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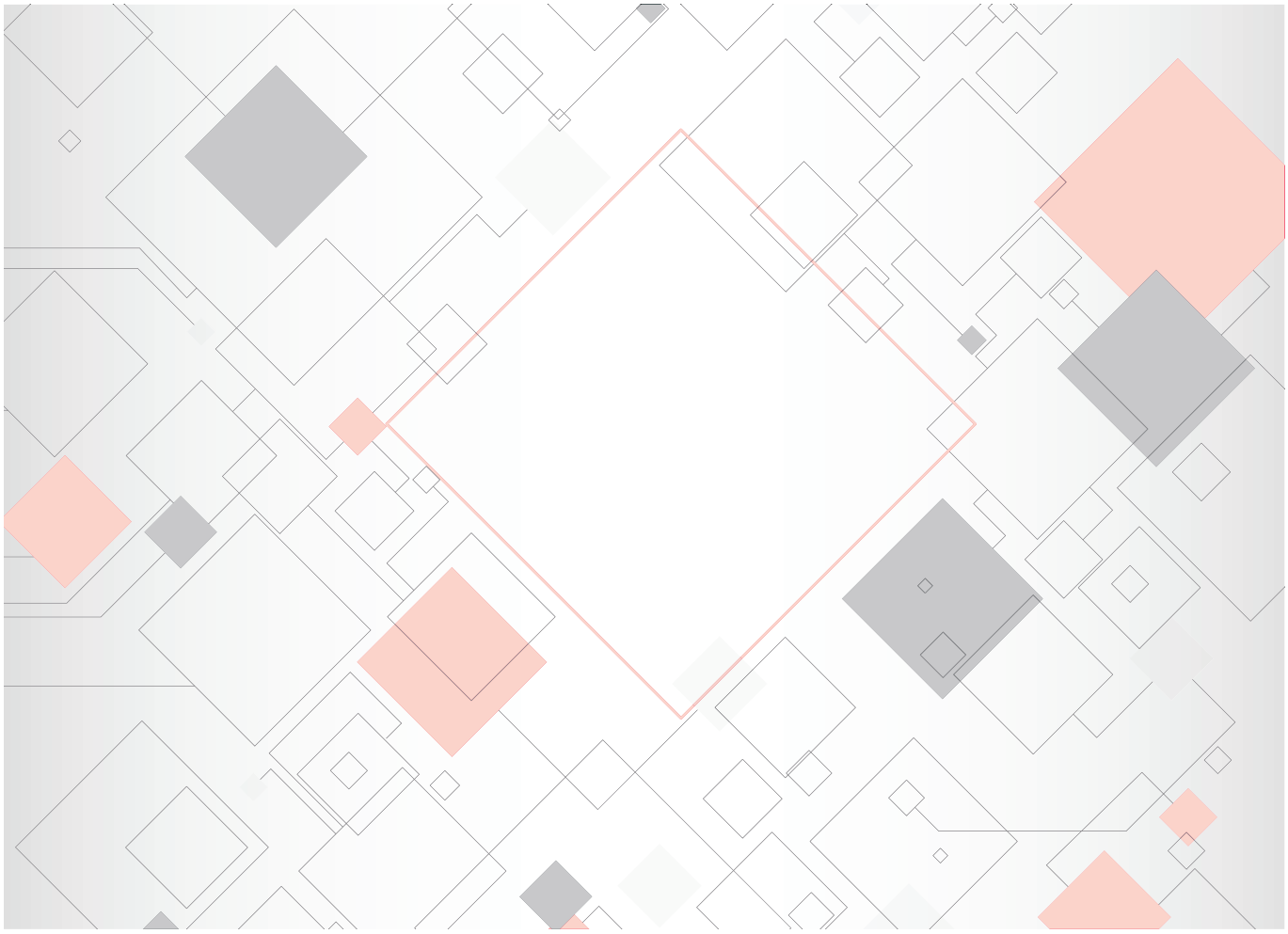

Sicherheitstechnik · Safety Technology

Produktkatalog · Product Catalogue

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Sicherheitstechnik · Safety Technology

Produktkatalog · Product Catalogue

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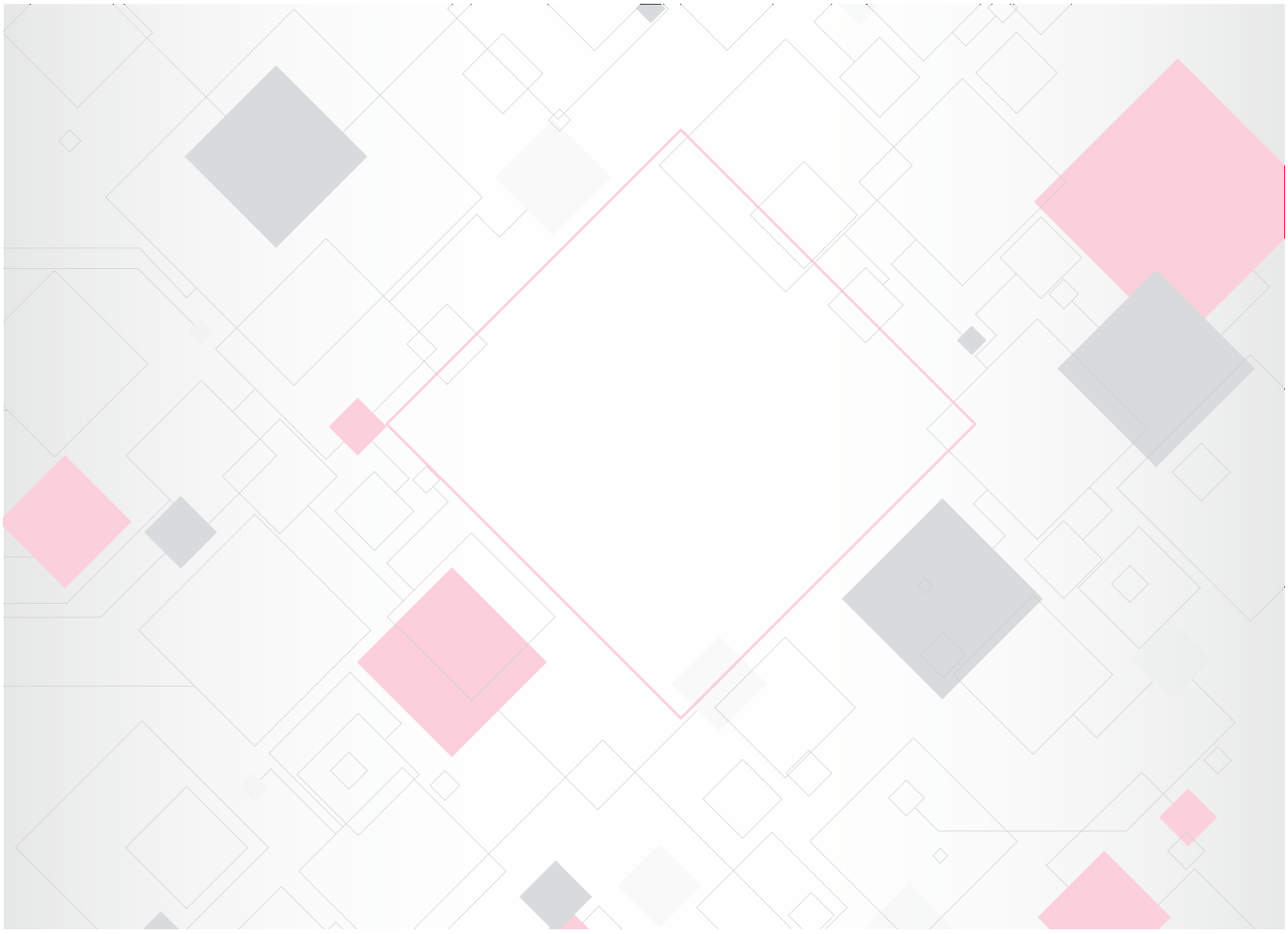

General

EN | Product information

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Quality management

In addition to our employees, the quality of our products is the basis for our success. We want our customers to be excited about our products and solutions. To achieve this, we offer intensive support, critically examine the requirements of our customers and generate new ideas.

In addition, Mayser strives for continuous improvement of quality – both in production and in development. This allows us to guarantee that all products, systems and solutions fulfil the quality standards and comply with the applicable standards and directives. That is also confirmed by our certifications.

We are certified by **TÜV SÜD Management Service GmbH** for the areas of

- development, construction and sales of safety technology products and electronic monitoring devices in accordance with **ISO 9001** and **ISO 14001**
- development and production of anti pinch protection systems and seat occupancy detectors and their components for the automotive industry in accordance with **IATF 16949**

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Certificates

Tip:
All certificates can be found in detailed form in the download area of our website at www.mayser.com.

Quality management

Quality management system	Certificate No.
according to ISO 9001:2008	12 100 22318 TMS
according to ISO/TS 16949:2009	12 111 22318 TMS

Environmental management

Environmental management system	Certificate No.
according to ISO 14001:2015	12 104 22318 TMS

Safety mats

Safety mats	Certificate No.
SM8	IFA 1701108
SM11	44 205 13 397650

Safety edges

Safety edges	Certificate No.
SL NO GP 38 EPDM	44 205 13 397675 004
SL NO GP 38L EPDM	44 205 13 397675 005
SL NO GP 58(L) EPDM	44 205 13 397675 003
SL NO GP 68 EPDM	44 205 13 397675 002
SL NC II GP 48 NBR	44 205 13 397652 003
SL NC II GP 65 EPDM	44 205 13 397652 001
SL NC II GP 100 EPDM	44 205 13 397652 002
SL NC II according to UL 508	U8V 07 10 31146 006
SK SP 37	44 205 13043610
SK SP 57	44 205 13043611

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Control units

Control unit	Certificate No.
SG-EFS 104/4L	44 205 15176904
SG-EFS 104/4L according to UL 508	20150327-E471221

Tip:
All certificates can be found in detailed form in the download area of our website at www.mayser.com.

Ultrasonic industrial sensor

Ultrasonic industrial sensor	Certificate No.
USi safety	1437

ATTENTION
The EC type-examination certificate becomes invalid if our products are used with control units or sensors which do not comply with the tested types.

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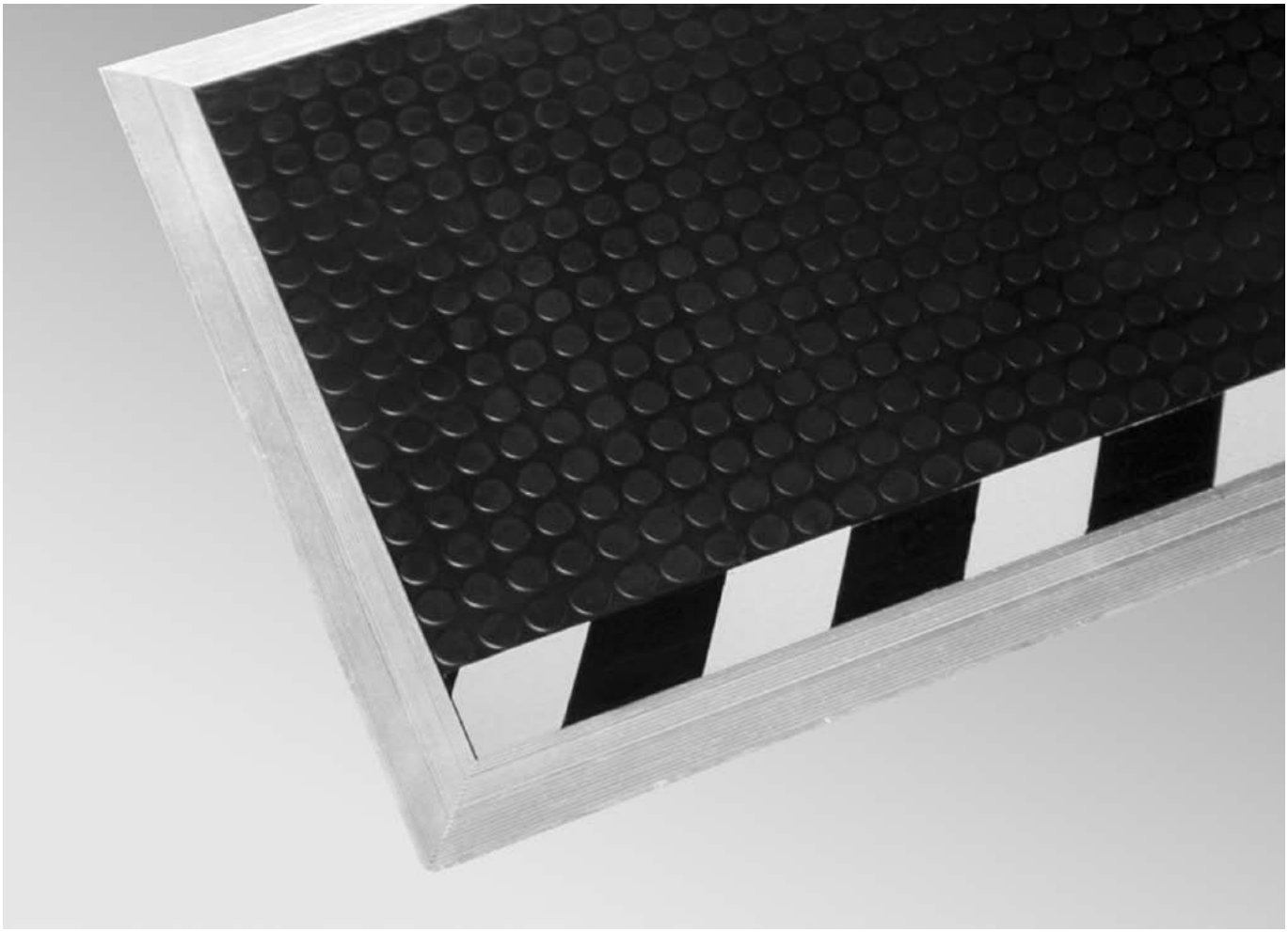

Safety mats SM

EN | Product information

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Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.

Always observe the safety instructions on the following pages under **ATTENTION.** Only use the product for the purpose described in the product information.

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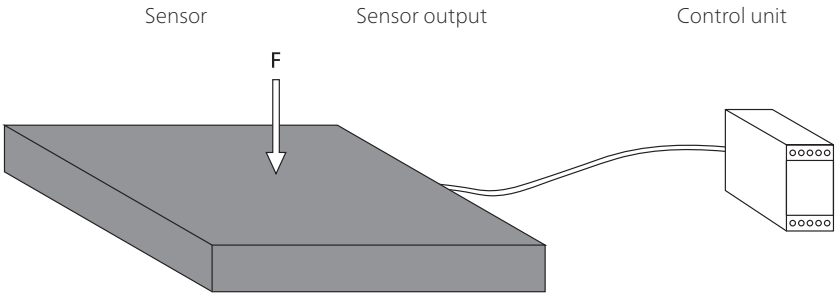
Definitions

Pressure-sensitive protection device

A pressure-sensitive protection device consists of pressure-sensitive sensor(s), signal processing and output signal switching device(s). The control unit is made up of the signal processing and output signal switching device(s). The pressure-sensitive protection device is triggered when the sensor is activated.



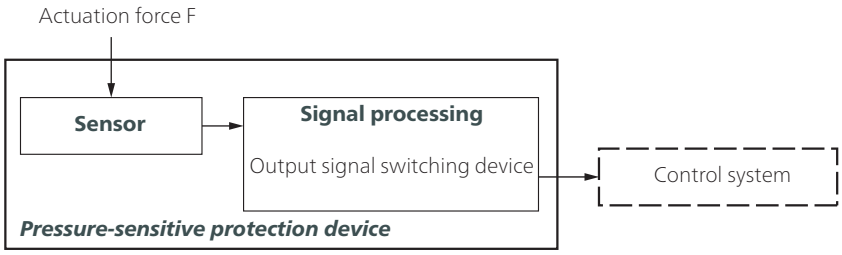
Note:
See also Chapter 3 **Terms** in ISO 13856-1.

Sensor

The sensor is the part of the pressure-sensitive protection device that generates a signal when the actuating force F is applied. Mayser safety systems have a sensor whereby the actuating surface is deformed locally.

Signal processing

The signal processing is the part of the pressure-sensitive protection device that converts the output signal of the sensor and controls the status of the output signal switching device. The output signal switching device is that part of the signal processing which is connected to the machine controls and transmits safety output signals such as STOP.



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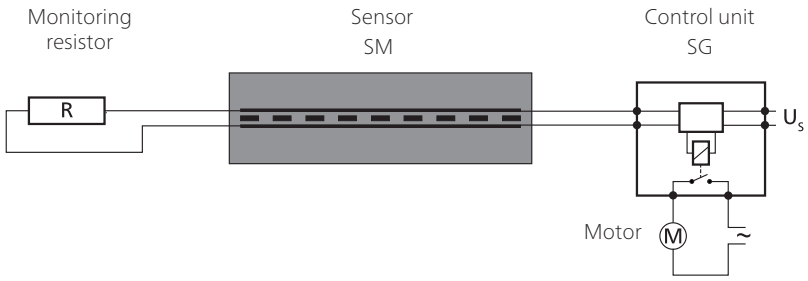
Subject to technical modifications.

Criteria for selecting the sensor type

- Category in accordance with ISO 13849-1
- Performance level of pressure-sensitive protection device = at least PL_r
- Temperature range
- Degree of protection in accordance with IEC 60529:
  IP65 is the standard for safety mats.
  Higher degree of protection must be checked individually.
- Environmental influences such as swarf, oil, coolant, outdoor use...
- Recognition of persons weighing < 35 kg necessary?

Operation principle 2-wire-technology



The monitoring resistor must be compatible with the control unit. Standard value is 1k2. 8k2 and 22k1 are also available.

For your safety:
Sensor and connecting cables are constantly monitored for function. Monitoring is carried out by controlled bridging of the contact surfaces with a monitoring resistor (closed current principle).

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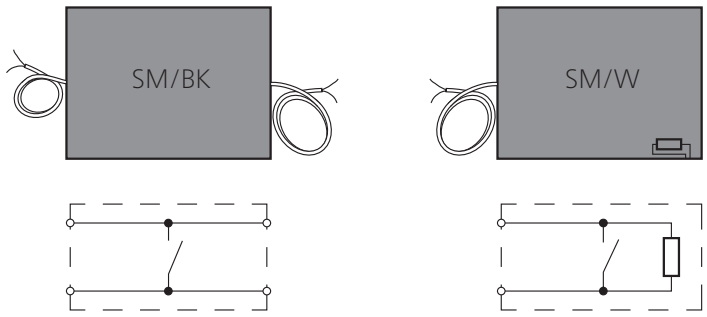
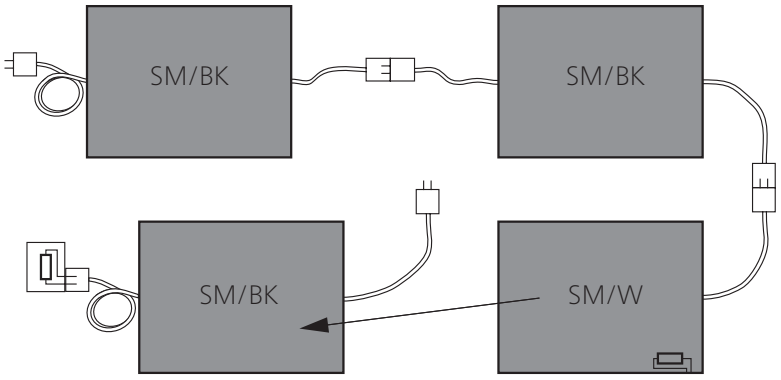
Design

SM/BK with cables on both sides as a through sensor or as an end sensor with external monitoring resistor

SM/W as an end sensor with integrated monitoring resistor



Combination of sensors



Model with external resistor, thus avoiding variety in type

Combination:

- connection of more than one sensor
- only one control unit required
- individual design of control areas with regard to size and shape

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Subject to technical modifications.

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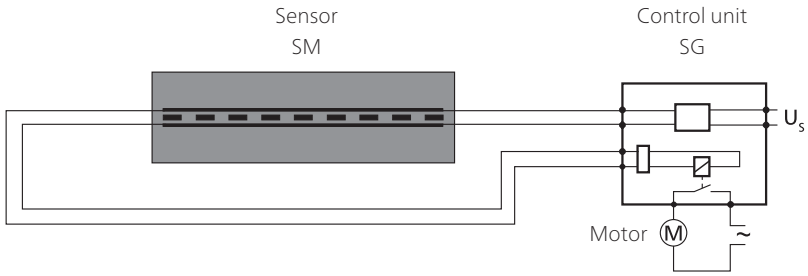
Operation principle 4-wire-technology

Unlike 2-wire technology, 4-wire-technology works **without** a monitoring resistor.

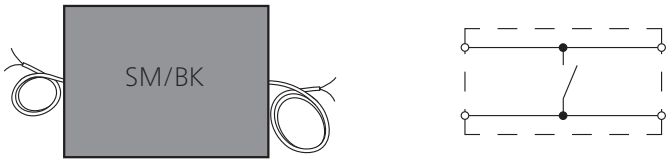
Note:
The 4-wire technology can be used only together with control unit SG-EFS 104/4L.



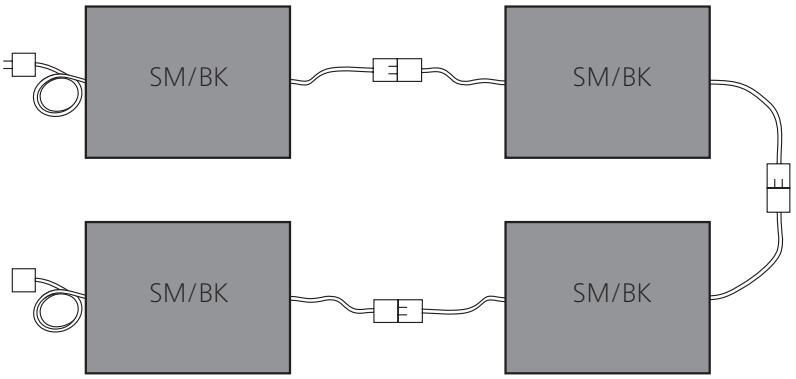
For your safety:
Sensor and connecting cables are constantly monitored for function.
This is possible because of signal transmission feedback – without monitoring resistor.

Design

SM/BK with cables on both sides as a through sensor



Combination of sensors



Combination:

- connection of more than one sensor
- only one control unit required
- individual design of control areas with regard to size and shape

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Subject to technical modifications.

Intended use

A safety mat detects a person that is standing on or stepping onto it. It is a protective device covering a certain area and monitoring the presence of a person on it as a safety function. Its purpose is to prevent possible hazardous situations for personnel within a danger zone. Typical applications are in the area of moving units on machines and plants.
Safe operation of a safety mat depends entirely on
The sensor is suitable for detection of walking aids.

- The surface condition of the mounting surface,
- the correct selection of size and resistance as well as
- correct installation.

Tip
See Annex B of ISO 13856-1, especially Figures B.1 and B.2.

Limits

- Max. 10 sensors type BK on one control unit
- Max. 9 sensors type BK and 1 sensor type W on one control unit
- System size max. 15 m^2
  = max. number × max. sensor size

Exclusions

Sensors are not suitable

- for detecting walking aids.
- for detecting individuals who weigh less than 20 kg.
- for navigating with industrial trucks.

Sensor combinations are not suitable

- for detecting individuals who weigh less than 35 kg.

Program selection

The safety mat SM range supplies individual solutions in terms of size and shape. Safety mats SM are highly resistant to environmental influences and normal chemicals.
If you only require sensors that meet low demands, our safety mats SM11 or safety mats TS may also be a suitable solution.

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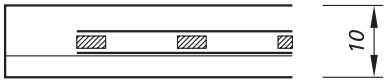
Subject to technical modifications.

Design



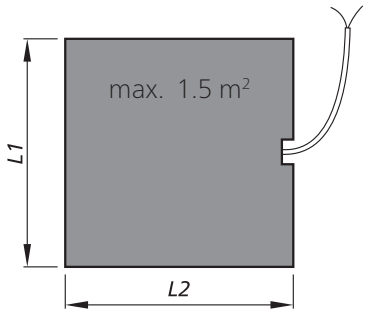
Standard version
moulded on plastic plate
Degree of protection: IP65

Note:
The standard version comes with a fully-bonded rubber surface topping GM1, GM4 or GM5 (see chapter *Surface toppings* and *Rubber surface toppings*).

Customised versions
Customised versions are available for special conditions, e.g. aggressive substances (fuels, solvents etc.).

Available sizes

Sensors are available up to a max. size of 1.5 m².
The side lengths must be within a range of 200 to 3,000 mm.



L1: cable side
L2: not cable side

$L1 \times L2 \leq 1.5\ m^2$

The cable exit on safety mats can be on the wide or the narrow side.

According to ISO 13855, the minimum depth to the danger zone must be taken into account (see Chapter *Calculation of the necessary actuation area*).
The non-sensitive edges must be taken into account (see Chapter *Non-sensitive edges*).

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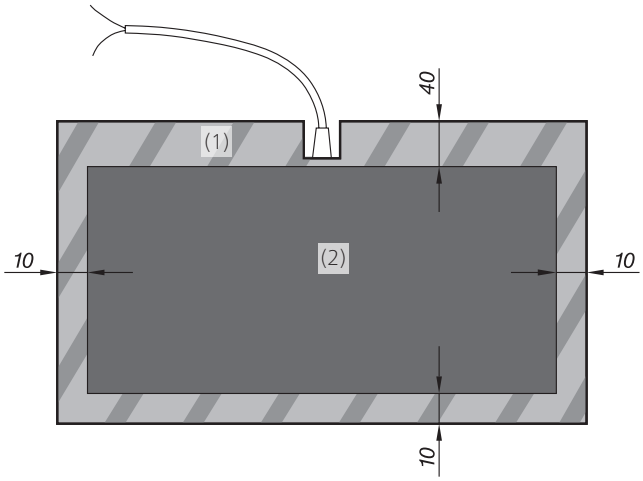
Subject to technical modifications.

Non-sensitive edges

A non-sensitive edge (1) surrounds the effective actuation area (2):

- 40 mm = on cable exit side
- 10 mm = on remaining three sides



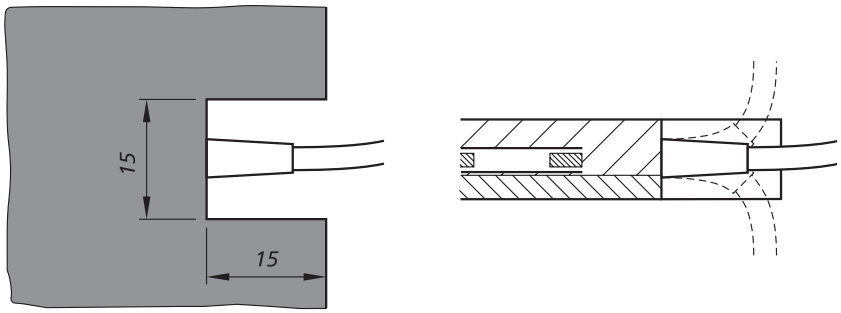
Note

With a combination of sensors, only the sides with an edge area of 10 mm may be placed together.

Connection

Cable exit

The multifunctional cutout also allows the cable to be laid upwards or downwards.
The cable exit is in the middle of the mat side.



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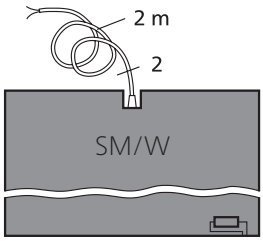
Cable connection

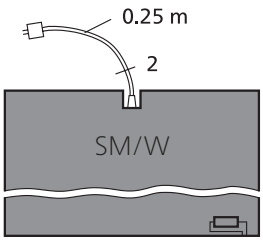
ATTENTION
The maximum overall cable length up to signal processing is 100 m.

