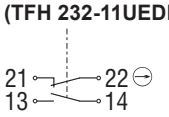
No.	Replace	Description
①	11UEDR/11UEDR	2 NO/2 NC contact
	22UEDR/22UEDR	4 NO/4 NC contact
	11/22UEDR	3 NO/3 NC contact
	22UEDR/11	3 NO/3 NC contact

Mode of operation -UEDR

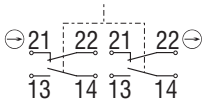


Contact variants

1-pedal
1 NO / 1 NC
(TFH 232-11UEDR)

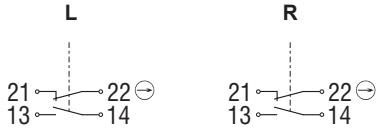


2 NO / 2 NC
(TFH 232-22UEDR)

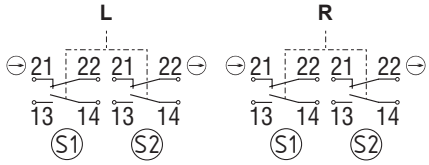


Contact variants

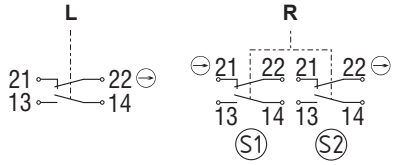
2-pedal
2 NO / 2 NC
(T2FH 232-11UEDR/11UEDR)



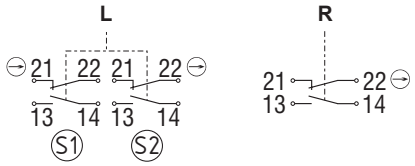
4 NO / 4 NC
(T2FH 232-22UEDR/22UEDR)



3 NO / 3 NC
(T2FH 232-11/22UEDR)



3 NO / 3 NC
(T2FH 232-22UEDR/11)



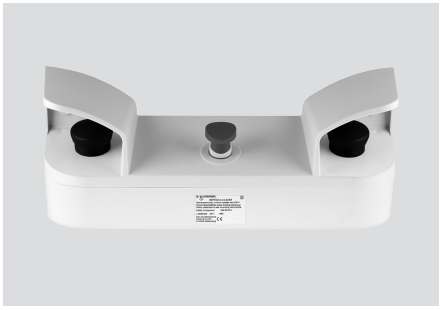
Legend

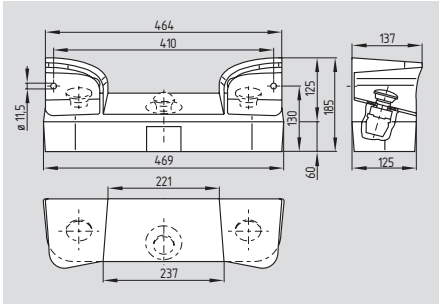
⊖ positive break NC contact
L left pedal
R right pedal

Note

The non-safety-related pedal of the 2-pedal safety foot switch does not have the over-lapping and latching functions.

SEPK





- Thermoplastic enclosure
- 2 black operating push buttons Ø 55 mm each with 1 NC and 1 NO contacts according to EN 574
- 1 Emergency-Stop button in thermoplastic version, KDRRKZ 40 RT, with 1 NC and 1 NO contact
- 8 knockouts for additional operating devices Ø 22.3 mm
- Stand and wall mounting possible
- 2 part enclosure
- Protection class IP64

Approvals

Technical data

Standards:	IEC/EN 60947-5-5 EN 574 EN ISO 13850
Enclosure:	Thermoplastic (Lexan 503 R)
Protection class:	IP64
Connection:	Screw terminals
Cable section:	max. 1.5 mm²
U_i:	440 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	8 A / 250 VAC 5 A / 24 VDC
Mechanical life:	10 million operations
Dimensions:	469 x 185 x 140 mm
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH value:	5.0 x 10^{-9}/h up to max. 100.000 switching cycles/year and max. 40% contact load
SIL:	up to 3 in combination with safety monitoring module
Mission time:	20 years

System components

SRB 201ZH

SRB 301HC/R

Ordering details

Standard: SEPK 02.0.4.0.22/95

1NO/1NC per button
1NO/1NC for Emergency-Stop

Empty enclosure: SEPK 02.0.L.22

with 3 mounting holes

Note

Customer-specific designs (also entirely pre-wired, special colors, etc.) available on request

Safety distance calculation:
S = (K × T) + C
Legend:
K = Gripping speed = 1,600 mm/s
T = Run-on time in seconds
C = Additional value = 250 mm

Ordering details

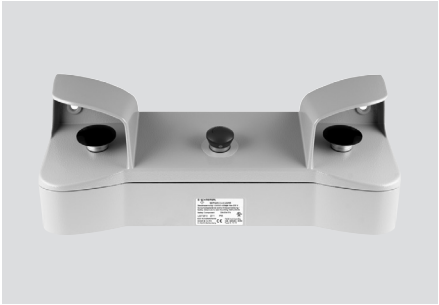
Safety monitoring modules for two-hand control circuits:

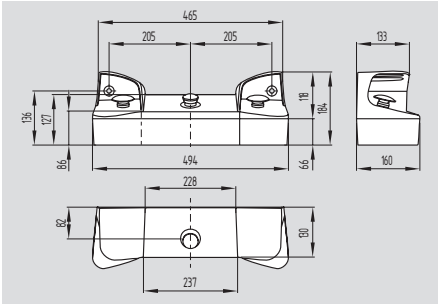
SRB 201ZH refer to page 2-28
SRB 301HC/R refer to page 3-14

See Section 5 for details on safety controllers

Two-hand control panels

SEPG





- Aluminum enlosure
- 2 black operating push buttons Ø 55 mm each with 1 NC and 1 NO contacts according to EN 574
- 1 Emergency-Stop button in metal version, EDRRZ 40 RT, with 1 NC and 1 NO contact
- Control panel suitable for mounting 8 supplementary signalling and command devices
- Stand and wall mounting possible
- 2 part enclosure
- Protection class IP65

Approvals

Technical data

Standards:	IEC/EN 60947-5-5 EN 574 EN ISO 13850
Enclosure:	Cast aluminum, powder-coated
Protection class:	IP65
Connection:	Screw terminals
Cable section:	max. 1.5 mm²
U_i:	440 V
I_{the}:	10 A
Utilization category:	AC-15, DC-13
I_e/U_e:	8 A / 250 VAC 5 A / 24 VDC
Mechanical life:	10 million operations
Dimensions:	494 x 184 x 160 mm
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH value:	5.0 x 10^{-9}/h up to max. 100.000 switching cycles/year and max. 40% contact load
SIL:	up to 3 in combination with safety monitoring module
Mission time:	20 years

System components

SRB 201ZH

SRB 301HC/R

Ordering details

Standard: SEPG 05.3.4.0.22/95

1NO/1NC per button
1NO/1NC for Emergency-Stop

Empty enclosure: SEPG 05.3.L.22

with 3 mounting holes

Note

Customer-specific designs (also entirely pre-wired, special colors, etc.) available on request

Safety distance calculation:
S = (K × T) + C
Legend:
K = Gripping speed = 1,600 mm/s
T = Run-on time in seconds
C = Additional value = 250 mm

Ordering details

Safety monitoring modules for two-hand control circuits:

SRB 201ZH	refer to page 2-28
SRB 301HC/R	refer to page 3-14

See Section 5 for details on safety controllers

SRB 201ZH

Monitoring two-hand control panels to EN 574 III C

- 2 safety contacts, STOP 0
- 1 auxiliary NC contact
- With feedback circuit
- With electronic protection
- 2 LEDs to show operating conditions
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1, EN 60947-5-1, EN ISO 13849-1, IEC 61508
Feedback circuit (Y/N):	yes
ON delay with automatic start:	typ. 50 ms
Drop-out delay:	typ. 30 ms
Rated operating voltage U_e:	24 VDC −15%/+10% residual ripple max. 10%
Fuse rating for the operating voltage:	Internal electronic trip, tripping current F1/F2: > 0.2 A, tripping current F3: > 0.6 A
Internal electronic protection (Y/N):	yes
Power consumption:	1.2 W
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Number of NC contacts:	2
Number of NO contacts:	2
Max. conduction resistance:	max. 40 Ω
Outputs:	
Stop category:	0
Number of safety contacts:	2
Number of auxiliary contacts:	1
Max. switching capacity of the safety contacts:	250 VAC, 6 A resistive (inductive in case of appropriate protective wiring); min. 10 V, 10 mA
Utilization category to EN 60947-5-1:	AC-15; DC-13
Fuse rating of the safety contacts:	6.3 A slow blow
Fuse rating of the auxiliary contacts:	2 A slow blow
Mechanical life:	10 million operations
Ambient conditions:	
Ambient temperature:	−25 °C … +45 °C
Storage and transport temperature:	−40 °C … +85 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw terminals, plug-in
- min. cable section:	0.25 mm²
- max. cable section:	2.5 mm²
Weight:	200 g
Dimensions (Height x Width x Depth):	120 x 22.5 x 121 mm

Approvals

Ordering details

SRB 201ZH-24VDC

Classification

Safety parameters:	
Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10^{-8}/h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10^{-8}/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts. Diverging applications upon request.

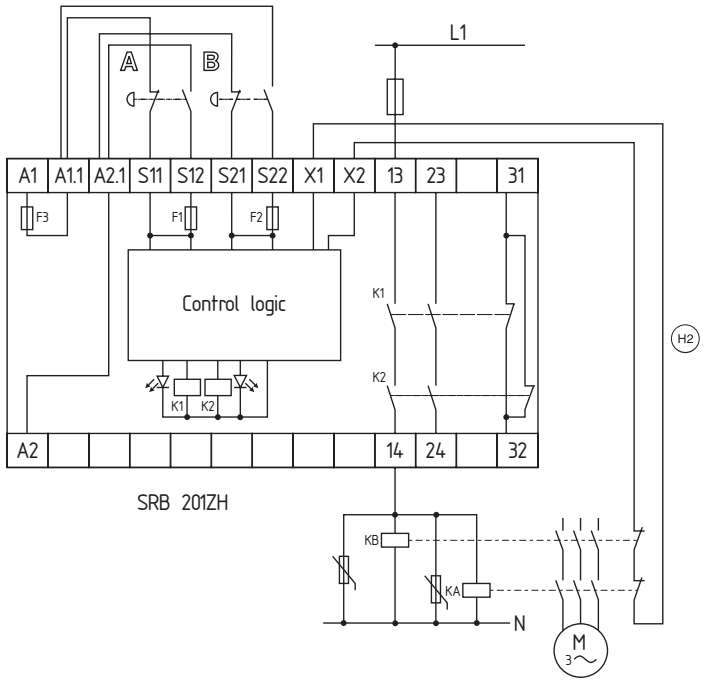
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Two-hand control panels

Note

- Button A and B: 1 NC contact / 1 NO contact (note: the NC contact of the buttons A and B must be opened, before the NO contact closes. No overlapping contacts to avoid triggering of fuse F1 und F2).
- Relay outputs: Suitable for 2 channel control, for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.
- (H2) = Feedback circuit
- The control recognizes cross-short, cable break and earth leakages in the monitoring circuit.
- Simultaneity monitoring 0.5 seconds

Wiring diagram



LED

The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2

Note

- The wiring diagram is shown with guard doors closed and in de-energized condition.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Further products and program extensions

Hygiene-compliant command and signalling devices

The special requirements placed on the hygienic design of food processing machines including those of the standards EN 1672-1 and EN 1672-2 with basic safety and hygienic requirements for machinery of this kind have been transferred to this range of command and signalling devices.

The devices have protection class IP67/IP69K, which makes them suitable for outdoor applications and applications where high hygienic requirements are applicable.

More information can be found in the **NK Catalog**

Enabling switch in mobile control housing with 2 or 3 levels

The Pilot 10/20/30 versions can integrate other control devices and indicator lights.

Pre-wired versions with supplementary functions and a monitored “Parking position“ are available as well.

More information can be found in the **ZB/03 Catalog**

Sub-assemblies for two hand control consoles

In addition to the standard two-hand operating panels, Schmersal can customize panels with additional control devices and illuminated indicator lights. We can also add additional bore holes or special paint finishes/colors to match specific application requirements.

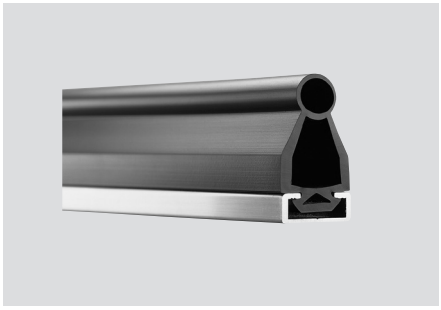
Also available are a wide variety of floor stands, with options for spacer rings, height adjustment, foot-pedal switches, or rollers.

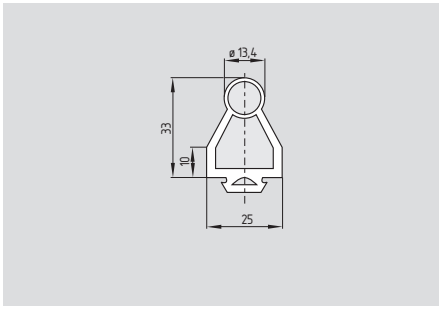
More information can be found in the **ZHS/08 catalog**

Wherever crushing or shearing points are to be safeguarded, such as on elevating platforms, rising stages, sliding doors or industrial gates, tactile safety devices offer a simple and easy to fit solution. In the hazardous area, two-dimensional safety devices could be useful as well, for instance at industrial robots, punching machines and woodworking machines.

Safety edges

SE 40

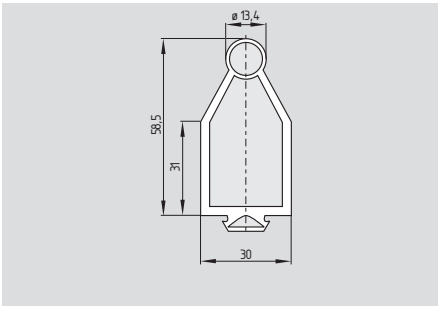




- Control category optionally 1, 3 or 4 in combination with the SE-100C, SE-304C or SE-400C safety-monitoring module
- Modulated infra-red signal
- Interference-proof against external light
- Regulated transmitter, i.e. automatic adaptation for distance to receiver
- Constant sensitivity independently of the length of the safety edge
- Lengths from 0.4 m to 8 m possible
- Dirt and moisture in the profile are to a great extent compensated
- Transmitter/receiver potted, protection class of the signal transmitter IP67
- Insensitive to environmental conditions
- Max. distance sensors / evaluation 200 m

Approvals

SE 70



Resistant to chemicals of the rubber material:

International abbreviation	EPDM (APTK)
Chemical name:	ethylene propylene ter polymer
Resilience at 20°C:	good
Resistance against permanent deformation:	good
General resistance against atmospheric conditions:	excellent
Resistance against ozone:	excellent
Resistance against oil:	low
Resistance against fuels:	low
Resistance against solvents:	low to satisfactory
General resistance against acids:	good
Temperature resistance:	
Short exposition:	− 50°C … + 170°C
Long exposition:	− 30°C … + 140°C

If a higher resistance is required, choose safety edge profiles with 20 µm plastic coating. The coating must be submitted to low mechanical loads only.

Technical data

Standards:	EN 1760-2
Material:	
- Rubber profile:	EPDM, 65 Shore A (optionally with 20 µm plastic coating)
- Emitter/Receiver:	polyurethane
- Mounting profile:	Al-Mg Si OF22
Protection class:	to EN 60529
- Emitter/Receiver :	IP68
- Signal transmitter, complete:	IP67
Mode of operation:	Optoelectronic
Possible length:	40 cm … 8 m
Operating range of the homologated signal transmitter:	+5 °C … +55 °C
Max. permanent load:	on the operational switching zone 500 N
Operating speed:	Signal transmitters: max. 100 mm/s, (Exception: SE-P40 with SE-400C: max. 40 mm/s)
Response travel:	max. 9 mm
After-travel:	P 40: max. 18 mm P 70: max. 45 mm
Connection:	Transmitter/Receiver: cable 3 x 0.14 mm² flexible
Cable length:	
- Receiver:	3 m or 20 m
- Emitter:	6.5 m or 10.5 m
Mechanical life:	20 million operations

* Certification in combination with safety monitoring modules SE-100C, SE-304C or SE-400C.
Coated and NBR profiles are not included in this approval.

Ordering details

Rubber profile SE-P①②-③

No.	Replace	Description
①		Uncoated profile
	C	Coated profile
②	40	40 mm high EPDM
	40NBR	40 mm high NBR
	70	70 mm high EPDM
③	XXXX	Profile length in mm
	1250	1,250 mm
	2500	2,500 mm
	5000	5,000 mm
	10000	10,000 mm

Note

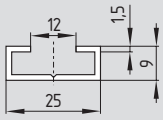
A safety edge system consists of individual components. The components must be ordered separately.

(Example)
- Rubber profile, SE-P40-1250
- Al profile, SE-AL 10-1250
- Emitter/ Receiver SE-SET
- Safety-monitoring module, SE-304 C
- Options: Caps, SE-T40; Sticker, SE-G8406
- Other accessories

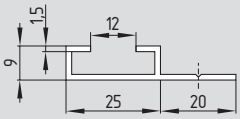
Note

In the extremities of the safety edge at approx. 60 mm (SE 40) or 50 mm (SE 70) finger guard is not guaranteed. Upon actuation of this area, the transmitter/receiver is pushed into the lower profile section and the switching signal is evaluated, but the required forces are high though. If this restriction is not acceptable for the specific application, constructive measures must be taken.

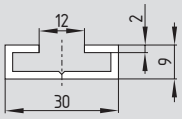
System components



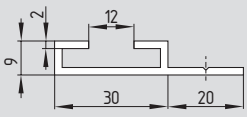
Aluminum profile SE-AL10



with Aluminum leg SE-AL12



Aluminum profile SE-AL20



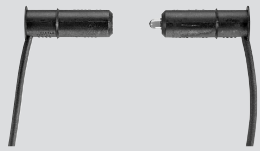
with Aluminum leg SE-AL22

System components

SE-100C

SE-304C

SE-400C



SE-SET

System components

Junction box SE-J2

Rubber scissors SE-SC

End plugs SE-T.40

End plugs SE-T.70

Ordering details

Aluminum profile SE-AL①②-③

No.	Replace	Description
①	1	For rubber profile SE-40
	2	For rubber profile SE-70
②	0	Without mounting flange
	2	With mounting flange
③	1250	1,250 mm Larger lengths possible by connecting multiple Aluminum profiles

Ordering details

Monitoring of safety edges using

Part	Number of safety edges	Max. control category	Refer to page
SE-100C	2	1	3-6
SE-304C	4	3	3-8
SE-400C	1	4	3-10

Sensor-Sets

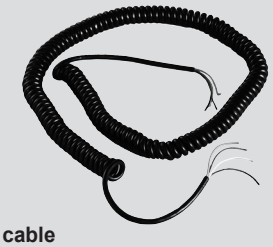
Part	Transmitter cable	Receiver cable
SE-SET	6.5 m	3 m
SE-SET 3M/10.5M	10.5 m	3 m
SE-SET10.5M/20M	10.5 m	20 m

Ordering details

Junction box	**SE-J2**
Rubber scissors	**SE-SC**
End plugs for SE-P40	
uncoated	**SE-T40**
coated	**SE-TC40**
End plugs for SE-P70	
uncoated	**SE-T70**
coated	**SE-TC70**
Gluing of the end caps:	
Primer (without drawing)	**SE-PR**
Glue (without drawing)	**SE-G 8406**

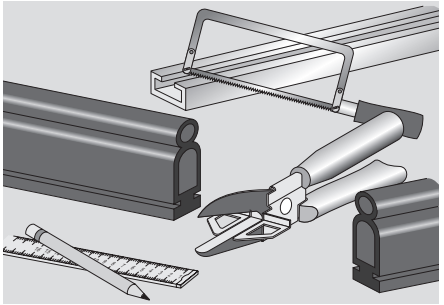
System components

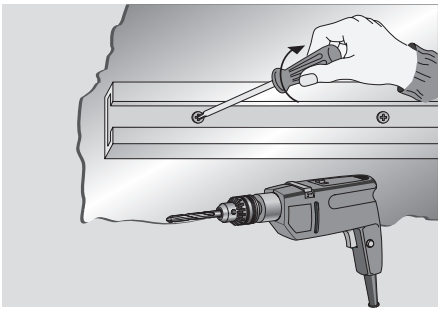
Wiring tool SE-WA

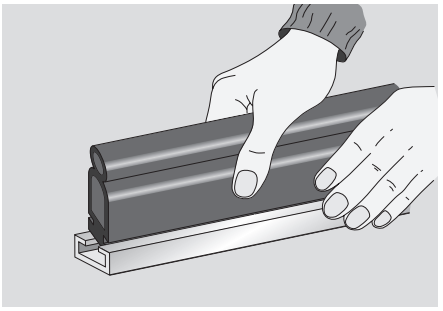


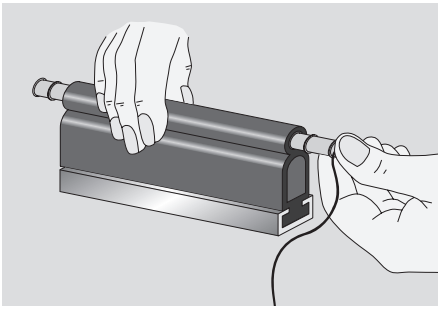
Spiral cable

Mounting









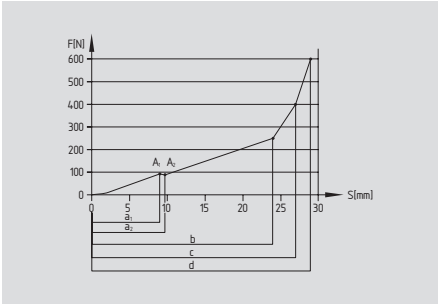
Ordering details

Wiring tool, 6 m	**SE-WA**
Spiral cable, 1 m extendable to 3 m	
4 x 0.25 mm²	**SE-CC 1301**
5 x 0.5 mm²	**SE-CC 1302**

Notice

- Saw off Aluminum rails and fit.
- Cut the rubber profile to length
- Clip the rubber profile into the Aluminum rail
- Press the transmitter and receiver units into the ends of the profile

Force-travel diagram



Legend

A	actuating point, switching point of the module
a	actuating travel
b, c, d	overall deformation travel until the indicated force is achieved

Run-on travel = $a_{1,2}$ – b / c / d

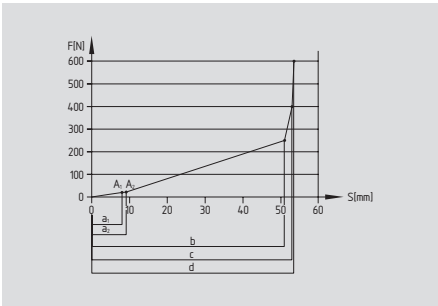
Applicable test conditions
Parameters of the measurement:
Temperature: T = 23 °C
Mounting position: B (nach EN 1760-2)
Place of measurement: C 3 (nach EN 1760-2)

The run-on travel is affected by the response time of the connected module.