Without plug (standard)
- Universally applicable
- Variable cable length

With plug
- Service-friendly
- Easy assembly
- Safe connection
- Watertight plug connection possible

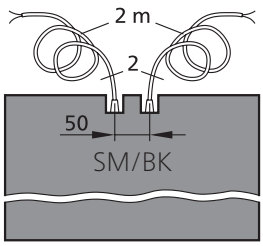
Sensor type W

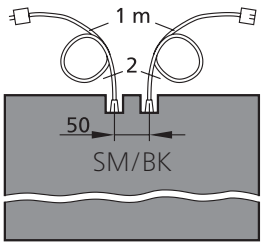




- As an individual sensor type W or an end sensor type W
- Integrated resistor
- 2-wire cable (Ø 5 mm; 2× 0.5 mm² Cu)

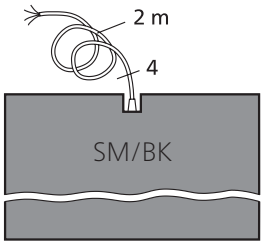
Sensor type BK with 2 lines

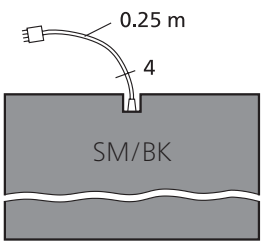




- As a feed-through sensor type BK
- Without resistor
- 2 two-wire cables (Ø 5 mm; 2× 0.5 mm² Cu)

Sensor type BK with 1 line





- As a feed-through sensor type BK
- Without resistor
- 4-wire cable (Ø 5 mm; 4× 0.34 mm² Cu)

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Wire colours

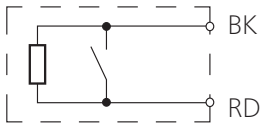
Without plug (standard)

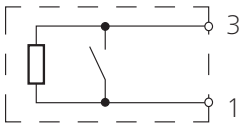
With plug (M8)

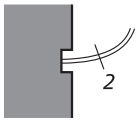
Colour coding

RD	Red	BK	Black
BU	Blue	BN	Brown
WH	White		

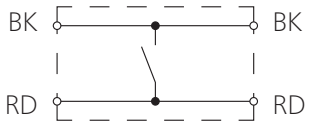
Sensor type W

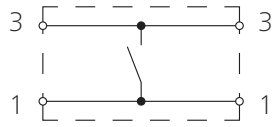


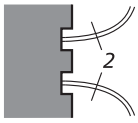




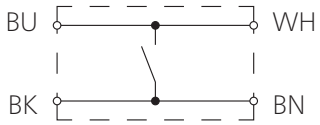
Sensor type BK with 2 lines

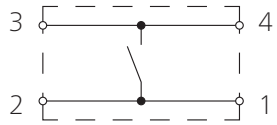


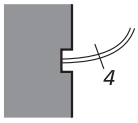




Sensor type BK with 1 line



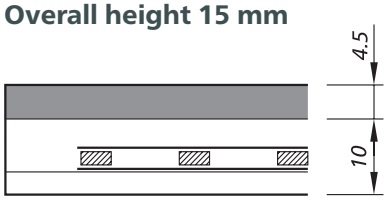




Sensor surface

A rubber surface topping provides a non-slip surface and mechanical protection.
The toppings are bonded in the factory.

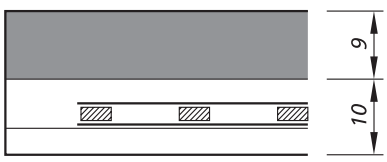
Overall height 15 mm



GM 1 or GM 4

Sensor

Overall height 19 mm



GM 5

Sensor

Subject to technical modifications.

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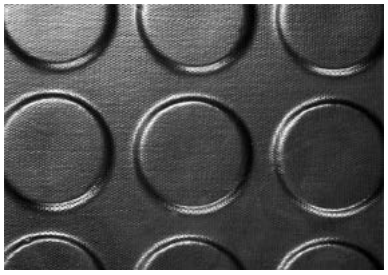
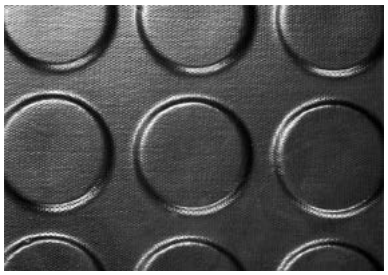
Rubber surface toppings



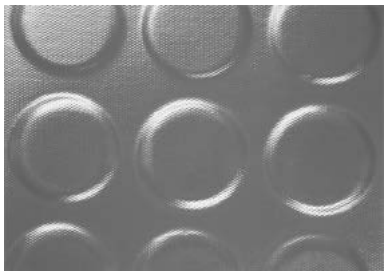
GM 1 SBR
Round nap topping, black
Round nap topping, yellow

Thickness: 4.5 mm ±0.5
Max. size: 1.0 m × 10 m
1.2 m × 10 m



GM 4 NBR
Round nap topping, black
Round nap topping, yellow

Thickness: 4.5 mm ±0.5
Max. size: 1.0 m × 10 m
1.2 m × 10 m



GM 5 NBR
Round nap topping, green
with high mechanical strength

Thickness: 9 mm ±0.5
Max. size: 1.2 m × 10 m

Resistances

The condition for the resistances listed in the following (at room temperature 23 °C) is a sensor with a rubber surface topping adhered over the entire area and with an undamaged surface.

Physical resistance

Rubber surface topping	GM 1	GM 4	GM 5
IEC 60529: Degree of protection	IP65	IP65	IP65
DIN 53516: Abrasion	120 mg	120 mg	120 mg
Static load (up to 8 h)	800 N/cm²	800 N/cm²	1200 N/cm²
DIN 4102: Behaviour in fire	B2	B2	B2
Smouldering tobacco products	+	+	+
DIN 5510: Flammability class	S3	S3	S3
Stress when subjected to climate changes	+	+	+
UV-resistance	+	+	+

Explanation of symbols:
+ = resistant

Subject to technical modifications.

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Chemical resistance
The sensor is resistant against normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

The values in the table are results of tests carried out in our laboratory. The suitability of our products for your special area of application must always be verified with your own practical tests.

Rubbber surface topping	GM 1	GM 4	GM 5
Acetone	+	+	+
Ammonia	+	+	+
Brake fluid	-	±	±
Cutting emulsion	-	±	±
Acetic acid	±	±	±
Greases	±	+	+
Caustic potash solution	+	+	+
Cooling lubricant	-	+	+
Metal working oil	-	+	+
Methyl alcohol	±	±	±
Sodium hydroxide	+	+	+
Cellulose thinner	±	±	±
Hydrochloric acid 10 %	±	+	+
Suds	+	+	+
White spirit (ethyl alcohol)	+	+	+
Water	+	+	+
Petroleum ether/ petrol	-	+	+
Citric acid	+	+	+
Drawing compound	-	±	±

Explanation of symbols:
+ = resistant
± = resistant to a certain extent
- = not resistant

Note:
Tests are carried out at room temperature (+23 °C).

Weight

Sensor with variable rubber surface topping GM and cable without plub.

SM without GM	11.4 kg/m^2
SM with GM 1	17.4 kg/m^2
SM with GM 4	17.4 kg/m^2
SM with GM 5	24.0 kg/m^2

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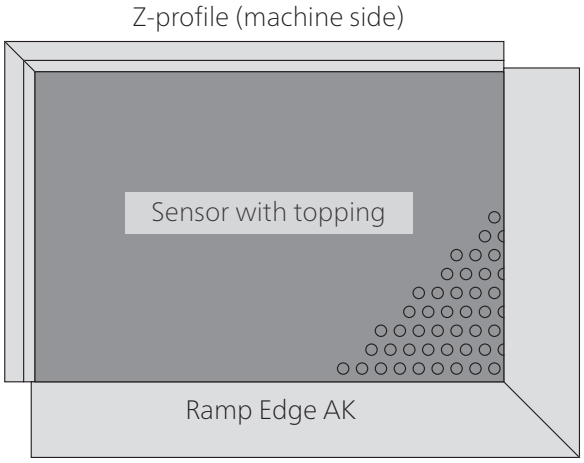
Subject to technical modifications.

Sensor attachment

Ramp edges can be installed quickly and easily.



Overview of fixing material

Sensor	Sensor height	Fixing material	See page
SM with GM 1 SM with GM 4	15 mm	Z-profile	16
		AK 66	16
		AK 105	17
		UP 80	18
SM with GM 5	19 mm	Z/1-profile	16
		AK 105/1	17

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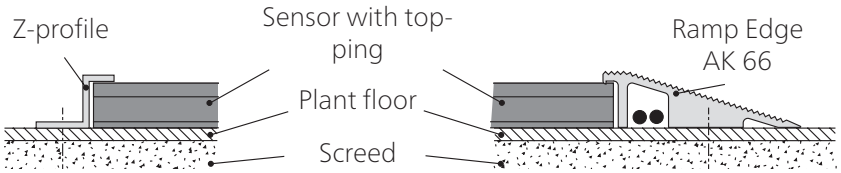
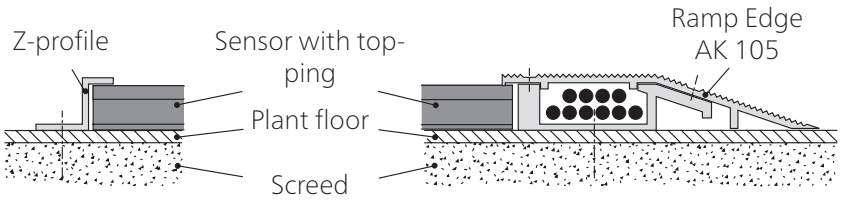
Ramp Edge AK 66



- Not suitable for plug-in cable connections
- Cable conduit for max. 2 cables

For dimensions, see page 16.

Ramp Edge AK 105 and AK 105/1

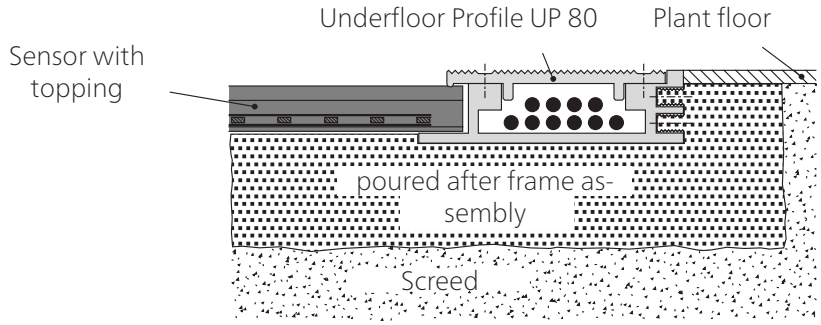


- Suitable for plug-in cable connections
- Cable conduit for max. 10 cables

Ramp Edge AK 105/1 only for sensors with GM 5 surface topping.

For dimensions, see page 17.

Underfloor Profile UP 80



- Suitable for plug-in cable connections
- Cable conduit for max. 10 cables

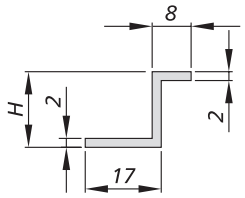
For dimensions, see page 18.

150917 v3.00

Subject to technical modifications.

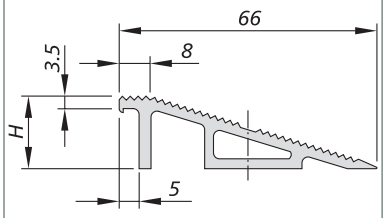
Aluminium Z- and aluminium Z/1-profile

- Edging at the machine or wall side
- Aluminium Z-profile for sensor with GM 1 and GM 4: H = 17.0mm
- Aluminium Z/1-profile for sensor with GM 5: H = 21.0mm
- Aluminium Z-profile: Rod, 3 m (7500054), Rod, 6 m (1000011) or fixed length
- Aluminium Z/1-profile: Rod, 3 m (7500738), Rod, 6 m (1001478) or fixed length



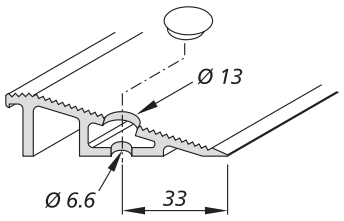
Aluminium Ramp Edge AK 66

- 1-part with cable conduit
- Combination of sensors up to max. 2 sensors
- Sensor without plug
- Aluminium Ramp Edge for sensors with GM 1 und GM 4: H = 18.7mm
- Rod, 3 m (7500053), Rod, 6 m (1000008) or fixed length



Threaded hole for AK 66

- For fixing aluminium Ramp Edge AK 66

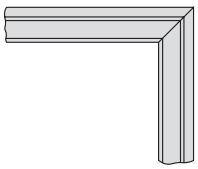


Stopper

- Closes threaded hole (1000615)

Mitre cut

- For corner connections



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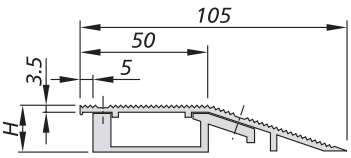
Subject to technical modifications.

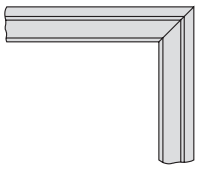
Aluminium Ramp Edge AK 105 and AK 105/1

- 2-part with cable conduit
- For combination of sensors
- Sensors with or without plugs
- Aluminium Ramp Edge AK 105 for sensors with GM 1 und GM 4: H = 17.5mm
- Aluminium Ramp Edge AK 105/1 for sensors with GM 5: H = 21.0mm
- Aluminium Ramp Edge AK 105: Rod, 3 m upper and lower sections (7500052), Rod, 6 m upper section (1000009), Rod, 6 m lower section (1000010), or fixed length
- Aluminium Ramp Edge AK 105/1: Rod, 3 m upper and lower sections (7500224), Rod, 6 m upper sections (1000992), Rod, 6 m lower sections (1000010), or fixed length



Mitre cut

- For corner connections



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Subject to technical modifications.

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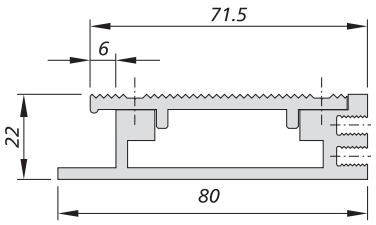
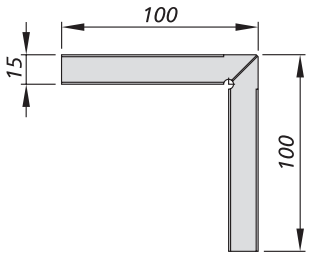
Aluminium Underfloor Profile UP 80

- Edge profile with top cover
- For installation flush with the floor
- For individual sensor or a combination of sensors
- Sensors with or without plugs
- For GM 1 and GM 4
- Rod, 3 m upper and lower sections (7500134),
  Rod, 6 m upper section (1000025),
  Rod, 6 m lower section (1000026),
  or fixed length



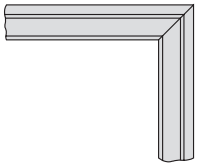
UP corner connection section

- For corner connection of the UP profiles when installing (1000599)



Mitre cut

- For corner connections



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Subject to technical modifications.

Calculation of the necessary actuation area

In accordance with ISO 13855, the necessary effective actuation area in relation to the danger area is calculated with the following:

$S = (K \times T) + C$ where: $K = 1600$ mm/s

$T = t_1 + t_2$

$C = 1200$ mm - 0.4H

With installation at floor level

H = 0; hence:

$S = (1600 \text{ mm/s} \times T) + 1200 \text{ mm}$

With installation on a step

H ≠ 0; hence:

$S = (1600 \text{ mm/s} \times T) + (1200 \text{ mm} - 0.4H)$

- S = Minimum distance between the danger zone and the furthest edge of the sensor [mm]
- K = Approximation parameters [mm/s]
- T = Follow-through of the complete system [s]
- t_1 = Response time of the protective device
- t_2 = Stopping time of the machine
- C = Safety tolerance [mm]
- H = Step height [mm]

Calculation examples

Example 1

A safety mat detects non-permitted access to the danger zone of an automated movement. The mat is installed flush to the floor, i.e. H = 0.

The follow-through time of the movement is 300 ms, the response time of the protective device is 18 ms.

$S = (1600 \text{ mm/s} \times (300 \text{ ms} + 18 \text{ ms})) + 1200 \text{ mm}$

$S = 509 \text{ mm} + 1200 \text{ mm}$

$S = 1709$ mm

Example 2

The same conditions as Example 1, however, a step with a height of 150 mm must be negotiated to the danger zone.

$S = (1600 \text{ mm/s} \times (300 \text{ ms} + 18 \text{ ms})) + (1200 - (0{,}4 \times 150)) \text{ mm}$

$S = (1600 \text{ mm/s} \times 0{,}318 \text{ s}) + (1200 - 60) \text{ mm}$

$S = 509 \text{ mm} + 1140 \text{ mm}$

$S = 1649$ mm

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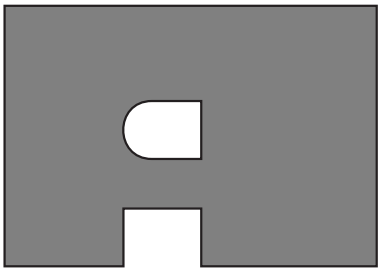
Customised designs

Customised shapes

e.g. different corner shapes

Different shapes such as circles, circle segments, trapeze shapes etc. are possible.



e.g. cut-outs

Mats can be ready-manufactured with cut-outs, e.g. for machine feet, switch cabinets etc.

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Subject to technical modifications.

Safety aspects

Without reset function
When a safeguard without reset function is used (automatic reset), the reset function must be made available in some other way.

Performance Level (PL)
The PL was determined during a simplified procedure according to ISO 13849-1.
Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contact by pressure-sensitive equipment according to ISO 13856. In this case, the sensor will no longer be taken into account in determining the PL. The overall system safety mat (pressure-sensitive protection device) can reach a maximum of PL d.

Is the safeguard appropriate?
The PL required for the hazard must be decided by the integrator. This is followed by the choice of safeguard.
Finally, the integrator needs to check whether the category and PL of the safeguard chosen are appropriate.

Maintenance and cleaning

The sensor is maintenance-free.
The control unit also monitors the sensor.

Regular inspection
Depending on the load, the sensors are to be tested at regular intervals (at least monthly)

- for correct functioning: by activation or by applying the relevant test sample.
- for damage: by visual checking.

Cleaning
If necessary, clean the sensor with a mild cleaning agent.

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Technical data

Safety mat:	SM/W with SG-EFS 1X4 ZK2/1	SM/BK with SG-EFS 104/4L
Testing basis:	ISO 13856-1	
Switching characteristics at v_{test} = 250 mm/s		
Switching operations at 0.1 A	> 4× 10^6	
Actuation forces		
Test piece (cylinder) Ø 11 mm	< 300 N	
Test piece (cylinder) Ø 80 mm	< 300 N	
Test piece (cylinder) Ø 200 mm	< 600 N	
Response time with Control Unit	18 ms	38 ms
Safety classifications		
ISO 13856: Reset function	with/without	with/without
ISO 13849-1:2015	category 3 PL d	category 3 PL d
$MTTF_D$ (Pressure-sensitive protection device)	246 a	65 a
$MTTF_D$ (sensor)	1142 a	1142 a
B_{10D} (sensor)	6× 10^6	6× 10^6
n_{op} (acceptance)	52560/a	52560/a
Mechanical operating conditions		
Sensor size	max. 1.5 m^2	
Side length (min./max.)	200 mm / 3000 mm	
Cable length (min./max.)	10 cm / 200 m	
Static load (up to 8 h)	max. 800 N/cm^2	
Driving on with industrial trucks	not suitable	
IEC 60529: Degree of protection	IP65	
max. humidity (23 °C)	95% (non-condensing)	
Operating temperature		
individual sensor	+5 to +55 °C	
combination of sensors	-5 to +55 °C	
Storage temperature	-20 to +55 °C	
Electrical operating conditions		
Connection cable	Ø 5.0 mm PVC 2× 0.5 mm^2 or 4× 0.34 mm^2	
Sensor	DC 24 V / max. 10 mA	
Number of sensors type BK	max. 10 in series	
Dimensional tolerances		
Length dimension	ISO 2768-c	
Perpendicularity	ISO 2768-c	

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Request for quotation

Fax:
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Submitted by

Company

Department

Surname, first name

P.O. Box | Postcode | Town/city

Street | Postcode | Town/city

Phone | Fax | E-mail

Area of application

(e.g. metalworking, textile machines, timber processing, tube drawing, local public transport, ...)

Environmental conditions

- ❑ Dry
- ❑ Water
- ❑ Oil
- ❑ Aggressive substances:
  - ❍ Coolant, type: _____
  - ❍ Solvent, type: _____
  - ❍ Other: _____
- ❑ Room temperature
- ❑ Other: from _____ °C to _____ °C

Mechanical conditions

- ❑ Only adults
- ❑ Also children
- ❑ Falling objects with __ kg maximum weight
- ❑ Vehicles with _____ kg maximum weight
- ❑ Vehicle type: _____

Area to be secured:

(Diagram incl. edge profiles and cable routing)

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For internal notes only

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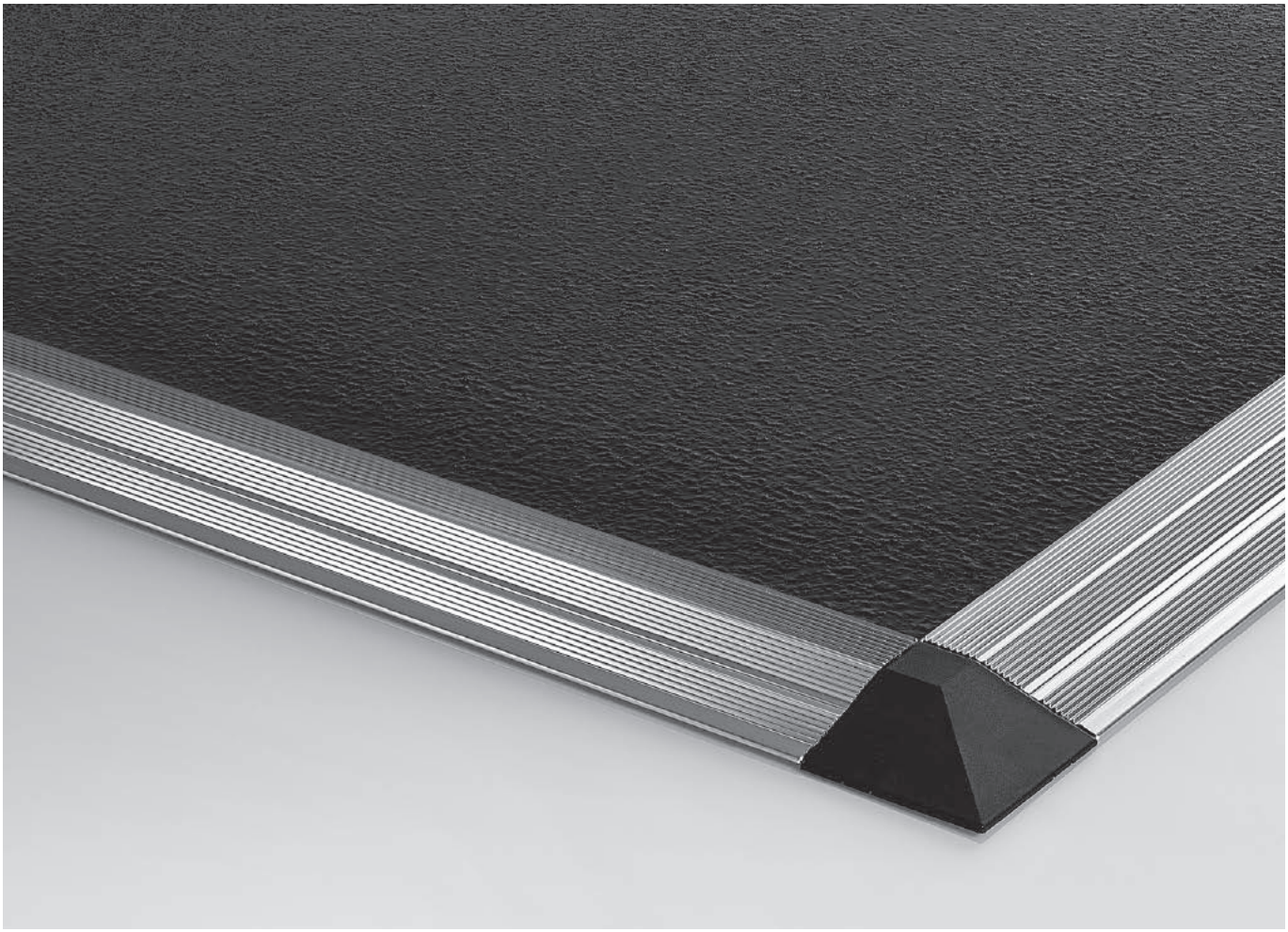
Innovative by tradition.



Safety mats SM11

EN | Product information

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Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.

Always observe the safety instructions on the following pages under **ATTENTION.** Only use the product for the purpose described in the product information.

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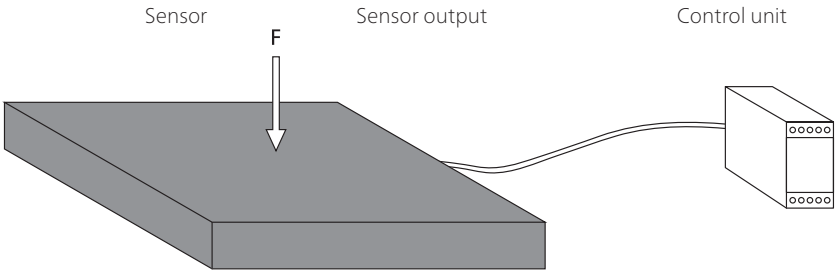
Definitions

Pressure-sensitive protection device

A pressure-sensitive protection device consists of pressure-sensitive sensor(s), signal processing and output signal switching device(s). The control unit is made up of the signal processing and output signal switching device(s). The pressure-sensitive protection device is triggered when the sensor is activated.



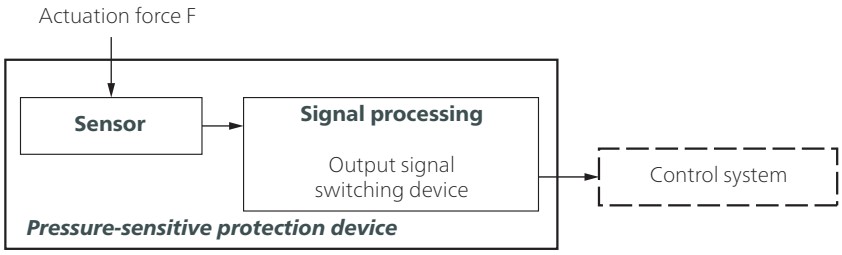
Note:
See also Chapter 3 **Terms** in ISO 13856-1.

Sensor

The sensor is the part of the pressure-sensitive protection device that generates a signal when the actuating force F is applied. Mayser safety systems have a sensor whereby the actuating surface is deformed locally.

Signal processing

The signal processing is the part of the pressure-sensitive protection device that converts the output signal of the sensor and controls the status of the output signal switching device. The output signal switching device is that part of the signal processing which is connected to the machine controls and transmits safety output signals such as STOP.



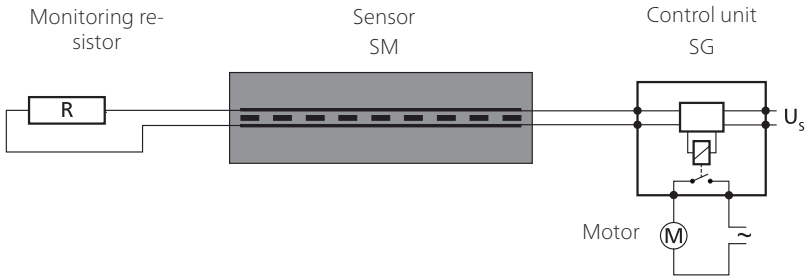
051017 v2.00

Subject to technical modifications.

Criteria for selecting the sensor type

- Category in accordance with ISO 13849-1
- Performance level of pressure-sensitive protection device = at least PL_r
- Temperature range
- Degree of protection in accordance with IEC 60529:
  IP65 is the standard for safety mats.
  Higher degree of protection must be checked individually.
- Environmental influences such as swarf, oil, coolant, outdoor use...
- Recognition of persons weighing < 35 kg necessary?

Operation principle 2-wire-technology



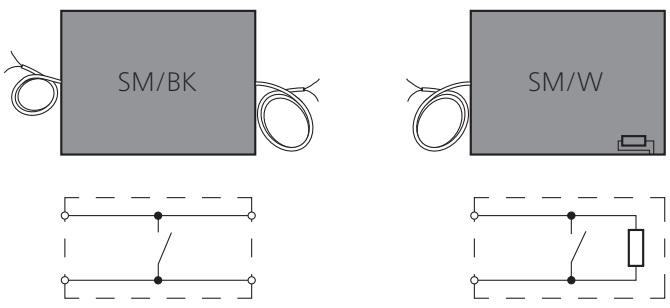
The monitoring resistor must be compatible with the control unit.
Standard value is 1k2. 8k2 and 22k1 are also available.

For your safety:
Sensor and connecting cables are constantly monitored for function.
Monitoring is carried out by controlled bridging of the contact surfaces with a monitoring resistor (closed current principle).

Design

SM/BK with cables on both sides as a through sensor or as an end sensor with external monitoring resistor

SM/W as an end sensor with integrated monitoring resistor



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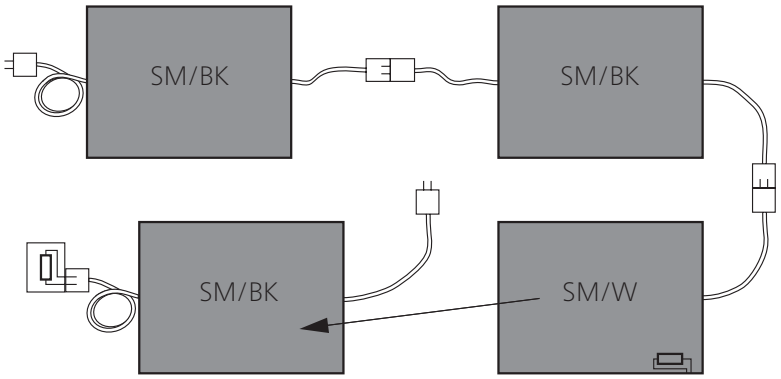
Combination of sensors



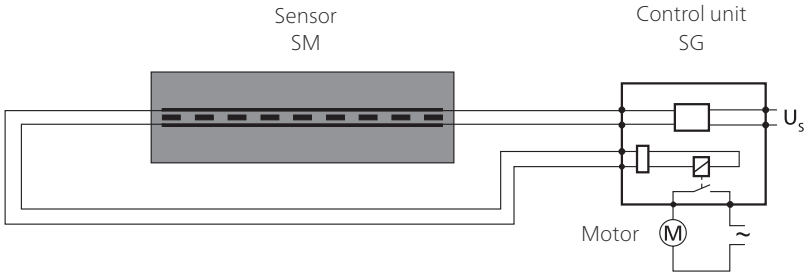
Model with external resistor, thus avoiding variety in type

Combination:

- connection of more than one sensor
- only one control unit required
- individual design of control areas with regard to size and shape

Operation principle 4-wire-technology

Unlike 2-wire technology, 4-wire-technology works **without** a monitoring resistor.

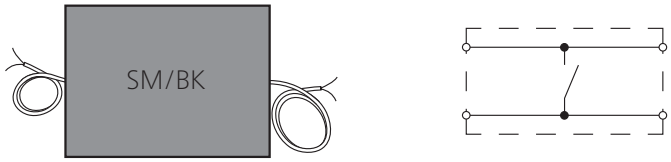


Note:
The 4-wire technology can be used only together with control unit SG-EFS 104/4L.

For your safety:
Sensor and connecting cables are constantly monitored for function.
This is possible because of signal transmission feedback – without monitoring resistor.

Design

SM/BK with cables on both sides as a through sensor



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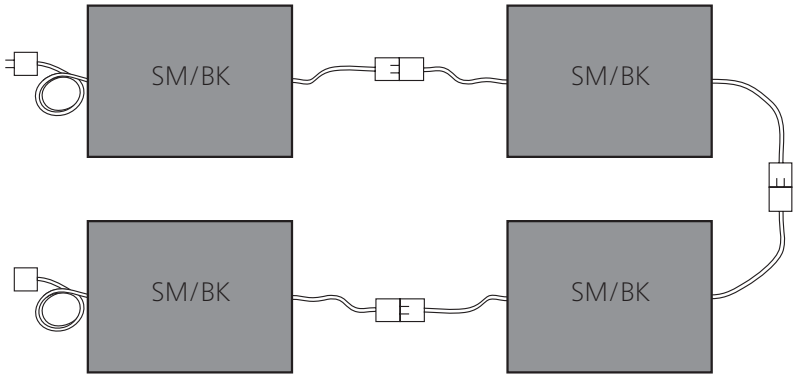
Subject to technical modifications.

Combination of sensors



Combination:

- connection of more than one sensor
- only one control unit required
- individual design of control areas with regard to size and shape

Intended use

A safety mat detects a person that is standing on or stepping onto it. It is a protective device covering a certain area and monitoring the presence of a person on it as a safety function. Its purpose is to prevent possible hazardous situations for personnel within a danger zone.
Typical applications are in the area of moving units on machines and plants.
Safe operation of a safety mat depends entirely on

- The surface condition of the mounting surface,
- the correct selection of size and resistance as well as
- correct installation.

Tip
See Annex B of ISO 13856-1, especially Figures B.1 and B.2.

Limits

- Max. 10 sensors type BK on one control unit
- Max. 9 sensors type BK and 1 sensor type W on one control unit
- System size max. 15 m^2
  = max. number × max. sensor size

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Exclusions

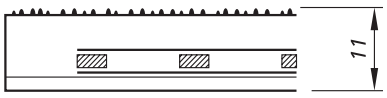
Sensors are not suitable
- for detecting walking aids.
- for detecting individuals who weigh less than 20 kg.
- for navigating with industrial trucks.

Sensor combinations are not suitable
- for detecting individuals who weigh less than 35 kg.

Program selection

Sensors in the SM11 safety mat programme are only available in rectangular shape. The surface is resistant to a certain extent to external influences and normal chemical influences.
If you have higher requirements of the sensors, we recommend our line of customised safety mats.

Design



Standard version
moulded onto a plastic plate;
fitted in the factory with a
non-slip structured surface;
non-slip category: R9
Degree of protection: IP65

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Subject to technical modifications.

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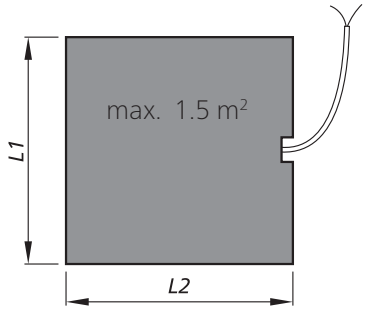
Available sizes

Sensors are available exclusively in rectangular shape up to a size of max.1.5 m^2.
The side lengths must be within a range of 200 to 3,000 mm.



L1: cable side
L2: not cable side

$L1 \times L2 \leq 1.5\ m^2$

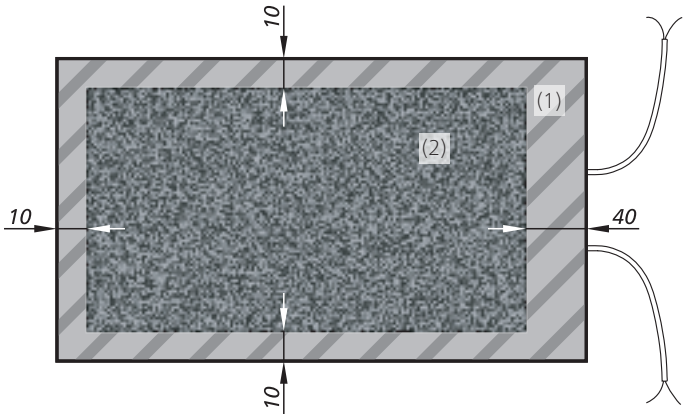
The cable exit on safety mats can be on the wide or the narrow side.

Non-sensitive edges

A non-sensitive edge (1) surrounds the effective actuation area (2):

- 40 mm = on cable exit side
- 10 mm = on remaining three sides

Note
With a combination of sensors, only the sides with an edge area of 10 mm may be placed together.



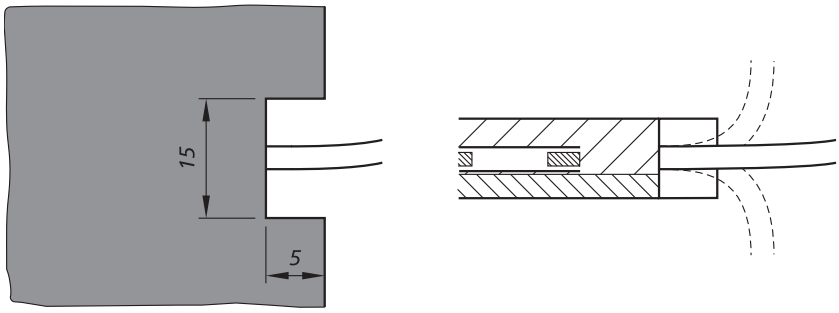
051017 v2.00

Subject to technical modifications.

Connection

Cable exit

The multifunctional cutout also allows the cable to be laid upwards or downwards.

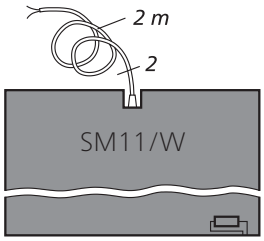


Cable connection

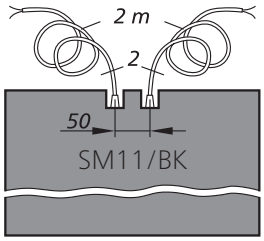
Without plug (standard)

- Universally applicable
- Variable cable length

ATTENTION
The maximum overall cable length up to signal processing is 100 m.



- As an individual sensor type W or an end sensor type W
- Integrated resistor
- 2-wire cable (Ø 5 mm; 2× 0.5 mm² Cu)



- As a feed-through sensor type BK
- Without resistor
- 2 two-wire cables (Ø 5 mm; 2× 0.5 mm² Cu)

Optional with M8 plug (IP67).

Subject to technical modifications.

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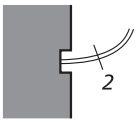
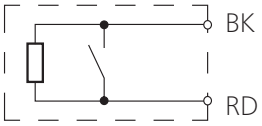
Wire colours

Sensor type W

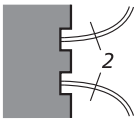


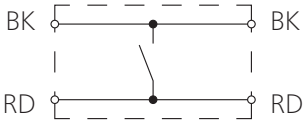


Colour coding

RD	Red	BK	Black

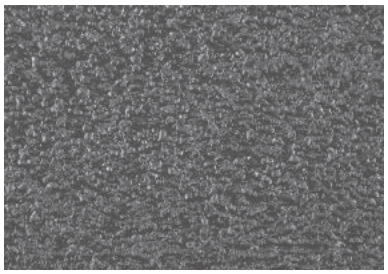
Sensor type BK with 2 lines





Sensor cover

A rough surface provides the necessary non-slip quality and acts as a mechanical protection.
The structured surface is applied in the factory.



Resistances

The condition for the resistances listed in the following (at room temperature 23 °C) is a sensor with an undamaged surface.

Physical resistance

Surface	PUR
IEC 60529: Degree of protection	IP65
DIN 53516: Abrasion	< 150 mg
DIN 51130: Non-Slip	R9
static load (up to 8 h)	800 N/cm²
DIN 4102: Behaviour in fire	B2
Stress when subjected to climate changes	+
UV-resistance	+

Explanation of symbols:
+ = resistant

Subject to technical modifications.

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Chemical resistance

The sensor is resistant against normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

The values in the table are results of tests carried out in our laboratory. The suitability of our products for your special area of application must always be verified with your own practical tests.

Surface	PUR
Acetone	-
Formic acid 5 %	+
Ammonia	+
ATF gear oil	+
Brake fluid DOT 4	-
Cutting emulsion	+
Demineralised water	+
Diesel	±
Acetic acid 10 %	+
Ethanol	-
Greases	-
Hydraulic oil	+
Caustic potash solution 10 %	+
Saline solution 5 %	+
Cooling lubricant	±
Metal working oil	+
Methanol	-
Mineral oil	+
Caustic soda 10 %	±
Cellulose thinner	-
Hydrochloric acid 10 %	±
Salt water 10 %	+
Suds 5 %	+
White spirit (ethyl alcohol)	-
Universal thinner	-
Water	+
Petroleum ether / petrol	-
Citric acid 10 %	+
Drawing compound	-

Explanation of symbols:

+ = resistant
± = resistant to a certain extent
- = not resistant

Note:
Tests are carried out at room temperature (+23 °C).

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Subject to technical modifications.

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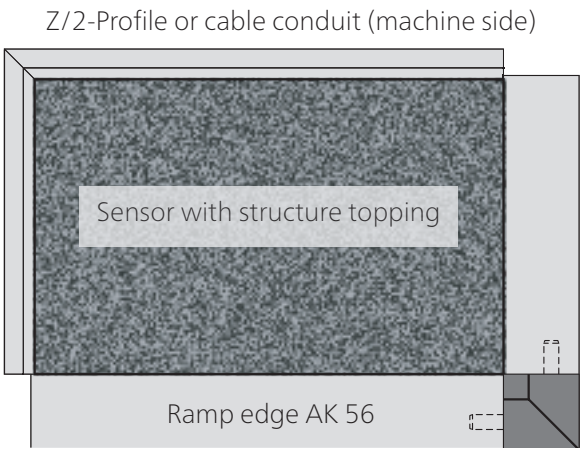
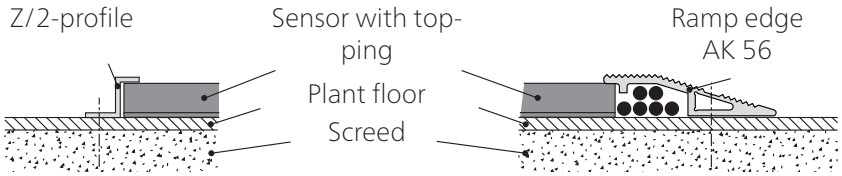
Sensor attachment

Ramp edges can be installed quickly and easily.

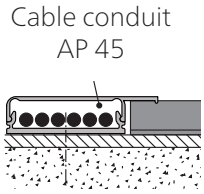


Ramp edge AK 56



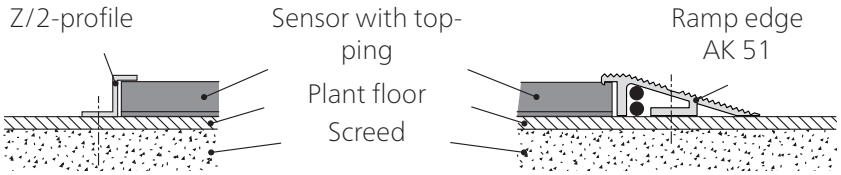
- Not suitable for plug-in cable connections
- Cable conduit for max. 6 cables

Cable conduit AP 45



- Cable conduit AP 45 instead of Z/2-Profile
- Suitable for plug-in cable connections
- Cable conduit for max. 6 cabels

Ramp edge AK 51



- Not suitable for plug-in cable connections
- Cable conduit for max. 2 cables
- Corner joints are only available with mitre cuts (not suitable for corner connectors and wedge connectors)

Subject to technical modifications.

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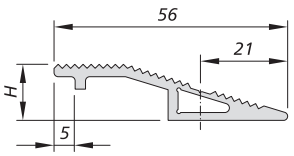
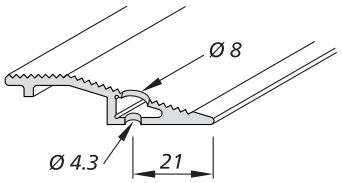
Aluminium ramp edge AK 56

- 1-part with cable conduit
- For combination of several sensors
- Sensors with or without plugs
- Rod 3 m (7501014), Rod 6 m (1002684) or fixed length



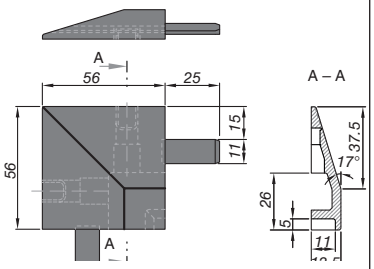
Threaded hole for AK 56

- For fixing ramp edge AK 56



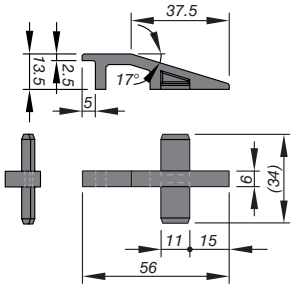
Corner connector E1 AK 56 outer

- For corner connectors ramp edge AK 56
- Material: plastic black (1002751)



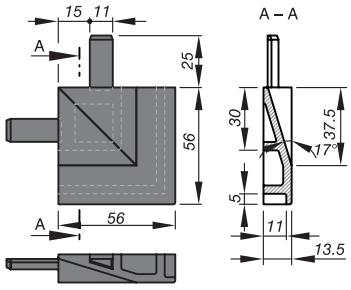
Connecting wedge Vk AK 56

- For longitudinal connection of ramp edge AK 56
- Material: plastic black (1002996)

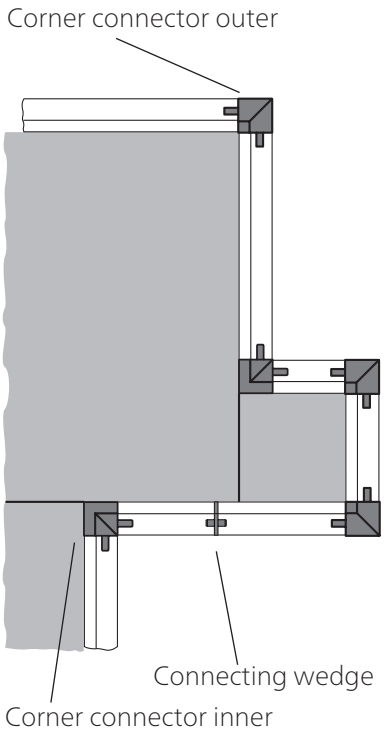


Corner connector E2 AK 56 inner

- For corner connectors ramp edge AK 56
- Material: plastic black (1002752)



Example:



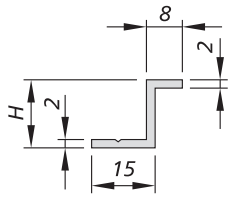
Note

Corner connector and connecting wedge are not suitable for ramp edge AK 51.

Subject to technical modifications.

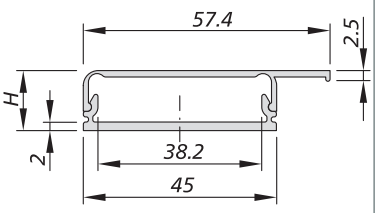
Aluminium-Z/2-Profile

- Edging at the machine or wall side
- Rod 3 m (7500385), Rod 6 m (1001666) or fixed length



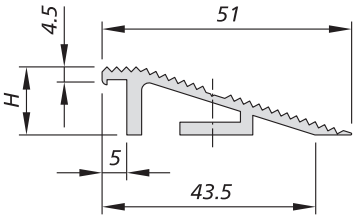
Aluminium cable conduit AP 45

- 2-part with cable conduit
- For combination of several sensors
- Sensors with or without plugs
- Upper section is clipped into lower section
- Rod 3 m upper part (1002546), Rod 3 m bottom part (1002547) or fixed length upper and bottom part



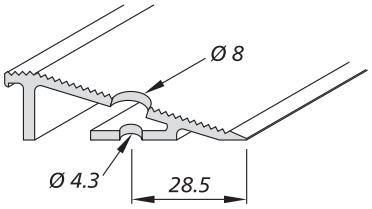
Aluminium ramp edge AK 51

- 1-part with cable conduit
- Combinations up to max. 2 sensors
- Sensor without plug
- Rod 3 m (7500384), Rod 6 m (1001667) or fixed length



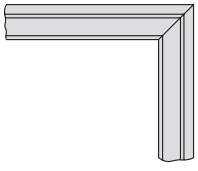
Threaded hole for AK 51

- For fixing ramp edge AK 51



Mitre cut

- For corner connections



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Calculation of the necessary actuation area

In accordance with ISO 13855, the necessary effective actuation area in relation to the danger area is calculated with the following:

$S = (K \times T) + C$ where: $K = 1600$ mm/s, $T = t_1 + t_2$, $C = 1200$ mm - 0.4H

With installation at floor level

H = 0; hence:

$S = (1600 \text{ mm/s} \times T) + 1200 \text{ mm}$

With installation on a step

H ≠ 0; hence:

$S = (1600 \text{ mm/s} \times T) + (1200 \text{ mm} - 0.4H)$

S = Minimum distance between the danger zone and the furthest edge of the sensor [mm]
K = Approximation parameters [mm/s]
T = Follow-through of the complete system [s]
t_1 = Response time of the protective device
t_2 = Stopping time of the machine
C = Safety tolerance [mm]
H = Step height [mm]

Calculation examples

Example 1

A safety mat detects non-permitted access to the danger zone of an automated movement. The mat is installed flush to the floor, i.e. H = 0. The follow-through time of the movement is 300 ms, the response time of the protective device is 23 ms.

$S = (1600 \text{ mm/s} \times (300 \text{ ms} + 23 \text{ ms})) + 1200 \text{ mm}$
$S = 517 \text{ mm} + 1200 \text{ mm}$
$S = 1717 \text{ mm}$

Example 2

The same conditions as Example 1, however, a step with a height of 150 mm must be negotiated to the danger zone.

$S = (1600 \text{ mm/s} \times (300 \text{ ms} + 23 \text{ ms})) + (1200 - (0.4 \times 150)) \text{ mm}$
$S = (1600 \text{ mm/s} \times 0.323 \text{ s}) + (1200 - 60) \text{ mm}$
$S = 517 \text{ mm} + 1140 \text{ mm}$
$S = 1657 \text{ mm}$

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Subject to technical modifications.

Safety aspects

Without reset function

When a safeguard without reset function is used (automatic reset), the reset function must be made available in some other way.

Performance Level (PL)

The PL was determined during a simplified procedure according to ISO 13849-1.
Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contact by pressure-sensitive equipment according to ISO 13856. In this case, the sensor will no longer be taken into account in determining the PL. The overall system safety mat (pressure-sensitive protection device) can reach a maximum of PL d.

Is the safeguard appropriate?

The PL required for the hazard must be decided by the integrator. This is followed by the choice of safeguard.
Finally, the integrator needs to check whether the category and PL of the safeguard chosen are appropriate.

Maintenance and cleaning

The sensor is maintenance-free.
The control unit also monitors the sensor.

Regular inspection

Depending on the load, the sensors are to be tested at regular intervals (at least monthly)

- for correct functioning: by activation or by applying the relevant test sample.
- for damage: by visual checking.

Cleaning

If necessary, clean the sensor with a mild cleaning agent.

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Technical data

Safety mat:	SM11/W with SG-EFS 1X4 ZK2/1	SM11/W with SG-EFS 104/2W	SM11/BK with SG-EFS 104/4L
Testing basis:	ISO 13856-1		
Switching characteristics at v_{test} = 250 mm/s			
Switching operations at 0.1 A	> 4× 10^6		
Actuation forces			
Test piece (cylinder) Ø 11 mm	< 300 N		
Test piece (cylinder) Ø 80 mm	< 300 N		
Test piece (cylinder) Ø 200 mm	< 600 N		
Response time with control unit	18 ms	23 ms	38 ms
Safety classifications			
ISO 13856: Reset function	with/without	with/without	with/without
ISO 13849-1:2006			
$MTTF_D$ (Pressure-sensitive protection device)	category 3 PL d 246 a	category 3 PL d 210 a	category 3 PL d 65 a
$MTTF_D$ (sensor)	1142 a	1142 a	1142 a
B_{10D} (sensor)	6× 10^6	6× 10^6	6× 10^6
n_{op} (acceptance)	52560/a	52560/a	52560/a
Mechanical operating conditions			
Sensor size	max. 1.5 m^2		
Side length (min./max.)	200 mm / 3000 mm		
Cable length (min./max.)	10 cm / 200 m		
Static load (up to 8 h)	max. 800 N/cm^2		
Driving on with industrial trucks	not suitable		
Weight	12.0 kg/m^2		
IEC 60529: Degree of protection	IP65		
max. humidity (23 °C)	95 % (not-condensing)		
Operating temperature			
individual sensor	-20 to +55 °C		
combined sensor	+5 to +55 °C		
Storage temperature	-20 to +55 °C		
Electrical operating conditions			
Connection cable	Ø 5.0 mm PVC 2× 0.5 mm^2		
Sensor	DC 24 V / max. 100 mA		
Number of sensors type BK	max. 10 in series		
Dimensional tolerances			
Length dimension	ISO 2768-c		
Perpendicularity	ISO 2768-c		

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Request for quotation

Fax:
+49 731 2061-222

Submitted by

Company

Department

Surname, first name

P.O. Box | Postcode | Town/city

Street | Postcode | Town/city

Phone | Fax | E-mail

Area of application

(e.g. metalworking, textile machines, timber processing, tube drawing, local public transport, ...)

⇩ Please do not write in this column! ⇩

For internal notes only

Protection of the danger zone with:

❑ SM11/W Quantity: _____
Width: _____ Depth: _____

❑ SM11/BK Quantity: _____
Width: _____ Depth: _____

Fixing with:

❑ Ramp edge AK 56
❑ Aluminium Z/2-Profile
❑ Aluminium cable conduit AP 45
❑ Ramp edge AK 51

Area to be secured:

(Diagram incl. edge profiles and cable routing)

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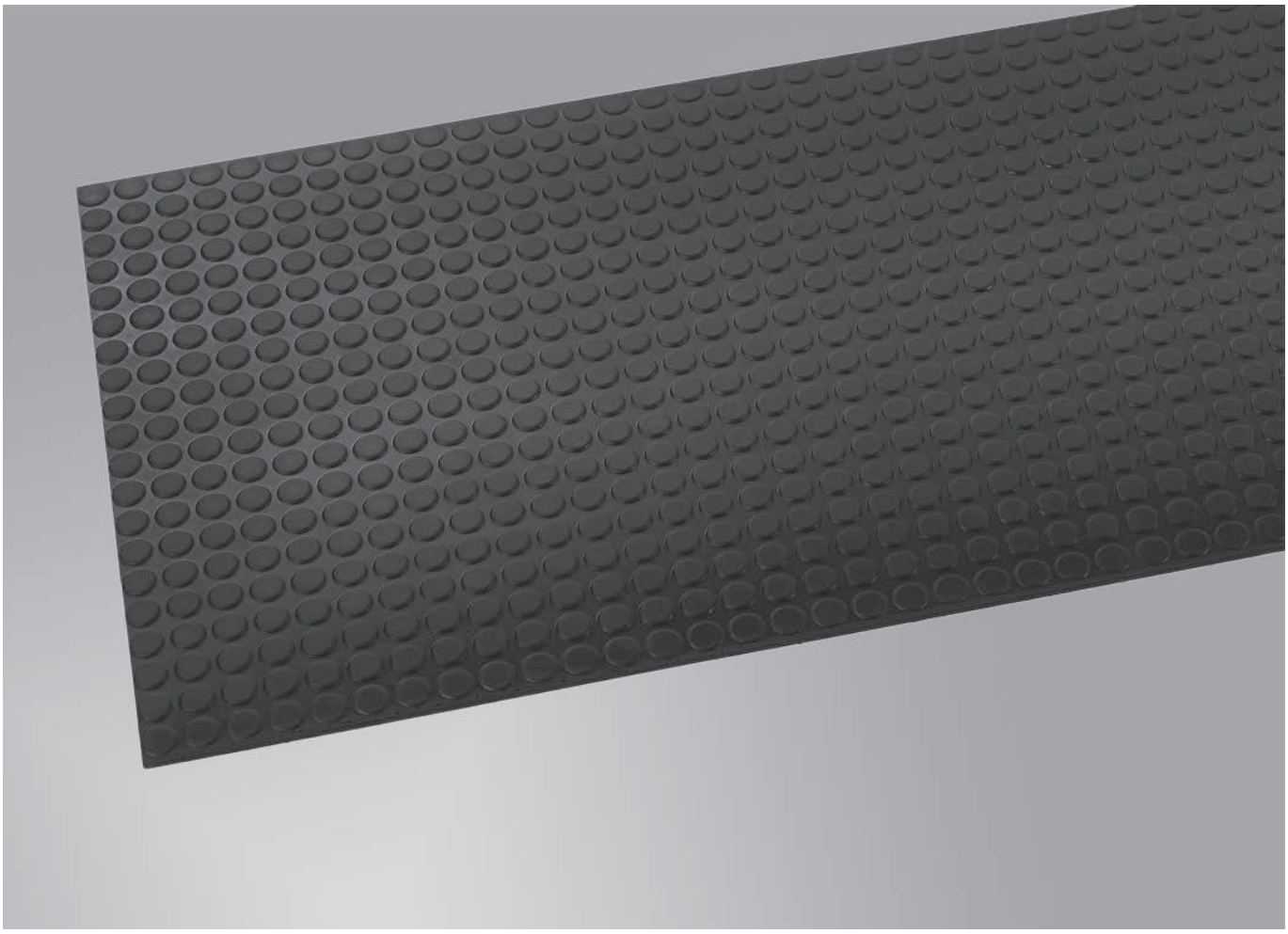
Innovative by tradition.