SE-P40

Speed [mm/s]	Curve section	Deformation travel [mm]	Force [N]	Connected module
up to A 100	a_1	9	92	SE-100C SE-304C SE-400C
40	a_2	9.7	88	
up to A 10	b	24	250	SE-100C SE-304C SE-400C
	c	27	400	SE-100C SE-304C SE-400C
	d	29	600	SE-100C SE-304C SE-400C

Force-travel diagram



Legend

A	actuating point, switching point of the module
a	actuating travel
b, c, d	overall deformation travel until the indicated force is achieved

Run-on travel = $a_{1,2}$ – b / c / d

Applicable test conditions
Parameters of the measurement:
Temperature: T = 23 °C
Mounting position: B (nach EN 1760-2)
Place of measurement: C 3 (nach EN 1760-2)

The run-on travel is affected by the response time of the connected module.

SE-P70

Speed [mm/s]	Curve section	Deformation travel [mm]	Force [N]	Connected module
up to A 100	a_1	8	22	SE-100C SE-304C SE-400C
100	a_2	9.1	23	
up to A 10	b	51	250	SE-100C SE-304C SE-400C
	c	53	400	SE-100C SE-304C SE-400C
	d	54	600	SE-100C SE-304C SE-400C

SE-100C

- To monitor 1 or 2 safety edges
- 1 safety contact, STOP 0
- 1 signalling output (changeover contact)
- Operating voltage 24 VDC
- LED display

Technical data

Standards:	EN 1760-2, IEC 60947-5-3, IEC 61508
Start conditions:	automatic
Feedback circuit (Y/N):	no
Response time:	16 ms
Time to readiness:	max. 300 ms
Opening duration:	max. 300 ms
Closing duration:	typ. 15 ms
Rated operating voltage U_e:	24 VDC (+ 20 % / -10%)
Rated operating current I_e:	ca. 150 mA
Internal electronic protection (Y/N):	yes
Power consumption:	< 4 W
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Outputs:	
Stop category 0:	1
Stop category 1:	0
Number of safety contacts:	1
Number of auxiliary contacts:	1
Number of signalling outputs:	1
Max. switching capacity of the safety contacts:	2 A / 230 VAC 2 A / 24 VDC
Utilization category to EN 60947-5-1:	AC-15: 230 V / 2 A DC-13: 24 V / 2 A
Mechanical life:	20 million operations
LED display:	supply voltage, safety edge function
Ambient conditions:	
Environmental temperature:	+5 °C … +55 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw connection
- max. cable section:	max. 2 x 1.5 mm² (incl. conductor ferrules)
Weight:	164 g
Dimensions (Height/Width/Depth):	100 x 22.5 x 120 mm

Approvals

Ordering details

SE-100C

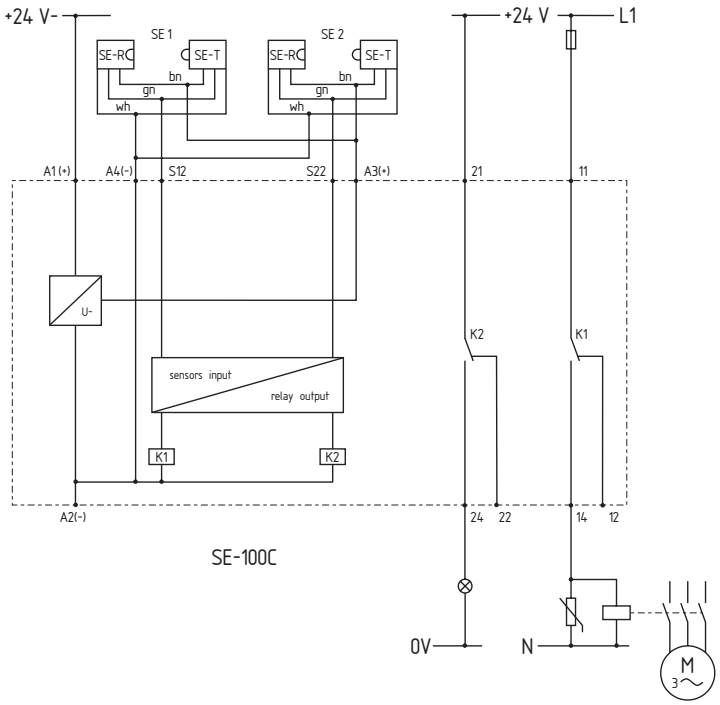
Classification

Safety parameters:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to c
Category:	up to 1
PFH value:	1.73 x 10^{-6} /h for max. 36,500 switching cycles/year and max. 60% contact load
SIL:	up to 1
Mission time:	20 years

Note

- Monitoring the safety edges SE 40 / SE 70 with a safety monitoring unit SE-100C for PL c and category 1.
- If only one safety edges SE 40 / SE 70 is connected, the terminals S12-S22 must be bridged.
- The manual reset function, if required, must be realized in the machine control. Both re-initialization and auto-reset must comply with the requirements of EN 1760-2 (diagram A2, A3).

Wiring diagram



Note

- The wiring diagram is shown for the de-energized condition.
- The overall machine safety depends on the professional mounting and installation of the safety monitoring module and the signal transmitter, as well as on the correct and professional electrical connection of the components.
- If there it any risk whatsoever, the machine may not be restarted.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

SE-304C

- To monitor 1 to 4 safety edges
- 1 safety contact, STOP 0
- 1 semi-conductor signalling output
- Operating voltage 24 VAC/DC
- LED display
- Start-function with trailing edge (optional)

Technical data

Standards:	EN 1760-2, IEC 60947-5-3, IEC 61508
Start conditions:	automatic or start button
Feedback circuit (Y/N):	yes
Response time:	< 17 ms
ON delay with reset button:	100 ms up to 2 s
Rated operating voltage U_e:	24 VDC (+ 20 % / -10%) 24 VAC (+ 10 % / - 10%)
Rated operating current I_e:	ca. 500 mA (for 4 safety edges)
Frequency range:	50 Hz
Internal electronic protection (Y/N):	yes
Power consumption:	< 4 W
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Outputs:	
Stop category 0:	1
Stop category 1:	0
Number of safety contacts:	1
Number of auxiliary contacts:	0
Number of signalling outputs:	1
Max. switching capacity of the safety contacts:	2 A / 230 VAC 2 A / 24 VDC
Utilization category to EN 60947-5-1:	AC-15: 230 V / 2 A DC-13: 24 V / 2 A
Mechanical life:	> 10 million operations
LED display:	supply voltage, safety edge function
Ambient conditions:	
Environmental temperature:	+5 °C … +55 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw connection
- max. cable section:	max. 2 x 1.5 mm² (incl. conductor ferrules)
Weight:	175 g
Dimensions (Height/Width/Depth):	100 x 22.5 x 121 mm

Approvals

Ordering details

SE-304C

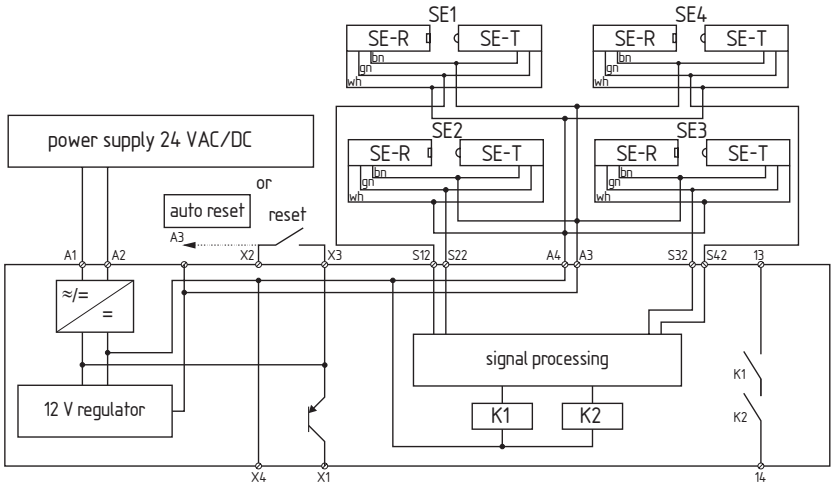
Classification

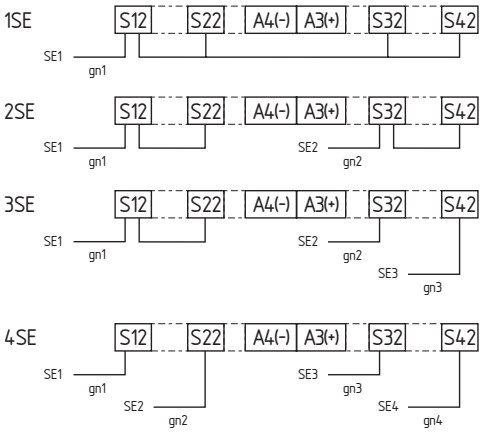
Safety parameters:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to d
Category:	up to 3
PFH value:	1.0 x 10^{-7} /h for max. 36,500 switching cycles/year and max. 60% contact load
SIL:	up to 2
Mission time:	20 years

Note

- Monitoring 1 – 4 safety edges SE 40 / SE 70 using safety monitoring module SE-304C for PL d and category 3.
- Manual reset function or auto-reset: The manual reset function is triggered by an edge-sensitive signal (edge switching „0-1-0“ within 100 ms up to 2 s) (X2/X3). Alternatively, the auto-reset function can be activated by a connection (A3/X2). Both re-initialization and auto-reset must comply with the requirements of EN 1760-2 (diagram A2, A3).
- If less than 4 safety edges are connected, the following diagram must be observed.

Wiring diagram





Note

- The wiring diagram is shown for the de-energized condition.
- The overall machine safety depends on the professional mounting and installation of the safety monitoring module and the signal transmitter, as well as on the correct and professional electrical connection of the components.
- If there it any risk whatsoever, the machine may not be restarted.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

SE-400C

- To monitor 1 safety edge
- 2 safety contacts, STOP 0
- 1 semi-conductor signalling output
- Operating voltage 24 VDC
- LED display
- Start function

Technical data

Standards:	EN 1760-2, IEC 60947-5-3, IEC 61508
Start conditions:	automatic or start button
Feedback circuit (Y/N):	yes
Response time:	32 ms
Time to readiness:	ca. 32 ms
Opening duration:	ca. 32 ms
Closing duration:	typ. 15 ms
Rated operating voltage U_e:	24 VDC (+ 20 % / -10%)
Rated operating current I_e:	ca. 150 mA
Internal electronic protection (Y/N):	yes
Power consumption:	< 4 W
Monitored inputs:	
- Short-circuit recognition:	yes
- Wire breakage detection:	yes
- Earth connection detection:	yes
Outputs:	
Stop category 0:	2
Stop category 1:	0
Number of safety contacts:	2
Number of auxiliary contacts:	0
Number of signalling outputs:	1
Max. switching capacity of the safety contacts:	2 A / 230 VAC 2 A / 24 VDC
Utilization category to EN 60947-5-1:	AC-15: 230 V / 2 A DC-13: 24 V / 3 A
Mechanical life:	30 million operations
LED display:	supply voltage, safety edge function
Ambient conditions:	
Environmental temperature:	+5 °C … +55 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw connection
- max. cable section:	max. 2 x 1.5 mm² (incl. conductor ferrules)
Weight:	184 g
Dimensions (Height/Width/Depth):	100 x 22.5 x 120 mm

Approvals

Ordering details

SE-400C

Classification

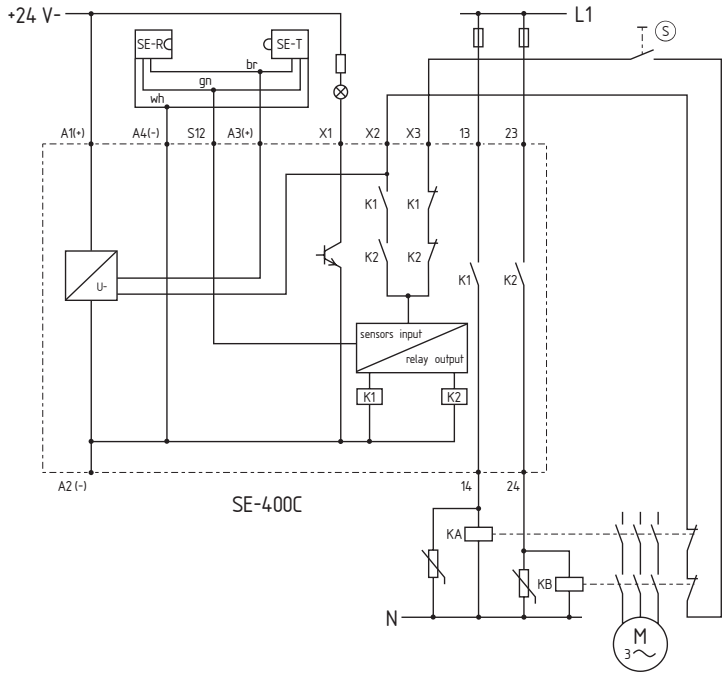
Safety parameters:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH value:	5.0 x 10^{-9} /h for max. 36,500 switching cycles/year and max. 60% contact load
SIL:	up to 3
Mission time:	20 years

Safety edges

Note

- Monitoring the safety edges SE 40 / SE 70 with a safety monitoring unit SE-400C for PL e and category 4.
- The feedback circuit monitors positions of the contactors KA and KB.
- A Start-Reset- push button Ⓢ can optionally be connected to the feedback circuit. Both re-initialization and auto-reset must comply with the requirements of EN 1760-2 (diagram A2, A3).

Wiring diagram

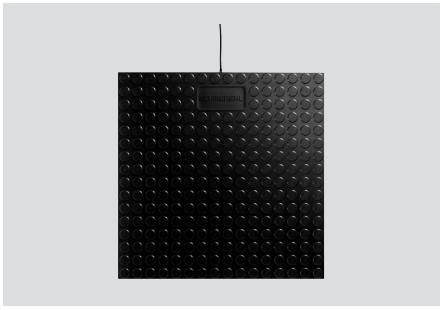


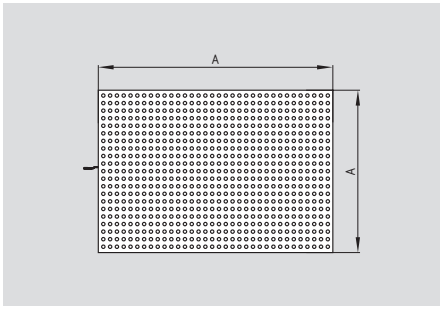
Note

- The wiring diagram is shown for the de-energized condition.
- The overall machine safety depends on the professional mounting and installation of the safety monitoring module and the signal transmitter, as well as on the correct and professional electrical connection of the components.
- If there it any risk whatsoever, the machine may not be restarted.
- Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Safety mat

SMS 4





- Certified to EN 1760-1
- Response time max. 25 ms
- Robust design
- High resistance to chemicals
- Slip-free surface
- Cascading possible
- Special sizes and shapes available on request
- No additional terminating resistor required
- Aluminum frame and corner sections available

Legend:
A: active surface

Approvals

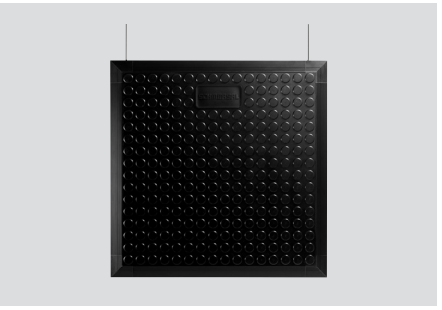
TÜV CE

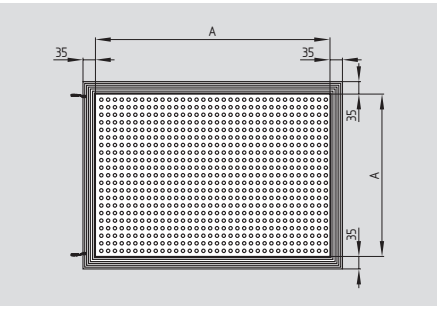
Ordering details

SMS 4-①

No.	Option	Description
		Active surface
①	250-500	250 x 500 mm
	500-500	500 x 500 mm
	500-1000	500 x 1000 mm
	750-1000	750 x 1000 mm
	1000-1000	1000 x 1000 mm
	1000-1500	1000 x 1500 mm

SMS 5





- Certified to EN 1760-1
- Response time max. 25 ms
- Robust design
- High resistance to chemicals
- Slip-free surface
- Cascading possible
- Special sizes and shapes available on request
- No additional terminating resistor required
- With molded ramp profile

Legend: A: active surface
Total size = A + 2 x 35 mm

Approvals

TÜV CE

Ordering details

SMS 5-①

No.	Option	Description
		Active surface
①	250-500	250 x 500 mm
	500-500	500 x 500 mm
	500-1000	500 x 1000 mm
	750-1000	750 x 1000 mm
	1000-1000	1000 x 1000 mm
	1000-1500	1000 x 1500 mm

Technical data

Standards:	EN 1760-1
Control category:	3 to EN 954-1
Surface material:	polyurethane, black
Protection class:	IP65 to EN 60529
Ambient temperature:	0° C … +60°C
Fitting height:	14 mm
Weight:	17 Kg / m²
Actuating force:	150N with round body Ø 80mm
Cable:	
- SMS 4:	4 x 0,34 mm²
- SMS 5:	2 pc. 2 x 0,34 mm²
Cable length:	6 m
Response time:	≤ 25 ms
Mechanical life:	>1.5 million operations
Admissible load:	2000 N / 80 mm Ø
Inactive edge	≤ 10mm
Classification:	(In combination with safety monitoring module SRB 301 HC)
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to d
Category:	up to 3
PFH value:	1.0×10^{-7} /h for max. 52,500 switching cycles/year and max. 60% contact load
SIL:	up to 2 in combination with safety monitoring module
Mission time:	20 years
Chemical resistance:	
Water:	Resistant
10% acids:	Resistant
10% caustic solutions:	Resistant
Oils:	Resistant
Gasoline:	Resistant

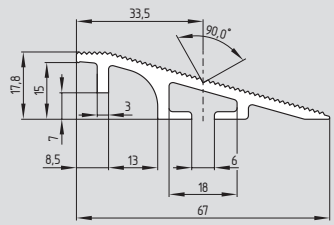
Other on request

Note

Safety Distance Calculations:
S = 1600 mm/s x (T) + 1200 mm
Legend:
T = Total response time from triggering to machine stop, in seconds.

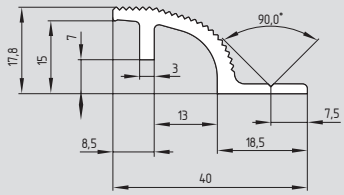
SMS 4 safety mats accessories

System components



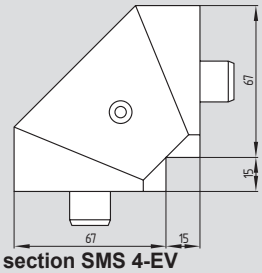
Ramp rail SMS 4-RS-3000

System components

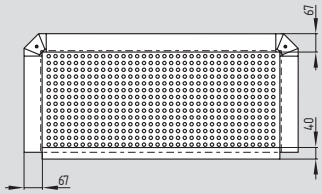


SMS 4-BS-3000 fixing rail

System components



Corner section SMS 4-EV



SMS 4

Ordering details

Ramp rail
3000 mm long **SMS 4-RS 3000**

Precut trim kits
includes 4 rails, 4 corners sections
For mat size:

250 x 500 mm	**SMS4-RS 250-500**
500 x 500 mm	**SMS4-RS 500-500**
500 x 1000 mm	**SMS4-RS 500-1000**
750 x 1000 mm	**SMS4-RS 750-1000**
1000 x 1000 mm	**SMS4-RS 1000-1000**
1000 x 1500 mm	**SMS4-RS 1000-1500**

Ordering details

Fixing rail
3000 mm long **SMS 4-BS-3000**

Ordering details

Corner section (1 pc) **SMS 4-EV**

SRB 301HC

- Safety-monitoring module for safety mats
- 3 enabling contacts
- 1 signalling contact
- Cross-wire detection
- Feedback circuit to monitor external contactors
- Monitored start or automatic start
- LED status indication
- Plug-in terminals

Approvals

Technical data

Standards:	IEC/EN 60204-1, IEC/EN 60947-5-1, EN ISO 13849-1; IEC 61508
Start conditions:	automatic or start button (optionally monitored)
With feedback circuit (Y/N):	yes
ON delay with reset button:	≤ 50 ms
Drop-out delay on „emergency stop“:	≤ 20 ms
Drop-out delay on „supply failure“:	≤ 100 ms
Rated operating voltage U_e:	48 ... 240 VAC; 24 VAC/DC
Frequency range:	50 / 60 Hz
Fuse rating for the operating voltage:	
230 VAC version: primary side:	smelting fuse, tripping current >1.0 A;
secondary side:	internal electronic fuse, tripping current > 0.12 A;
24 VAC/DC version:	internal electronic fuse, tripping current > 0.5 A
Internal electronic fuse (Y/N):	230 VAC version: no 24 VAC/DC version: yes
Current consumption:	230 VAC version: 1.6 W; 4.2 VA 24 VAC/DC version: 1.4 W; 3.3 VA
Inputs monitoring:	
-Cross-wire detection:	yes
- Wire breakage detection:	yes
- Earth leakage detection:	yes
Number of NC contacts:	2
Number of NO contacts:	0
Max. total line resistance:	40 W
Outputs:	
Stop category 0:	3
Stop category 1:	0
Number of safety contacts:	3
Number of signaling outputs:	1
Max. switching capacity of the safety contacts:	250 VAC, 8 A resistive (inductive with suitable protective circuit)
Utilization category to EN 60947-5-1:	AC-15: 230 V / 6 A; DC-13: 24 V / 6 A
Mechanical life:	107 operations
Ambient conditions:	
Operating ambient temperature:	−25°C … +60°C
Storage and transport temperature:	−25°C … +85°C
Protection class:	enclosure: IP40, terminals: IP20, terminal space: IP54
Mounting:	snaps onto standard DIN rails to DIN EN 60715
Connection type:	plug-in type screw terminals
- min. cable section:	0.25 mm²
- max. cable section:	2.5 mm²
Weight:	230 VAC version: 340 g; 24 VAC/DC version: 320 g
Dimensions (height/width/depth):	100 x 45 x 121 mm

Ordering details

SRB 301HC/①-②

No.	Option	Description
①	R	Manual start
	T	Automatic start
②	230 V	48 … 240 VAC
	24 V	24 VAC/DC

Classification

Safety parameters:	
Standards:	EN ISO 13849-1, IEC 61508, EN 60947-5-1
PL:	STOP 0: up to e
Category:	STOP 0: up to 4
PFH value:	STOP 0: ≤ 2.00 x 10^{-8}/h
SIL:	STOP 0: up to 3
Mission time:	20 years

The PFH value of 2.00 x 10^{-8}/h applies to the combinations of contact load (current through enabling contacts) and number of switching cycles (n-op/y) mentioned in the table below. At 365 operating days per year and a 24-hours operation, this results in the below-mentioned switching cycle times (t-cycle) for the relay contacts.
Diverging applications upon request.

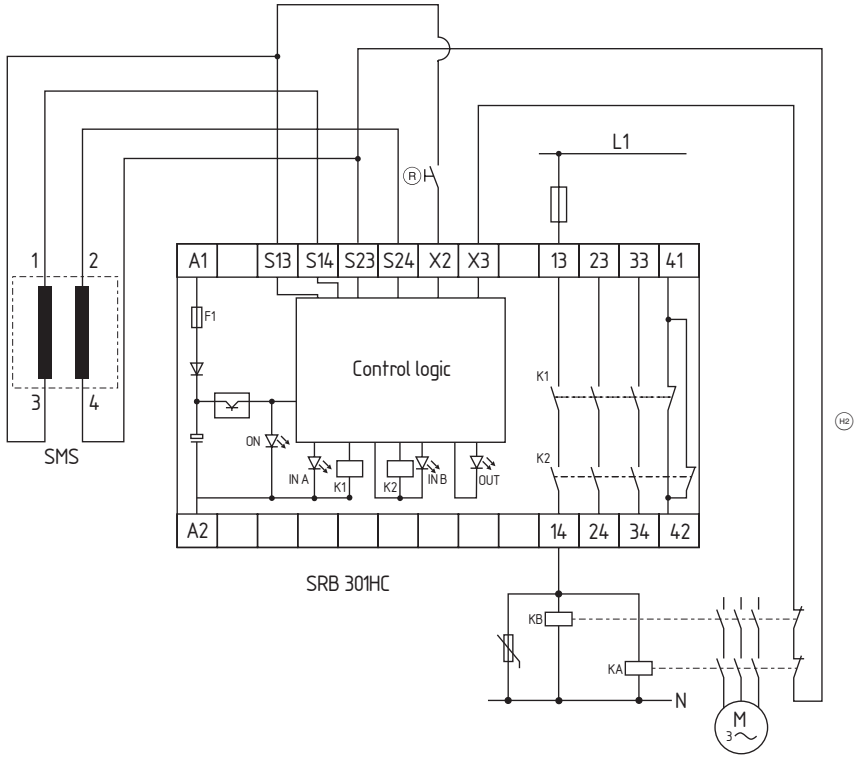
Contact load	n-op/y	t-cycle
20 %	525,600	1.0 min
40 %	210,240	2.5 min
60 %	75,087	7.0 min
80 %	30,918	17.0 min
100 %	12,223	43.0 min

Safety mat

Note

- Protection of a safety mat
- Start button with edge detection
- Feedback circuit ⓗ2 to monitor the external contactors
- Series-wiring of multiple safety mats possible
- Reset button ⓡ

Wiring example



LED

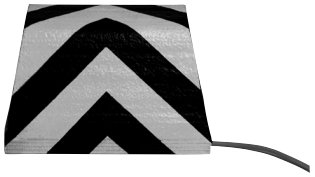
The integrated LEDs indicate the following operating states.

- Position relay K1
- Position relay K2
- Supply voltage U_B

Note

- The wiring example is shown with the safety mat in non-actuated and de-energized condition.
- Inductive loads (e.g. contactors, relays, etc.) are to be supressed by means of a suitable circuit

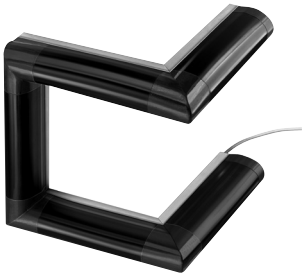
Further products and program extensions



SSG-SBL safety bumper

Safety bumpers are often used to monitor automated-guided vehicles or at rotating machine components where long run-ons, up to approximately 400 mm, can be expected.

Contrary to the conventional safety devices of this kind, the BIA-approved SSG-SBL has a dual-channel design. Several modules are available for signal monitoring.



STW-SL safety edges

Safety edges are used for the protection of shearing and crushing points.

Depending on the application, different rubber profiles and rails are available.

Special advantage: Depending on the system, geometrically more complicated and customer-specific models without dead corners can be produced.

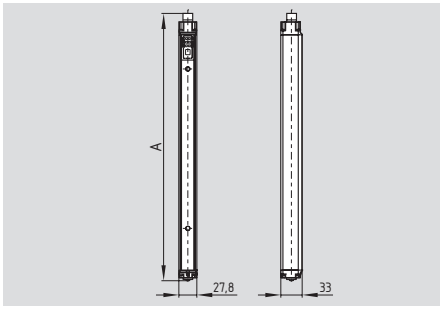
Safe switching and monitoring
Optoelectronic safety devices

Schmersal offers a comprehensive range of active optoelectronic devices (AOPD) to provide non-separating safeguarding of hazardous areas, ranging from point of operation to danger zone or perimeter guarding. These “virtual safety guards” are available as safety light barriers, safety light grids and safety light curtains. They are available with different functions such as blanking, muting, cascading, or cyclic operation. IP69K versions are also available. A large assortment of accessories such as deflecting mirrors and mounting brackets helps the user in installing and using AOPD in his specific application.

Our safety light curtains and grids feature one-piece extruded aluminum housings, in rectangular and circular profiles. This closed housing profile has proven to be less susceptible to mechanical damage, misalignment from torsion or bending, and relieves the stress normally put on the lens in other light curtains.

Further detailed information on this product group can be found in the Optoelectronics catalog

SLC 440



- **Safety light curtain**
- Type 4 to EN 61496-1, CLC/TS 61496-2
- Resolution 14 and 30 mm
- Protection field heights 170 mm ... 1770 mm
- Integrated start/restart interlock
- Integrated contactor control
- Integrated blanking function (fixed and mobile blanking)
- Diagnostic and parametrization interface
- Range 0,3 m ... 10 m
- Fail-safe transistor outputs
- Optical synchronisation
- LED Status display, 7-segment display
- Protection class IP67

Legend: A = Total length
A = 81 mm + Protection field height

Approvals

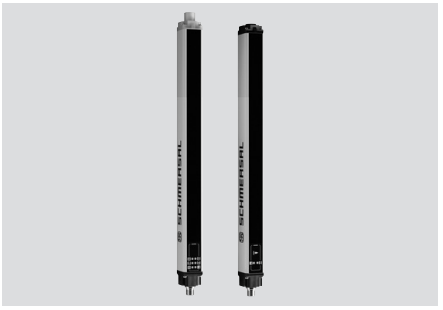
TÜV cULus CE

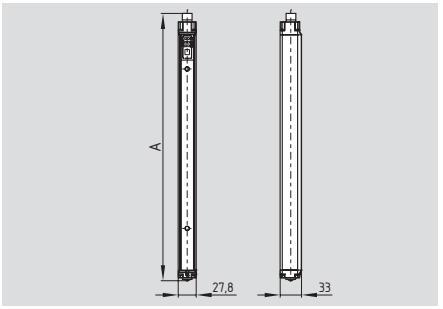
Ordering details

SLC 440-E/R①-②-01

No.	Option	Description
①	xxxx	Protected heights (mm) 0170, 0250, 0330, 0410, 0490, 0570, 0650, 0730, 0810, 0890, 0970, 1050, 1130, 1210, 1290*, 1370*, 1450*, 1530*, 1610*, 1690*, 1770*
②	14	Resolution 14 mm with a range of 0.3 m ... 7 m
	30	Resolution 30 mm with a range of 0.3 m ... 10 m

SLG 440





- **Safety light grid**
- 2-, 3- or 4-beam light grid
- Range 0,3 ... 12 m

Legend: A = Total length
2-beam A = 610 mm
3-beam A = 910 mm
4-beam A = 1010 mm

Approvals

TÜV cULus CE

Ordering details

SLG 440-E/R①-01

No.	Option	Description
①	Distance between outermost beams:	
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam
		Range 0.3 … 12 m

-01 = integrated status indication (option)
* only for resolution 30 mm

Technical data

Standards:	EN 61496-1; CLC/TS 61496-2
Category:	Type 4
Enclosure:	aluminum
Enclosure dimensions:	27.8 x 33 mm
Connection:	Connector plug
- Emitter:	M12, 4-pole,
- Receiver:	M12, 8-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP67 to EN 60529
Response time:	10 … 27 ms (depends on length and resolution)
Detection sensitivity (Resolution):	14 and 30 mm
Protection field height:	
- Resolution 14 mm	170 ... 1210 mm
- Resolution 30 mm	170 ... 1770 mm
- 2-, 3-, 4-beam	500, 800, 900 mm
Protection field width, Range:	
- Resolution 14 mm	0.3 m ... 7 m
- Resolution 30 mm	0.3 m ... 10 m
- 2-, 3-, 4-beam	0.3 m ... 12 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Blanking function:	Integrated
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 250 mA
Power consumption:	Emitter 1,8 W, Receiver 3,8 W
Status and diagnostics:	LED-, 7-segment display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−25 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; EN 62061
PL:	up to e
Category:	up to 4
PFH-value:	
- SLC 440	11,4 x 10^{-9} /h
- SLG 440	8,14 x 10^{-9} /h
SIL:	up to 3
Service life:	20 years

Ordering details

Connector:
Female connector M12, 4-pole straight
for emitter

cable length 5 m	**KA-0804**
cable length 10 m	**KA-0805**
cable length 20 m	**KA-0808**

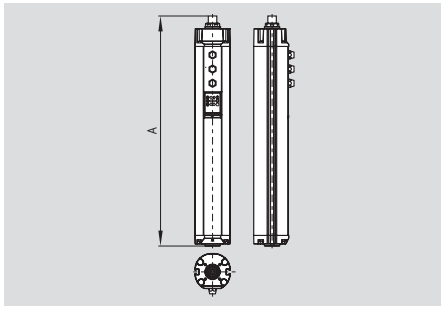
Female connector M12, 8-pole straight
for receiver

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

Cable for the parametrization

cable length 1 m	**KA-0974**

SLC 425I

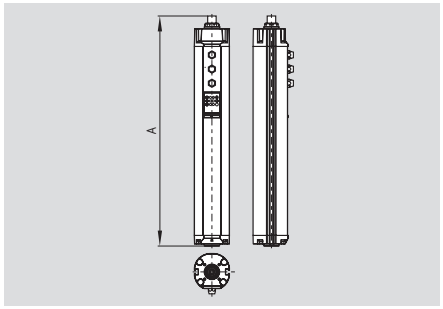


- **Safety light curtain**
- Type 4 to IEC/EN 61496-1, -2
- Resolution 14 and 30 mm
- Protection field heights 170 mm ... 1770 mm
- Integrated start/restart interlock
- Integrated contactor control
- Integrated muting and override function
- Integrated blanking function (fixed and mobile blanking)
- Cyclic operation (1 ... 8 Cycles)
- Range 0.3 ... 10 m
- Fail-safe transistor outputs
- Optical synchronisation
- Status display
- Different muting sequences can be parameterized
- Protection class IP67

Legend: A = Total length
Emitter:
A = 84.5 mm + Protection field height
Receiver:
A = 148.5 mm + Protection field height

Approvals

SLG 425I



- **Safety light grid**
- 2-, 3-, 4-beam light grid
- Protection field heights 500, 800 or 900 mm
- Range 0.3 ... 18 m

Legend: A = Total length
Emitter:
2-beam A = 804 mm
3 and 4-beam A = 1124 mm
Receiver:
2-beam A = 868 mm
3 and 4-beam A = 1188 mm

Approvals

Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 4
Enclosure:	aluminum
Enclosure dimensions:	Ø 49 mm
Connection:	Connector plug
- Emitter:	M12, 4-pole,
- Receiver:	M12, 8-pole,
- Muting sensors:	2 x connector plugs M8, 3-pole
- Muting lamp:	M8, 3-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP67 to EN 60529
Response time:	7 … 28.5 ms (Depends on length and resolution)
Detection sensitivity (Resolution):	14 and 30 mm
Protection field height:	
- Resolution 14 mm	170 ... 1450 mm
- Resolution 30 mm	170 ... 1770 mm
- 2-, 3-, 4-beam	500, 800, 900 mm
Protection field width, Range:	
- Resolution 14 mm	0.3 m ... 7 m
- Resolution 30 mm	0.3 m … 10 m
- 2-, 3-. 4-beam	0.3 m ... 18 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Muting and override function:	Integrated
Muting sensors:	2 or 4 external sensors
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 500 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH-value:	7.42 x 10^{-9}/h
SIL:	up to 3
Service life:	20 years

Ordering details

SLC 425I-E/R①-②-RFBC

No.	Option	Description
①	xxxx	Protected heights (mm) 0170, 0250, 0330, 0410, 0490, 0570, 0650, 0730, 0810, 0890, 0970, 1050, 1130, 1210, 1290, 1370, 1450, 1530*, 1610*, 1690*, 1770*
②	14, 30	Resolution 14 mm, 30 mm

Ordering details

SLG 425I-E/R①-RF

No.	Option	Description
①	Distance between outermost beams:	
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam

Mounting brackets are included in the delivery.

Note:
* only for resolution 30 mm

Converter for the parametrization NSR 0801

Ordering details

Connector:
Female connector M12, 4-pole straight
for emitter

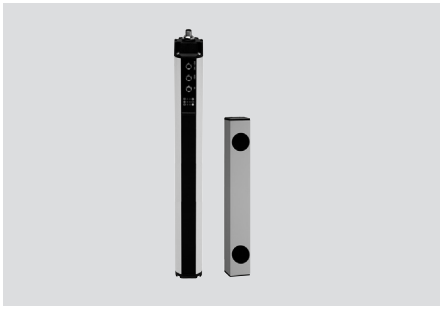
cable length 5 m	**KA-0804**
cable length 10 m	**KA-0805**
cable length 20 m	**KA-0808**

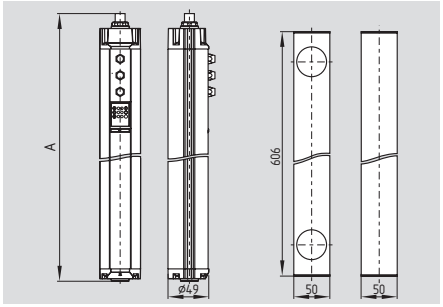
Female connector M12, 8-pole straight
for receiver

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

Connecting cable for the muting sensors
M8, 3-pole to M12, 4-pole, 2 m **KA-0965**

SLG 425-IP





- **Safety light grid**
- Emitter and receiver in one enclosure (retro reflector)
- Type 4 to IEC/EN 61496-1, -2
- Protection field heights 500 mm
- 2-beam light grid
- Integrated start/restart interlock
- Integrated muting and override function
- Range 0.3 m ... 7 m
- Fail-safe transistor outputs
- Status display
- Protection class IP67

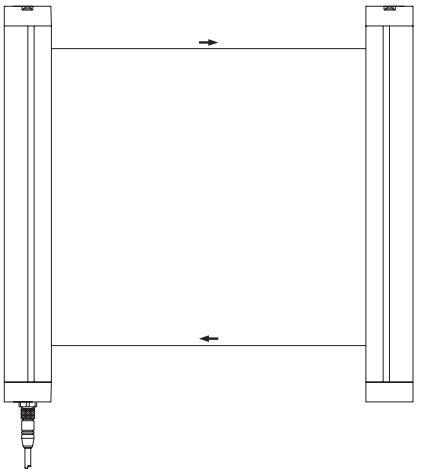
Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 4
Enclosure:	aluminum
Enclosure dimensions:	Ø 49 mm
Deflecting mirror:	50 x 50 x 606 mm
Connection:	Connector plug
- emitter/receiver:	M12, 8-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP67 to EN 60529
Response time:	15 ms
Detection sensitivity (Resolution):	500 mm
Protection field height:	500 mm
Protection field width, Range:	0.3 m ... 7 m
Start/restart interlock:	Integrated
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 500 mA
Power consumption:	10 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C

Classification:

Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH-value:	7.42 x 10^{-9}/h
SIL:	up to 3
Service life:	20 years

Technical data



Approvals

TÜV cULus CE

Ordering details

SLG 425IP-E/R0500-02-RF	Light grid
ULS-P-0501	Deflecting mirror

Note

Mounting brackets are included in the delivery.

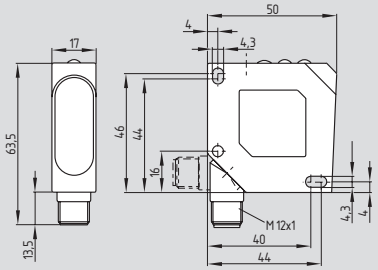
Note
Converter for the parametrization NSR 0801

Ordering details

Connector:
Female connector M12, 8-pole straight

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

LF 50-11P



- Range up to 5.5 m
- Connector plug can be rotated
- LED status display
- Protection class IP67
- Infrared light 660 nm
- Laser protection class 1
- Polarisation filter
- Antivalent switching outputs

Approvals

CE

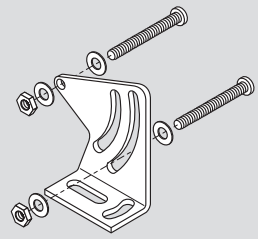
Technical data

Standards:	EN 60974-5-2
Laser protection class 1	EN 60825-1-10/03
Enclosure:	ABS
Enclosure dimensions:	50 x 50 x 17 mm
Connection:	Connector plug M12, 4-pole, can be rotated
Max. cable length:	100 m
Protection class:	IP67
Switching frequency:	2500 Hz
Range:	0 ... 5.5 m
Infrared laser light:	660 nm
U_e:	10 ... 30 VDC
Switching output:	2 x PNP 200 mA
Beam diameter:	5 ... 24 mm
LED status display:	soiling, switching condition and power on
Ambient temperature:	−20 °C ... +60 °C
Storage and transport temperature:	−20 °C … +80 °C

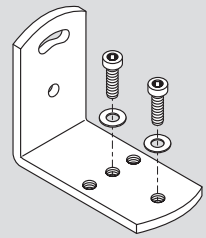
System components

Reflector R 51 x 61-L

Reflector R D83



Mounting angle BF 50



Mounting angle BF UNI 1

Ordering details

LF 50-11P

Note:
System components (cables, mounting angles, etc.) not included in the delivery.

Ordering details

Connector M12, 4-pole straight	
without cable	**KD M12-4**
with cable 2 m	**KD M12-4-2M**
with cable 5 m	**KD M12-4-5M**

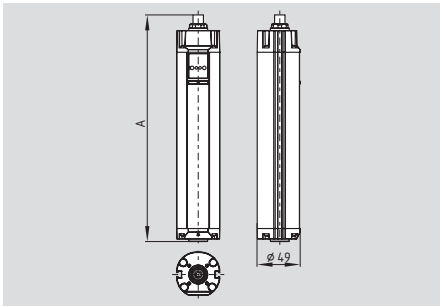
Connecting cable to connect SLG 425I

M12, 4-pole to M8, 3-pole, 2 m	**KA-0965**

Ordering details

Reflector	**R 51 x 61-L**
Reflector	**R D83**
Mounting angle	**BF 50**
Mounting angle universal	**BF UNI 1**

SLC 420 standard



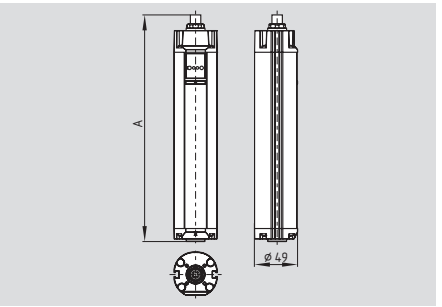
- **Safety light curtain**
- Type 4 to IEC/EN 61496-1, -2
- Resolution 14, 30 and 50 mm
- Protection field heights 170 mm ... 1770 mm
- Integrated start/restart interlock
- Integrated contactor control
- Integrated blanking function (fixed and mobile blanking)
- Diagnostic and parametrization interface
- Range 0.3 m ... 18 m
- Fail-safe transistor outputs
- Optical synchronisation
- Status display
- Protection class IP67

Legend: A = Total length
A = 84.5 mm + Protection field height

Approvals

TÜV cULus CE

SLG 420 standard



- **Safety light grid**
- 2-, 3- or 4-beam light grid
- Range 0.3 ... 40 m

Legend: A = Total length
2-beam A = 734.5 mm
3 and 4-beam A = 1054.5 mm

Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 4
Enclosure:	aluminum
Enclosure dimensions:	Ø 49 mm
Connection:	Connector plug
- Emitter:	M12, 4-pole,
- Receiver:	M12, 8-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP67 to EN 60529
Response time:	10 … 27 ms (depends on length and resolution)
Detection sensitivity (Resolution):	14, 30 and 50 mm
Protection field height:	
- Resolution 14 mm	170 ... 1450 mm
- Resolution 30, 50 mm	170 ... 1770 mm
- 2-, 3-, 4-beam	500, 800, 900 mm
Protection field width, Range:	
- Resolution 14 mm	0.3 m ... 7 m
- Resolution 30, 50 mm	0.3 m ... 10 m
- High Range/Resolution 30 mm	0.3 m ... 18 m
- 2-, 3-, 4-beam	0.3 m ... 18 m
- High Range 2-, 3-, 4-beam	8 m ... 40 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Blanking function:	Integrated
Cascading: (Master/Slave)	-
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 500 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH-value:	7.42 x 10^{-9}/h
SIL:	up to 3
Service life:	20 years

Ordering details

SLC 420-E/R①-②-RFB-③

No.	Option	Description
①	xxxx	Protected heights (mm) available lengths: 0170, 0250, 0330, 0410, 0490, 0570, 0650, 0730, 0810, 0890, 0970, 1050,1130, 1210, 1290, 1370, 1450, 1530*, 1610*, 1690*,1770*
②	14, 30, 50	Resolution 14, 30, 50 mm
③		Range 0.3 m ... 7 m**
		Range 0.3 m ... 10 m *
	H***	High Range 0.3 m ... 18 m

Ordering details

SLG 420-E/R①-RF-②

No.	Option	Description
①	Distance between outermost beams:	
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam
②		Range 0.3 m ... 18 m
	H	Range 8 m ... 40 m

Mounting brackets are included in the delivery.
Note:
* only for resolution 30 mm, 50 mm
** only for resolution 14 mm
*** only for resolution 30 mm
Converter for the parametrization NSR 0801

Ordering details

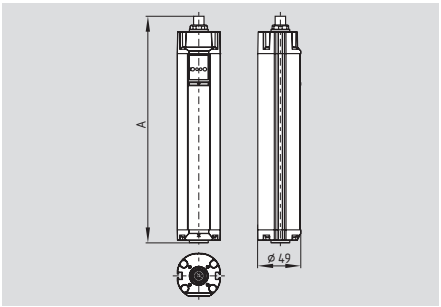
Connector:
Female connector M12, 4-pole straight
for emitter

cable length 5 m	**KA-0804**
cable length 10 m	**KA-0805**
cable length 20 m	**KA-0808**

Female connector M12, 8-pole straight
for receiver

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

SLC 420 Master / Slave



- **Safety light curtain**
- Type 4 to IEC/EN 61496-1, -2
- Resolution 14, 30 and 50 mm
- Protection field height:
  Master 170 mm ... 1770 mm
  Slave 170 mm ... 650 mm
- Integrated start/restart interlock
- Integrated contactor control
- Integrated blanking function
- Diagnostic and parametrization interface
- Cascading of Master and Slave devices
- Range 0.3 m ... 18 m
- Fail-safe transistor outputs
- Optical synchronisation
- Status display

Legend: A = Total length
A = 84.5 mm + Protection field height

Approvals

TÜV cULus CE

Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 4
Enclosure:	aluminum
Enclosure dimensions:	Ø 49 mm
Connection:	Connector plug
- Master emitter:	M12, 4-pole
- Master receiver:	M12, 8-pole
- Slave emitter:	M12, 4-pole
- Slave receiver:	M12, 8-pole
Max. cable length:	100 m / 1 Ω
Max. cable length: (Master/Slave)	0.8 m
Protection class:	IP67 to EN 60529
Response time:	10 … 37 ms (Depends on length and resolution)
Detection sensitivity (Resolution):	14, 30 and 50 mm
Protection field height:	
- Resolution 14 mm	170 ... 2100 mm
- Resolution 30, 50 mm	170 ... 2420 mm
Protection field width, Range:	
- Resolution 14 mm	0.3 m ... 7 m
- Resolution 30, 50 mm	0.3 m ... 10 m
- High Range	0.3 m ... 18 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Blanking function:	Integrated
Cascading: (Master/Slave)	Possible
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 500 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C