Safety mats TS

EN | Product information

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Original instructions

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Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.

Always observe the safety instructions on the following pages under **ATTENTION.** Only use the product for the purpose described in the product information.

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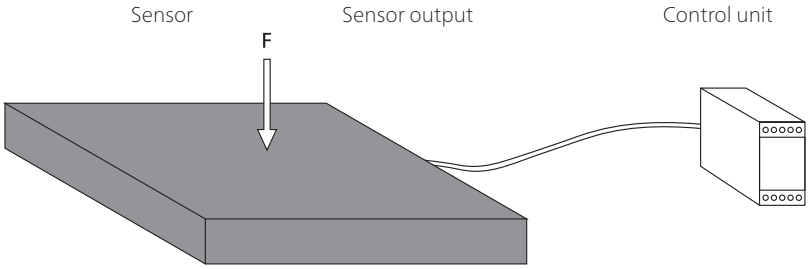
Definitions

Pressure-sensitive protection device

A pressure-sensitive protection device consists of pressure-sensitive sensor(s), signal processing and output signal switching device(s). The control unit is made up of the signal processing and output signal switching device(s). The pressure-sensitive protection device is triggered when the sensor is activated.



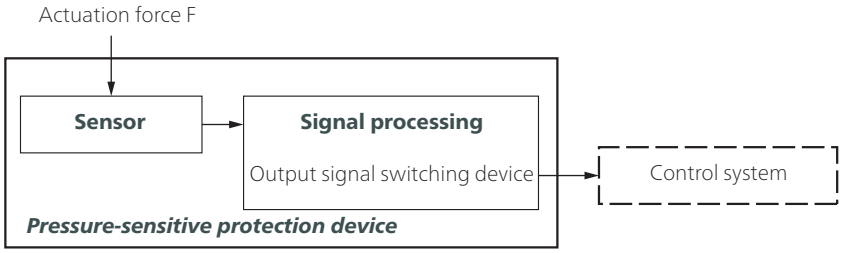
Note:
See also Chapter 3 **Terms** in ISO 13856-1.

Sensor

The sensor is the part of the pressure-sensitive protection device that generates a signal when the actuating force F is applied. Mayser safety systems have a sensor whereby the actuating surface is deformed locally.

Signal processing

The signal processing is the part of the pressure-sensitive protection device that converts the output signal of the sensor and controls the status of the output signal switching device. The output signal switching device is that part of the signal processing which is connected to the machine controls and transmits safety output signals such as STOP.



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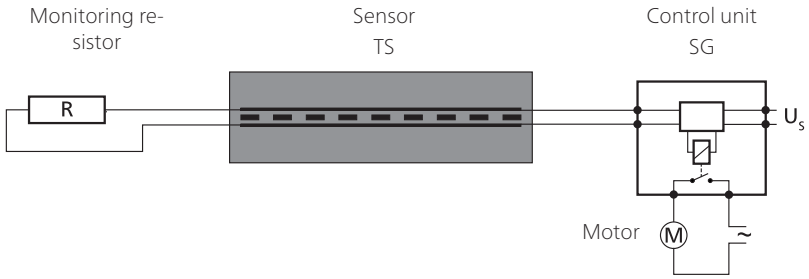
Criteria for selecting the sensor type

- Category in accordance with ISO 13849-1
- Performance level of pressure-sensitive protection device = at least PL_r
- Temperature range
- Degree of protection in accordance with IEC 60529:
  IP65 is the standard for safety mats.
  Higher degree of protection must be checked individually.
- Environmental influences such as swarf, oil, coolant, outdoor use...
- Recognition of persons weighing < 35 kg necessary?

Operation principle 2-wire-technology



The monitoring resistor must be compatible with the control unit.
Standard value is 1k2. 8k2 and 22k1 are also available.

For your safety:
Sensor and connecting cables are constantly monitored for function.
Monitoring is carried out by controlled bridging of the contact surfaces with a monitoring resistor (closed current principle).

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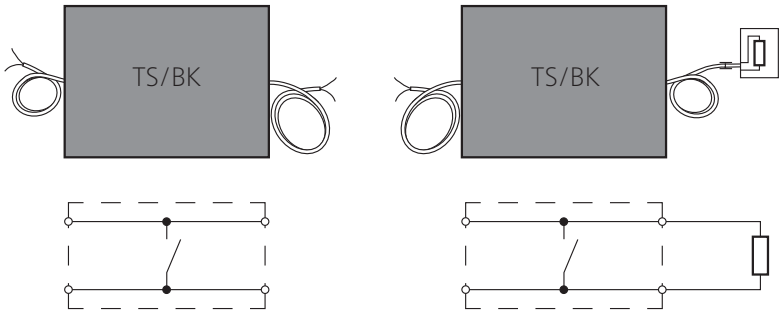
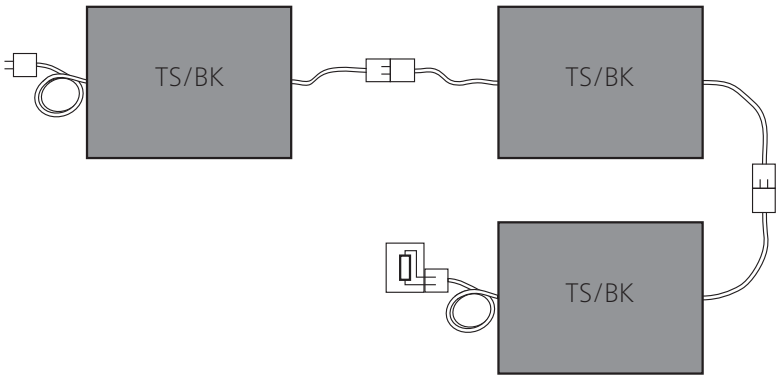
Design

TS/BK with cables on both sides as a through sensor or as an end sensor with external monitoring resistor



Combination of sensors



Combination:

- connection of more than one sensor
- only one control unit required
- individual design of control areas with regard to size and shape

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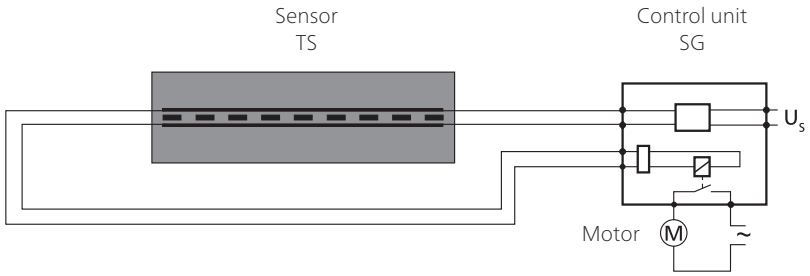
Operation principle 4-wire-technology

Unlike 2-wire technology, 4-wire-technology works **without** a monitoring resistor.

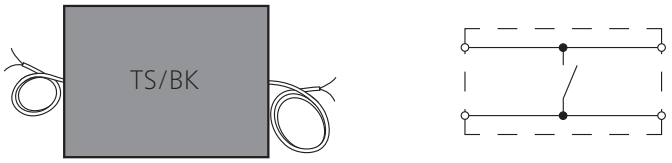
Note:
The 4-wire technology can be used only together with control unit SG-EFS 104/4L.



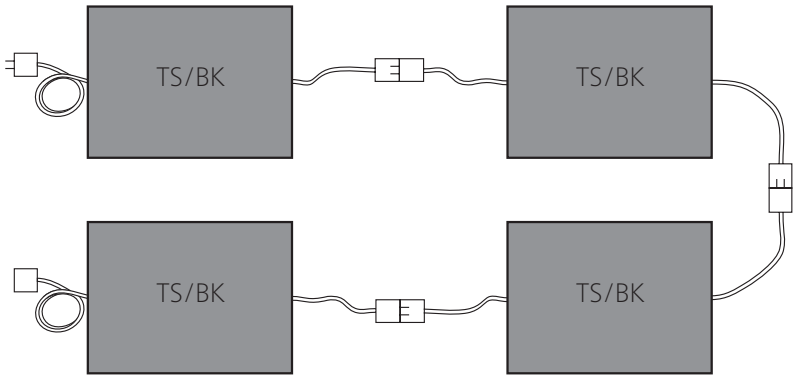
For your safety:
Sensor and connecting cables are constantly monitored for function.
This is possible because of signal transmission feedback – without monitoring resistor.

Design

TS/BK with cables on both sides as a through sensor



Combination of sensors



Combination:

- connection of more than one sensor
- only one control unit required
- individual design of control areas with regard to size and shape

210817 v2.00

Subject to technical modifications.

Intended use

A safety mat detects a person that is standing on or stepping onto it. It is a protective device covering a certain area and monitoring the presence of a person on it as a safety function. Its purpose is to prevent possible hazardous situations for personnel within a danger zone.
Typical applications are in the area of moving units on machines and plants.
Safe operation of a safety mat depends entirely on

- The surface condition of the mounting surface,
- the correct selection of size and resistance as well as
- correct installation.

Tip
See Annex B of ISO 13856-1, especially Figures B.1 and B.2.

Limits

- Max. 10 sensors type BK on one control unit
- System size max. 15 m^2
  = max. number × max. sensor size

Exclusions

Sensors are not suitable

- for detecting walking aids.
- for detecting individuals who weigh less than 20 kg.
- for navigating with industrial trucks.

Sensor combinations are not suitable

- for detecting individuals who weigh less than 35 kg.

Program selection

Sensors in the safety mats TS programme are only available in fixed, predefined sizes. The surface is resistant to a certain extent to external influences and normal chemical influences.
If you have higher requirements of the sensors, we recommend our line of customised safety mats.

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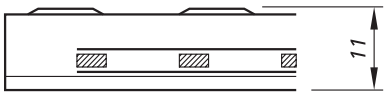
Design

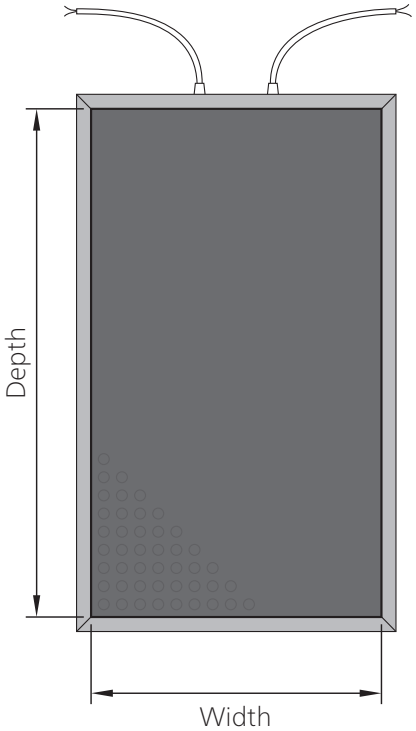


Standard version
Moulded onto a plastic plate. The surface structure created during casting ensures the necessary non-slip protection as well as mechanical protection.
Load capacity: max. 800 N/cm²
Degree of protection: IP65

Available sizes

TS sensors are only available in fixed sizes:

Part number		Width × Depth
5001881	TS/BK	500 x 1200 mm
5000777	TS/BK	500 x 1600 mm
5001882	TS/BK	750 x 1200 mm
5001005	TS/BK	750 x 1600 mm
5001238	TS/BK	1000 x 1200 mm
5000776	TS/BK	1000 x 1600 mm



According to ISO 13855, the minimum depth to the danger zone must be taken into account (see Chapter *Calculation of the necessary actuation area*).
The non-sensitive edges must be taken into account (see Chapter *Non-sensitive edges*).

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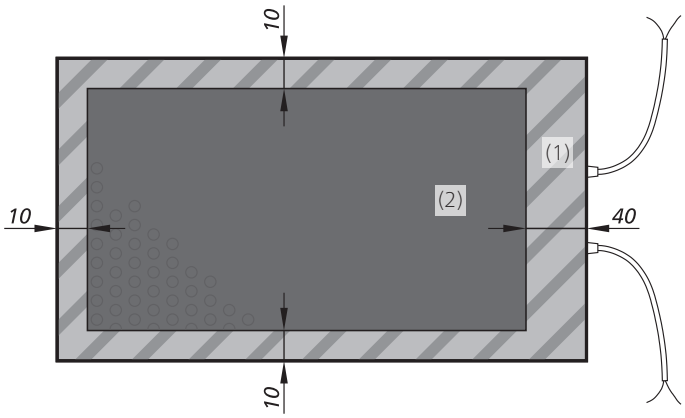
Non-sensitive edges

A non-sensitive edge (1) surrounds the effective actuation area (2):

- 40 mm = on cable exit side
- 10 mm = on remaining three sides

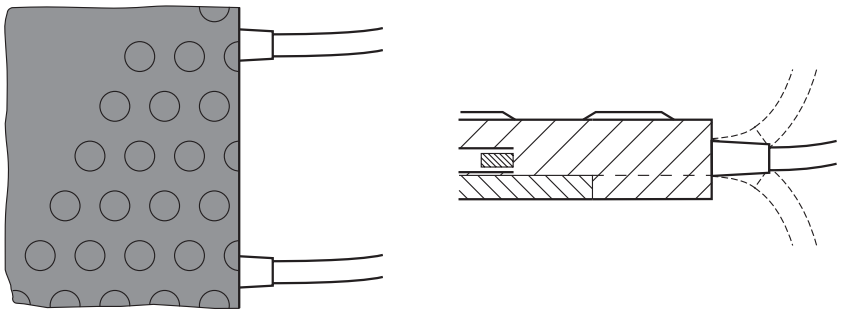


Note
With a combination of sensors, only the sides with an edge area of 10 mm may be placed together.

Connection

Cable exit

The cable exit is only available in the centre of the narrow side.
Lay the cables in the attached cable conduit. They can only be laid upwards or downwards to a limited extent.



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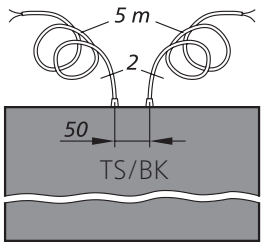
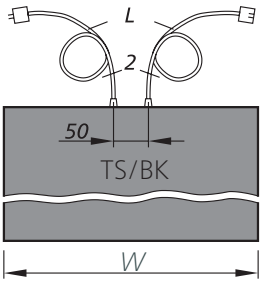
Cable connection

ATTENTION
The maximum overall cable length up to signal processing is 100 m.

Without plug (standard)
- Universally applicable
- Variable cable length

With plug
- Service-friendly
- Easy assembly
- Safe connection
- Watertight plug connection possible
- Standard cable lengths
  L = W/2 + 200 mm
  (Other cable lengths available on request.)



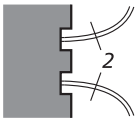


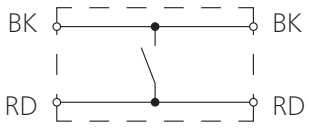
- As a feed-through sensor type BK
- Without resistor
- 2 two-wire cables (Ø 5 mm; 2× 0.5 mm² Cu)

Wire colours

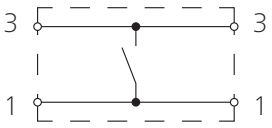
Without plug (standard)

Sensor type BK with 2 lines





With plug (M8)



Colour coding
RD Red BK Black

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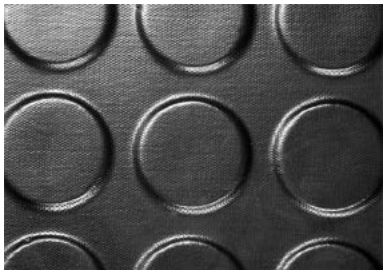
Sensor cover

The rubber nub structure is produced during the manufacturing process at the factory. It prevents slipping and provides mechanical protection. Further covering of the sensor is not necessary.



Resistances

The condition for the resistances listed in the following (at room temperature 23 °C) is a sensor with an undamaged surface.

Physical resistance

Surface	PUR
IEC 60529: degree of protection	IP65
DIN 53516: abrasion	120 mg
DIN 51130: non-Slip	R9
static load (8 h)	800 N/cm²
DIN 4102: behaviour in fire	B2
Stress when subjected to climate changes	+
UV-resistance	+

Explanation of symbols:
+ = resistant

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Chemical resistance

The sensor is resistant against normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

The values in the table are results of tests carried out in our laboratory. The suitability of our products for your special area of application must always be verified with your own practical tests.

Explanation of symbols:

+ = resistant
± = resistant to a certain extent
- = not resistant

Surface	PUR
Acetone	-
Formic acid 5 %	+
Ammonia	+
ATF gear oil	+
Brake fluid DOT 4	-
Cutting emulsion	+
Demineralised water	+
Diesel	±
Acetic acid 10 %	+
Ethanol	-
Greases	-
Hydraulic oil	+
Caustic potash solution 10 %	+
Saline solution 5 %	+
Cooling lubricant	±
Metal working oil	+
Methanol	-
Mineral oil	+
Caustic soda 10 %	±
Cellulose thinner	-
Hydrochloric acid 10 %	±
Salt water 10 %	+
Suds 5 %	+
White spirit (ethyl alcohol)	-
Universal thinner	-
Water	+
Petroleum ether / petrol	-
Citric acid 10 %	+
Drawing compound	-

Note:
Tests are carried out at room temperature (+23 °C).

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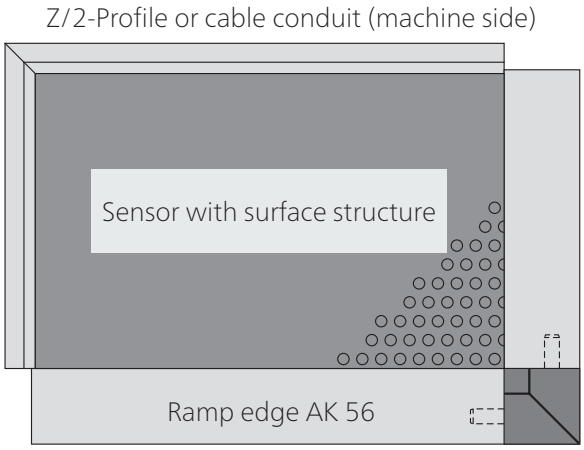
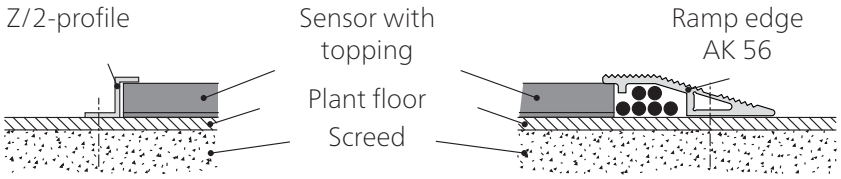
Sensor attachment

Ramp edges can be installed quickly and easily.

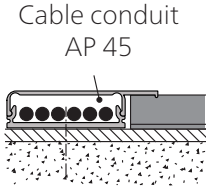


Ramp edge AK 56



- Not suitable for plug-in cable connections
- Cable conduit for max. 6 cables

Cable conduit AP 45



- Cable conduit AP 45 instead of Z/2-Profile
- Suitable for plug-in cable connections
- Cable conduit for max. 6 cabels

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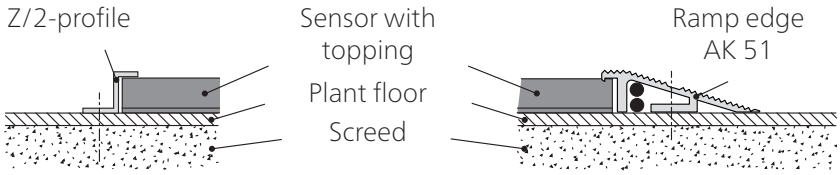
Subject to technical modifications.

Ramp edge AK 51



- Not suitable for plug-in cable connections
- Cable conduit for max. 2 cables
- Corner joints are only available with mitre cuts (not suitable for corner connectors and wedge connectors)

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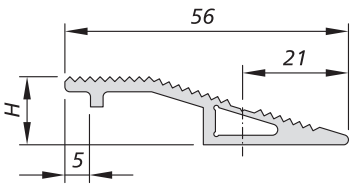
Subject to technical modifications.

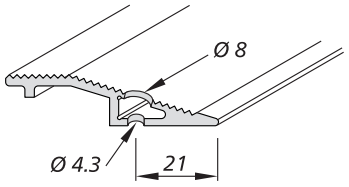
Aluminium ramp edge AK 56

- 1-part with cable conduit
- For combination of several sensors
- Sensors with or without plugs
- Rod 3 m (7501014), Rod 6 m (1002684) or fixed length



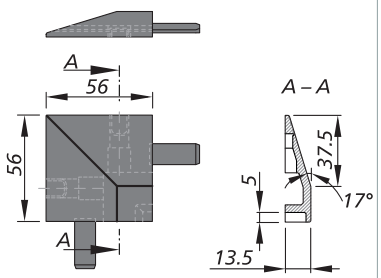
Threaded hole for AK 56

- For fixing ramp edge AK 56



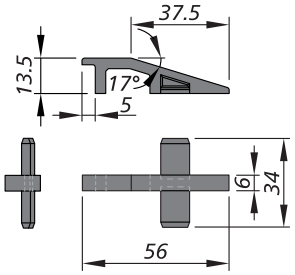
Corner connector E1 AK 56 outer

- For corner connectors ramp edge AK 56
- Material: plastic black (1002751)



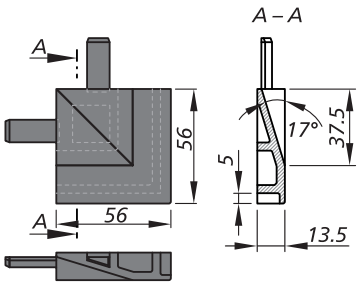
Connecting wedge Vk AK 56

- For longitudinal connection of ramp edge AK 56
- Material: plastic black (1002996)

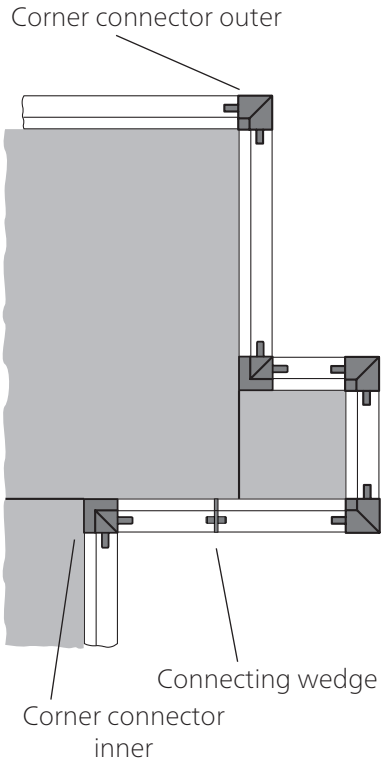


Corner connector E2 AK 56 inner

- For corner connectors ramp edge AK 56
- Material: plastic black (1002752)



Example:



Note

Corner connector and connecting wedge are not suitable for ramp edge AK 51.

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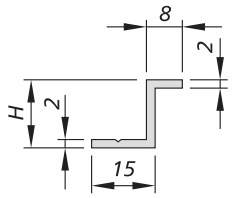
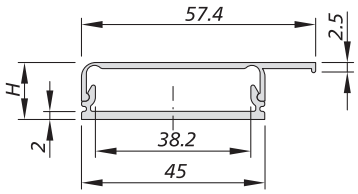
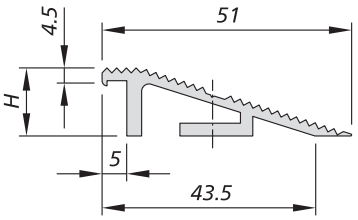
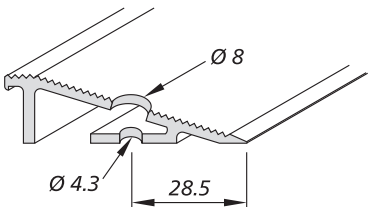
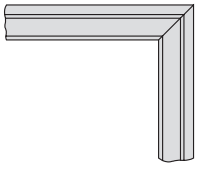
Aluminium-Z/2-Profile • Edging at the machine or wall side • Rod 3 m (7500385), Rod 6 m (1001666) or fixed length	
Aluminium cable conduit AP 45 • 2-part with cable conduit • For combination of several sensors • Sensors with or without plugs • Upper section is clipped into lower section • Rod 3 m upper part (1002546), Rod 3 m bottom part (1002547) or fixed length upper and bottom part	
Aluminium ramp edge AK 51 • 1-part with cable conduit • Combinations up to max. 2 sensors • Sensor without plug • Rod 3 m (7500384), Rod 6 m (1001667) or fixed length	
Threaded hole for AK 51 • For fixing ramp edge AK 51	
Mitre cut • For corner connections	

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Calculation of the necessary actuation area

In accordance with ISO 13855, the necessary effective actuation area in relation to the danger area is calculated with the following:

$S = (K \times T) + C$ where: $K = 1600$ mm/s, $T = t_1 + t_2$, $C = 1200$ mm - 0.4H

- S = Minimum distance between the danger zone and the furthest edge of the sensor [mm]
- K = Approximation parameters [mm/s]
- T = Follow-through of the complete system [s]
- t_1 = Response time of the protective device
- t_2 = Stopping time of the machine
- C = Safety tolerance [mm]
- H = Step height [mm]

With installation at floor level

H = 0; hence:

$S = (1600 \text{ mm/s} \times T) + 1200 \text{ mm}$

With installation on a step

H ≠ 0; hence:

$S = (1600 \text{ mm/s} \times T) + (1200 \text{ mm} - 0.4H)$

Calculation examples

Example 1

A safety mat detects non-permitted access to the danger zone of an automated movement. The mat is installed flush to the floor, i.e. H = 0. The follow-through time of the movement is 212 ms, the response time of the protective device is 38 ms.

$S = (1600 \text{ mm/s} \times (212 \text{ ms} + 38 \text{ ms})) + 1200 \text{ mm}$

$S = 400 \text{ mm} + 1200 \text{ mm}$

$S = 1600 \text{ mm}$

Example 2

The same conditions as Example 1, however, a step with a height of 150 mm must be negotiated to the danger zone.