Classification:

Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH-value:	7.42 x 10^{-9}/h
SIL:	up to 3
Service life:	20 years

System components

Connector

Ordering details

SLC 420-E/R①-②-RFB-③④

No.	Option	Description
①	xxxx	Protected heights (mm) available lengths: 0170, 0250, 0330, 0410, 0490, 0570, 0650, 0730, 0810, 0890, 0970, 1050, 1130, 1210, 1290, 1370, 1450, 1530*, 1610*, 1690*, 1770*
②	14, 30, 50	Resolution 14, 30, 50 mm
③		Range 0.3 m ... 7 m**
		Range 0.3 m ... 10 m*
	H*	High Range 0.3 m ... 18 m

Ordering details

SLC 420-E/R①-②-RFB-③④

No.	Option	Description
④	M	Master function
	S***	Slave function

Mounting brackets are included in the delivery.
Note:
* only for resolution 30 and 50 mm
** only for resolution 14 mm
*** Protection field heights 170 ... 650 mm

Converter for the parametrization NSR 0801

Ordering details

Connector:
Female connector M12, 4-pole straight
for emitter

cable length 5 m	**KA-0804**
cable length 10 m	**KA-0805**
cable length 20 m	**KA-0808**

Female connector M12, 8-pole straight
for receiver

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

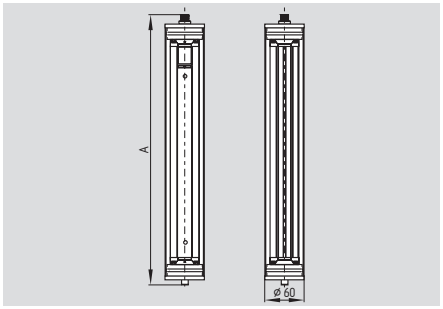
for Master/Slave connection:

for emitter cable length 0.8 m	**KA-0810**

Female connector M12, 8-pole straight

for receiver cable length 0.8 m	**KA-0901**

SLC 420 IP69K



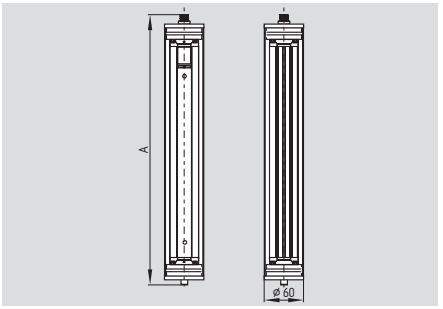
- **Safety light curtain**
- Type 4 to IEC/EN 61496-1, -2
- Resolution 14 mm, 30 mm
- Protection field heights 170 mm ... 1450 mm
- Protection class IP69K
- Integrated start/restart interlock
- Integrated contactor control
- Integrated blanking function (fixed and mobile blanking)
- Diagnostic and parametrization interface
- Range 0.3 m ... 10 m
- Fail-safe transistor outputs
- Optical synchronisation
- Status display

Legend: A = Total length
A = 97 mm + Protection field height

Approvals

TÜV cULus CE

SLG 420 IP69K



- **Safety light grid**
- 2-, 3- or 4-beam light grid
- Range 0.3 ... 18 m

Legend: A = Total length
2-beam A = 747 mm
3 and 4-beam A = 1067 mm

Approvals

TÜV cULus CE

Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 4
Enclosure:	aluminum protective tube housing PMMA
Enclosure dimensions:	Ø 60 mm
Connection:	Cable (5 m) with
- Receiver	connector M12, 8-pole
- Emitter	connector M12, 4-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP69K to EN 60529
Response time:	10 … 27 ms (depends on length and resolution)
Detection sensitivity (Resolution):	14, 30 mm
Protection field height:	
- Resolution 14, 30 mm	170 ... 1450 mm
- 2-, 3-, 4-beam	500, 800, 900 mm
Protection field width, Range:	
- Resolution 14 mm	0.3 m ... 7 m
- Resolution 30 mm	0.3 m ... 10 m
- 2-, 3-, 4-beam	0.3 m ... 18 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Blanking function:	Integrated
Cascading: (Master/Slave)	-
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 500 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH-value:	7.42 x 10^{-9}/h
SIL:	up to 3
Service life:	20 years

Ordering details

SLC 420-E/R①-②-69-RFB

No.	Option	Description
①	xxxx	Protected heights (mm) available lengths: 0170, 0250, 0330, 0410, 0490, 0570, 0650, 0730, 0810, 0890, 0970, 1050, 1130, 1210, 1290, 1370, 1450
②	14	Resolution 14 mm with a range of 0.3 m ... 7 m
	30	Resolution 30 mm with a range of 0.3 m ... 10 m

Ordering details

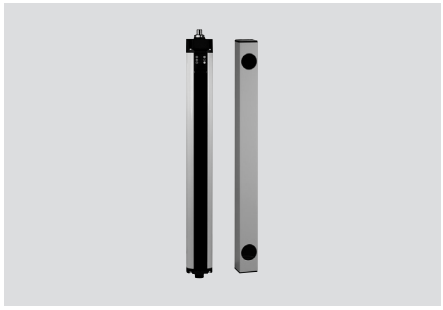
SLG 420-E/R①-69-RF

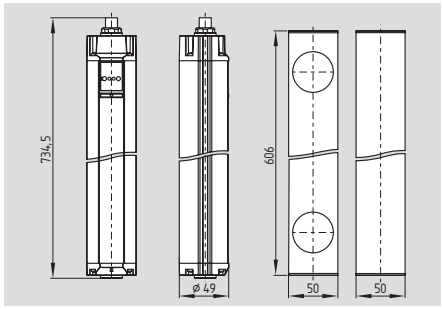
No.	Option	Description
①	Distance between outermost beams:	
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam

Mounting brackets (**V4A**) are included in the delivery.

Note:
Converter for the parametrization NSR 0801

SLG 422-P





- **Safety light grid**
- Emitter and receiver in one enclosure (retro reflector)
- Type 4 to IEC/EN 61496-1, -2
- Protection field heights 500 mm
- 2-beam light grid
- Integrated start/restart interlock
- Integrated contactor control
- Range 0.3 m ... 7 m
- Fail-safe transistor outputs
- Status display
- Protection class IP67

Approvals

TÜV cULus CE

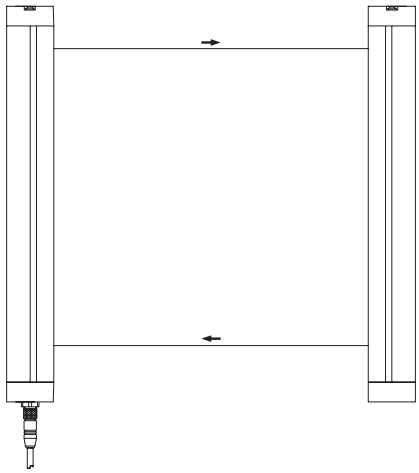
Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 4
Enclosure:	aluminum
Enclosure dimensions:	Ø 49 mm
Deflecting mirror:	50 x 50 x 606 mm
Connection:	Connector plug M12, 8-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP67 to EN 60529
Response time:	10 ms
Detection sensitivity (Resolution):	500 mm
Protection field height:	500 mm
Protection field width, Range:	0.3 m ... 7 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 500 mA
Power consumption:	10 W
Data interface:	-
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C

Classification:

Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to e
Category:	up to 4
PFH-value:	7.42 x 10^{-9}/h
SIL:	up to 3
Service life:	20 years

Technical data



Ordering details

SLG 422-P-E/R0500-02-RF	Light grid
ULS-P-0501	Deflecting mirror

Note

Mounting brackets are included in the delivery.

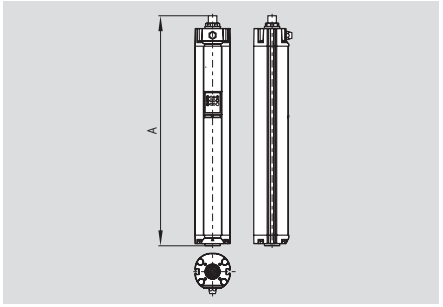
Note:
Converter for the parametrization NSR 0801

Ordering details

Connector:
Female connector M12, 8-pole straight

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

SLC 421



- **Safety light curtain**
- Category Type 4 to IEC/EN 61496-1, -2
- Resolution 14 and 30 mm
- Protection field heights from 170 ... 1770 mm
- **Smooth parameter assignment using external command devices, no PC software required**
- Integrated start/restart interlock
- Integrated contactor control
- Integrated blanking function (fixed and floating blanking)
- Integrated cyclic function 1 or 2-cycle operation
- Diagnostic and parametrization interface
- Range 0.3 ... 10 m
- Fail-safe transistor outputs
- Optical synchronisation
- Status display
- Protection class IP67

Legend:
A: Total length
Transmitter A = 84.5 mm + protected field height
Receiver A = 148.5 mm + protection field height

Approvals

Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 4
Enclosure:	aluminum
Enclosure dimensions:	Ø 49 mm
Connection:	Connector plug
- Transmitter:	M12, 4-pole,
- Receiver:	M12, 12-pole and M8, 6-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP67 to EN 60529
Response time:	15 … 32 ms (depends on length and resolution)
Detection sensitivity (resolution):	14 and 30 mm
Protected height:	
- Resolution 14 mm	170 ... 1450 mm
- Resolution 30 mm	170 ... 1770 mm
Protection field width, range:	
- Resolution 14 mm	0.3 m ... 7 m
- Resolution 30 mm	0.3 m … 10 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Blanking function:	Integrated
Cyclic operation:	1 cycle or 2 cycles
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 500 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; IEC 61508
PL:	up to e
Category:	up to 4
PFH-value:	7.42 x 10^{-9}/h
SIL:	up to 3
Service life:	20 years

System components

Connector

Ordering details

SLC 421-E/R①-②-RFBC-③

No.	Option	Description
①	xxxx	Protected heights (mm) Available lengths: 0170, 0250, 0330, 0410, 0490, 0570, 0650, 0730, 0810, 0890, 0970, 1050, 1130, 1210, 1290, 1370, 1450, 1530*, 1610*, 1690*, 1770*

Note

②	14	Resolution 14 mm
	30	Resolution 30 mm
③	01	Integrated status indication (rt/gn) (optional)

* only 30 mm

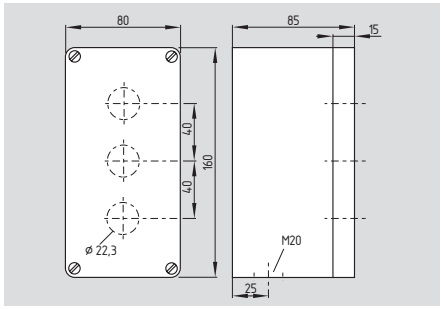
Control units ordered separately, see next page

Ordering details

Connector:

Female connector **for emitter**	
M12, 4-pole, straight	
cable length 5 m	**KA-0804**
cable length 10 m	**KA-0805**
cable length 20 m	**KA-0808**
Female connector **for receiver**	
M12, 12-pole, straight	
cable length 5 m	**KA-0980**
cable length 10 m	**KA-0981**
Female connector **for receiver/control unit**	
M8, 6-pole, angled	
cable length 2 m	**KA-0053**
cable length 5 m	**KA-0054**

BDB 01



- **Blanking control unit**
- Smooth parameter assignment using external command devices, no PC software required
- Modular enclosure in ABS version
- 3 Command devices:
  1 key-operated switch (Pos. 0, 1)
  1 selector switch, latching
  1 restart button

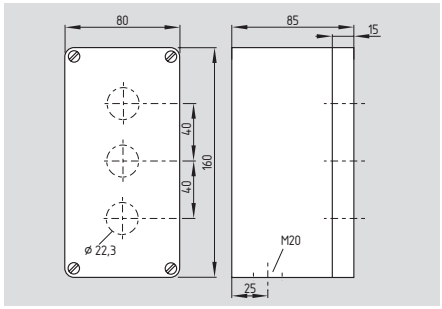
Approvals

CE

Ordering details

BDB 01 **101213356**

BDT 01



- **Control unit cyclic operation**
- Smooth parameter assignment using external command devices, no PC software required
- Modular enclosure in ABS version
- 3 Command devices:
  1 key-operated switch (Pos. 0, 1, 2)
  1 teach-in button
  1 restart button

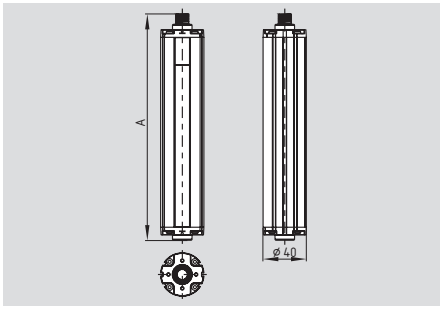
Ordering details

BDT 01 **101213358**

Technical data

Standards:	IEC/EN 60947-5-1
Enclosure:	ABS
Protection class:	IP40
Contact type BDB 01	
- Key-operated switch:	2 NC / 2 NO
- Selector switch:	2 NC / 4 NO
- Restart button:	1 NO
Contact type BDT 01:	
- Key-operated switch:	2 NC / 4 NO
- Teach-in button:	1 NO
- Restart button:	1 NO
Switching principle:	IEC 60947-5-1
Connection:	PVC cable, 5 m long
Cable section:	8 x 0.25 mm²
Cable entry:	M20
U_{imp}:	4 kV
I_{the}:	3 A
Utilization category:	DC-13
I_e/U_e:	1 A / 24 VDC
Max. fuse rating:	6 A gL D-fuse
Ambient temperature:	−10 °C … +50 °C
Mechanical life:	
- Key-operated switch:	1 million operations
- Selector switch:	1 million operations
- Button:	1 million operations
Switching frequency:	max. 50/h
Dimensions (L x W x H):	160 x 80 x 85mm

SLC 220 standard

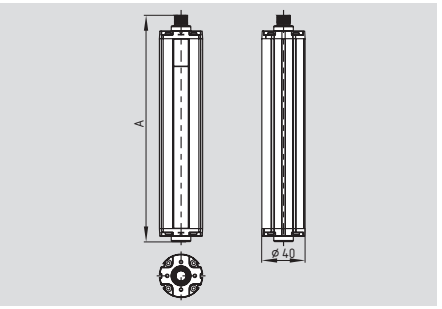


- **Safety light curtain**
- Type 2 to IEC/EN 61496-1, -2
- Resolution 30 and 80 mm
- Protection field heights 175 mm ... 1675 mm
- Integrated start/restart interlock
- Integrated contactor control
- Integrated blanking function
- Diagnostic and parametrization interface
- Range 0.3 m ... 14 m
- Integrated self-test
- Fail-safe transistor outputs
- Status display
- Protection class IP65
- Signaling output

Legend: A = Total length
Protection field height 175 mm
A = 216 mm
Protection field height 250 ... 1675 mm
A = 28.5 mm + Protection field height

Approvals

SLG 220 standard



- **Safety light grid**
- 2-, 3- or 4-beam light grid
- Range 0.3 ... 30 m

Legend: A = Total length
A = 78.5 mm + Distance between outermost beams

Approvals

Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 2
Enclosure:	aluminum
Enclosure dimensions:	Ø 40 mm
Connection:	Connector plug M12, 8-pole
Max. cable length:	100 m / 1Ω
Protection class:	IP65 to EN 60529
Response time:	9 … 45 ms (depends on length and resolution)
Detection sensitivity (Resolution):	30 and 80 mm
Protection field height:	
- Resolution 30 mm	175 ... 1675 mm
- Resolution 80 mm	325 ... 1675 mm
- 2-, 3-, 4-beam	500, 800, 900 mm
Protection field width, Range:	0.3 ... 6 m (Standard),
- SLC	4 ... 14 m (High range)
- SLG	5 ... 30 m (High range)
Start/restart interlock:	Integrated
Contactor control:	Integrated
Blanking function:	Integrated
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 200 mA
Signaling output:	PNP 100 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to d
Category:	up to 2
PFH-value:	3.59 x 10^{-8}/h
SIL:	up to 2
Service life:	20 years

Ordering details

SLC 220-E/R①-②RFB-③

No.	Option	Description
①	xxxx	Protected heights (mm), available lengths: 0175*, 0250*, 0325, 0475, 0625, 0775, 0925, 1075, 1225, 1375, 1525, 1675
②	30, 80	Resolution 30, 80 mm
③		Range 0.3 m ... 6 m
	H	High Range 4 m ... 14 m

Note:
* only for resolution 30 mm

Ordering details

SLG 220-E/R①RF-②

No.	Option	Description
①	Distance between outermost beams:	
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam
②		Range 0.3 m ... 6 m
	H	High Range 5 m ... 30 m

Mounting brackets are included in the delivery.

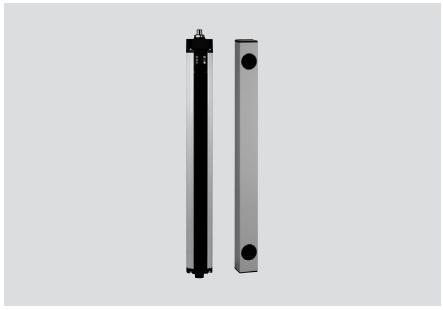
Note:
Converter for the parametrization NSR 0700

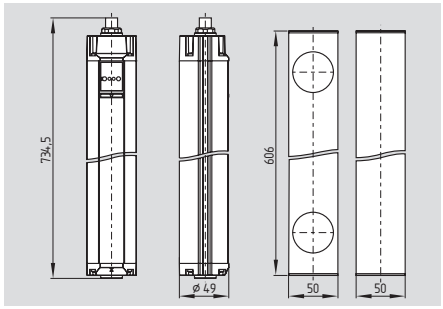
Ordering details

Connector:
Female connector M12, 8-pole straight
for emitter/receiver

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

SLG 220-P





- **Safety light grid**
- Emitter and receiver in one enclosure (retro reflector)
- Type 2 to IEC/EN 61496-1, -2
- Protection field heights 500 mm
- 2-beam light grid
- Range 0.3 m ... 6 m
- Fail-safe transistor outputs
- Status display
- Protection class IP65

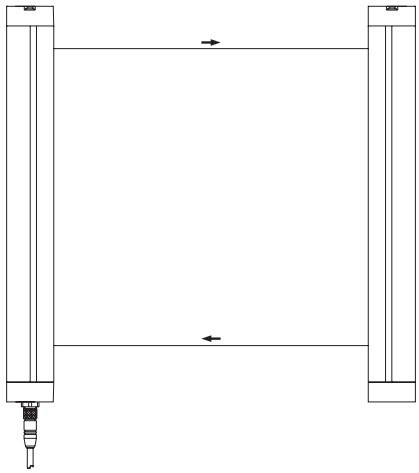
Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 2
Enclosure:	aluminum
Enclosure dimensions:	Ø 40 mm
Deflecting mirror:	50 x 50 x 606 mm
Connection:	Connector plug M12, 8-pole
Max. cable length:	100 m / 1 Ω
Protection class:	IP65 to EN 60529
Response time:	12 ms
Detection sensitivity (Resolution):	500 mm
Protection field height:	500 mm
Protection field width, Range:	0.3 m ... 6 m
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 200 mA
Signaling output:	PNP, 100 mA
Power consumption:	10 W
Data interface:	-
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C

Classification:

Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to d
Category:	up to 2
PFH-value:	3.59 x 10^{-7}/h
SIL:	up to 2
Service life:	20 years

Technical data



Approvals

TÜV cULus CE

Ordering details

SLG 220-P-E/R0500-02RF	Light grid
ULS-P-0500	Deflecting mirror

Note

Mounting brackets are included in the delivery.

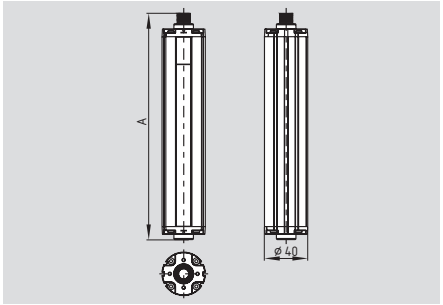
Note:
Converter for the parametrization NSR 0700

Ordering details

Connector:
Female connector M12, 8-pole straight

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

SLC 220 Master / Slave



- **Safety light curtain**
- Type 2 to IEC/EN 61496-1, -2
- Resolution 30 and 80 mm
- Protection field height:
  Master 175 mm ... 1675 mm
  Slave 325 mm ... 775 mm
- Integrated start/restart interlock
- Integrated contactor control
- Diagnostic and parametrization interface
- Cascading of Master and Slave devices
- Range 0.3 m ... 6 m
- Fail-safe transistor outputs
- Status display
- Protection class IP65
- Signaling output
- Integrated self-test

Legend: A = Total length
Protection field height 175 mm
A = 216 mm
Protection field height 250 ... 1675 mm
A = 28.5 mm + Protection field height

Approvals

TÜV cULus CE

Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 2
Enclosure:	aluminum
Enclosure dimensions:	Ø 40 mm
Connection:	Connector plug
- Master emitter:	M12, 8-pole
- Master receiver:	M12, 8-pole
- Slave emitter:	M12, 6-pole
- Slave receiver:	M12, 6-pole
Max. cable length:	100 m / 1Ω
Max. cable length: (Master/Slave)	0.3 m
Protection class:	IP65 to EN 60529
Response time:	12 … 65 ms (depends on length and resolution)
Detection sensitivity (Resolution):	30 and 80 mm
Protection field height:	
- Resolution 30 mm	175 ... 2450 mm
- Resolution 80 mm	325 ... 2450 mm
Protection field width, Range:	0.3 ... 6 m
Start/restart interlock:	Integrated
Contactor control:	Integrated
Cascading: (Master/Slave)	Possible
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 200 mA
Signaling output:	PNP, 100 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to d
Category:	up to 2
PFH-value:	3.59 x 10^{-8}/h
SIL:	up to 2
Service life:	20 years

System components

Connector

Ordering details

SLC 220-E/R①-②-RFB③

No.	Option	Description
①	xxxx	Protected heights (mm), available lengths: 0175*, 0250*, 0325, 0475, 0625, 0775, 0925, 1075, 1225, 1375, 1525, 1675
②	30	Resolution 30mm
	80	Resolution 80mm
③	M	Master function
	S	Slave function**

Ordering details

Note:
* only for resolution 30 mm
** only protected heights 325 mm ... 775 mm

Converter for the parametrization NSR 0700

Different lengths and resolutions can be combined for Master/Slave.

Mounting brackets are included in the delivery.