$S = (1600 \text{ mm/s} \times (212 \text{ ms} + 38 \text{ ms})) + (1200 - (0.4 \times 150)) \text{ mm}$

$S = (1600 \text{ mm/s} \times 0.25 \text{ s}) + (1200 - 60) \text{ mm}$

$S = 400 \text{ mm} + 1140 \text{ mm}$

$S = 1540 \text{ mm}$

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Safety aspects

Without reset function

When a safeguard without reset function is used (automatic reset), the reset function must be made available in some other way.

Performance Level (PL)

The PL was determined during a simplified procedure according to ISO 13849-1.
Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contact by pressure-sensitive equipment according to ISO 13856. In this case, the sensor will no longer be taken into account in determining the PL. The overall system safety mat (pressure-sensitive protection device) can reach a maximum of PL d.

Is the safeguard appropriate?

The PL required for the hazard must be decided by the integrator. This is followed by the choice of safeguard.
Finally, the integrator needs to check whether the category and PL of the safeguard chosen are appropriate.

Maintenance and cleaning

The sensor is virtually maintenance-free.
The control unit also monitors the sensor.

Regular inspection

Depending on the load, the sensors are to be tested at regular intervals (at least monthly)

- for correct functioning: by activation or by applying the relevant test sample.
- for damage: by visual checking.

Cleaning

If necessary, clean the sensor with a mild cleaning agent.

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Technical data

Safety mat:	TS/BK with SG-EFS 104/4L
Testing basis:	ISO 13856-1
Switching characteristics at v_{test} = 250 mm/s	
Switching operations at 0.1 A	> 4× 10^6
Actuation forces	
Test piece (cylinder) Ø 11 mm	< 300 N
Test piece (cylinder) Ø 80 mm	< 300 N
Test piece (cylinder) Ø 200 mm	< 600 N
Response time with control unit	38 ms
Safety classifications	
ISO 13856: reset function	with/without
ISO 13849-1:2015	category 3 PL d
$MTTF_D$ (pressure-sensitive protection device)	65 a
$MTTF_D$ (sensor)	1142 a
$B10_D$ (sensor)	6× 10^6
n_{op} (acceptance)	52560 per year
Mechanical operating conditions	
Sensor size	max. 1.6 m^2
Static load (up to 8 h)	max. 800 N/cm^2
Driving on with industrial trucks	not suitable
Weight	13.5 kg/m^2
IEC 60529: degree of protection	IP65
max. humidity (23 °C)	95% (not-condensing)
Operating temperature	
individual sensor	-5 to +55 °C
combined sensor	+5 to +55 °C
Storage temperature	-20 to +55 °C
Electrical operating conditions	
Connection cable	Ø 5.0 mm PVC 2× 0.5 mm^2
Sensor	DC 24 V / max. 100 mA
Number of sensors type BK	max. 10 in series
Dimensional tolerances	
Length dimension	ISO 2768-c
Perpendicularity	ISO 2768-c

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Subject to technical modifications.

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Request for quotation

Submitted by

Company

Department

Surname, first name

P.O. Box | Postcode | Town/city

Street | Postcode | Town/city

Phone | Fax | E-mail

Fax:
+49 731 2061-222

Area of application

(e.g. metalworking, textile machines, timber processing, tube drawing, local public transport, ...)

Protection of the danger zone with:

- ❑ TS/BK 500 × 1200 Quantity: _____
- ❑ TS/BK 500 × 1600 Quantity: _____
- ❑ TS/BK 750 × 1200 Quantity: _____
- ❑ TS/BK 750 × 1600 Quantity: _____
- ❑ TS/BK 1000 × 1200 Quantity: _____
- ❑ TS/BK 1000 × 1600 Quantity: _____

Fixing with:

- ❑ Ramp edge AK 56
- ❑ Aluminium-Z/2-profile
- ❑ Aluminium cable conduit AP 45
- ❑ Ramp edge AK 51

Area to be secured:
(Diagram incl. cable routing)

⇩ Please do not write in this column! ⇩
For internal notes only

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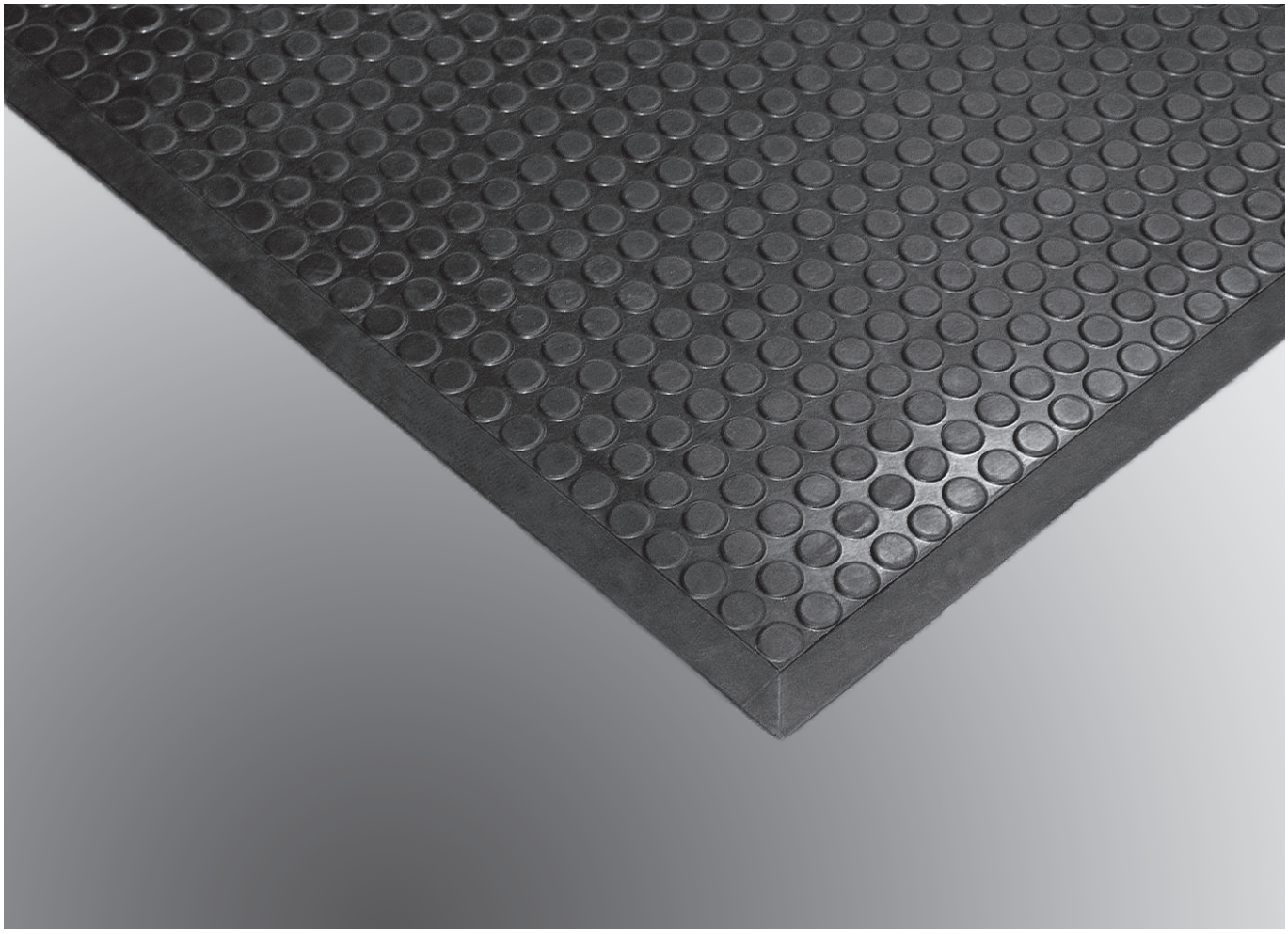
Innovative by tradition.



Safety mats SM8

EN | Product information

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Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.

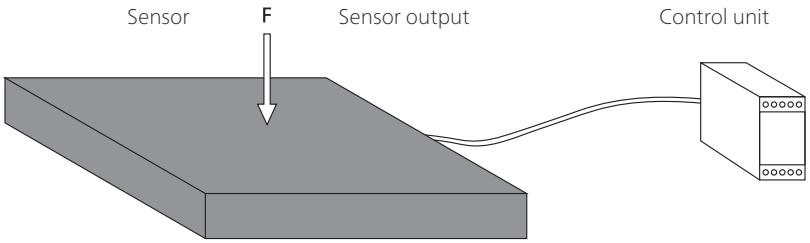
Always observe the safety instructions on the following pages under **ATTENTION.** Only use the product for the purpose described in the product information.

230617 v2.00

Definitions

Pressure-sensitive protection device

A pressure-sensitive protection device consists of pressure-sensitive sensor(s), signal processing and output signal switching device(s). The control unit is made up of the signal processing and output signal switching device(s). The pressure-sensitive protection device is triggered when the sensor is activated.



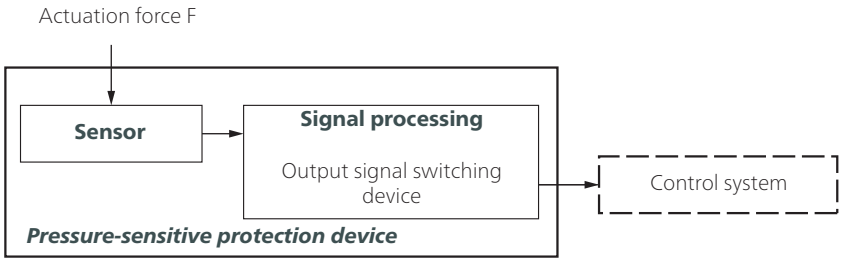
Note:
See also Chapter 3 **Terms** in ISO 13856-1.

Sensor

The sensor is the part of the pressure-sensitive protection device that generates a signal when the actuating force F is applied. Mayser safety systems have a sensor whereby the actuating surface is deformed locally.

Signal processing

The signal processing is the part of the pressure-sensitive protection device that converts the output signal of the sensor and controls the status of the output signal switching device. The output signal switching device is that part of the signal processing which is connected to the machine controls and transmits safety output signals such as STOP.



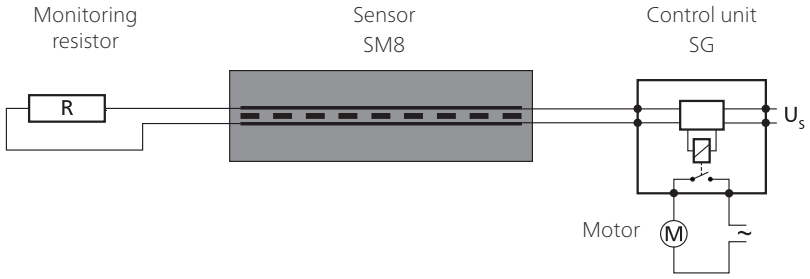
230617 v2.00

Subject to technical modifications.

Criteria for selecting the sensor type

- Category in accordance with ISO 13849-1
- Performance level of pressure-sensitive protection device = at least PL_r
- Temperature range
- Degree of protection in accordance with IEC 60529:
  IP65 is the standard for safety mats.
  Higher degree of protection must be checked individually.
- Environmental influences such as swarf, oil, coolant, outdoor use...
- Recognition of persons weighing < 35 kg necessary?

Operation principle 2-wire-technology

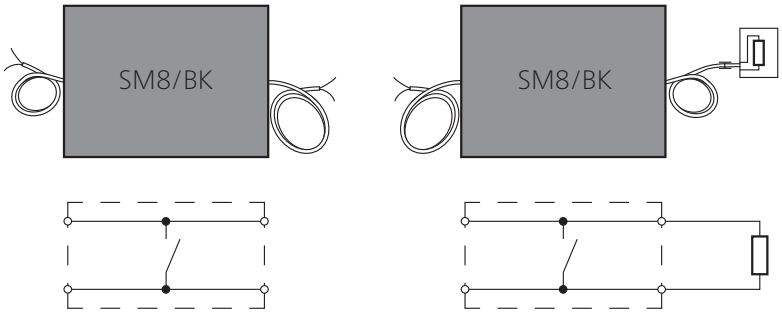


The monitoring resistor must be compatible with the control unit.
Standard value is 1k2. 8k2 and 22k1 are also available.

For your safety:
Sensor and connecting cables are constantly monitored for function.
Monitoring is carried out by controlled bridging of the contact surfaces with a monitoring resistor (closed current principle).

Design

SM8/BK with cables on both sides as a through sensor or as an end sensor with external monitoring resistor



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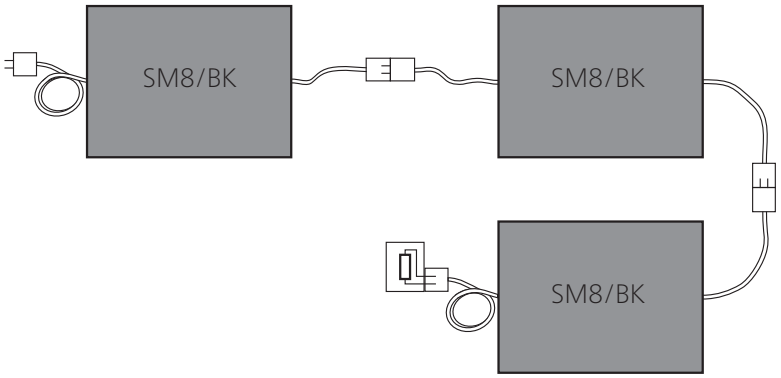
Subject to technical modifications.

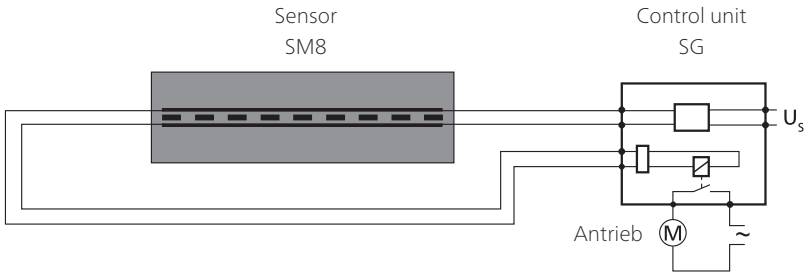
Combination of sensors



Combination:
- connection of more than one sensor
- only one control unit required
- individual design of control areas with regard to size and shape

Operation principle 4-wire-technology

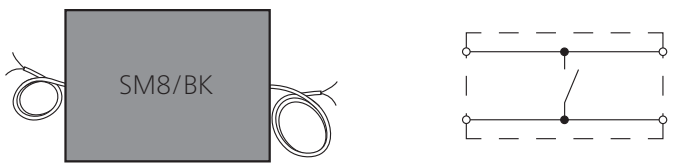
Unlike 2-wire technology, 4-wire-technology works **without** a monitoring resistor.



Note:
The 4-wire technology can be used only together with control unit SG-EFS 104/4L.

For your safety:
Sensor and connecting cables are constantly monitored for function.
This is possible because of signal transmission feedback – without monitoring resistor.

Design
SM8/BK with cables on both sides as a through sensor



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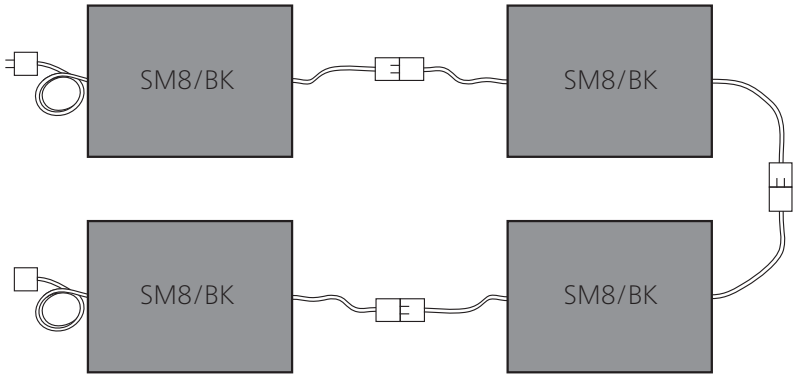
Combination of sensors



Combination:

- connection of more than one sensor
- only one control unit required
- individual design of control areas with regard to size and shape

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Subject to technical modifications.

Intended use

A safety mat detects a person that is standing on or stepping onto it. It is a protective device covering a certain area and monitoring the presence of a person on it as a safety function. Its purpose is to prevent possible hazardous situations for personnel within a danger zone.
Typical applications are in the area of moving units on machines and plants.
Safe operation of a safety mat depends entirely on

- The surface condition of the mounting surface,
- the correct selection of size and resistance as well as
- correct installation.

Tip
See Annex B of ISO 13856-1, especially Figures B.1 and B.2.

Limits

- Max. 10 sensors type BK on one control unit
- System size max. 15 m^2
  = max. number × max. sensor size

Exclusions

Sensors are not suitable

- for detecting walking aids.
- for detecting individuals who weigh less than 20 kg.
- for navigating with industrial trucks.

Sensor combinations are not suitable

- for detecting individuals who weigh less than 35 kg.

Program selection

Sensors in the SM8 Safety mat programme are only available in rectangular shape. The surface is to a certain extent resistant to external influences and normal chemical influences.
If you have higher requirements of the sensors, we recommend our line of customised safety mats.

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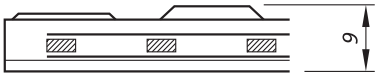
Design



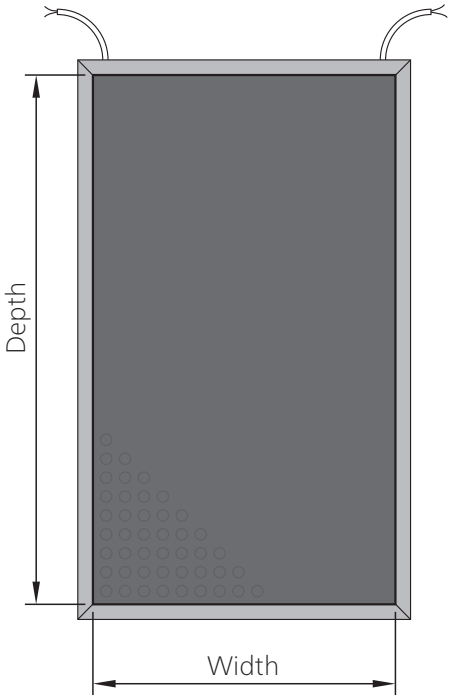
Standard version
Moulded onto a plastic plate. The surface structure created during casting ensures the necessary non-slip protection as well as mechanical protection.
Load capacity: max. 800 N/cm²
Degree of protection: IP65

Available sizes

SM8 sensors are only available in fixed sizes:

Part number	SM8/BK	Width × Depth
5006626	SM8/BK	750 × 1000 mm
5006627	SM8/BK	750 × 1250 mm
5006628	SM8/BK	750 × 1500 mm
5006623	SM8/BK	1000 × 1000 mm
5006624	SM8/BK	1000 × 1250 mm
5006625	SM8/BK	1000 × 1500 mm

The dimensions refer to the pressure sensitive area. For each side with a moulded ramp, 30 mm must be added.



According to ISO 13855, the minimum depth to the danger zone must be taken into account (see Chapter *Calculation of the necessary actuation area*).
The non-sensitive edges must be taken into account (see Chapter *Non-sensitive edges*).

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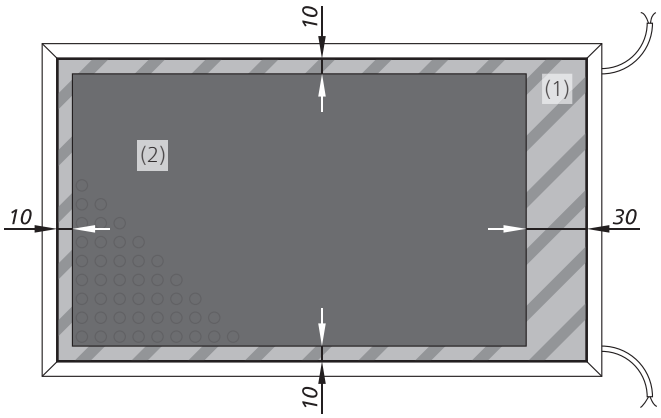
Non-sensitive edges

A non-sensitive edge (1) surrounds the effective actuation area (2):

- 30 mm = on cable exit side
- 10 mm = on remaining three sides



The ramps around the edges are not included in determining the effective actuation area.

Note

With a combination of sensors, only the sides with an edge area of 10 mm may be placed together.
In addition, the integrated ramps must be removed on these sides; for this procedure, see the assembly instructions for SM8 safety mats.

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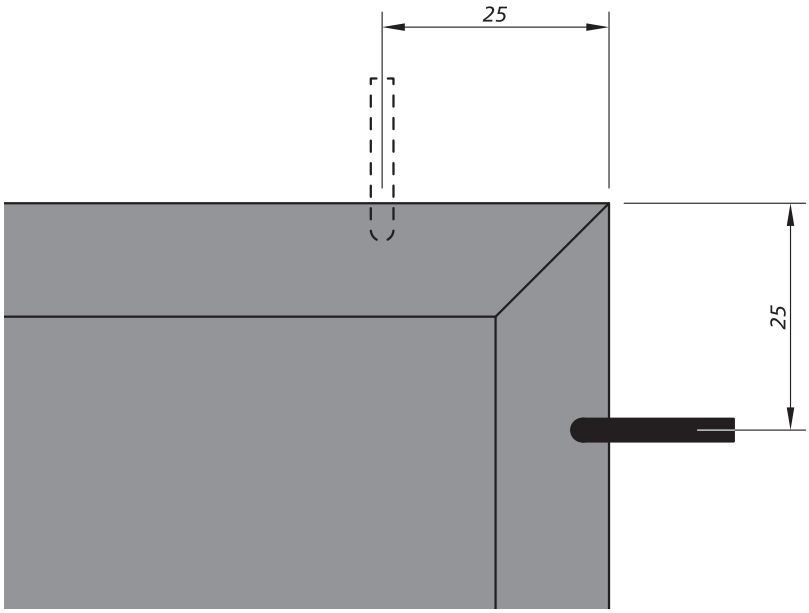
Connection

Cable exit

The cables are executed at the corners.
Two cable exits are available for each corner: either to the broad side or the longitudinal side (depth). The cable exit is cut free at the specified location during local installation.

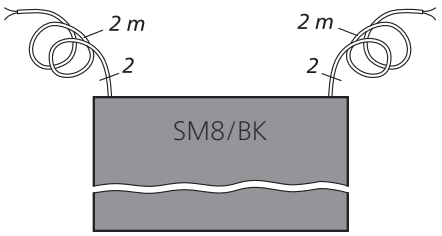


Cable connection

ATTENTION
The maximum overall cable length up to signal processing is 100 m.

- Standard cable lengths
  L = 2 m

Sensor type BK with 2 lines



- As a feed-through sensor type BK
- Without resistor
- 2 two-wire cable (Ø 3.8 mm; 2× 0.25 mm² Cu)

Subject to technical modifications.

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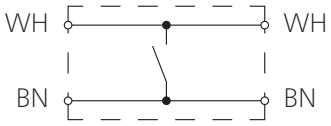
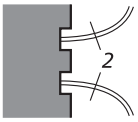
Wire colours

Sensor type BK with 2 lines





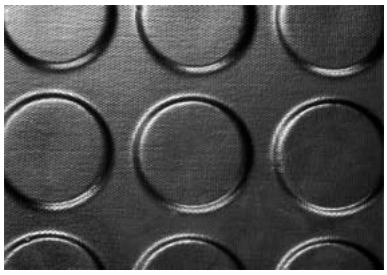
Colour coding

BN Brown

WH White

Sensor cover

The rubber nub structure is produced during the manufacturing process at the factory. It prevents slipping and provides mechanical protection. Further covering of the sensor is not necessary.



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Resistances

The condition for the resistances listed in the following (at room temperature 23 °C) is a sensor with an undamaged surface.

Physical resistance

Surface	PUR
IEC 60529: degree of protection	IP65
DIN 53516: abrasion	120 mg
DIN 51130: non-Slip	R9
static load (up to 8 h)	≤ 800 N/cm²
DIN 4102: behaviour in fire	B2
Stress when subjected to climate changes	+
UV-resistance	+

Explanation of symbols:
+ = resistant

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Chemical resistance

The sensor is resistant against normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

The values in the table are results of tests carried out in our laboratory. The suitability of our products for your special area of application must always be verified with your own practical tests.

Surface	PUR
Acetone	-
Formic acid 5 %	+
Ammonia	+
ATF gear oil	+
Brake fluid DOT 4	-
Cutting emulsion	+
Demineralised water	+
Diesel	±
Acetic acid 10 %	+
Ethanol	-
Greases	-
Hydraulic oil	+
Caustic potash solution 10 %	+
Saline solution 5 %	+
Cooling lubricant	±
Metal working oil	+
Methanol	-
Mineral oil	+
Caustic soda 10 %	±
Cellulose thinner	-
Hydrochloric acid 10 %	±
Salt water 10 %	+
Suds 5 %	+
White spirit (ethyl alcohol)	-
Universal thinner	-
Water	+
Petroleum ether / petrol	-
Citric acid 10 %	+
Drawing compound	-

Explanation of symbols:

+ = resistant
± = resistant to a certain extent
- = not resistant

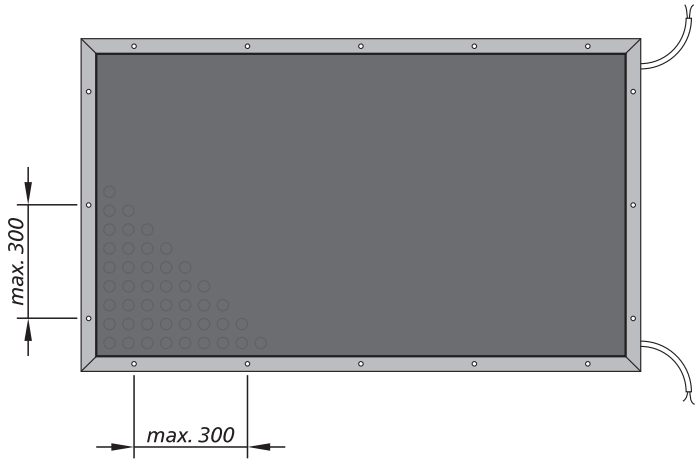
Note:
Tests are carried out at room temperature (+23 °C).

230617 v2.00

Subject to technical modifications.

Sensor attachment

The sensor has built-in ramps all around it in order to avoid the risk of tripping. Separate ramp edging is not required.



The sensor is fixed to the floor with screws, min. Ø 5 mm (recommended: flat head screws 6 x 50). These are not included in the standard delivery scope. The distance between screws must not exceed 300 mm.

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Subject to technical modifications.

Calculation of the necessary actuation area

In accordance with ISO 13855, the necessary effective actuation area in relation to the danger area is calculated with the following:

$S = (K \times T) + C$ where: $K = 1600$ mm/s

$T = t_1 + t_2$

$C = 1200$ mm - 0.4H

With installation at floor level

H = 0; hence:

$S = (1600 \text{ mm/s} \times T) + 1200 \text{ mm}$

With installation on a step

H ≠ 0; hence:

$S = (1600 \text{ mm/s} \times T) + (1200 \text{ mm} - 0.4H)$

S = Minimum distance between the danger zone and the furthest edge of the sensor [mm]

K = Approximation parameters [mm/s]

T = Follow-through of the complete system [s]

t_1 = Response time of the protective device

t_2 = Stopping time of the machine

C = Safety tolerance [mm]

H = Step height [mm]

Calculation examples

Example 1

A safety mat detects non-permitted access to the danger zone of an automated movement. The mat is installed flush to the floor, i.e. H = 0. The follow-through time of the movement is 140 ms, the response time of the protective device is 38 ms.

$S = (1600 \text{ mm/s} \times (140 \text{ ms} + 38 \text{ ms})) + 1200 \text{ mm}$

$S = 285 \text{ mm} + 1200 \text{ mm}$

$S = 1485 \text{ mm}$

Example 2

The same conditions as Example 1, however, a step with a height of 150 mm must be negotiated to the danger zone.