Ordering details

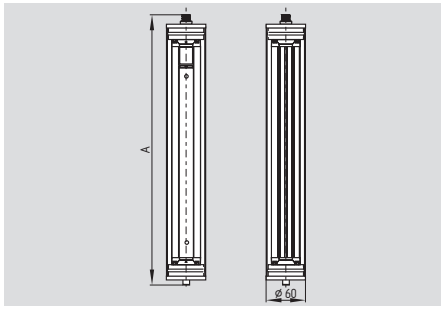
Connector:
Female connector M12, 8-pole straight
for emitter/receiver

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

for Master/Slave connection
Female connector 2 x M12, 6-pole straight

cable length 0.3 m	**KA-0907**

SLC 220 IP69K



- **Safety light curtain**
- Type 2 to IEC/EN 61496-1, -2
- Resolution 30 and 80 mm
- Protection field heights 175 mm ... 1675 mm
- Protection class IP69K
- Integrated start/restart interlock
- Integrated contactor control
- Integrated blanking function
- Diagnostic and parametrization interface
- Range 0.3 m ... 14 m
- Integrated self-test
- Fail-safe transistor outputs
- Status display
- Signaling output

Legend: A = Total length
A = 54 mm + Protection field height

Approvals

TÜV cULus CE

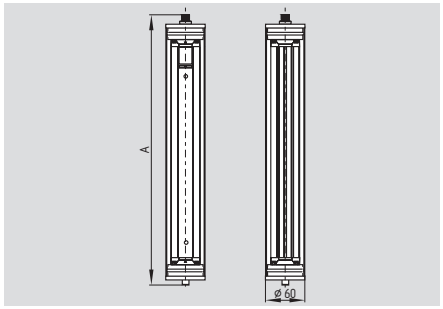
Ordering details

SLC 220-E/R①-②-69-RFB-③

No.	Option	Description
①	xxxx	Protected heights (mm), available lengths: 0175*, 0250*, 0325, 0475, 0625, 0775, 0925, 1075, 1225, 1375, 1525, 1675
②	30	Resolution 30 mm
	80	Resolution 80 mm
③		Range 0.3 m ... 6 m
	H	High Range 4 m ... 14

* only for resolution 30 mm

SLG 220 IP69K



- **Safety light grid**
- 2-, 3- or 4-beam light grid
- Range 0.3 ... 30 m

Legend: A = Total length
A = 104 mm + Distance between outermost beams

Approvals

TÜV cULus CE

Ordering details

SLG 220-E/R①-69-RF-②

No.	Option	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam
②		Range 0.3 m ... 6 m
	H	High Range 5 m ... 30 m

Technical data

Standards:	IEC/EN 61496-1/-2
Category:	Type 2
Enclosure:	aluminum protective tube housing PMMA
Enclosure dimensions:	Ø 60 mm
Connection:	Cable (5 m) with connector M12, 8-pole
Max. cable length:	100 m / 1Ω
Protection class:	IP69K
Response time:	9 … 45 ms (depends on length and resolution)
Detection sensitivity (Resolution):	30 and 80 mm
Protection field height:	
- Resolution 30 mm	175 ... 1675 mm
- Resolution 80 mm	325 ... 1675 mm
- 2-, 3-, 4-beam	500, 800, 900 mm
Protection field width, Range:	0.3 ... 6 m (Standard),
- SLC	4 ... 14 m (High range)
- SLG	5 ... 30 m (High range)
Start/restart interlock:	Integrated
Contactor control:	Integrated
Blanking function:	Integrated
Light emission wavelength:	880 nm (infrared)
U_e:	24 VDC ± 10%
Safety outputs:	2 x PNP, 200 mA
Signaling output:	PNP, 100 mA
Power consumption:	Emitter 4 W, Receiver 8 W
Data interface:	RS 485
Status and diagnostics:	LED display
Ambient temperature:	−10 °C … +50 °C
Storage and transport temperature:	−20 °C … +70 °C
Classification:	
Standards:	EN ISO 13849-1; IEC 61508; IEC 60947-5-3
PL:	up to d
Category:	up to 2
PFH-value:	3.59 x 10^{-8}/h
SIL:	up to 2
Service life:	20 years

Ordering details

Connector:
Female connector M12, 8-pole straight

cable length 5 m	**KA-0904**
cable length 10 m	**KA-0905**
cable length 20 m	**KA-0908**

Mounting brackets (**V4A**) are included in the delivery.

Note:
Converter for the parametrization NSR 0700

System components

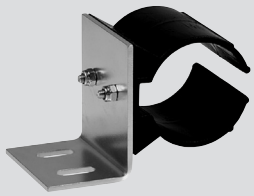
Programming cable KA-0974

Alignment kit EA-5

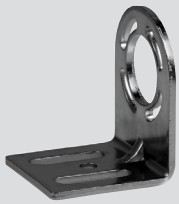
Muting lamp with wall bracket MK2

Mounting kit MS-1000 / MS 1072

System components



Mounting kit MS-1010



Mounting kit MS-1031 for ULS-A4

Mounting kit MS-1038

Mounting kit MS-1051

System components

Mounting kit MS-1073

Vibration damper MSD-2 / MSD-4

Test rod PLS-01, PLS-02

Ordering details

Programming cable
for SLC/SLG 440 **KA-0974**
Laser alignment tool
for SLC / SLG **EA5**
Lighting element
Muting lamp with LED block **MK2**
Operating conditions indication
Mounting kit for SLC /SLG 220
4 x angle incl. screws **MS-1000**
2 x angle incl. screws **MS-1072**

Ordering details

Mounting kit for central fixation for SLC /SLG 220
2 x angle **MS-1010**
Mounting kit for ULS-A4
2 x angle incl. screws **MS-1031**
Mounting kit for SLC/SLG 420-425 (V4A)
4 x angle incl. screws **MS-1038**
Mounting kit for lateral fixation for SLC/SLG 420-425
Consisting of 2 steel angles,
4 screws and 4 T-slot nuts **MS-1051**

Ordering details

Mounting kit for deflecting mirror ULS-M
2 x angle **MS-1073**
Mounting kit for SLC 420
4 x angle incl. screws **MS-1030**
Vibration damper
8 x vibration damper
for SLC/SLG 220 **MSD-2**
for SLC/SLG 420-425 **MSD-4**
for SLC/SLG 440 **MSD-5**
Test rod
for resolution 30 mm **PLS-01**
for resolution 14 mm **PLS-02**

System components

Bus converter NSR-0801

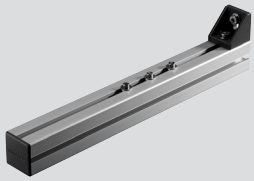
Bus converter NSR-0700

Deflecting mirror ULS-M

System components

Deflecting mirror ULS-A4, Ø 49 mm

Mounting stands MST



Muting Carrier Set

System components

Protective enclosure with deflecting mirror

Protective enclosure

Deflection Mirror Application Notes

ULS-M: Must be used when range is greater than 6m. With 1 mirror, range reduced by 10%, with 2 or more mirrors range reduced by 15% for each mirror.

ULS-A4: Must be used when range is less than 6m. With a loss of 20% at each mirror, only 1 mirror per emitter/receiver pair is recommended.

Ordering details

Bus converter	
Converter for the parametrization of SLC/SLG 420-425 USB 2.0 interface	**NSR 0801**
Converter for the parametrization of SLC / SLG 220 RS232 interface	**NSR 0700**
Deflecting mirror ULS-MLC	
Mirror height 200 mm	**ULS-MLC-0200**
Mirror height 350 mm	**ULS-MLC-0350**
Mirror height 500 mm	**ULS-MLC-0500**
Mirror height 650 mm	**ULS-MLC-0650**
Mirror height 800 mm	**ULS-MLC-0800**
Mirror height 950 mm	**ULS-MLC-0950**
Mirror height 1250 mm	**ULS-MLC-1250**
Mirror height 1550 mm	**ULS-MLC-1550**
Mirror height 1700 mm	**ULS-MLC-1700**

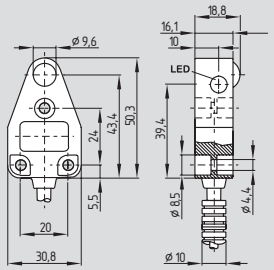
Ordering details

Deflecting mirror ULS-A4 incl. mounting angle	
Mirror height 200 mm	**ULS-A4-0200**
Mirror height 400 mm	**ULS-A4-0400**
Mirror height 550 mm	**ULS-A4-0550**
Mirror height 700 mm	**ULS-A4-0700**
Mirror height 850 mm	**ULS-A4-0850**
Mirror height 1000 mm	**ULS-A4-1000**
Mounting stands	
Height including plinth 500 mm	**MST-0500**
Height including plinth 750 mm	**MST-0750**
Height including plinth 1000 mm	**MST-1000**
Height including plinth 1250 mm	**MST-1250**
Height including plinth 1500 mm	**MST-1500**
Height including plinth 1750 mm	**MST-1750**
Height including plinth 2000 mm	**MST-2000**
Muting Carrier Set	
2 x aluminum profile	**MT-0400**

Ordering details

Protective enclosure with deflecting mirror	
Version for 2-beam light grid	**ULS-ST2**
Version for 3-beam light grid	**ULS-ST3**
Version for 4-beam light grid	**ULS-ST4**
Protective enclosure for light grids/curtains	
Powder coated steel	
Height 1334 mm	**SG5**
Height 2134 mm	**SG6**
Safety screen for protective enclosures (PMMA)	
for SG5: height 1310 mm	**SGS5**
for SG6: height 2110 mm	**SGS6**
Deflecting mirror for protective enclosures	
mirror height 1000 mm includes mounting hardware	**ULS-SG-1000**

SLB 200



- Range to 4 m
- LEDs visible from both sides
- Protection class IP67

Approvals

TÜV CE

Technical data

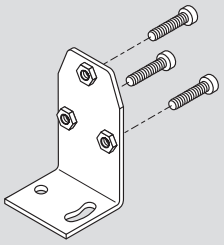
Standards:	IEC/EN 61496
Control Category:	2
Enclosure:	ABS 10 % GF
Enclosure dimensions:	31 x 50.5 x 19 mm
Connection:	
- emitter:	10 cm cable with male connector M8, 3-pole
- receiver:	10 cm cable with male connectorM8, 4-pole
Max. cable length:	50 m
Protection class:	IP67
Response time:	30 ms *
Range:	4 m
Start/Restart interlock:	*
Contactor control:	*
Light emission wavelength:	880 nm
U_e:	24 VDC ± 20%
Safety outputs:	*
Angle of radiation:	± 4°
Min. size of object:	9 mm Ø
LED status indication:	soiling, switching condition and power on
Ambient temperature:	−10 °C … +55 °C
Storage and transport temperature:	−20 °C … +80 °C

* only in combination with safety monitoring module SLB 200-C04-1R

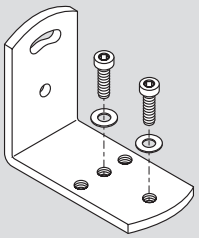
System components

SLB 200-C04-1R

Connector plug



Mounting angle BF 31



Mounting angle BF UNI 1

Ordering details

SLB 200-①31-21

Nr.	Option	Description
①	E	Emitter
	R	Receiver

Note

The system components (safety monitoring module, cable, etc.) are not included in delivery.

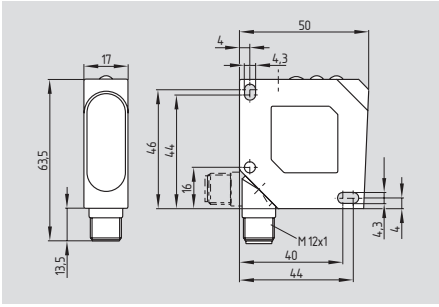
Ordering details

Monitoring of safety light barriers
SLB 200-C04-1R **refer to page 4-22**

Connector plug (female)
for emitter: 3-pole straight
without cable **KDE M8-3**
with cable 2 m **KDE M8-3-2M**
with cable 5 m **KDE M8-3-5M**
for receiver: M8, 4-pole straight
without cable **KDR M8-4**
with cable 2 m **KDR M8-4-2M**
with cable 5 m **KDR M8-4-5M**

Mounting angles **BF 31**
Mounting angles universal **BF UNI 1**

SLB 400



- Range to 15 m
- Connecting plug can be rotated
- LED switching conditions display
- Protection class IP67

Approvals

Technical data

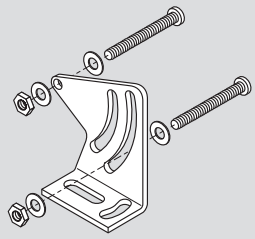
Standards:	IEC/EN 61496
Control Category:	4*
Enclosure:	ABS
Enclosure dimensions:	50 x 50 x 17 mm
Connection:	M12, 4-pole coupler socket, can be rotated
Max. cable length:	100 m
Protection class:	IP67
Response time:	25 ms*
Range:	15 m
Start/Restart interlock:	*
Contactor control:	*
Light emission wavelength:	880 nm
U_e:	24 VDC ± 20%
Safety outputs:	*
Angle of radiation:	± 2°
Min. size of object:	13 mm Ø
LED status indication:	soiling, switching condition and power on
Ambient temperature:	0 °C … +60 °C
Storage and transport temperature:	−20 °C … +80 °C

* only in combination with safety monitoring module SLB 400-C10-1R

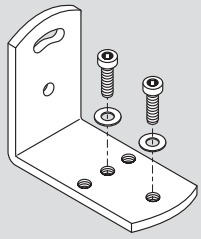
System components

SLB 400-C10-1R

Connector plug



Mounting angle BF 50



Mounting angle BF UNI 1

Ordering details

SLB 400-①50-21P

Nr.	Option	Description
①	E	Emitter
	R	Receiver

Note

The system components (safety monitoring module, cable, etc.) are not included in delivery.

Ordering details

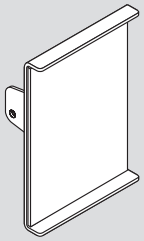
Monitoring of safety light barriers
SLB 400-C10-1R **refer to page 4-24**

Connector plug (female) for emitter/receiver: M12, 4-pole straight

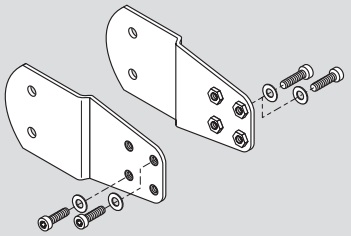
without cable	**KD M12-4**
with cable 2 m	**KD M12-4-2M**
with cable 5 m	**KD M12-4-5M**

Mounting angles	**BF 50**
Mounting angles universal	**BF UNI 1**

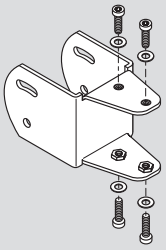
System components



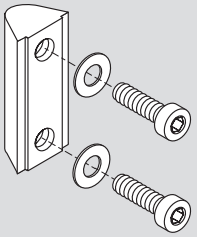
Mirror SLB 200/400 SMA 80



Mounting angle BF SMA 80-1



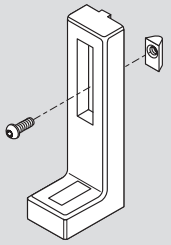
Mounting angle BF SMA 80-2



T-slot nut NST 20-8

System components

Mounting post ST 1250



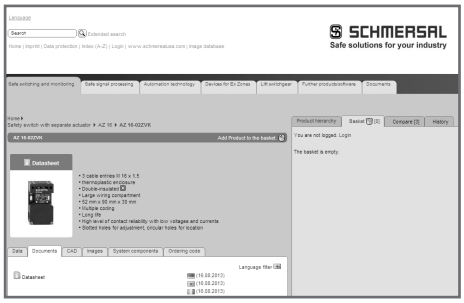
Floor-stand base STB 1

Ordering details

Mirror	**SMA 80**
Mounting angles for mirror	**BF SMA 80-1**
Mounting angles for mirror	**BF SMA 80-2**
T-slot nut	**NST 20-8**

Ordering details

Mounting post	**ST 1250**
Floor-stand base	**STB 1**



Online Product Catalog

www.usa.schmersal.net

Documentation
Every part number page has an Documents tab where you can view or download PDFs of the technical data page, operating instructions and declaration of conformity, mounting and wiring instructions, and certificates for various standards.

The main Documents tab lets you search nearly **275,000 archived** PDF documents, including catalogs and brochures, technical articles, ISD Tables, certifications, and more.

All of it is available in several languages.

SLB 200-C

- Up to two pairs of light barrier devices can be connected
- Co-ordinated for use with SLB 200 R/E safety light barriers
- 1 safety contact, STOP 0
- 1 signaling output
- Operating voltage 24 VDC
- Test input
- LED display of switching conditions
- Response time ≤ 30 ms
- Start/Restart interlock can be switched active or inactive
- Contactor monitoring can be switched active or inactive
- Additional cyclic testing

Technical data

Standards:	IEC/EN 61496-1/-2, IEC 60947-5-3, IEC 61508
Start conditions:	Test button, start-reset button, ON/OFF coding
Feedback circuit (Y/N):	yes
Max. switching frequency:	10 Hz
Rated operating voltage U_e:	24 VDC ± 20%
Rated operating current I_e:	180 mA
Outputs:	
Stop category 0:	1
Stop category 1:	0
Number of safety contacts:	1
Number of auxiliary contacts:	0
Number of signaling outputs:	1
Max. switching capacity of the safety contacts:	8 A
Switching capacity of the signaling outputs:	500 mA
Max. fuse rating of the safety contacts:	4 A gG D-fuse
Utilization category to EN 60947-5-1:	AC-15: 250 V / 2 A DC-13: 24 V / 2 A
Ambient conditions:	
Environmental temperature:	0 °C … +50 °C
Storage and transport temperature:	−20 °C … +80 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw connection
max. cable section:	4.0 mm² (incl. conductor ferrules)
Dimensions (Height/Width/Depth):	84 x 45 x 118 mm

Approvals

TÜV CE

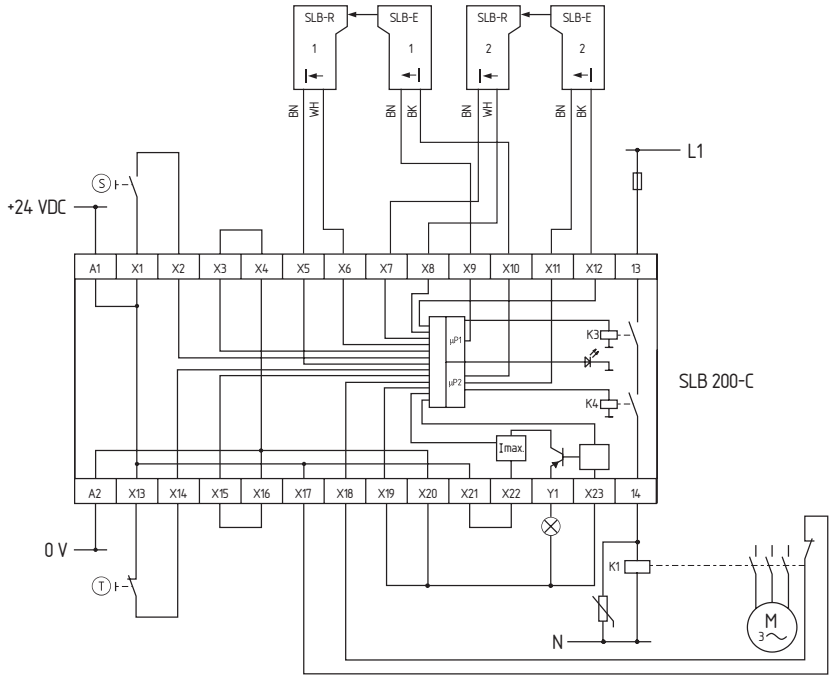
Ordering details

SLB 200-C04-1R

Note

- Monitoring two pairs of light barrier devices and the power contactor using the SLB 200-C safety monitoring module
- Test push button Ⓣ
  The test push button is connected to X13 and X14 in order to carry out a check of the light barrier monitoring function. The terminals X15 and X16 must be bridged.
- The wiring diagram is shown for the de-energized condition.
- Contactor check
  To monitor an external contactor, the feedback circuit is connected to X17 and X18. The terminals X19 and X20 must be bridged.
- Start push button Ⓢ
  The start push button can be used to start the monitoring of the light barriers for a new start or after an interruption. The terminals X3 and X4 must be bridged.
- It is also possible to connect only one pair of light barrier devices.

Wiring diagram



Note

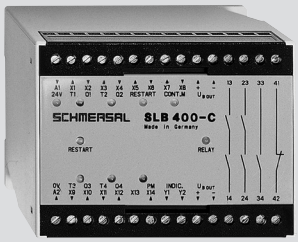
In order to set for the desired mode of operation and number of light barriers connected, remove the front cover of the safety monitoring module. As supplied all switches are in Position 1.

The required functions can be selected by means of the internal DIPswitches.

	DIPswitch 1	DIPswitch 2	DIPswitch 3
Position 1	With contactor check	With start/restart interlock	Connection of two light barriers
Position 2	Without contactor check	Without start/restart interlock	Connection of one light barrier

Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

SLB 400-C



- Up to 4 light barrier pairs SLB 400 can be connected
- Co-ordinated for use with SLB 400 R/E safety light barriers
- 2 safety contacts, STOP 0
- 2 signaling outputs
- Cross-wire monitoring
- ISD Integral System Diagnostics
- Operating voltage 24 VDC
- Feedback circuit to monitor external contactors
- Two short-circuit proof additional transistor outputs
- Response time ≤ 30 ms
- Start/Restart interlock can be switched active or inactive
- Contactor monitoring can be switched active or inactive
- Can be coded

Technical data

Standards:	IEC/EN 61496-1/-2, IEC 60947-5-3, IEC 61508
Start conditions:	Start-reset button, ON/OFF coding
Feedback circuit (Y/N):	yes
Max. switching frequency:	10 Hz
Rated operating voltage U_e:	24 VDC ± 15%
Rated operating current I_e:	0.3 A without additional transistor outputs and safety light barriers
Max. fuse rating of the operating voltage:	1 A
Outputs:	
Stop category 0:	2
Stop category 1:	0
Number of safety contacts:	2
Number of auxiliary contacts:	2
Number of signaling outputs:	2
Max. switching capacity of the safety contacts:	2 A
Switching capacity of the auxiliary contacts:	2 A
Switching capacity of the signaling outputs:	100 mA
Max. fuse rating of the safety contacts:	2 A gG D-fuse
Utilization category to EN 60947-5-1:	AC-15: 250 V / 2 A DC-13: 24 V / 2 A
LED display:	ISD
Ambient conditions:	
Environmental temperature:	0 °C … +55 °C
Storage and transport temperature:	−25 °C … +70 °C
Protection class:	Enclosure: IP40, Terminals: IP20, Clearance: IP54
Mounting:	Snaps onto standard DIN rail to EN 60715
Connection type:	Screw connection
max. cable section:	4.0 mm² (incl. conductor ferrules)
Dimensions (Height/Width/Depth):	75 x 99.7 x 110 mm

Approvals

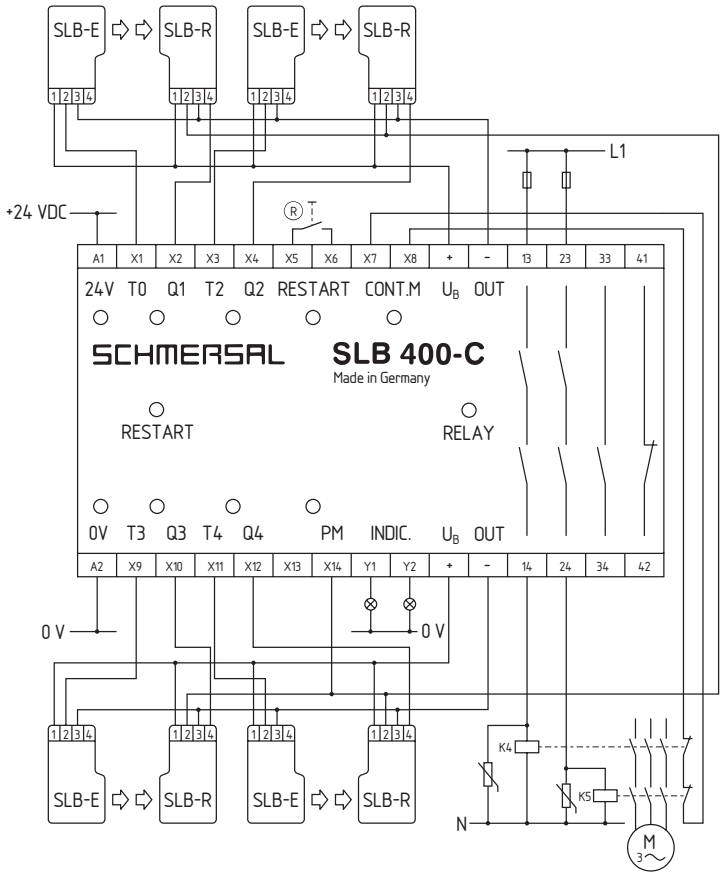
Ordering details

SLB 400-C10-1R

Note

- Monitoring up to four pairs of light barrier devices and the power contactors using the SLB 400-C safety monitoring module
- The wiring diagram is shown for the de-energized condition.
- Connection of two pairs of safety light barrier devices
  When two pairs of safety light barriers are connected, the terminals X9-X10 and X11-X12 must be bridged.
- Restart push button Ⓡ
  The restart function can be selected by means of the DIPswitches. When a start push button is connected to X5 and X6, it must be operated for min. 250 ms and max. 5 s after an interruption of the safety light barriers.