$S = (1600 \text{ mm/s} \times (140 \text{ ms} + 38 \text{ ms})) + (1200 - (0.4 \times 150)) \text{ mm}$

$S = (1600 \text{ mm/s} \times 0.178 \text{ s}) + (1200 - 60) \text{ mm}$

$S = 285 \text{ mm} + 1140 \text{ mm}$

$S = 1425 \text{ mm}$

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Safety aspects

Without reset function
When a safeguard without reset function is used (automatic reset), the reset function must be made available in some other way.

Performance Level (PL)
The PL was determined during a simplified procedure according to ISO 13849-1.
Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contact by pressure-sensitive equipment according to ISO 13856. In this case, the sensor will no longer be taken into account in determining the PL. The overall system safety mat (pressure-sensitive protection device) can reach a maximum of PL d.

Is the safeguard appropriate?
The PL required for the hazard must be decided by the integrator. This is followed by the choice of safeguard.
Finally, the integrator needs to check whether the category and PL of the safeguard chosen are appropriate.

Maintenance and cleaning

The sensor is virtually maintenance-free.
The control unit also monitors the sensor.

Regular inspection
Depending on the load, the sensors are to be tested at regular intervals (at least monthly)

- for correct functioning: by activation or by applying the relevant test sample.
- for damage: by visual checking.

Cleaning
If necessary, clean the sensor with a mild cleaning agent.

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Technical data

Safety mat	SM8/BK with SG-EFS 104/4L
Testing basis	ISO 13856-1
Switching characteristics at v_{Test} = 250 mm/s	
Switching operations at 0.1 A	> 4× 10^6
Actuation forces	
Test piece Ø 80 mm	< 300 N
Test piece Ø 200 mm	< 600 N
Response time with control unit	38 ms
Safety classifications	
ISO 13856: reset function	with/without
ISO 13849-1:2006	category 3 PL d
$MTTF_D$ (pressure-sensitive protection device)	65 a
$MTTF_D$ (sensor)	1142 a
B_{10D} (sensor)	6× 10^6
n_{op} (acceptance)	52560 per year
Mechanical operating conditions	
Sensor size	max. 1.5 m^2
Static load (up to 8 h)	max. 800 N/cm^2
Driving on with industrial trucks	not suitable
Weight	13.0 kg/m^2
IEC 60529: degree of protection	IP65
max. humidity (23 °C)	95 % (not-condensing)
Operating temperature	
individual sensor	-25 to +55 °C
combined sensor	+5 to +55 °C
Storage temperature	-25 to +55 °C
Electrical operating conditions	
Connection cable	Ø 3.8 mm PVC 2× 0.25 mm^2
Sensor	DC 24 V / max. 100 mA
Number of BK type sensors	max. 10 in series
Dimensional tolerances	
Length dimension	ISO 2768-c
Perpendicularity	ISO 2768-c

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Request for quotation

Fax:
+49 731 2061-222

Submitted by

Company

Department

Surname, first name

P.O. Box | Postcode | Town/city

Street | Postcode | Town/city

Phone | Fax | E-mail

Area of application

(e.g. metalworking, textile machines, timber processing, tube drawing, local public transport, ...)

Protection of the danger zone with:

- ❑ SM8/BK 750 × 1000 Quantity: _____
- ❑ SM8/BK 750 × 1250 Quantity: _____
- ❑ SM8/BK 750 × 1500 Quantity: _____
- ❑ SM8/BK 1000 × 1000 Quantity: _____
- ❑ SM8/BK 1000 × 1250 Quantity: _____
- ❑ SM8/BK 1000 × 1500 Quantity: _____

Area to be secured:

(Diagram incl. cable routing)

⇩ Please do not write ⇩
in this column!
For internal notes only

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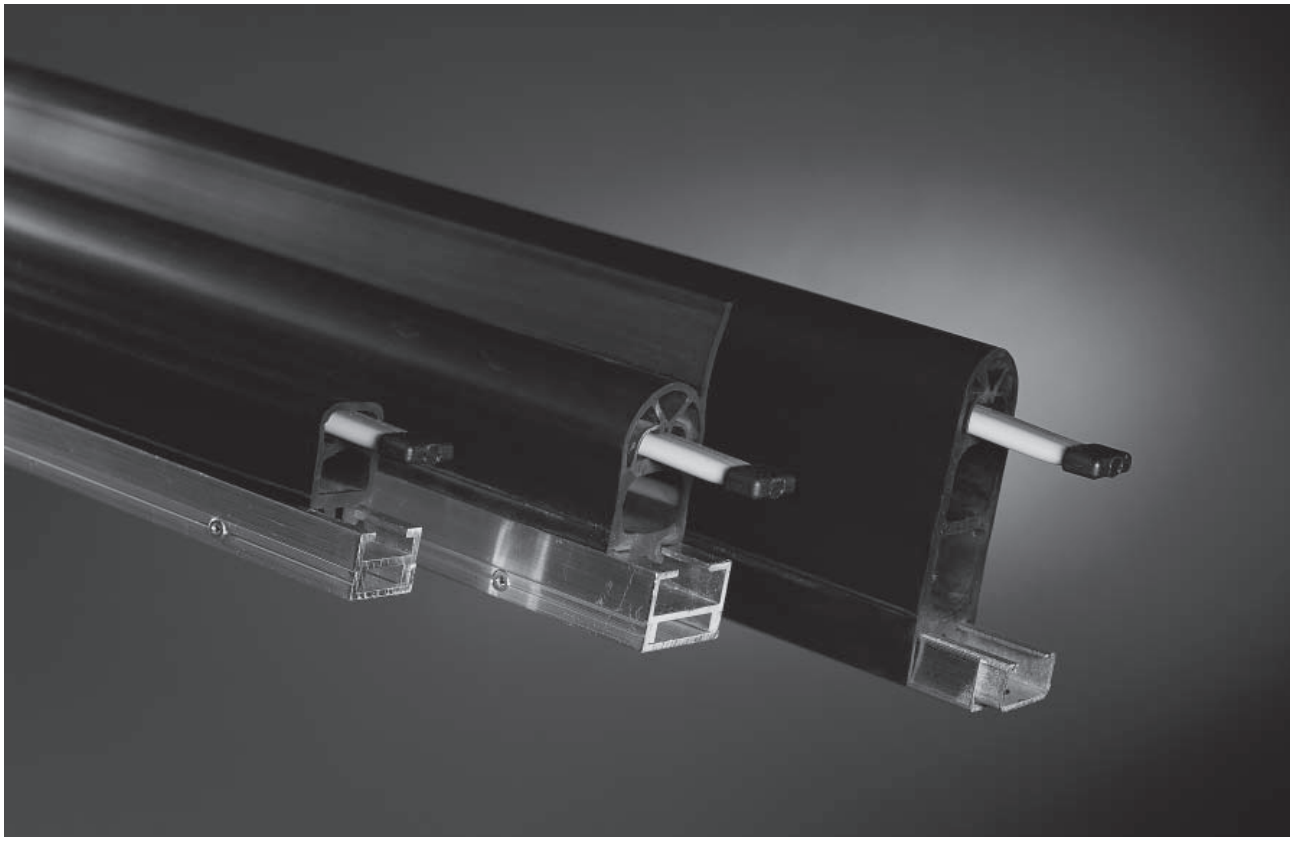
Product Information



Safety Edges SL/W and SL/BK

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Internet: www.mayser.com

Contents

Available lengths **3.3**
Calculation for selection of the Safety Edge height **3.3**
Cable connection **3.3**
Chemical resistance **3.4**
Rubber profiles and operating distances **3.5**
Aluminium profile range C 15, C 25 and C 35 ..... **3.6**
Steel-Profile C 27 / U 27 ..... **3.7**
Cable exits KA **3.8**
Lateral bends and radii **3.9**
Custom-made **3.9**
Overall view of combinations **3.10**
Technical data GP 39, GP 50, GP 60 ..... **3.11**
Technical data GP 302 ..... **3.12**
Request for quotation **3.13**

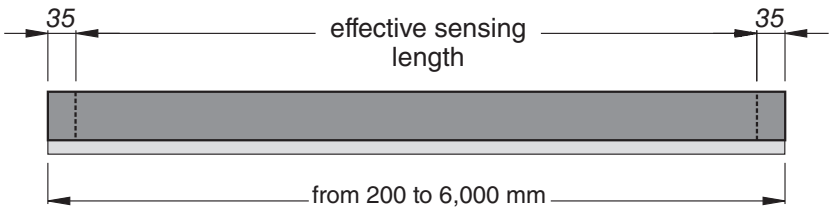
Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the normally open Safety Edge. Retain the product information for later reference.
Always observe the safety instructions on the following pages under **ATTENTION**. Only use the normally open Safety Edge for the purpose described in the product information.

270710 v1.0

Available lengths

The contact elements can be supplied in lengths between200 und 6,000 mm.
In the case of the standard Safety Edge both ends have a non-sensitive area 35 mm long



Calculation for selection of the Safety Edge height

The stopping distance of the dangerous movement is calculated using the following formula:

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$

In accordance with EN 1760-2, the minimum overtravel distance of the Safety Edge is calculated using the following formula:

$s = s_1 \times C$ where: $C = 1.2$

Overtravel distances:see 3.5

Mit dem Ergebnis kann nun ein geeignetes Schaltleistenprofil ausgewählt werden.

s_1 = Stopping distance of the dangerous movement [mm]
v = Velocity of the dangerous movement [mm/s]
T = Follow-through of the complete system [s]
t_1 = Response time Safety Edge
t_2 = Stopping time of the machine
s = Minimum overtravel distance of the Safety Edge so that the pinching force does not exceed a limit value [mm]
C = Safety factor; if components susceptible to failures (braking system) exist in the system, a higher factor must be selected.

Cable connection

Standard

- Cables: ∅ 3.7 mm TPE, 2× 0.22 mm²
  Wire colours: red, black
- Cable length: 2 m / 5 m / 10 m
- Cable ends without plug and coupling
  Option: Kabelenden mit Stecker bzw. Kupplung lieferbar

ATTENTION
Max. cable length to signal processing unit: 200 m

Subject to technical modifications.

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Chemical resistance

Rubber profile GP Identification rills on side of profile	EPDM v	NBR vv	CR vvv
Material Rating			
Hardness as per Shore A	55 ±5	60 ±5	60 ±5
Application area Machines		x	x
Application area Doors+Gates	x		
Chemical resistance			
Acetone	+	±	+
Formic acid	+	+	+
Ammonia	+	+	+
Petrol	-	+	±
Brake fluid	±	±	±
Chloride solutions	+	+	+
Diesel oils	-	+	+
Greases	-	+	+
Isopropyl alcoho	+	+	+
Cooling lubricant	-	+	+
Metal working oil	-	+	+
Methyl alcohol	+	+	±
Oils	-	+	+
Ozone and weather conditions	+	-	+
Hydrochloric acid 10 %	+	+	+
Spirit (ethyl alcohol)	+	+	+
Carbon tetrachloride	-	+	-
Water and frost	+	-	±
Hydrogen peroxide 10 %	+	+	-
Household/sanitary cleaners	+	+	+

Tests are carried out at room temperature (+23 °C).

Explanation of symbols:
+ = resistant
± = limited resistance
- = not resistant

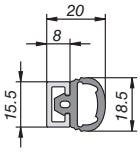
The values in the table are results of tests carried out in our laboratory to the best of our knowledge and belief. The suitability of our products for your special area of application must always be verified with your own practical tests.

270710 v1.0

Subject to technical modifications.

Rubber profiles and operating distances

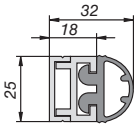
Actuation force: < 150 N (bei 23 °C und Prüfkörper ∅ 80 mm)
Dimensional tolerances: ISO 3302 E2/L2



GP 15 **NBR**

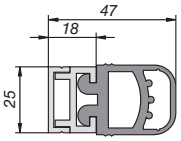
Actuation distance:
at 10 mm/s 2 - 4 mm
Overtravel distance: –

Al - profile range: C 15



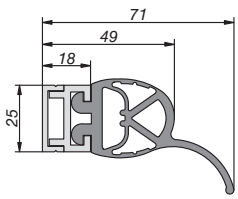
GP 22 **NBR**

Actuation distance:
at 10 mm/s 5 mm
Overtravel distance:
at 10 mm/s 1 mm
Al - profile range: C 25



GP 39 **EPDM** **NBR**

Actuation distance:
at 10 mm/s 4 mm 5 mm
Overtravel distance:
at 10 mm/s 2 mm 2 mm
Al - profile range: C 25 C 25

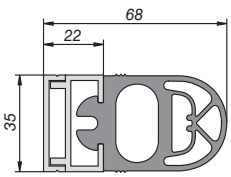


GP 39L **EPDM**

Actuation distance:
at 10 mm/s 23 mm

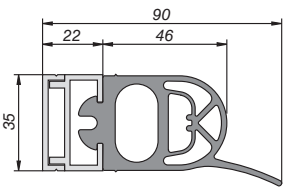
Overtravel distance:
at 10 mm/s 7 mm

Al - profile range: C 25



GP 50 **EPDM** **CR**

Actuation distance:
at 10 mm/s 8 mm 7 mm
at 100 mm/s 15 mm 8 mm
Overtravel distance:
at 10 mm/s 13 mm 5 mm
at 100 mm/s 5 mm 4 mm
Al - profile range: C 35 C 35

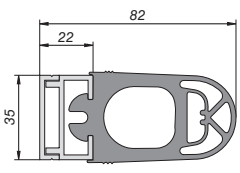


GP 50L **EPDM**

Actuation distance:
at 10 mm/s 20 mm

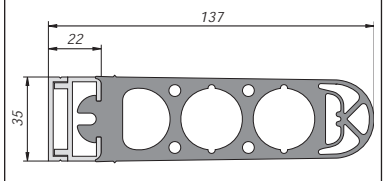
Overtravel distance:
at 10 mm/s 12 mm

Al - profile range: C 35



GP 60 **EPDM** **CR**

Actuation distance:
at 10 mm/s 7 mm 8 mm
at 100 mm/s 10 mm 9 mm
Overtravel distance:
at 10 mm/s 20 mm 7 mm
at 100 mm/s 16 mm 6 mm
Al - profile range: C 35 C 35

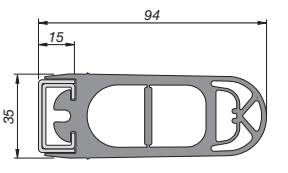


GP 120 **EPDM**

Actuation distance:
at 10 mm/s 11 mm

Overtravel distance:
at 10 mm/s ca. 45 mm

Al - profile range: C 35



GP 302 **EPDM**

Actuation distance:
at 10 mm/s 13 mm
at 100 mm/s 12 mm
Overtravel distance:
at 10 mm/s 25 mm
at 100 mm/s 22 mm
Steel profile: C 27

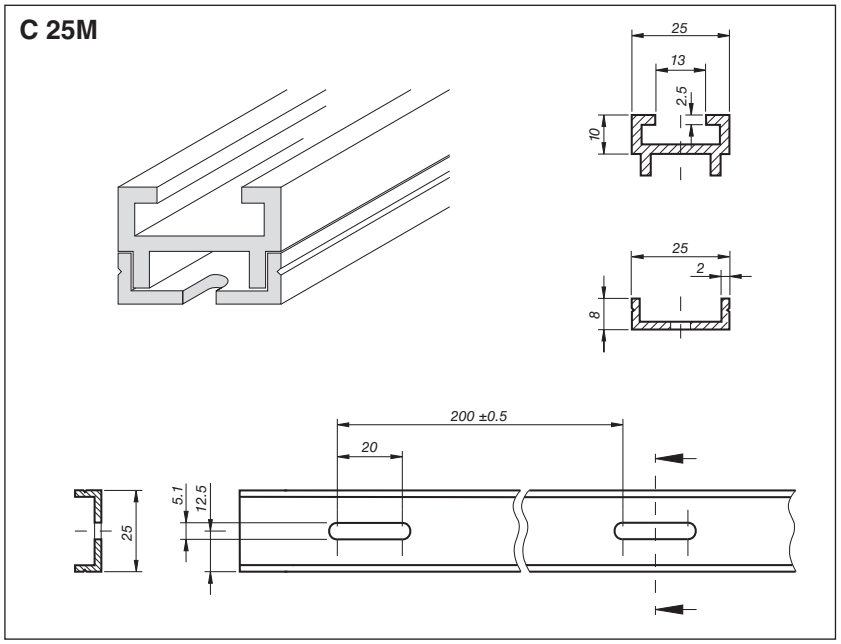
270710 v1.0

Aluminium profile range C 15, C 25 and C 35

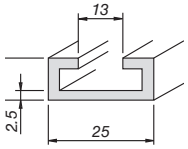
Dimensional tolerances: ISO 2768-v

Aluminium profile range C 25 for GP 22 and GP 39(L)

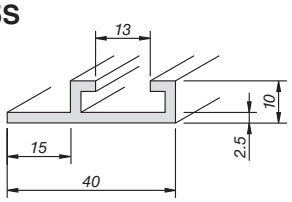
C 25M



C 25

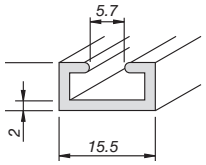


C 25S



Al-profile C 15 for GP 15

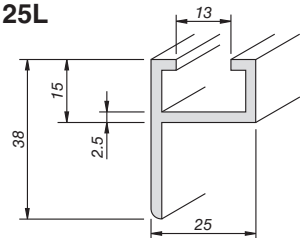
C 15



Note C 25M / C 35M:

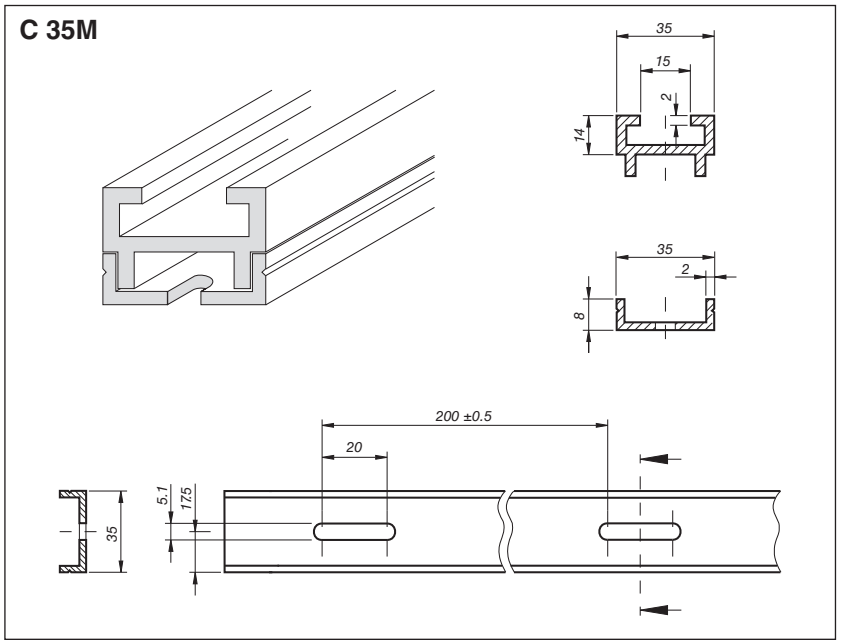
Fix upper part to the lower part using self-tapping SK M3×8 DIN 7500 countersunk screws in pre-drilled positions

C 25L

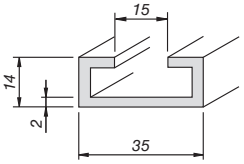


Aluminium profile range C 35 for GP 50(L), GP 60 and GP 120

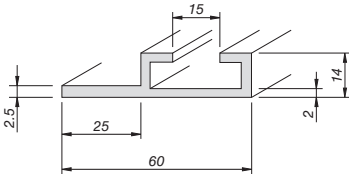
C 35M



C 35



C 35S

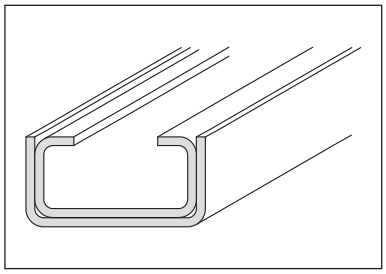


270710 v1.0

Steel-Profile C 27 / U 27

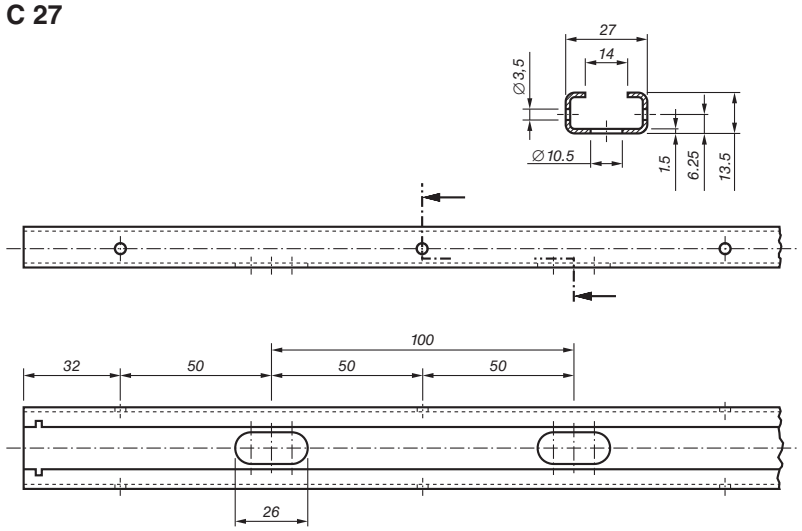
Dimensional tolerances: ISO 2768-v

Profile for GP 302

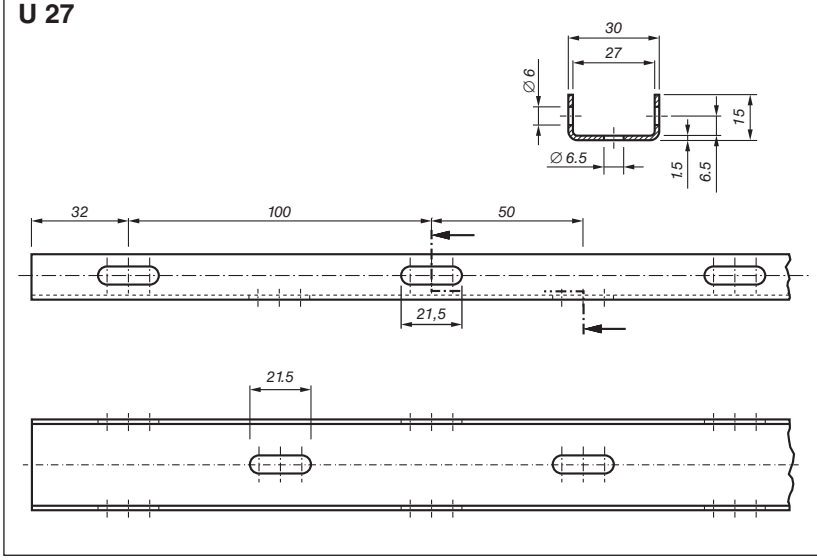


Fix the C-Profile
to the U-Profile using self-tapping SK M4×10 DIN 7500 countersunk screws in pre-drilled positions

C 27



U 27



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Subject to technical modifications.

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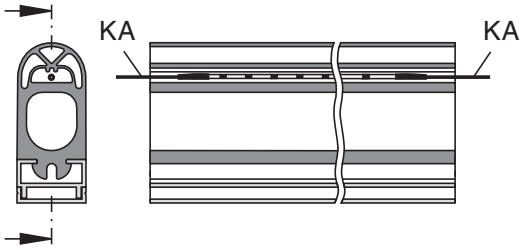
Cable exits KA

some with cable sleeves KT

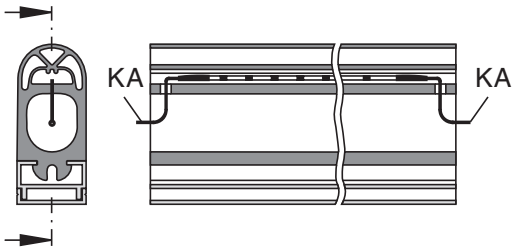
Note: non-sensitive end = c. 35mm (standard)

Safety Edge Type BK
cable on both ends

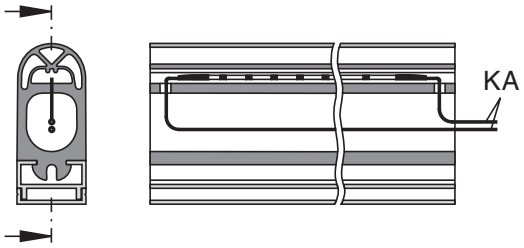
Version 1 GP 15, 22, 39(L), 50(L), 60, 120, 302



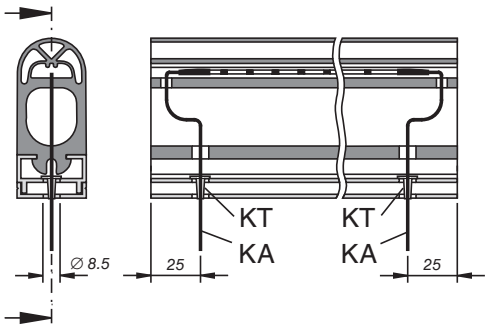
Version 3 GP 39(L), 50(L), 60, 120, 302



Version 4 GP 39(L), 50(L), 60, 120, 302



Version 5 GP 39(L), 50(L), 60, 120, 302

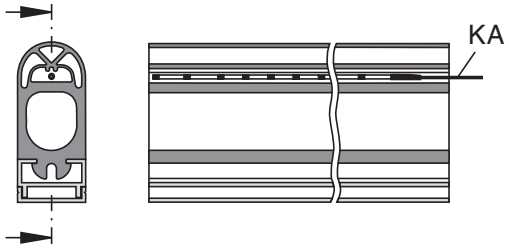


ATTENTION
Max. cable length to signal processing unit: 200 m

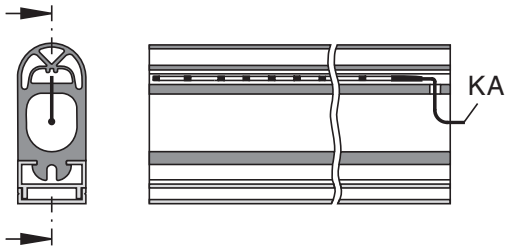
Subject to technical modifications.

Safety Edge Type W
with integrated resistor

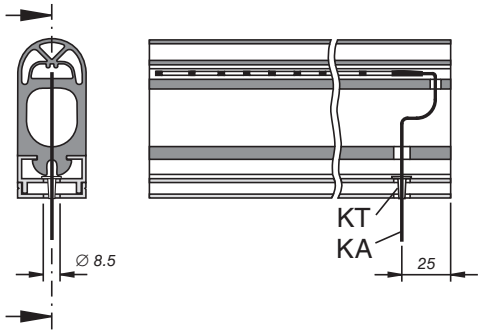
Version 9 GP 15, 22, 39(L), 50(L), 60, 120, 302



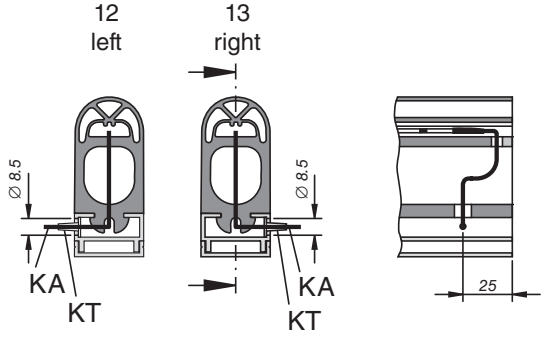
Version 10 GP 39(L), 50(L), 60, 120, 302



Version 11 GP 39(L), 50(L), 60, 120, 302



Version 12/13 GP 39(L), 50(L), 60



For rubber profiles, type L, please note: the rubber lip is always on the left side looking at the cross section (to the left of the intersection line).

other variations (e.g. smaller non-sensitive areas on ends) on enquiry

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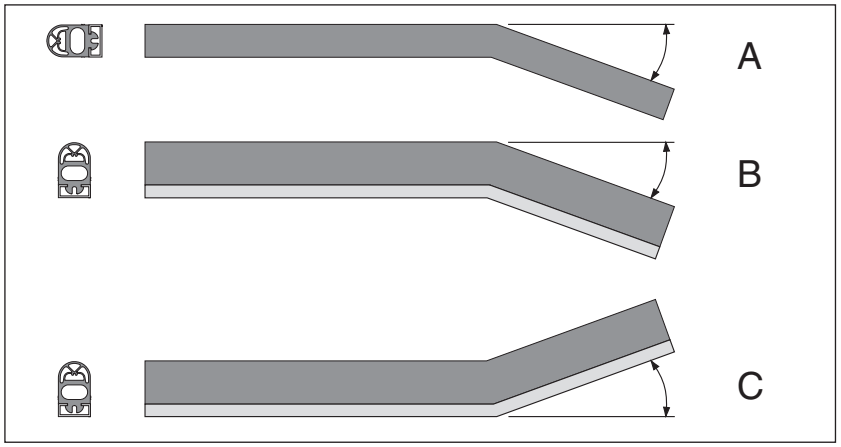
Lateral bends and radii

Lateral bends

All Al-profiles from the C25 and C35 range are suitable for bend angles.
The Al-profile must be prepared at our plant for this.



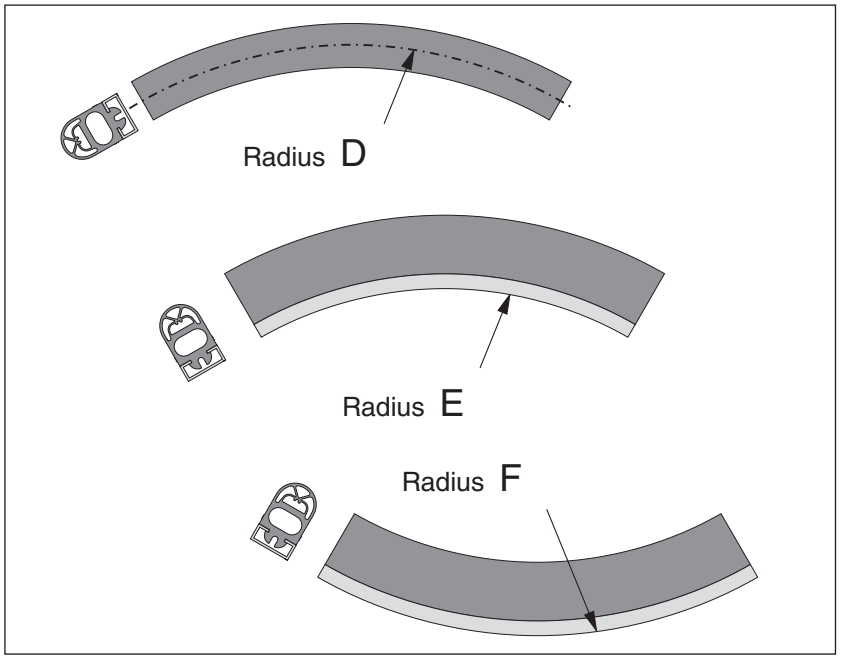
Maximum lateral bend

Bend type:	A	B	C
GP 22	30°	25°	10°
GP 39	25°	20°	5°
GP 50	20°	20°	15°
GP 60	16°	15°	10°
GP 120	15°	15°	5°

Angled Safety Edges (type A to 90°): see custom-made section.

Radii

Safety Edges with a radius are only available with C 25 and
C 35 Al-profiles. The Al-profile must be prepared at our plant for this.



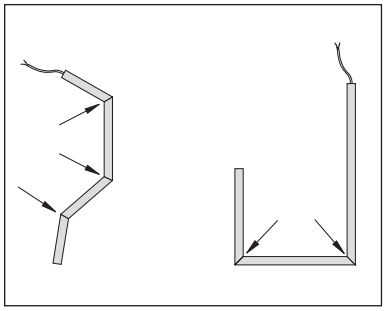
Minimum radius in mm

Radius type:	D	E	F
GP 22	300	300	350
GP 39	300	300	350
GP 50	350	400	400
GP 60	350	450	550
GP 120	500	–	–

Note:
Lateral bends and radii are not covered by the EC-certification of design.

Custom-made

- angled Safety Edges with sensitive zones in problem areas
- Safety Edges with active ends possible using GP39 upwards



Subject to technical modifications.

270710 v1.0

Overall view of combinations

Safety Edges SL	GP 15	GP 22	GP 39	GP 39L	GP 50	GP 50L	GP 60	GP 120	GP 302
Material									
NBR	●	●	●						
EPDM			●	●	●	●	●	●	●
CR					●		●		
Mounting									
C 15	●								
C 25M/S/L		●	●	●					
C 35M/S					●	●	●	●	
C 27 / U 27									●
Monitoring resistor									
1k2	●	●	●	●	●	●	●	●	○
8k2	○	○	○	○	○	○	○	○	○
22k1	○	○	○	○	○	○	○	○	●
Control Unit									
SG-EFS 1X4 ZK2/1	●	●	●	●	●	●	●	●	○
SG-SLE 04-0X1	○	○	○	○	○	○	○	○	●
SG-SUE 41X4 NA	○	○	○	○	○	○	○	○	○

● = Standard ○ = Option

How to order:

Example 1 - Fully assembled Safety Edge without control unit:
SL/BK 2,250 mm GP 50 NBR + Al-Profile C 35M
Cable 10 m, Version 4 (siehe 3.8)

Example 2 - Fully assembled Safety Edge with control unit (230 V):
SL/W 3,700 mm GP 60 EPDM + Al-Profile C 35M
Cable 5 m, Version 11 (see 3.8)
Control Unit SG-EFS 134 ZK 2/1 (1k2)

Example 3 - Fully assembled Safety Edge, 4-wire-connection system withcontrol unit (230V):
SL/BK 1,650 mm GP 39 NBR + Al-Profile C 25M
Cable 2 m, Version 3 (see 3.8)
Control Unit SG-SUE 4134 NA

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Subject to technical modifications.

Technical data GP 39, GP 50, GP 60

Safety Edges consisting of sensor SL/W and SL/BK
at rubber profiles GP 39/50/60 with aluminium profile and Control Unit.

1	Degree of protection sensor	IP65			IP65		
2	Switching operations sensor	> 10^5			> 10^5		
3	Sensor	**GP 39 EPDM**	**GP 50 EPDM**	**GP 60 EPDM**	**GP 50 CR**	**GP 60 CR**	**GP 50 EPDM**
	with Control Unit SG-	EFS 1X4 ZK2/1			EFS 1X4 ZK2/1		SLE 04-0X1
3.1	Response time	38 ms	144 ms	95 ms	72 ms	82 ms	575 ms
	Test speed	100 mm/s	100 mm/s	100 mm/s	100 mm/s	100 mm/s	10 mm/s
3.2	Control command reset	either manual or automatic			manual / automatic		automatic
4	Actuation force, actuation distance, overtravel and switching angle						
	Testing basis: EN 1760-2						
4.1	Actuation force	< 150 N	< 150 N	< 150 N	< 150 N	< 150 N	< 150 N
4.2	Actuation distance						
	at 10 mm/s	4 mm	8 mm	7 mm	7 mm	8 mm	6 mm
	at 100 mm/s	4 mm	15 mm	10 mm	8 mm	9 mm	–
4.3	Overtravel distance						
	at 10 mm/s	2 mm	13 mm	20 mm	5 mm	7 mm	13 mm
	at 100 mm/s	1 mm	5 mm	16 mm	4 mm	6 mm	–
4.4	Effective actuation angle	45°	90°	90°	90°	90°	90°
5	Error behaviour	EN 954 Category 3			EN 954 Category 3		
6	Operating and environmental conditions						
6.1	Operating temperature						
	Sensor	-20 °C to +55 °C			-20 °C to +55 °C		
7	Operation – Maintenance						
7.1	Maintenance	The sensor is maintenance free.					
7.2	Monitoring	The control unit aids monitoring					
7.3	Expert inspection (once per year)	• Depending on the amount of use the sensors are to be checked regularly for correct operation and visible signs of damage by manual operation or by applying the relevant test piece. • The correct position of the rubber profile in the aluminium profile is to be checked.					
8	Chemical resistance	The sensor is resistant to customary-chemical influences such as diluted-acids, alkaline solutions and alcohol-for an exposure duration of 24 hours.					
9	Dimensional tolerances						
	Rubber profile	ISO 3302 E2/L2					
	Al-profile	ISO 2768-v					

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Technical data GP 302

Safety Edges consisting of sensor SL/W and SL/BK
at rubber profiles GP 302 with Steel-Profile and Control Unit

1	Degree of protection sensor	IP65	IP65
2	Switching operations sensor	> 10^4	> 10^4
3	Sensor	**GP 302** **EPDM**	**GP 302** **EPDM**
	with Control Unit SG-	EFS 1X4 ZK2/1	SLE 04-0X1
3.1	Response time	115 ms	120 ms
	Test speed	100 mm/s	100 mm/s
3.2	Control command reset	either manual or automatic	automatic
4	Actuation force, actuation distance, overtravel and switching angle Testing basis: EN 1760-2		
4.1	Actuation force	< 150 N	< 150 N
4.2	Actuation distance		
	at 10 mm/s	13 mm	13 mm
	at 100 mm/s	12 mm	12 mm
4.3	Overtravel distance		
	at 10 mm/s	25 mm	25 mm
	at 100 mm/s	22 mm	22 mm
4.4	Effective actuation angle	90°	90°
5	Error behaviour	EN 954 Category 3	EN 954 Category 3
6	Operating and environmental conditions		
6.1	Operating temperature Sensor	0 °C to +55 °C	0 °C to +55 °C
7	Operation – Maintenance		
7.1	Maintenance	The sensor is maintenance free.	
7.2	Monitoring	The control unit aids monitoring	
7.3	Expert inspection (once per year)	• Depending on the amount of use the sensors are to be checked regularly for correct operation and visible signs of damage by manual operation or by applying the relevant test piece. • The correct position of the rubber profile in the aluminium profile is to be checked.	
8	Chemical resistance	The sensor is resistant to customary-chemical influences such as diluted-acids, alkaline solutions and alcohol-for an exposure duration of 24 hours.	
9	Dimensional tolerances Rubber profile Steel-profile	ISO 3302 E2/L2 ISO 2768-v	

270710 v1.0

Request for quotation

From:

Fax:

+49 731 2061-222

Company

Department

Name, first name

P. O. Box | Post code | City

Street | Post code | City

Phone | Fax | E-mail

Area of application

(e.g. door and gate systems, machine closing edges, textile machines, local public transport, ...)

⇩ Please keep free ⇩
For internal use only

Environmental conditions

- ❑ dry
- ❑ water
- ❑ oil
- ❑ aggressive substances::
- ❍ Coolant, type: _____
- ❍ Solvent, type:_____
- ❍ other: _____
- ❑ room temperature
- ❑ other: from _____ °C to _____°C

Mechanical conditions

- ❑ The stopping distance of the system is max. ____ mm
- ❑ sensitive ends
- ❑ non-sensitive ends permitted
- ❑ cable exit version ____
- ❑ number of monitoring circuits: ____
- ❑ SG- _____

Pinching and shearing edges to be protected::

(Diagram incl. mounting possibility and cable routing)

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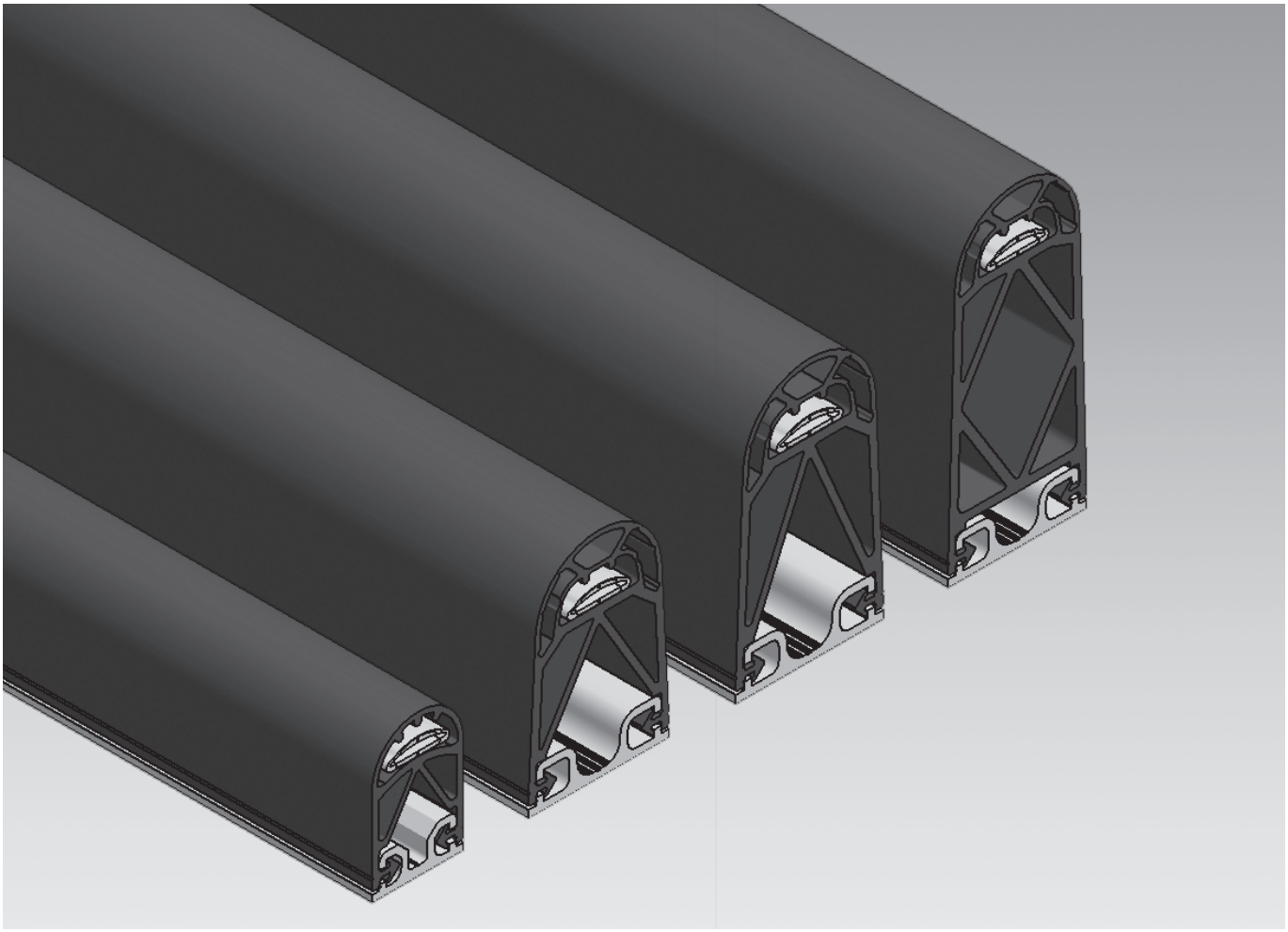
Innovative by tradition.



Normally open safety edges SL NO

EN | Product information

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Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.

Always observe the safety instructions on the following pages under **ATTENTION.** Only use the product for the purpose described in the product information.

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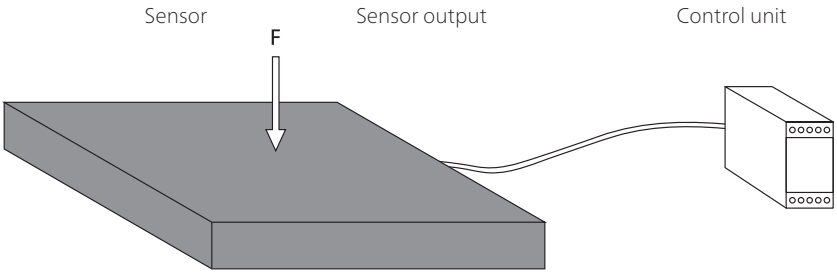
291117 v2.02

Definitions

Pressure-sensitive protection device

A pressure-sensitive protection device consists of pressure-sensitive sensor(s), signal processing and output signal switching device(s). The control unit is made up of the signal processing and output signal switching device(s). The pressure-sensitive protection device is triggered when the sensor is activated.

Note:
See also chapter 3 **Terms** in ISO 13856-2.

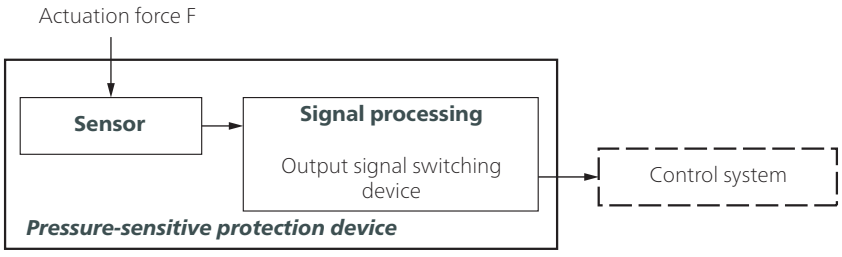


Sensor

The sensor is the part of the pressure-sensitive protection device that generates a signal when the actuating force F is applied. Mayser safety systems have a sensor whereby the actuating surface is deformed locally.

Signal processing

The signal processing is the part of the pressure-sensitive protection device that converts the output signal of the sensor and controls the status of the output signal switching device. The output signal switching device is that part of the signal processing which is connected to the machine controls and transmits safety output signals such as STOP.



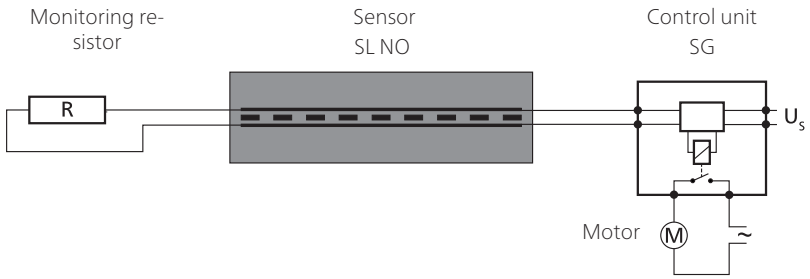
291117 v2.02

Subject to technical modifications.

Criteria for selecting the sensor type

- B_{10D}-value according to ISO 13849-1
- Performance level of pressure-sensitive protection device = at least PL_r
- Temperature range
- Degree of protection in accordance with IEC 60529:
  IP65 is the standard for safety edges.
  Higher degrees of protection must be checked individually.
- Environmental influences such as swarf, oil, coolant, outdoor use...
- Finger detection necessary?

Operation principle 2-wire-technology



The monitoring resistor must be compatible with the control unit.
Standard value is 1k2. 8k2 and 22k1 are also available.

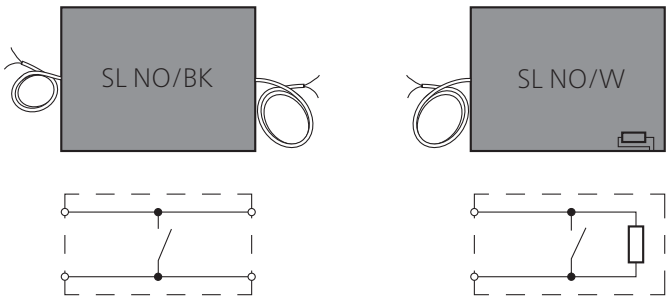
For your safety:
Sensor and connecting cables are constantly monitored for function.
Monitoring is carried out by controlled bridging of the contact surfaces with a monitoring resistor (closed current principle).

291117 v2.02

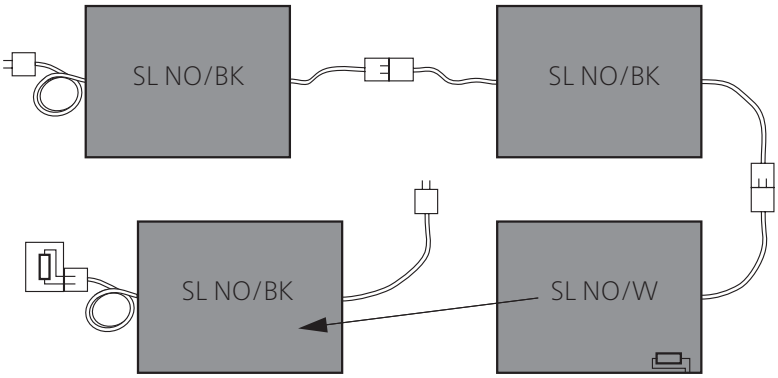
Design

SL NO/BK with cables on both sides as a through sensor or as an end sensor with external monitoring resistor

SL NO/W as an end sensor with integrated monitoring resistor



Combination of sensors



Model with external resistor, thus avoiding variety in type

Combination:

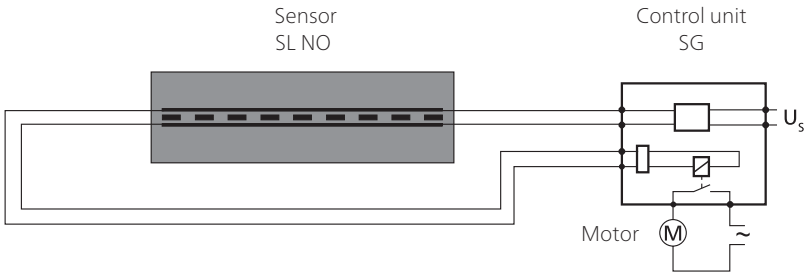
- Connection of more than one sensor
- Only one control unit required
- Safety edge design with custom lengths and angles

291117 v2.02

Subject to technical modifications.

Operation principle 4-wire-technology

Unlike 2-wire technology, 4-wire-technology works **without** a monitoring resistor.

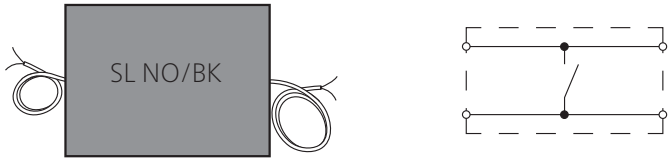


Note:
The 4-wire technology can be used only together with control unit SG-EFS 104/4L.

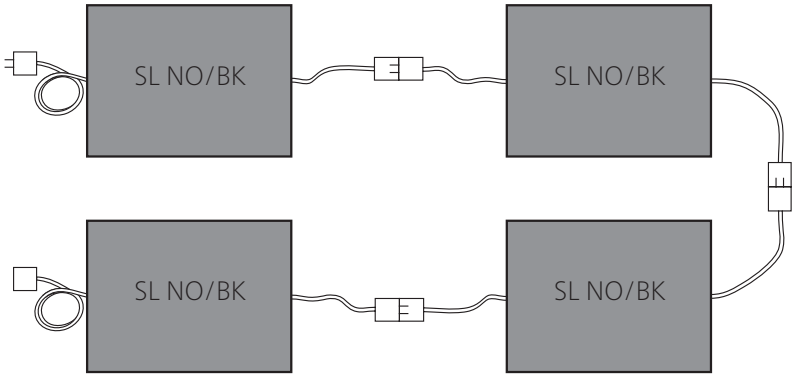
For your safety:
Sensor and connecting cables are constantly monitored for function.
This is possible because of signal transmission feedback – without monitoring resistor.

Design

SL NO/BK with cables on both sides as a through sensor



Combination of sensors



Combination:
- Connection of more than one sensor
- Only one control unit required
- Safety edge design with custom lengths and angles

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Subject to technical modifications.

Intended use

A safety edge detects a person or part of the body when pressure is applied to the actuation area. It is a linear tripping device. Its task is to avoid possible hazardous situations for a person within a danger zone, such as shearing and pinching edges.
Typical areas of application are door and gate systems, moving parts on machines, platforms and lifting devices.
Safe operation of a safety edge depends entirely on

- the surface condition of the mounting surface,
- the correct selection of the size and resistance as well as
- correct installation.

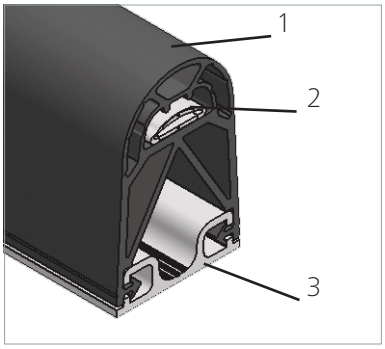
Tip
See ISO 13856-2 Appendix E.

Limits

- Max. 10 sensors type BK on one control unit
- Max. 9 sensors type BK and 1 sensor type W on one control unit
- GP 38(L)-2, GP 58(L)-2 and GP 68-2 deviate with respect to the actuation angle from the requirements in ISO 13856-2 and EN 12978; the suitability for doors and gates must be examined on an individual basis.

Design

Tip
For the risk and safety assessment of your machine, we recommend ISO 12100 "Safety of machinery – Basic concepts; general principles for design".



The normally open safety edge SL NO consists of one sensor (1 to 3)
(1) Rubber profile GP,
(2) Normally open safety element SE 1 TPE,
(3) Aluminium profile C 26 or C 36 and an evaluating control unit SG.

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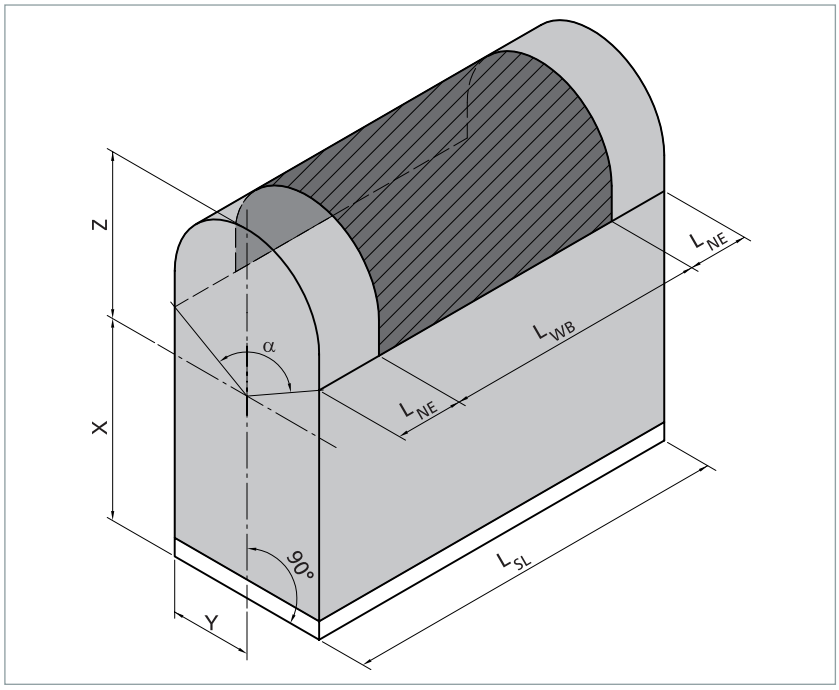
Effective actuation area

The parameters X, Y, Z, L_{NE} and the angle α describe the effective actuation area.
For the effective actuation area, the following applies:

$$L_{WB} = L_{SL} - 2 \times L_{NE}$$



Parameters:
L_{WB} = effective actuation length
L_{SL} = overall length of the safety edge
L_{NE} = non-sensitive length at the end of the safety edge
α = effective actuation angle

	GP 38(L)-2	GP 58(L)-2	GP 68-2	GP 88-2
α	60°	60°	60°	90°
L_{NE}	30 mm	30 mm	40 mm	30 mm
X	30.5 mm	43.2 mm	53.2 mm	71.7 mm
Y	13 mm	18 mm	18 mm	20 mm
Z	9.5 mm	16.8 mm	16.8 mm	18.3 mm

ATTENTION
The effective actuation angle α of GP 38(L)-2, GP 58(L)-2 and GP 68-2 is 60°, which is smaller than the requirement of ISO 13856-2 and EN 12978.