Wiring diagram



ISD

The following faults are registered by the safety monitoring modules and indicated by ISD

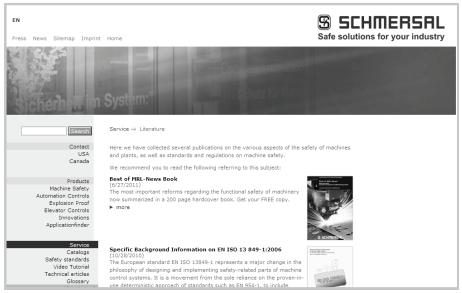
- Short-circuit on the connecting leads
- Interruption of the connecting leads
- Failure of the safety relay to pull-in or drop-out
- Fault on the input circuits or the relay control circuits of the safety monitoring module
- Mutual influence between the connected pairs of light barrier device and others on neighbouring systems

Note

The ISD tables (Intergral System Diagnostics) for analysis of the fault indications and their causes are shown in the manual.

Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Excellent references.



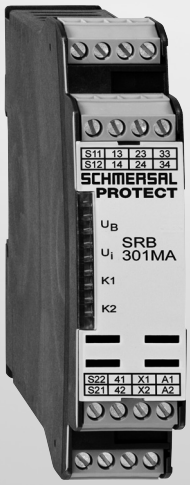
Schmersal Website
www.schmersalusa.com

The Innovations section of the website goes way beyond new product announcements, focusing on the emerging technology being applied to our safety products.

The site also has helpful reference sections:
- PDFs of print catalogs and books,
- lists of applicable safety standards,
- technical articles on various safety topics,
- an archive of The Gatekeeper newsletter.

Also view videos of our safety webinars, safety tutorials, and product demonstartions (You Tube)

Safety monitoring modules
Safety monitoring modules and control systems



Safety controllers are designed to increase the level of safety in machine guarding and/or E-stop control circuits. They feature redundant, dual channel, cross monitoring logic circuits. These continuously check for, and detect, faults in the system‘s safety circuit components and interconnection wiring.

Safety controllers are capable of detecting many types of potential safety circuit faults (depending on the model): Welded interlock/E-stop switch contacts; Open circuits, short circuits or ground faults; Faults in the modules safety relays; Faults in the modules monitoring circuits; Inadequate supply voltage; Welded or stuck contacts in the controlled output motor contactor or control relay; Capacitive or inductive interference on controller inputs.

Schmersal offers both conventional electro-mechanical relay based (AES) and unique microprocessor based (SRB) models.

For more information on Safety Controllers, please consult our online product catalog at www.usa.schmersal.com, or our GK-2 guide to safety controllers

INPUT			OUTPUT			Model Code
Input Contacts	No. of Independent Dual Channel Devices	Operating Voltage	Output Type	Safety Outputs Instant (Delayed)	Auxiliary Output Dry Contact (Semiconductor)	
2NC	1	24VDC	Instant	1 (0)	0 (2)	AES 1135
				2 (0)	0 (0)	AES 1235
		24VAC/DC	Instant	3 (0)	1 (0)	SRB 301 MC
						SRB 301 MA
						SRB 301 ST
						SRB 301 LC(I)
						SRB 301 LC/B
				5 (0)	1 (3)	SRB 504 ST
			Delayed	2 (1)	0 (1)	SRB 211 ST
				3 (2)	1 (3)	SRB 324 ST
				0 (3)	1 (0)	SRB 031 MC
		24-230VAC/DC	Instant	1 (0)	0 (2)	AES 2135
				3 (0)	0 (2)	AES 2335
		48-230VAC	Instant	3 (0)	1 (0)	SRB 301 ST-230
						SRB 301 SQ
	6	24VAC/DC	Instant	2 (0)	0 (6)	SRB 206 ST
						SRB 206 SQ
		48-230VAC	Instant	2 (0)	0 (6)	SRB 206 ST-230
						SRB 206 SQ-230
1NO/1NC (Isolated)[1]	1	24VDC	Instant	1 (0)	0 (2)	AES 1135
				2 (0)	0 (0)	AES 1235
		24VAC/DC	Instant	3 (0)	0 (1)	AES 1337
					1 (0)	SRB 301 AN
			Delayed	2 (1)	0 (1)	SRB 211 AN
		24-230VAC/DC	Instant	1 (0)	0 (2)	AES 2135
				3 (0)	0 (2)	AES 2335
	2	24VDC	Instant	1 (0)	0 (0)	AES 1165
				2 (0)	0 (2)	AES 1265
	6	24VDC	Instant	2 (0)	1 (6)	SRB 207 AN-24VDC
						AES 2285
		48-230VAC	Instant	2 (0)	1 (6)	SRB 207 AN-230
1NO/1NC (C-Form)[2]	1	24VAC/DC	Instant	1 (0)	0 (0)	AES 1102-24VAC(DC)
		110VAC	Instant	1 (0)	0 (0)	AES 1102.1
	2	24VAC/DC	Instant	1 (0)	0 (0)	AES 1112-24VAC(DC)
		110VAC	Instant	1 (0)	0 (0)	AES 1112.1
1NC	1	24VAC/DC	Instant	4 (0)	1 (0)	SRB 401 LC

[1] **Isolated Contacts:** Galvanically separated contacts
[2] **C-Form Contacts:** Contacts having a common contact between them

For complete technical information, please visit www.usa.schmersal.net

Model Code	Control Category (Performance Level)	INPUT DEVICE TYPE								
		E-Stop	Safety Switch[4]	Reed Switch Compatible	AOPD[5]	Pulse Echo/ RFID	Method of Reset[6]			Cross Short Monitoring
							Automatic	Manual	Monitored Manual	
AES 1135	3 (d)	√	√	√	—	√	√			—
AES 1235	3 (d)	√	√	√	–	√	√	√		—
SRB 301 MC	4 (e)	√	√	√	√	√	√	√		Selectable
SRB 301 MA	4 (e)	√	√	√	√	√			√	Selectable
SRB 301 ST	4 (e)	√	√	√	√	√	√		√	Selectable
SRB 301 LC(I)	4 (e)	√	√	—	—	—	√	√		
SRB 301 LC/B	3 (d)/4 (e)[3]	√	√	√	√	√	√	√		—
SRB 504 ST	4 (e)	√	√	√	√	—	√		√	Selectable
SRB 211 ST	4 (e)	√	√	√	√	√	√		√	Selectable
SRB 324 ST	4 (e)	√	√	√	√	√	√		√	Selectable
SRB 031 MC	3 (d)	√	√	√	√	√	√	√		Selectable
AES 2135	3 (d)	√	√	√	—	—	√			—
AES 2335	3 (d)	√	√	√	—	—	√	√		—
SRB 301 ST-230	4 (e)	√	√	—	—	—	√		√	—
SRB 301 SQ	4 (e)	√	√	—	—	—	√		√	√
SRB 206 ST	3 (d)	√	√	—	—	—	√		√	—
SRB 206 SQ	3 (d)	√	√	—	—	—	√		√	√
SRB 206 ST-230	3 (d)	√	√	—	—	—	√		√	—
SRB 206 SQ-230	3 (d)	√	√	—	—	—	√		√	√
AES 1135	3 (d)	√	√	√	—	—	√			√
AES 1235	3 (d)	√	√	√	—	—	√	√		√
AES 1337	4 (e)	√	√	√	—	—	√		√	√
SRB 301 AN	4 (e)	—	√	√	—	—	√		√	√
SRB 211 AN	4 (e)	√	√	√	—	—	√		√	Selectable
AES 2135	3 (d)	√	√	√	—	—	√			√
AES 2335	3 (d)	√	√	√	—	—	√	√		√
AES 1165	3 (d)	√	√	√	—	—	√			—
AES 1265	3 (d)	√	√	√	—	—	√	√		√
SRB 207 AN-24VDC	3 (d)	√	√	√	—	—	√		√	√
AES 2285	3 (d)	√	√	√	—	—	√		√	√
SRB 207 AN-230	3 (d)	√	√	√	—	—	√		√	√
AES 1102-24VAC(DC)	1 (c)	—	√	√	—	—	√			—
AES 1102.1	1 (c)	—	√	√	—	—	√			—
AES 1112-24VAC(DC)	1 (c)	—	√	√	—	—	√			—
AES 1112.1	1 (c)	—	√	√	—	—	√			—
SRB 401 LC	3 (d)	√	√	—	—	—	√	√		—

[3] **SRB 301LC/B:** Performance Level e (Control Category 4) when used with a PLe input device which features self-monitoring

[4] **Safety Switch:** Devices having dry contacts, e.g., keyed interlock switches with and without guardlocking, limit switches, cable pulls, hinge switches, foot switches, etc.

[5] **AOPD:** Active Optical Protective Device, e.g. safety light curtain

[6] **Automatic:** Safety outputs enabled as soon as safety inputs are satisfied (no reset signal required)

***Manual:** Safety outputs enabled when safety inputs are satisfied and reset signal supplied (0v to 24v transition)

***Monitored Manual:** Safety outputs enabled when safety inputs are satisfied and reset signal supplied (24v to 0v transition)

Input Expansion Modules

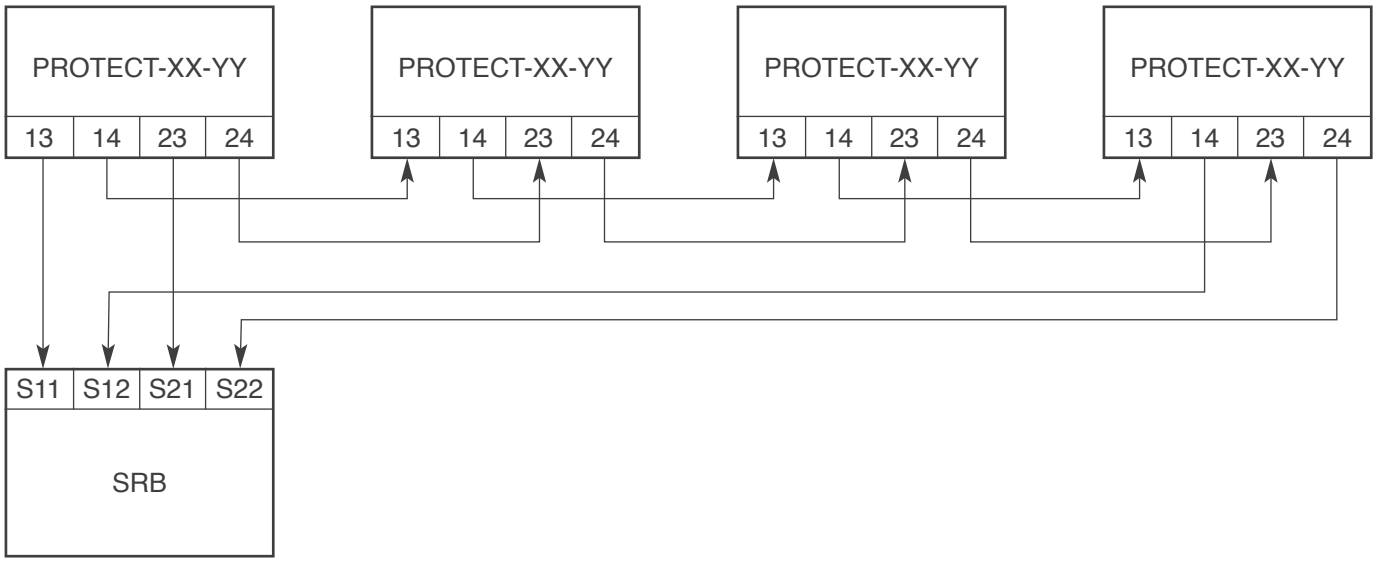
A majority of standard safety controllers used in the industry today will monitor 1 discrete device with 2 channels. Depending on the safety level to be obtained, wiring multiple switches in series to one safety controller can be a solution to scenarios such as an expanding application. This form of “daisy-chaining” however will not allow for individual diagnostics for low level safety device (i.e., limit switches) and can increase installation time and costs. Input expanders allow multiple devices to be wired to one safety controller while still having the ability of individual diagnostics. Multiple PROTECT input expanders can be used to wire a maximum of 80 dual channel devices.

	No. of 2 Channel Devices Monitored	Type of Monitored Input	Output Configu-ration	Input Configu-ration	Terminal Connec-tion	Model Code	E-Stop Monitoring	Safety Switch[1]	Coded Magnetic Sensor	AOPD[2]	Pulse Echo Compat-ible	Module Indicator[3] (PNP Out)
Input Expander	4	Dry Contacts	2NC	1NO/1NC	Cage Clamps	PROTECT-IE-11	√	√	√	–	–	–
						PROTECT-PE-11	√	√	√	–	–	√
					Screw Terminals	PROTECT-IE-11-SK	√	√	√	–	–	–
						PROTECT-PE-11-SK	√	√	√	–	–	√
				2NC	Cage Clamps	PROTECT-IE-02	√	√	√	–	–	–
					Screw Terminals	PROTECT-IE-02-SK	√	√	√	–	–	–
			1NO/1NC	1NO/1NC	Cage Clamps	PROTECT-PE-11-AN	√	√	√	–	–	√
					Screw Terminals	PROTECT-PE-11-AN-SK	√	√	√	–	–	√
		Dry/Non-Floating	2NC	2NC	Cage Clamps	PROTECT-PE-02	√	√	√	√	√	√
					Screw Terminals	PROTECT-PE-02-SK	√	√	√	√	√	√

[1] **Devices having dry contacts,** e.g., keyed interlock switches with and without guard locking, limit switches, cable pulls, hinge switches, foot switches, etc.

[2] **AOPD:** Active Optical Protective Device, e.g. safety light curtain

[3] **Module Indication:** +24VDC PNP auxiliary signal indicating that all inputs are satisfied on the expansion unit.



For complete technical information, please visit www.usa.schmersal.net

Output Expansion Modules

Output expanders allow a safety controller to increase the number of safe signals that can be delivered. Each SRB-EM module will provide an additional 4 dry contact safety outputs, 2 dry contact auxiliary contacts and a connection to the main monitoring safety controller to complete an external feedback monitoring loop for the safety function.

	Additional Safety Outputs	Additional Auxiliary Outputs	Terminal Connection	Operating Voltage	Model
Output Expanders	4	2	Screw Terminals	24VAC/DC	SRB 402 EM
				115VAC	SRB 401 EM

Dual Zone Monitoring

The SRB 202C and SRB 400C safety controllers allow for dual zone monitoring without adding the complexity of using a safety PLC. No software or programming tool is required for zone setup. Input 1 is reserved for a global shutdown (the release of all safety outputs) such as an E-Stop actuation. Input 2 is reserved for dropping out only half of the safety outputs of the relay. (More information can be found on Page 9.)

Safety Outputs	Auxiliary Outputs	Input 1 Contacts	Input 2 Contacts	Input 1 Reset	Input 1 Cross Short Monitoring[1]	Model Code	Control Category (Performance Level)	E-Stop Monitoring	Safety Switch[2]	Coded Magnetic Sensor	AOPD[3]	Pulse Echo Compatible
2	2	2NC	1NO/1NC	Auto or Manual	No	SRB202CA	4 (e)	√	√	√	–	–
					Yes	SRB202CA/Q	4 (e)	√	√	√	–	–
				Trailing Edge	No	SRB202CA/T	4 (e)	√	√	√	–	–
					Yes	SRB202CA/QT	4 (e)	√	√	√	–	–
			2NC	Auto or Manual	No	SRB202CS	4 (e)	√	√	√	–	–
				Trailing Edge		SRB202CS/T	4 (e)	√	√	√	–	–
4	0	2NC	1NO/1NC	Auto or Manual	No	SRB400CA	4 (e)	√	√	√	–	–
					Yes	SRB400CA/Q	4 (e)	√	√	√	–	–
				Trailing Edge	No	SRB400CA/T	4 (e)	√	√	√	–	–
					Yes	SRB400CA/QT	4 (e)	√	√	√	–	–
			2NC	Auto or Manual	No	SRB400CS	4 (e)	√	√	√	–	–
				Trailing Edge		SRB400CS/T	4 (e)	√	√	√	–	–

[1] **Cross short monitoring and trailing edge** not available for Input device 2.

[2] **Devices having dry contacts,** e.g., keyed interlock switches with and without guard locking, limit switches, cable pulls, hinge switches, foot switches, etc.

[3] **AOPD:** Active Optical Protective Device, e.g. safety light curtain

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Safe Speed Monitoring

Monitored Speeds	Monitored Method	Operating Voltage	Model Code	Control Category (Performance Level)	Safety Outputs
Standstill	Timer	24VDC	AZS 2305-24VDC	4 (d)	3
		110VAC	AZS 2305-110VAC	4 (d)	3
		230VAC	AZS 2305-230VAC	4 (d)	3
	1 PNP Impulse Sensor	24VDC	FWS 1206	3 (d)	2
		24-230VAC/DC	FWS 2106	3 (d)	1
			FWS 2506	3 (d)	4
	2 PNP Impulse Sensors	24VDC	FWS 1205	3 (d)	2
			DNDS	4 (d)	Selectable
		24-230VAC/DC	FWS 2105	3 (d)	1
			FWS 2505	3 (d)	4
	690VAC Back EMF	24VDC	DN3PS2	4 (e)	3
Safe Speeds	Encoders/Resolver 2 PNP Impulse Sensors	24VDC	DNDS	4 (e)	Selectable

Mats/2-Hand Controls

Operating Voltage	Type of Reset	Model	E-Stop	Safety Switch[1]	Safety Mat[2]	Two-Hand Control
24VAC/DC	Monitored Reset	SRB 301HC/R-24	√	√	√	√
	Auto Reset	SRB 301HC/T-24	√	√	√	—
		SRB 201 ZH	—	—	—	√
48-230VAC	Monitored Reset	SRB 301HC/R-230	√	√	√	√
	Auto Reset	SRB 301HC/T-230	√	√	√	—

[1] **Devices having dry contacts,** e.g., keyed interlock switches with and without guard locking, limit switches, cable pulls, hinge switches, foot switches, etc.

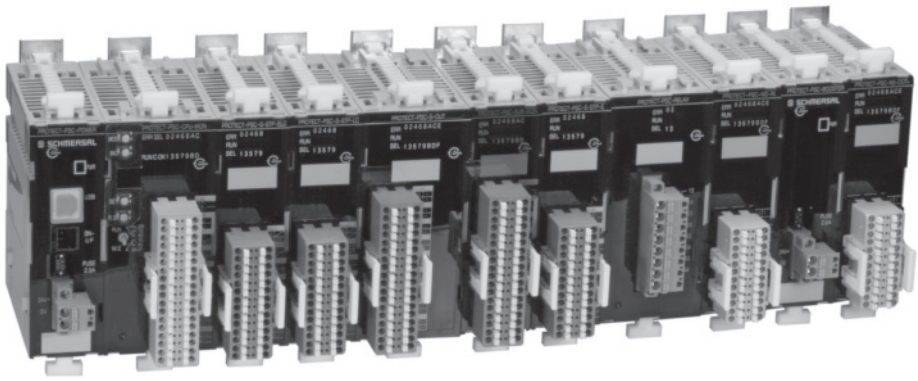
[2] **Safety mats** operating with an electrical cross-short principle to detect actuation.

Safety Edges Monitors

Operating Voltage	Maximum Number of Edges Monitored	Model	Control Category (Performance Level)	Method of Reset
24VDC	1	SE-400C	4 (e)	Trailing Edge
	2	SE-100C	1 (c)	—
24VAC/DC	4	SE-304C	3 (d)	Trailing Edge

For complete technical information, please visit www.usa.schmersal.net

SYSTEM OVERVIEW OF PROTECT-PSC



The PSC power and PSC-CPU-MON modules with 8 safe inputs and 6 safe outputs form the basic configuration for PROTECT-PSC. (For description, see next page.)

Expand safety with:
- Safe input modules PSC-S-IN-E and PSC-S-IN-LC
- Safe output modules PSC-S-IN-OUT and PSC Relay
- Safe input/output modules PSC-SUB-MON, PSC-STP-E, PSC-S-STP-LC and PSC-S-STP-ELC

Expand operationally (right, gray terminals) with:
- Operational input modules PSC-NS-IN
- Operational output modules PSC-NS-OUT

CE

Module	Number of single channel inputs				Number of single channel outputs			
	Standard signals with dry contacts	Safe			Standard signals with dry contacts	Safe		
		Dry	Non-floating	Selectable*		Transistor		Relay
					0.3 A**	0.5 A**	0.3 A**	4 A**
PSC-CPU-MON	—	4	—	4	—	6	—	—
PSC-SUB-MON	—	4	—	4	—	6	—	—
PSC-S-STP-E	—	4	—	2	—	4	—	—
PSC-S-STP-LC	—	–	4	2	—	4	—	—
PSC-S-STP-ELC	—	2	2	2	—	4	—	—
PSC-S-Relay	—	—	—	—	—	—	—	2 × 2
PSC-S-IN-E	—	16	—	—	—	—	—	—
PSC-S-IN-LC	—	—	16	—	—	—	—	—
PSC-S-OUT	—	—	—	—	—	—	16	—
PSC-NS-IN	16	—	—	—	—	—	—	—
PSC-NS-OUT	—	—	—–	—–	16	—	—	—

* The dry or non-floating information refers to the technical properties of the input signals:
- **Dry-contacts input signals,** e.g. from emergency stop control devices, safety switches, interlocking devices, safety solenoid switches and similar.
- **Non-floating input signals,** e.g. PNP outputs from optoelectronic protective devices such as safety light curtains, laser scanners etc., but also from safety sensors from Schmersal CSS or AZM200 ranges.
- **Selectable,** input signals are monitored without cross short recognition. Outputs from optoelectronic protective devices can be directly connected, or dry contacts can be monitored up to a PL_d.

** Maximum current per output with resistive load.

For complete technical information, please visit www.usa.schmersal.net

Note

Appendix

Glossary of Common Safety Terms

A

Authorized Output: an output from a safety controller's positive-guided relays (used to "authorize" or "enable" a machine's start circuit when safety system conditions exist). Also known as "safety output."

Automatic Reset: a safety controller reset circuit that automatically resets the safety controller when safe system conditions (no system faults) exist. A manual reset button is optional.

Auxiliary Output: a non-safety related contact closure or semiconductor output primarily used for signaling component or system status to a PLC, audible alarm or visual indicator (such as a stack light). Also called a "signaling contact" or "auxiliary monitoring contact".

ANSI (American National Standards Institute): an association of industry representatives who, working together, develop safety and other technical standards.

Auxiliary monitoring contact: See "auxiliary output".

B

BG (Berufgenossenschaft): an independent German insurance agency whose legislative arm recommends industry safety practices. One of many "notified bodies" authorized to certify that safety products comply with all relevant standards.

C

CE (Conformité Europeéne) mark: a symbol (CE) applied to finished products and machinery indicating it meets all applicable European Directives. For electrical and electronic "finished products", such as a safety relay module, these include the Low Voltage Directive and, where relevant, the Electromagnetic Compatibility (EMC) Directive.

Coded Magnet Sensor: a two-piece position sensor consisting of an array of reed switches and a multiple magnet array-actuating element. Such devices will only deliver an output signal when the reed switch element is in the presence of a matched, multiple-magnetic field array. Coded-magnet sensors cannot be actuated using a simple magnet. Hence they are far more difficult to defeat/bypass than a simple magnetic switch or proximity sensor.

Control Reliability: A term applied to safety devices or systems which are designed constructed and installed such that the failure of a single component within the device or system does not prevent normal machine stopping action from taking place… but does prevent a successive machine cycle from being initiated.

CSA (Canadian Standards Association): an independent Canadian testing and standards-making organization similar to Underwriters Laboratories (UL) in the U.S. "CSA-certified" products meet relevant CSA electrical and safety standards.

D

Declaration of Conformity: a manufacturer's self-certified document, signed by a highly-positioned technical manager, which lists all the Standards and Directives to which a product conforms. A Declaration of Conformity is mandatory for all CE-marked products, and for machine components which, if they fail, could lead to a dangerous or hazardous situation on a machine.

Defined Area: a predetermined area scanned by a light beam within which the presence of an opaque object of specified minimum size will result in the generation of a control signal.

Direct Action Contacts: See "positive break" contacts.

Diverse Redundancy: the use of different components and/or different microprocessor instruction sets written by different programmers in the design and construction of redundant components/circuits. Its purpose is to increase system reliability by minimizing the possibility of common-mode failure (the failure of like components used in redundant circuits).

Dual Channel Safety System: a safety control system characterized by two inputs; each connected to one of two independent safety circuits. Dual-channel systems are typically capable of detecting interconnection wiring faults such as open circuits, short-circuits and ground faults. As such they provide a higher level of safety than single-channel systems.

E

Electronic Safety Sensor: A safety switch that uses non-contact communication between the safety sensor and the actuator. Provides a large switching distance, a high degree of fail-safety, and tamper resistance. Contains a microprocessor to provide continual internal function tests and monitor safety outputs, and allows intelligent diagnostic as well as fast failure detection.

Emergency Stop (E-Stop): A manual device allowing an operator to safely stop a machine in an emergency situation.

European Machinery Directive (EMD) 2006/42/EC: a set of machine safety design requirements which must be satisfied to meet the Essential Health and Safety standards established by the European Economic Community. This Directive, and other relevant European Directives (such as the Low Voltage Directive, EMC Directive, et al) must be satisfied for the machine to bear the CE mark.

F

Fail-to-Danger: a component or system failure which allows a machine to continue operating, exposing personnel to a hazardous or unsafe condition.

Fail-to-Safe: a component failure causes the device/system to attain rest in a safe condition.

Fault Detection: the monitoring of selected safety system components whose failure would compromise the functioning of the safety system. The detection of such failures is known as "fault detection." Examples are:

- a short-circuit in the safety circuit's interconnection wiring
- an open-circuit in the safety circuit's interconnection wiring
- a welded contact in the safety controller's positive- guided relays
- an open machine guard

Fault Exclusion: the ability to minimize known possible component failures ("faults") in a safety system by design criteria and/or component selection. Simple examples of "excluded faults" are:

- The use of an overrated contactor to preclude the possibility of contact welding.
- Design of a machine guard such that the safety interlock switch actuator cannot be damaged.
- Selection of a suitable safety interlock switch.
- Use of positive-break safety interlock switches together with a self-monitoring safety relay module, such that the possibility of a contact weld resulting in the loss of the safety function is eliminated.

Feedback Loop: an auxiliary input on a safety controller designed to monitor and detect a contact weld in the primary machine-controlled device (e.g. motor contactor, relay, et al) having positive-guided contacts.

Force Guided Contacts: See "Positive Guided Contacts".

Fixed Barrier Guard: See "Hard Guarding".

G

Guard: a barrier that prevents entry of an individual's hands or other body parts into a hazardous area.

H

Hard Guarding: the use of screens, fences, or other mechanical barriers to prevent access of personnel to hazardous areas of a machine. "Hard guards" generally allow the operator to view the point-of-operation.

Hazardous Area: an area of a machine or process which presents a potential hazard to personnel.

I

Interlock: an arrangement in which the operation of one device automatically brings about or prevents the operation of another device.

Interlocked Barrier Guard: a fixed or movable guard which, when opened, stops machine operation.

L

Limit Switch: switch operated by the motion of a machine part or presence of an object. They are used for control of a machine, as safety interlocks, or to count objects passing a point.

M

Machine Primary Control Element (MPCE): an electrically powered component which directly controls a machine's operation. MPCE's are the last control component to operate when a machine's motion is initiated or stopped.

Machine Secondary Control Element (MSCE): a machine control element (other than an MPCE) capable of removing power from the hazardous area(s) of a machine.

Manual Start-Up Test: a term applied to safety controllers designed such that at least one of the system's interlocked machine guards must be manually opened and closed (after applying power) before machine operation is authorized.

Manually Monitored Reset: a safety controller reset circuit requiring the presence of a discrete "trailing-edge" signal (24V to 0V) to activate the controller's authorized outputs. A reset button is mandatory.

Muting: the ability to program a monitoring and/or control device to ignore selected system conditions.

N

Negative Mode Mounting: the mounting of a single piece safety interlock switch (e.g. a limit switch) such that the force applied to open the normally closed (NC) safety contact is provided by an internal spring. In this mounting mode the NC contacts may not open when the safety guard is "open". Here welded/stuck contacts, or failure of a contact-opening spring, may result in exposing the machine operator to a hazardous/unsafe area. When mounted in the "negative-mode", single-piece safety interlock switches can be easily circumvented/ defeated by the operator…simply by taping down the switch actuator when the safety guard is open.

Non-Separating Guard: sensing devices such as light curtains, scanners, or pressure mats that detect the presence of operators, but do not provide a physical barrier between the operator and hazard.

O

OSHA (Occupational Safety Health Administration): a U.S. Department of Labor Federal agency responsible for monitoring and regulating workplace safety. OSHA enforcement may reference their own regulations, as well as those of other industry standards-making groups (e.g. ANSI, NFPA, UL, et al).

P

PELV Circuits: Protected Extra Low Voltage. A method to avoid shock hazards. Circuits should be designed to guarantee a low risk of accidental contact with a higher voltage, and may be grounded.

Performance Level: outlined in EN ISO 13849-1, a required level of safety for SRPCS. Designated PLa through PLe.

PLC or Programmable Logic Controller: a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures.

Point of Operation: the area(s) of a machine where material or the work piece is positioned and a process is performed.

Point of Operation Guarding: a device or guard installed at the interface between the operator and the point of operation which is intended to protect personnel from hazardous areas.

Position Switch: see "Limit Switch"

Positive Break Contacts: normally-closed (NC) contacts which, upon actuation, are forced to open by a non-resilient mechanical drive mechanism. Also called "positive-opening" or "direct-action" contacts.

Positive Guided Contacts: Normally-open (NO) and normally-closed (NC) contacts which operate interdependently such that the NO and NC contacts can never be closed at the same time. They are designed such that if one of the contacts welds/sticks closed, the other contacts cannot change state. The interdependent operation between NO and NC contacts permits self-checking/monitoring of the functioning of relays and contactors featuring positive-guided contacts. Hence they are desirable in machine safety circuits where "fail-to-safe" or "control reliability" is desired. Also called "force-guided contacts".

Positive Linkage: a term applied to roller lever, rocking lever and other switch actuating members designed such that the integrity of the linkage between the actuator and the shaft is heightened (beyond a set screw on a smooth shaft) by its mechanical design. Examples of positive-linkages are pinned, square and serrated shafts.

Positive Mode Mounting: the mounting of a single piece safety interlock switch (e.g. a limit switch) such that the non-resilient mechanical mechanism which forces the normally-closed (NC) contacts to open is directly driven by the interlocked machine safety guard. In this mode (as opposed to "negative-mode mounting") the safety guard physically forces the NC contacts to open when the guard is opened.

Positive Opening Contacts: See "Positive-Break Contacts".

Pulse Echo: A non-contact technology patented by Schmersal for electronic safety sensors. It uses electromagnetic pulses to communicate between the sensor and actuator target. When approaching the sensor, the actuator oscillates at a predetermined resonant frequency which is detected by the sensor. While doing this, the sensor evaluates the coding of the actuator as well as its distance to determine a closed guard and enable safety outputs.

Push/Pull Operation: a term applied to emergency rope-pull switches designed to actuate when the rope/trip-wire is pulled and when it is pushed (goes slack). Such rope-pull switches provide a higher level of safety than units which only actuate when the trip- wire/rope is pulled.

R

Redundancy: the duplication of control circuits and/or components such that if one component/ circuit should fail the other (redundant) component/circuit will ensure safe operation.

Risk Assessment: a systematic means of quantifying the relative level of danger different types of machine hazards present to the machine operator and/or maintenance personnel. This assessment is usually done in the early stages of the machine's design to permit such hazards to be designed-out or alternatively determine the scope of the safety system needed to protect personnel from possible injury.

RFID (Radio Frequency Identification): A non-contact technology for electronic safety sensors that uses radio waves to communicate between the sensor and actuator target. When approaching the sensor, the actuator broadcasts its identification number over the frequency detected by the sensor. The proximity of the actuator determines that the guard is closed and safety outputs are enabled.

S

Safeguarding: protecting personnel from hazards using guards, barriers, safety devices and/or safe working procedures.

Safety Controller: an electronic and/or electromechanical device designed expressly for monitoring the integrity of a machine's safety system. Such controllers are designed using positive-guided (force-guided) relays. Depending upon the model, safety controllers are capable of detecting the following types of potential safety system faults:

- Machine guard(s) open
- Guard monitoring switch/sensor failure
- Interconnection wiring "open circuit"
- Interconnection wiring "short circuit"
- Interconnection wiring "short-to-ground"

• Welded contact in controlled output device
• Failure of one of the safety controller's positive- guided relays
• Fault in the safety controller's monitoring circuit
• Insufficient safety controller operating voltage Upon detection of a system fault, the safety controller will initiate a "machine stop" command and/or prevent the restarting of the machine until the fault has been corrected. The "stop" command may be immediate or time-delayed depending upon the model safety controller selected.

Safety Distance: for the proper placement of non-separating guards, a calculation of factors such as approach speed and system reaction time, to insure that the machine stops before the hazard is reached.

Safety Enable: see "Authorized Output."

Safety Interlock Switch: a switch designed expressly to safely monitor the position of a machine barrier guard. Such switches typically feature positive-break contacts and are designed to be more tamper-resistant than conventional position/presence-sensing switches.

Safety Output: see "Authorized Output."

Safety Relay: an electromechanical relay designed with positive-guided contacts.

Self Checking: the performing of periodic self diagnostics on the safety control circuit to ensure that critical individual components are functioning properly.

Self Monitoring: see "Self-Checking".

Separating guard: a panel, fence, window, or door that physically separates the operator form the hazard.

Serial Diagnostics: A system for series-wired electronic safety sensors that transmits the operational status of each participant in the chain to a central processor that is connected to conventional and commercially available PLC systems. It provides fast and accurate error messages with detailed information about the failure.

Single Channel Safety System: a safety control system characterized by one safety interlock switch whose normally closed contact is the sole input to a safety controller or a motor contactor. Such systems are unable to detect a short circuit failure in the interconnection wiring and are only recommended for addressing Safety Categories B, 1 and 2 (see "Risk Assessment").

Solenoid Latching Safety Interlock Switch: a two-piece safety interlock (actuating key and switch mechanism) whose design prevents the removal of the actuating key until released by an integral latching solenoid. Solenoid latching is typically controlled by a time-delay, motion detector, position sensor or other control components.

Stop Category "0": immediate removal of power from the controlled devices.

Stop Category "1": removal of power after a time delay, up to 30 seconds. This is commonly used with drive systems where immediate removal of power may result in a longer stop time.

SRPCS (Safety Related Parts of Control Systems): systems or subsystems which perform a safety function.

T

Tamper Resistant: a term applied to safety interlock switches referring to their relative ability to be defeated or bypassed using simple, readily available means such as a screwdriver, paper clip, piece of tape or wire, etc. Switches and sensors designed expressly for use as machine guard safety interlocks are designed to be more "tamper-resistant" than conventional switches/ sensors (e.g. proximity switches, reed switches, conventional limit switches).

Time Delayed Authorized Outputs: a safety controller's authorized outputs whose activation is delayed (up to 30 seconds) to satisfy Stop Category 1 requirements.

Trailing Edge Reset: (See "Manually Monitored Reset.")

Two Hand Control: a machine control system which requires "simultaneous" use of both of the operator's hands to initiate a machine cycle.

U

UL (Underwriters Laboratories): an independent testing and standards-making organization. UL tests products for compliance to relevant electrical and safety standards/ requirements.

Machinery Safety Standards

EUROPEAN STANDARDS

The European safety requirements for man and machine are established in the European Machinery Directive (EMD). According to the EMD, machinery must be designed and built to meet the Directive's requirements as defined by existing and emerging European standards. These "European Norms", prepared by representatives of the European Economic Community (EEC) member states and produced by the European standards committees CEN and CENELEC, provide a harmonized baseline for the design and construction of safe machinery.

As of January 1, 1997, machinery sold into or within the EEC must comply with the requirements of the European Machinery Directive. Equipment which complies may be affixed with the CE mark (for "Conformité Europeene"). The CE mark on a machine signifies that it conforms to the essential health and safety requirements defined by the relevant European Norms.

These "Norms" form a hierarchical structure which include:

Type A Standards: Fundamental Safety Standards which contain basic concepts, principles of design, and general aspects applicable to all machinery.

Type B Standards: Group Safety Standards, each of which focuses on a specific subject applicable to a range of machinery types. "B1 Standards" cover a specific safety aspect defined in the Fundamental Standards. "B2 Standards" cover the requirements of specific safety related devices such as two-hand controls, interlocking devices, movable guards, etc.

Type C Standards: Specific Machine Safety Standards, each of which define protective measures required for hazardous areas of a specific machine or group of machines.

Type A and Type B Standards are intended to assist in the machinery design process, and eliminate the need to repeat these general requirements in the machine- specific (Type C) Standards.

Many product standards are still in the planning stage and the number of Type C Standards is continuously increasing. Some are still in draft form (designated as "prEN" standards). Others exist as finished ("EN") standards.

Where no machine-specific standard exists, the requirements of the Machinery Directive can be satisfied by observing existing European Standards and relevant national standards/ specifications. Draft standards (prEN) published by the European Union are also accepted and used as a basis for evaluating products for compliance to the Directives. It is important to note that such draft standards may change before being finalized and adopted as EN standards.

Selected European Standards

Type "A" Standards:

EN ISO 12100,
Safety Machinery – Basic Concepts, General Principles of Design, Parts 1 & 2.

Type "B1" Standards:
EN ISO 13849-1
Safety of Machinery – Safety-Related Parts of Control Systems – Part 1: General Principles for Design

EN ISO 13857
Safety of Machinery – Safety Distances to Prevent Danger Zones from Being Reached by Upper and Lower Limbs.

EN349
Safety of Machinery – Minimum Gaps to Avoid Crushing of Parts of the Human Body.

EN ISO 13855
Safety of Machinery – The Positioning of Protective Equipment in Respect of Approach Speeds of the Human Body.

EN ISO 12100
Safety of Machinery – Principles of Risk Assessment.

Type "B2" Standards:

EN ISO 13850
Safety of Machinery – Emergency Stop Devices, Functional Aspects – Principles for Design.

EN 574
Safety of Machinery – Two-Hand Control Devices, Functional Aspects – Principles for Design.

EN1088
Safety of Machinery – Interlocking Devices Associated with Guards – Principles for Design & Selection.

EN 953
Safety of Machinery – General Requirements for the Design and Construction of Guards.

EN1760-1
Safety of Machinery – Pressure Sensitive Safety Devices – Mats & Floors.

EN1760-2
Safety of Machinery – Pressure Sensitive Safety Devices – Edges & Bars.

prEN61496
Safety of Machinery – Electrosensitive Protective Equipment.

Type "C" Standards:

EN415 Packaging Machines

EN692 Mechanical Presses

EN693 Hydraulic Presses

EN746 Thermoprocessing Machines

EN931 Footwear Manufacturing Machines

EN1114-1 Rubber & Plastics Machines

EN1672 Food Processing Machines

SOURCE FOR STANDARDS

EN & IEC Standards are available from:
Global Engineering Documents
15 Inverness Way East
Englewood, CO 80112
Telephone: (800) 854-7179

American National Standards Institute (ANSI)
11 West 42nd Street
New York, NY 10036
Telephone: (212) 642-4900

US STANDARDS

In the United States, the protection of workers is the primary concern of OSHA, the Occupational Health and Safety Administration, a division of the Department of Labor. OSHA's role is to assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Occupational Safety & Health Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health. OSHA is the primary regulatory agency for safety and health, setting national standards and providing for the enforcement thereof. OSHA also relies on consensus standards. These are guidelines and standards created by standards-making organizations, trade associations, and third party testing facilities. In the machinery industry, these include: American National Standards Institute (ANSI), Robotics Industry of America (RIA), Instrument Society of America (ISA), National Fire Prevention Association (NFPA), Underwriters Laboratories, Inc. (UL),

State OSH Standards

Section 18 of the Occupational Safety and Health Act of 1970 (the OSH Act) encourages states to develop and operate their own safety and health programs in the workplace. OSHA approves and monitors State Plans.

The following states have adopted safety and health standards:

Alaska
Arizona
California
Hawaii
Indiana
Iowa
Kentucky
Maryland
Michigan
Minnesota
Nevada
New Mexico
North Carolina
Oregon
South Carolina
Tennessee
Utah
Vermont
Virginia
Washington
Wyoming

Selected US Standards and Guidelines

OSHA 29 CFR 1910.212
General Requirements for (Guarding of) All Machines

OSHA 29 CFR 1910.217
(Guarding of) Mechanical Power Presses

ISA S84.01
Safety Instrumented Systems

ANSI B11.1
Machine Tools – Mechanical Power Presses – Safety Requirements for Construction, Care, and Use of

ANSI B11.2
Hydraulic Power Presses – Safety Requirements for Construction, Care, and Use of

ANSI B11.3
Power Press Brakes – Safety Requirements for Construction, Care, and Use of

ANSI B11.4
Shears – Safety Requirements for Construction, Care, and Use of

ANSI B11.5
Machine Tools – Iron Workers – Safety Requirements for Construction, Care, and Use of

ANSI B11.6
Lathes – Safety Requirements for Construction, Care, and Use of

ANSI B11.7
Cold Headers & Cold Formers – Safety Requirements for Construction, Care, and Use of

ANSI B11.8
Drilling, Milling , and Boring Machines – Safety Requirements for Construction, Care, and Use of

ANSI B11.9
Grinding Machines – Safety Requirements for Construction, Care, and Use of

ANSI B11.10
Metal Sawing Machines – Safety Requirements for Construction, Care, and Use of

ANSI B11.11
Gear Cutting Machines – Safety Requirements for Construction, Care, and Use of

ANSI B11.13
Machine Tools – Single- and Multiple-Spindle Automatic Bar and Chucking Machines – Safety Requirements for Construction, Care, and Use of

ANSI B11.14
Coil Slitting Machines/Systems – Safety Requirements for Construction, Care, and Use of

ANSI B11.15
Pipe, Tube, and Shape Bending Machines – Safety Requirements for Construction, Care, and Use of

ANSI B11.16
Metal Powder Compacting Presses – Safety Requirements for Construction, Care, and Use of

ANSI B11.17
Horizontal Extrusion Presses – Safety Requirements for Construction, Care, and Use of

ANSI B11.18
Machinery and Machine Systems for the Processing of Coiled Strip, Sheet, and Plate – Safety Requirements for

ANSI B11.19
Performance Criteria for the Design, Construction, Care, and Operation of Safeguarding when Referenced by Other B11 Machine Tool Safety Standards

ANSI B11.20
Machine Tools – Manufacturing Systems/Cells – Safety Requirements for Construction, Care, and Use of

ANSI B183
Roll Forming and Roll Bending Machines – Safety Requirements for Construction, Care, and Use of

ANSI/RIA 15.06
Safety Requirements for Industrial Robots and Robot Systems

NFPA 79
Electrical Standard for Industrial Machinery
1994 Edition

SOURCE FOR STANDARDS

ANSI & NFPA Standards are available from:
American National Standards Institute (ANSI)
11 West 42nd Street
New York, NY 10036
Telephone: (212) 642-4900

OSHA Regulations are available from:
Superintendent of Documents
Government Printing Office
Washington, DC 20402-9371
Telephone: (202) 783-3238

CANADIAN STANDARDS:

In Canada, each province has its own regulatory body for occupational health and safety, such as the Ministry of Labour in Ontario. There are fourteen jurisdictions – one federal, ten provincial, and three territorial – each governing the way industrial safety is implemented and enforced in their specific province or territory. Federal legislation covers employees of the federal government and Crown agencies and corporations across Canada. In each province or territory, there is an act (typically called the Occupational Health and Safety Act, or something similar) which applies to most workplaces in that region.

Duties of Employers and Other Persons

The various Occupation Health and Safety Acts impose duties on those who have any degree of control over the workplace, the materials and equipment in the workplace, and the direction of the work force. There is a general duty on employers to take all reasonable precautions to protect the health and safety of workers. In addition, the Act and regulations set out many specific responsibilities of the employer. For example, there are duties that specifically relate to toxic substances, hazardous machinery, worker education, and personal protective equipment. There is a duty on all officers and directors of corporations to ensure that their corporations comply with the Act and regulations. The duties of workers are generally to work safely, in accordance with the Act and regulations.

Canadian Regulatory Agencies
Please find the regulatory agency in each province and territory as below:

Alberta
Workplace Health and Safety, Alberta Employment and Immigration

British Columbia
WorkSafeBC

Manitoba
SAFE Manitoba

New Brunswick
WorkSafeNB

Newfoundland and Labrador
Occupational Health and Safety Branch, Department of Government Services

Northwest Territories and Nunavut
Workers' Compensation Board of the Northwest Territories and Nunavut

Nova Scotia
Occupational Health & Safety Division, Nova Scotia Labour and Workforce Development

Ontario
Occupational Health and Safety Branch, Ministry of Labour

Prince Edward Island
Occupational Health and Safety Division, Workers' Compensation Board

Quebec
Commission de la santé et de la sécurité du travail du Québec (Occupational Health and Safety Commission of Quebec)

Saskatchewan
Occupational Health and Safety Division, Saskatchewan Ministry of Advanced Education, Employment and Labour

Yukon
Yukon Workers' Compensation Health and Safety Board

Resources:

There is also a national Canadian Standards Association that sets safety standards which are voluntary and represent best practices. CSA standards may be enforced by law when referenced in provincial, territorial or federal legislation or regulations. These standards are designed to be complem-entary to the actions of government in tackling the issue of worker safety and can provide tools to help organizations comply with regulations and demonstrate due diligence.

Relevant Canadian Standards

CAN/CSA-Z142-10
Code for Power Press Operation: Health, Safety, and Guarding Requirements

CAN/CSA-Z432-04
Safeguarding of Machinery

CAN/CSA-Z434-03
Industrial Robots and Robot Systems – General Safety Requirements

CAN/CSA-Z460-05
Control of Hazardous Energy – Lockout and Other Methods

CAN/CSA-Z615-87 (R2006)
Code for Hot Forging Producers, Health and Safety Requirements

CAN/CSA-Z462
Workplace Electrical Safety

CAN/CSA-Z1002
Injury Risk Assessment and Management

CAN/CSA-Z1006
Work in Confined Spaces

CAN/CSA-Z1004
General Workplace Ergonomics

CAN/CSA Z1000-06
Occupational Health and Safety Management

CAN/CSA-Z1600
Emergency Management and Business Continuity Programs

CSA Standards are available from:
CSA Head Office – Mississauga
5060 Spectrum Way, Suite 100
Mississauga, Ontario L4W 5N6 CANADA

SOURCE FOR STANDARDS

CSA Head Office - Mississauga5060 Spectrum Way, Suite 100Mississauga, OntarioL4W 5N6 CANADA

Selected Conversion Factors

TO CONVERT				TO CONVERT			
Parameter	**From**	**To**	**Multiply by**	**Parameter**	**From**	**To**	**Multiply by**
Temperature	°C	°F	(°C × 9/5) + 32	**Force**	centigrams	grams	0.01
	°F	°C	(°F–32) × 5/9		dynes	grams	0.00102
	°C	°K	°C + 273.18		dynes	newtons	1.0×10^{-5}
					dynes	kg	1.02×10^{-6}
Distance	cm	inches	0.3937		dynes	pounds	2.248×10^{-6}
	mm	inches	0.03937		grams	kilograms	1.0×10^{-3}
	cm	feet	0.03281		grams	milligrams	1.0×10^{3}
	inches	mm	25.4		grams	oz (avdp)	3.527×10^{-2}
	feet	cm	30.48		grams	oz (troy)	3.215×10^{-2}
	meters	feet	3.281		grams	pounds	2.205×10^{-3}
	meters	inches	39.37		kilograms	dynes	9.80665×10^{5}
					kilograms	grams	1.0×10^{3}
Energy	btu	gram calories	2.52×10^{2}		kilograms	newtons	9.807
	btu	hp-hours	3.927×10^{-4}		kilograms	pounds	2.2046
	btu	joules	1.055×10^{3}		kilograms	oz (avdp)	3.5274×10^{1}
	btu	kW-hours	2.928×10^{-4}		newtons	dynes	4.448×10^{5}
	btu	ergs	1.055×10^{10}		newtons	pounds	0.2248
	ergs	btu	9.486×10^{-11}		pounds	dynes	1.0×10^{5}
	ergs	joules	1.0×10^{-7}		pounds	grams	4.5359×10^{2}
	ergs	watt-hours	2.773×10^{-11}		pounds	newtons	4.448
	foot pounds	btu	1.286×10^{-3}		pounds	kilograms	4.536×10^{-1}
	foot pounds	gm-calories	3.241×10^{-1}		pounds	oz (avdp)	1.6×10^{1}
	foot pounds	hp-hours	5.05×10^{-7}		pounds	oz (troy)	1.458×10^{1}

NEMA, UL, CSA and IEC have each established ratings systems intended to identify an enclosure's ability to repel elements from the outside environment. These rating systems address the enclosure's ability to protect against a variety of environmental conditions. These include:

- Incidental contact
- Rain, sleet and snow
- Windblown dust
- Hosedown and splashing liquids
- Falling dirt
- Oil or coolant spraying/splashing
- Corrosive agents
- Occasional temporary submersion
- Occasional prolonged submersion

While these ratings are intended to help you make a more informed product selection, there are some differences between each organization's system.

As shown in Table 1, the NEMA, UL and CSA ratings most commonly used in North America are based on similar application descriptions and expected performance. However, while UL and CSA require testing in the laboratories (and periodic manufacturer site inspections to ensure continued adherence to prescribed standards), NEMA leaves compliance and certification up to the manufacturer.

While the European IEC (IP) ratings summarized in Table 2 are based on similar test methods, their performance has some slight and subtle differences in interpretation. For example, selected IP ratings permit limited ingress of water, while UL/CSA ratings do not.

For your reference and convenience we have attempted to provide an approximate cross-reference between North American enclosure ratings (NEMA, UL and CSA) and selected IEC (IP) enclosure ratings (Table 3). Please recognize that these are nearest-equivalents only and should not be considered as direct comparisons.

TABLE 1:
IEC (IP) Enclosure Ratings

IP	Tests	IP	Tests
0	No protection	0	No protection
1	Protected against solid objects up to 50mm, e.g. accidental touch by hands	1	Protected against vertically falling drops of water, e.g. condensation
2	Protected against solid objects up to 12mm, e.g. fingers	2	Protected against direct sprays of water up to 15° from vertical
3	Protected against solid objects over 2.5mm, e.g. tools and wires	3	Protected against sprays to 60° from vertical
4	Protected against solid objects over 1mm	4	Protected against water sprayed from all directions (limited ingress permitted)
5	Protected against dust (limited ingress, no harmful deposit)	5	Protected against low pressure jets of water from all directions (limited ingress permitted)
6	Totally protected against dust	6	Protected against strong jets of water
		7	Protected against the effects of immersion between 1 cm and 1 m
		8	Protected against the effects of immersion beyond 1 m
		9K**	Protection against high pressure high temperature washdown applications

Example: IP 2 3

Characteristic letters
1st characteristic numeral (Protection against solid objects)
2nd characteristic numeral (Protection against liquids)

An enclosure with this designation is protected against the penetration of solid objects greater than 12mm and against spraying water.

TABLE 2:
NEMA, UL & CSA vs. IEC (IP) Ingress Protection Ratings*

NEMA, UL, CSA Rating	IEC Rating								
	IP23	IP30	IP32	IP64	IP65	IP66	IP67	IP68	IP69K**
1	•								
2		•							
3				•					
3R			•						
3S				•					
4						•			
4X						•			•
6							•	•	•
6P								•	
12					•				•
13					•				•

*** These are nearest equivalents only, and should not be used to make direct conversions from IEC to NEMA classifications.**

**** Designed to meet DIN 40050, Part 9 (1983) Protection Type Test.**

Safety distance for light curtains

Safety distances for light curtains

Between the interruption of a light beam and the standstill of the machine, a certain time expires. The safety light grid or light curtain must be sized and installed such that a stop would be signalled and the hazard ceased prior to a person or a body part accessing the hazard. The standard EN 999 provides the user with detailed information about the calculation of the minimum safety distances. These include the following important influencing factors:

- run-out time of the entire system, taking the different reaction times of the individual systems into account (e.g. machine, safety monitoring module, AOPD etc.)
- capacity of the AOPD to detect body parts (fingers, hand and entire human body)
- set-up of the safety guard in normal condition (vertical fitting), parallel condition (horizontal fitting) or at an arbitrary angle in front of the safety guard and
- the speed at which the protection field is approached.

For the calculation of the minimum safety distance **S** to the hazardous area, EN 999 presents the following general formula:

$$S = K \times T + C$$

Where:

S the safety distance to the dangerous area (mm)

K the approach speed of the body or the body part (mm/s)

T the entire reaction time of the system(s) (including the machine's run-out time, the reaction time of the safety guard and the safety monitoring module etc.)

C additional distance (mm) in front of the safety guard

Normal approach for light curtains: (Resolution: max. 40 mm)

The minimum safety distance S is calculated in the following way:

$$S = 2000\ T + 8\ (D-14)$$

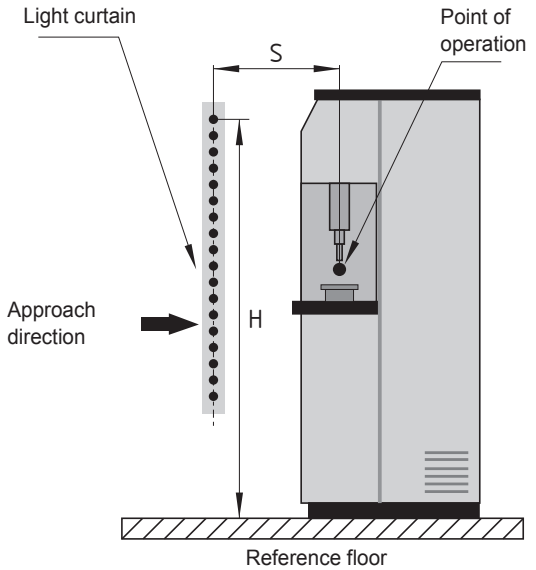
(**D** = Resolution)

This formula applies to safety distances up to 500 mm.
The minimum safety distance Smin may not be less than 100 mm.

If the calculation produces a distance larger than 500 mm for **S**, the calculation can be repeated with a lower approach speed:

$$S = 1600\ T + 8\ (D-14)$$

In this case, Smin may not be less than 500 mm.
If the dangerous area of the machine is accessible from the top because of its particular construction, the height H of the topmost beam of the light barrier must be at least 1800 mm above the base G of the machine.



Normal approach for light curtains: (Resolution: from 40 mm up to max. 70 mm)

The minimum safety distance **S** is calculated in the following way:

S = 1600 T + 850

The height of the topmost light beam must be at least 900 mm, the height of the lowermost light beam maximum 300 mm above the bottom (for the protection of children younger than 14: 200 mm)

Normal approach for light grids: (Resolution: > 70 mm)

The minimum safety distance **S** is calculated using the following formula:

S = 1600 T + 850

For safety guards with multiple beams, height H (mm) above the reference floor of the individual beams must be applied in the following way:

Number of beams	Height above the reference floor
2	400, 900
3	300, 700, 1100
4	300, 600, 900,1200

When using light curtains or light grids, particular attention must be paid to the tampering possibilities of the safety guard and to the mechanical risks (e.g. crushing, shearing, cutting, ejection).

Horizontal approach for light curtains/grids (Resolution: > 50 mm)

The minimum safety distance **S** is calculated using the following formula:

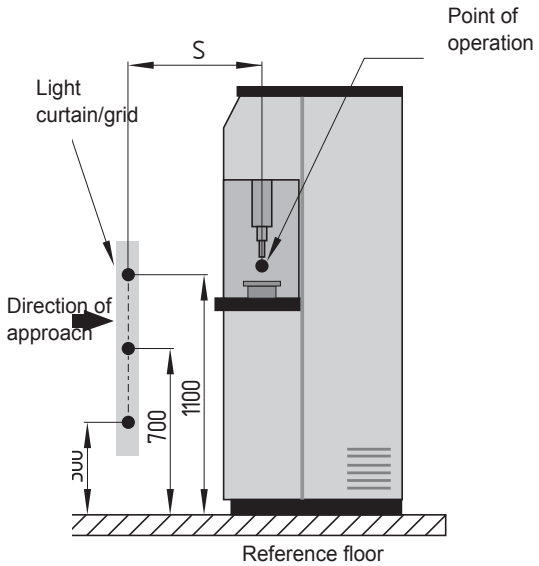
S = 1600 T + 1200 – 0.4 H

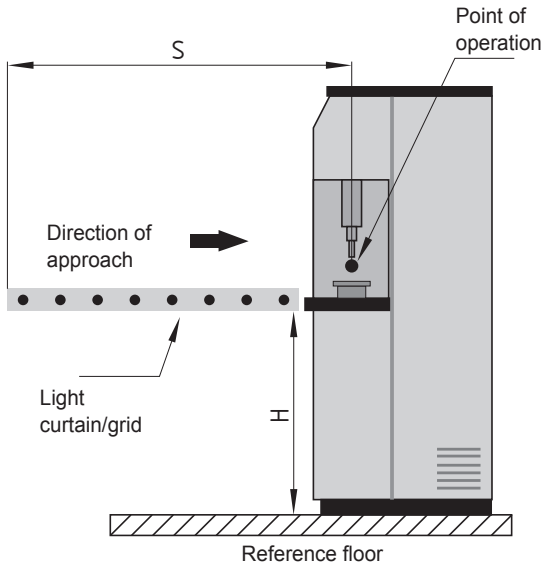
Here, Smin is 850 mm.
The lowest authorised height H depends on the resolution D of the light curtain:

H = 15 (D-50)

For this type of safety guard, the maximum height H is 1000 mm.
In the risk analysis, special attention must be paid to the prevention of unintentional undetected access from underneath the protection field.

Further calculation examples can be found in DIN EN 999 as well as in the mounting instructions of the SLC/SLG safety light curtains and grids.





General Terms and Conditions of Sale

ORDERS & BLANKET ORDERS
All orders must include proper description, pricing, quantity and shipping requirements. Buyer must contact the Seller's head-quarters for terms and conditions associated with blanket orders.

PRICES
Unless otherwise stated, prices are firm for thirty days. Seller reserves the right to revise price if there is a change in quantity, size, finish, or method and time shipment differing from those indicated herein. Prices and terms on this quotation and/or acknowl-edgement of order are not subject to verbal changes or other agreements unless approved in writing by the Seller's headquarters' staff. Unless otherwise negotiated, prices for orders for future delivery will be invoiced at the prevailing price at the time of shipment.

DELIVERY
All material is sold and priced F.O.B. Tarrytown, NY, USA. Unless otherwise specified by the Buyer, all shipments will be made via UPS Ground.

MINIMUM ORDER & PACKAGING CHARGES
Unless otherwise agreed upon, the minimum order billing is $100 per shipment exclusive of shipping, insurance or other misc-ellaneous charges.

PAYMENT TERMS
Payment terms are net 30 days. Seller reserves the right to hold shipments to firms with unpaid past due balances. Seller also reserves the right to charge interest at the rate of 1.5% interest per month for accounts in arrears more than 30 days. This interest will never be greater than that allowed by local law.

TITLE
Title to material, priced at Seller's shipping point, shall pass to Buyer upon shipment. Any charges by carrier for switching, demurrage or other services shall be paid by the Buyer.

CHANGES & CANCELLATIONS
Should Buyer desire to cancel, revise or suspend this order for reasons beyond the Buyer's control, Seller shall discuss the matter promptly with the Buyer and do all possible to make a mutually satisfactory agreement. In cases where the material has been manufactured partially or completely for Buyer's requirements, Seller will advise Buyer of charges incurred to Buyer's account.

CLAIMS FOR DEFECTIVE MATERIALS
All material is warranted to be free from defects in quality and workmanship, and to meet the specifications to which ordered. The Seller's obligation under this warranty is limited to repairing or replacing defective material, or crediting the Buyer with the price of the defective material. If Buyer believes the material to be defective, Buyer must notify Seller within 30 days after delivery. Seller has the right to inspect any goods before determination of a reasonable settlement. Toward this end, Buyer must contact Seller's headquarters requesting a formal Return Material Authorization (RMA). Seller will not accept any material returns without reference to the RMA number of the Buyer's returned goods packing list.

ORDERS FOR NON-STANDARD/SPECIAL ITEMS
Unless otherwise negotiated and confirmed in writing by the Seller, orders for non-standard and special items made to the Buyer's specifications are non-cancelable. Seller reserves the right to bill Buyer for materials purchased for the production of such items, and for all goods fully or partially manufactured at the time of notice of the Buyer's desire to cancel the order.

SPECIAL TOOLING
Special tooling required and paid for by the Buyer shall become the property of the Buyer. Where such tooling incorporates trade secrets, it shall be held in perpetuity at the manufacturer's premises for the exclusive use of the Buyer.

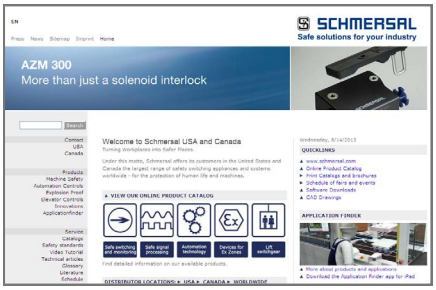
GENERAL
All agreements are contingent upon strikes, accidents, fires, availability of materials and all other causes beyond the Seller's control. Typographical, accounting and other administrative errors are subject to correction. Buyer assumes the liability for patent and copyright infringement for goods made to Buyer's specifications. When Buyer furnishes material for use in production, ample allowance must be made for reasonable spoilage. Such materials must be of suitable quality to facilitate efficient production. Conditions not specifically stated herein shall be governed by established trade customs. Terms inconsistent with those stated herein that may appear on the Buyer's formal order will not be binding on the Seller.

SUSPENSIONS & CANCELLATIONS
Unless otherwise negotiated and agreed to by the Seller, the Buyer must accept final and/or complete delivery on all orders within 90 days from date of first shipment. Should the Buyer fail to accept the complete order within this or the negotiated period for order, the Seller reserves the right to cancel the order and re-bill the Buyer at the price schedule covering the total quantity of parts shipped through the date of cancellation.

WARRANTY AND LIMITATIONS OF WARRANTY:
SCHMERSAL INC agrees to replace or repair products which have been found defective due to workmanship or material. This warranty is made only for a period within one year of the date of the invoice to the Buyer. This warranty applies to products which have been subjected to normal and proper usage, and to which inspection of the product by SCHMERSAL INC shows it to be thus defective. THE AGREEMENT TO REPAIR OR REPLACE SUCH PRODUCT IS LIMITED TO F.O.B. SHIPPING POINT AND IS IN NO WAY A LIABILITY FOR DAMAGES, DIRECT OR CONSEQUEN-TIAL, OR FOR DELAYS, INSTALLATION, TRANSPORTATION, ADJUSTMENT OR OTHER EXPENSES ARISING IN CONNECTION WITH SUCH PRODUCT. SCHMERSAL INC is not responsible in this warranty for product which is repaired or altered. Nor is SCHMERSAL INC responsible in this warranty for products subject to misuse, negligence, or accident. SCHMERSAL INC IS IN NO WAY LIABLE OR RESPONSIBLE FOR INJURIES OR DAMAGES TO PERSONS OR PROPERTY ARISING FROM OR OUT OF USE OF THE PRODUCT WITHIN DESCRIBED SPECIFICATIONS. Except for the warranty herein before stated, THERE ARE NO EXPRESS WARRANTIES AND NO IMPLIED WARR-ANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTIC-ULAR PURPOSE, OTHER THAN THOSE EXPRESSLY SET FORTH ABOVE. THIS LIMITED WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER REPRE-SENTATIONS MADE, BOTH EXPRESS AND IMPLIED, UNLESS SET FORTH IN WRITING AND SIGNED BY AN AUTHOR-IZED EXECUTIVE OF SCHMERSAL INC.

Product index - alphabetical

We are at your disposal - anyplace, anywhere , anytime!



Schmersal USA Website

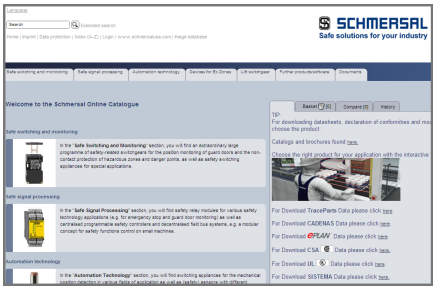
www.schmersalusa.com

The Schmersal homepage contains up-to-date information on general subjects, technical articles on machine safety as well as news regarding events and trainings.

Need a distributor? State by state listings of our 100+ distributors can be found in our contact section.

This and all our printed catalogs are available for download as PDFs. There is a video section with product demonstrations, webinar recordings, safety tutorials, and product animations.

Sign up for our newsletter, the Gatekeeper, or check our schedule of upcoming events.



Online Product Catalog

www.usa.schmersal.net

The online catalog is continually updated. The technical data of our entire product range are always up-to-date. Declarations of conformity, test certificates, and mounting & wiring instructions can be viewed or downloaded as well.

The online catalog can be consulted in several languages: German, English, Spanish, French, Italian, Russian, Chinese, Japanese, and more.

The online catalog also includes dimensional drawings and links to CAD images of our products - a special service to designers. In this way, they can be downloaded and directly fed in CAD systems.

Application Finder

www.applicationfinder.net/us/home/

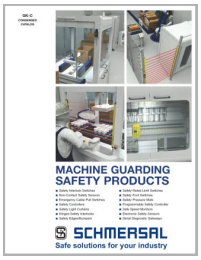
The Application Finder displays an interactive animated packaging plant floor. Users can click on one of the work areas which will open a window with a selection of Schmersal safety switching devices that are optimal for the particular application.

Each selection ultimately links to the Schmersal online product catalog website, where users can see technical data on the selected components.

There are many product-specific animations available throughout, explaining the operation of the switch or providing recommendations for the integration of safety technology into the processes of the machine.

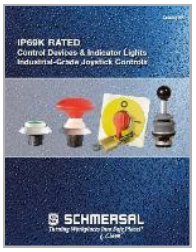
Also available as an app for the iPad. Download from iTunes: search *Schmersal*

Other catalogs and publications from Schmersal



GK-C Overview

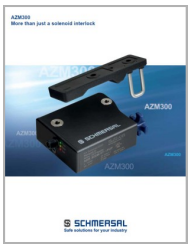
Safety Controller Guide (GK-2)



IP69K Controls and Joysticks

Gatekeeper newsletter

Tech Briefs



AZM300 Brochure

SLC440 Brochure

AS-I Components

Pulse Echo/RFID

Optoelectronic

EX Explosion Proof

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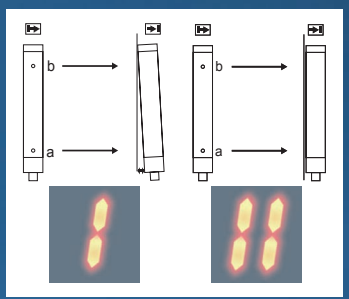
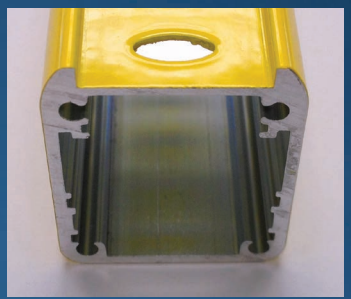
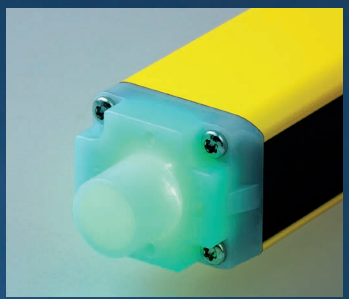
More information to be found on page 4-2



Alignment aid display


Rugged closed housing profile


Output status LED endcap


7 segment Alignment aid display

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