Available lengths

Subject to technical modifications.

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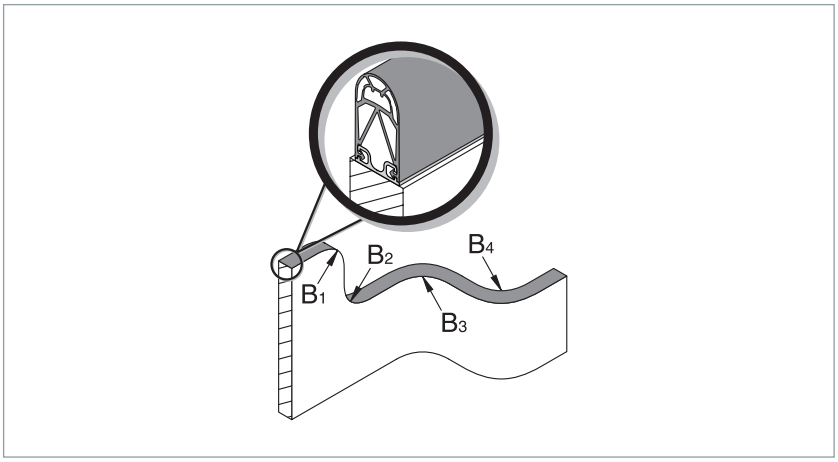
Bend angles and bend radii

Bend angles
Bend angles are not possible on the safety edge.

Bend radii
Safety edges with a bend radius are only possible with the aluminium profiles C 26, C 36 and C 36S. The aluminium profile must be prepared in the factory for this.

Note:
Bend angles and bend radii are not part of the EC design tests.



Bend radii min.	GP 38-2	GP 58-2	GP 68-2	GP 88-2
B_1	750 mm	750 mm	750 mm	750 mm
B_2	750 mm	750 mm	750 mm	750 mm
B_3	750 mm	750 mm	750 mm	750 mm
B_4	750 mm	750 mm	750 mm	750 mm

Note:
Bend radii are not possible with GP 38L and GP 58L.

Installation position

The installation position can be selected as required, i.e. all installation positions A to D as per ISO 13856-2 are possible.

ATTENTION
No pressure may be exerted on the safety edge in non-operative mode.

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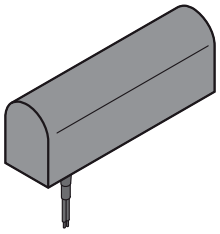
Subject to technical modifications.

Connection

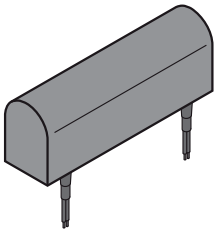
Cable exits

90° exit

Distance from front face 25 mm each; versions with cable bushing



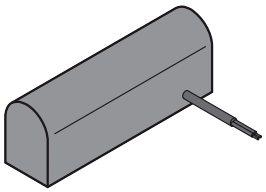
Version 11: SL NO/W



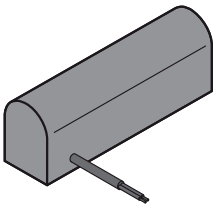
Version 5: SL NO/BK

Lateral exit

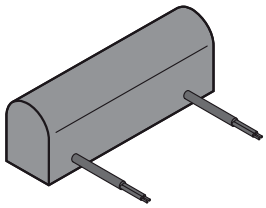
Distance to front face 25 mm each; versions without cable bushing



Version 15: SL NO/W



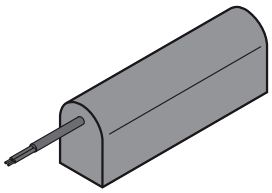
Version 16: SL NO/W



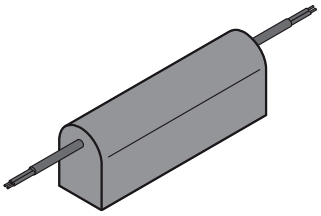
Version 17: SL NO/BK

Axial exit

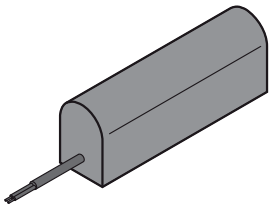
Versions without cable bushing



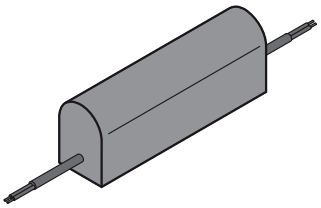
Version 9: SL NO/W



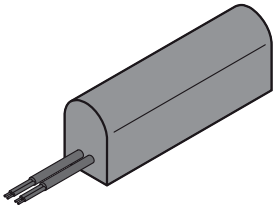
Version 1: SL NO/BK



Version 10: SL NO/W



Version 3: SL NO/BK



Version 4: SL NO/BK

Note

The standard is SL NO/W1k2. Optionally, SL NO/W8k2 or SL NO/W22k1 are also available.

Tip

With more than one sensor connected one behind the other, we recommend version 1, 3, 5 or 17.

ATTENTION

The cables must be laid free of tension.

Subject to technical modifications.

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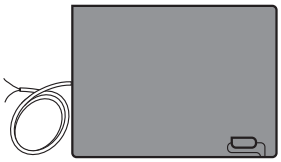


Cable connection

Sensor type W

- As an individual sensor type W or an end sensor type W
- Integrated resistor
- 2-wire cable (Ø 3.7 mm TPE, 2× 0.22 mm²)
- Cable ends: Wires stripped
  Option: Cable ends available with plug and coupling

Sensor type BK with 2 lines

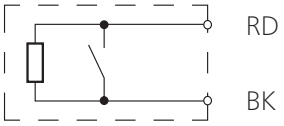
- As a feed-through sensor type BK
- Without resistor
- 2 two-wire cable (Ø 3.7 mm TPE, 2× 0.22 mm²)
- Cable ends: Wires stripped
  Option: Cable ends available with plug and coupling

Wire colours

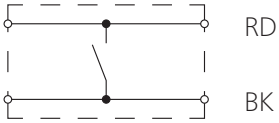
Colour coding

RD Red BK Black

Sensor type W



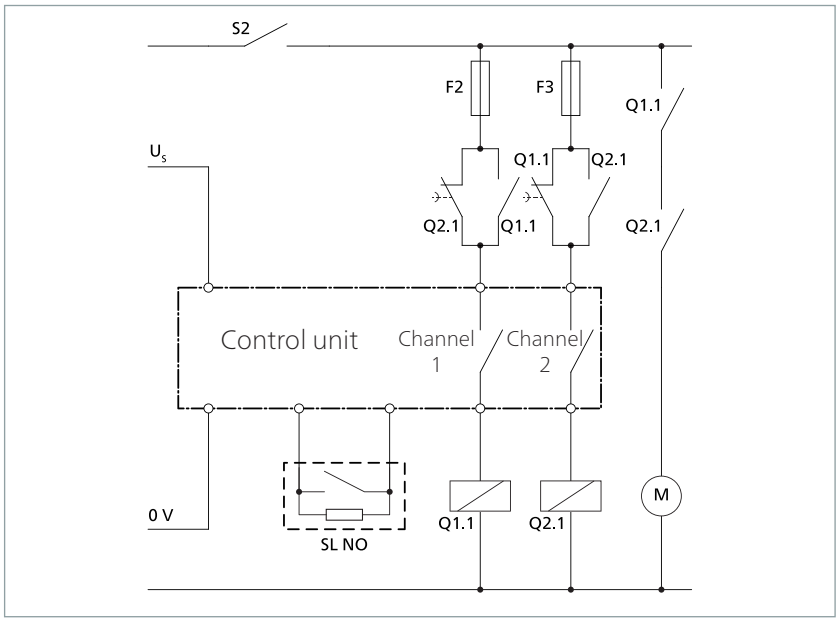
Sensor type BK with 2 lines



Connection examples

Connection example 1

Normally open safety edge to single-fault-safe control unit with dual channel extension.



Subject to technical modifications.

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Physical resistance

Rubber profile GP	EPDM
Degree of protection (IEC 60529)	IP67
Hardness as per Shore A	
GP 58(L)-2, GP 68-2, GP 88-2	63 ±5
GP 38(L)-2	57 ±5

Chemical resistance

The sensor is resistant against normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

The values in the table are results of tests carried out in our laboratory. The suitability of our products for your special area of application must always be verified with your own practical tests.

Rubber profile GP	PDM
Acetone	+
Formic acid	+
Ammonia	+
Petrol	-
Brake fluid	±
Chloride solutions	+
Diesel oils	-
Greases	-
Household/sanitary cleaners	+
Isopropyl alcohol	+
Cooling lubricant	-
Metal working oil	-
Methyl alcohol	+
Oils	-
Ozone and weather conditions	+
Hydrochloric acid 10 %	+
Spirit (ethyl alcohol)	+
Carbon tetrachloride	-
Hydrogen peroxide 10 %	+
Water and frost	+

Explanation of symbols:
+ = resistant
± = resistant to a certain extent
- = not resistant

Note:
Tests are carried out at room temperature (+23 °C).

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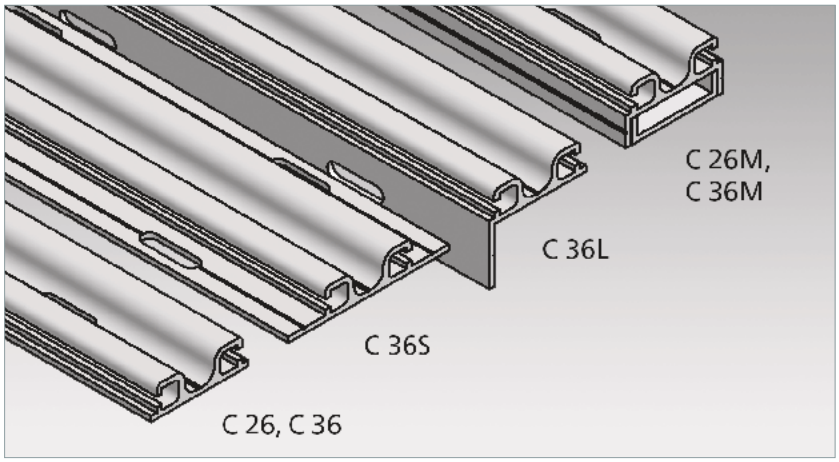
Subject to technical modifications.

Attachment

The sensors are mounted directly to the dangerous main and secondary closing edges. The aluminium profiles C 26 and C 36 are used for mounting. The aluminium profiles are mounted with screws M5 or rivets.



Material properties

- AlMgSi0.5 F22
- Wall thickness 2 mm
- Tolerances as per EN 755-9
- extruded
- hot hardened

Aluminium profiles: Overview of combinations

Aluminium profiles for		GP 38(L)-2	GP 58(L)-2	GP 68-2	GP 88-2
Clip bars (outside)	...-2	C 26 C 26M	C 36 C 36M, C 36L, C 36S	C 36 C 36M, C 36L, C 36S	C 36 C 36M, C 36L, C 36S

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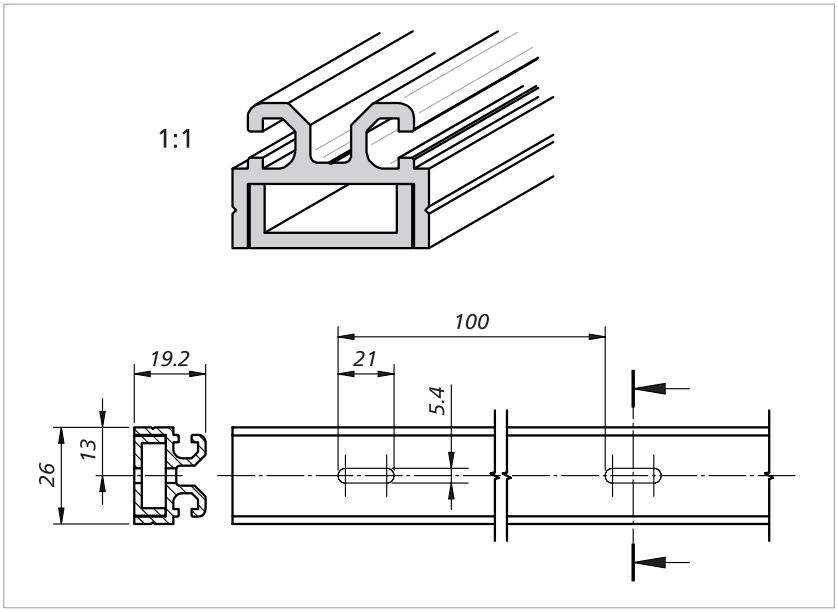
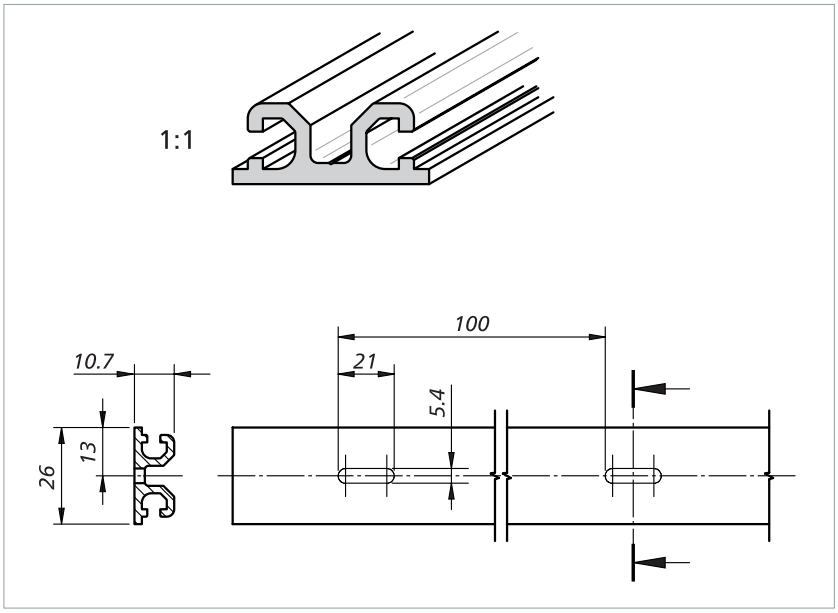
Subject to technical modifications.

Aluminium profile C 26M



Two-part profile for GP 38(L)-2:
For convenient assembly and disassembly. The rubber profile is clipped into the upper section and the upper section inserted in the installed lower section and fastened.

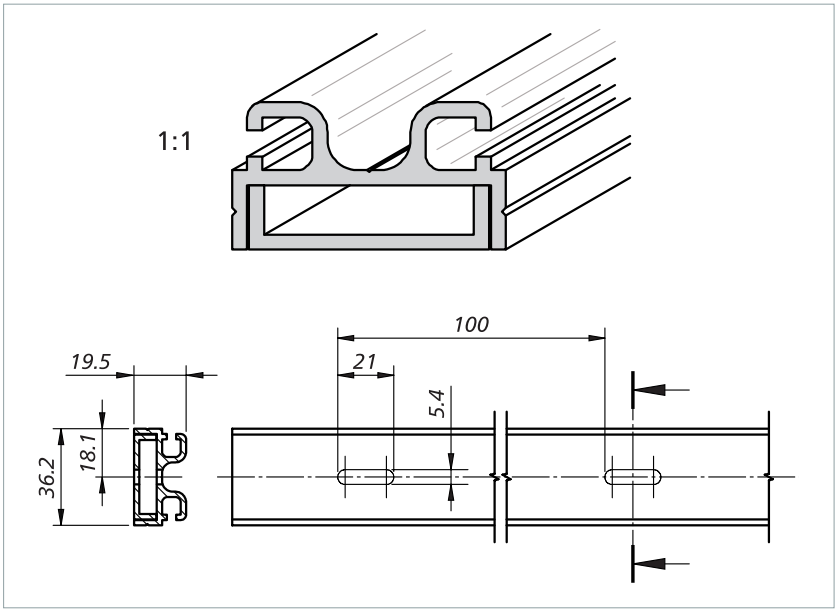
Aluminium profile C 26



Standard profile for GP 38(L)-2:
First the aluminium profile must be mounted to the closing edge and then the rubber profile clipped into the aluminium profile.

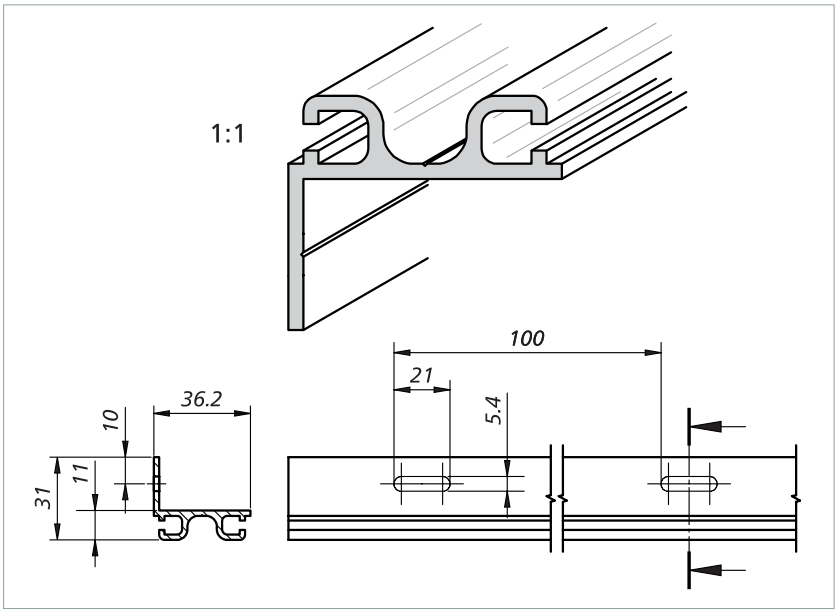
Subject to technical modifications.

Aluminium profile C 36M



Two-part profile for GP 58(L)-2, GP 68-2 and GP 88-2:
For convenient assembly and disassembly. The rubber profile is clipped into the upper section and the upper section inserted in the installed lower section and fastened.

Aluminium profile C 36L



Angle profile for GP 58(L)-2, GP 68-2 and GP 88-2:
If the closing edge should or must not have assembly holes, this "round-the-corner" solution is suitable. Final assembly is also possible when the rubber profile is already clipped into the aluminium profile.

Subject to technical modifications.

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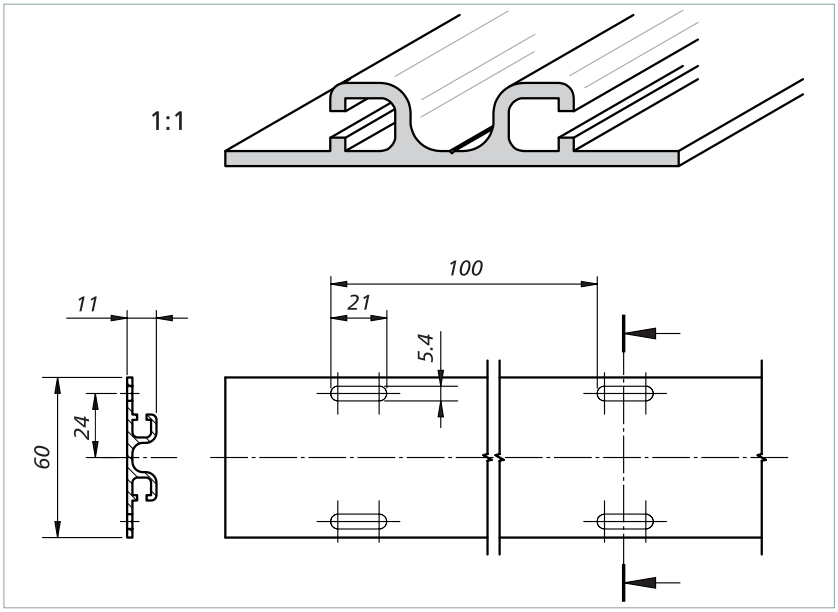
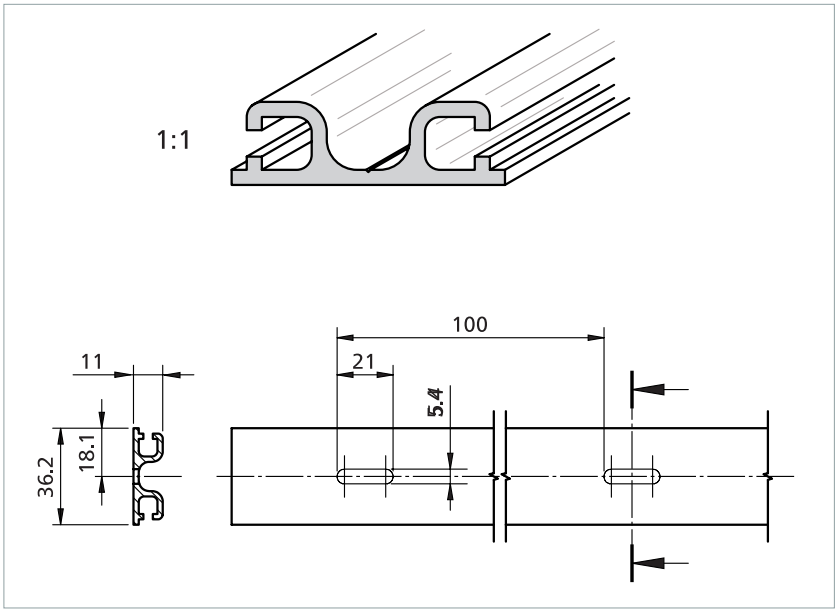
Aluminium profile C 36S



Flange profile for GP 58(L)-2, GP 68-2 and GP 88-2:
Final assembly is also possible when the rubber profile is already clipped into the aluminium profile.

Aluminium profile C 36



Standard profile for GP 58(L)-2, GP 68-2 and GP 88-2:
First the aluminium profile must be mounted to the closing edge and then the rubber profile clipped into the aluminium profile.

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Subject to technical modifications.

SL NO: The right selection

Calculation for selection of the safety edge height

s_1 = Stopping distance of the dangerous movement [mm]
v = Velocity of the dangerous movement [mm/s]
T = Follow-through of the complete system [s]
t_1 = Response time safety edge
t_2 = Stopping time of the machine
s = Minimum overtravel distance of the safety edge so that the required limit forces are not exceeded [mm]
C = Safety factor; if components susceptible to failures (braking system) exist in the system, a higher factor must be selected

The stopping distance of the dangerous movement is calculated using the following formula:

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$

In accordance with ISO 13856-2 , the minimum overtravel distance of the safety edge is calculated using the following formula:

$s = s_1 \times C$ where: $C = 1{,}2$

A suitable safety edge profile can now be selected based on the result. Overtravel distances of safety edge profile: see chapter "Dimensions and distances".

Calculation examples

Example 1

The dangerous movement on your machine has a velocity of v = 10 mm/s and can be brought to a standstill within t_2 = 200 ms. The relatively low velocity suggests that a short overtravel distance is to be expected. Therefore the safety edge SL NO GP 38-2 EPDM could be sufficient. The response time of the safety edge is t_1 = 920 ms.

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$
$s_1 = 1/2 \times 10$ mm/s $\times$ (0.92 s + 0.2 s)
$\mathbf{s_1} = 1/2 \times 10$ mm/s $\times$ 1.12 s **= 5.6 mm**

$s = s_1 \times C$ where: $C = 1.2$
s = 5.6 mm $\times$ 1.2 **= 6.72 mm**

The safety edge must have a minimum overtravel distance of s = 6.7 mm. The selected SL NO GP 38-2 EPDM has an overtravel distance of at least 10.8 mm. This is more than the required 6.7 mm.
Result: The SL NO GP 38-2 EPDM is **suitable** for this case.

Note:
t_1 = sensor response time + control unit response time (typically 10 ms).

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Subject to technical modifications.

Example 2

The same conditions as in calculation example 1 with the exception of the velocity of the dangerous movement. This is now v = 200 mm/s. The response time of the safety edge is t_1 = 54 ms.

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$

$s_1 = 1/2 \times 200$ mm/s $\times$ (0.054 s + 0.2 s)

s_1 = 1/2 × 200 mm/s × 0.254 s = 25.4 mm

$s = s_1 \times C$ where: C = 1.2

s = 25.4 mm × 1.2 **= 30.48 mm**

The safety edge must have a minimum overtravel distance of s = 30.5 mm. The selected SL NO GP 38-2 EPDM has an overtravel distance of at least 10.1 mm. This is less than the required 30.5 mm.
Result: The SL NO GP 38-2 EPDM is **not suitable** for this case.

Tip
For further selection criteria, see appendices C and E in ISO 13856-2.

Example 3

The same conditions as in calculation example 2. Instead of SL NO GP 38-2 EPDM the SL NO GP 68-2 EPDM is selected. The response time of the safety edge is t_1 = 56 ms.

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$

$s_1 = 1/2 \times 200$ mm/s $\times$ (0.056 s + 0.2 s)

s_1 = 1/2 × 200 mm/s × 0.256 s = 25.6 mm

$s = s_1 \times C$ where: C = 1.2

s = 25.6 mm × 1.2 **= 30.72 mm**

The safety edge must have a minimum overtravel distance of s = 30.7 mm haben. The selected SL NO GP 68-2 EPDM has an overtravel distance of at least 32.2 mm. This is more than the required 30.7 mm.
Result: The SL NO GP 68-2 EPDM is **suitable** for this case.

Customised designs

In addition to the standard range, special solutions are also possible, such as

- Safety edges with sensitive ends
- Durability at high temperatures:
  short-term (< 5 min) up to +100 °C
  long-term (> 5 min) up to +80 °C
  in the case of degree of protection: IP50
- Durability at low temperatures:
  long term up to -40 °C

Subject to technical modifications.

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Conformity

CE

The CE symbol indicates that this Mayser product complies with the relevant EC directives and that the stipulated conformity assessments have been carried out.
The design type of the product complies with the basic requirements of the following directives:

- 2006/42/EG (Safety of Machinery)
- 2004/108/EG(EMC)

Safety aspects

Without reset function
When a safeguard without reset function is used (automatic reset), the reset function must be made available in some other way.

Performance Level (PL)
The PL was determined during a simplified procedure according to ISO 13849-1.
Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contact by pressure-sensitive equipment according to ISO 13856. In this case the sensor will no longer be taken into account in determining the PL. The entire pressure sensitive safety edge (Pressure-sensitive protection device) system can reach a maximum of PL d.

Is the safeguard appropriate?
The PL required for the hazard must be decided by the integrator. This is followed by the choice of safeguard.
Finally, the integrator needs to check whether the category and PL of the safeguard chosen are appropriate.

Maintenance and servicing

The sensor is maintenance-free.
The control unit also monitors the sensor.

Regular inspection
Depending on the utilisation, sensors need to be inspected at regular intervals (at least monthly)

- for functionality: by activating or applying the respective test sample.
- for damage: by a visual check.
- for fit between rubber and aluminium profile: by a visual check.

Cleaning
If necessary, clean the sensor with a mild cleaning agent.

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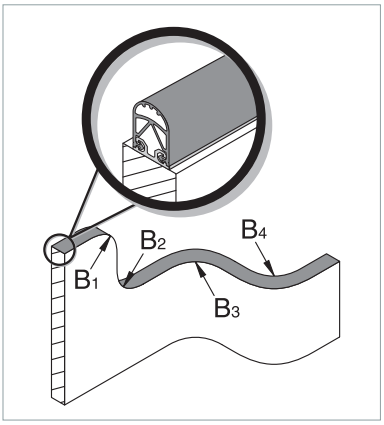
Technical data

GP 38-2 EPDM

Normally open safety edge SL NO consisting of sensor, aluminium profile C 26 and control unit SG-EFS 1X4 ZK2/1.

Testing basis	
ISO 13856-2	
Switching characteristics at v_{test} = 200 mm/s	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	11 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	60°
Response time	54 ms
Finger detection	yes
Safety classifications	
ISO 13856: reset function	with/witout
ISO 13849-1:2015	Category 3 PL d
$MTTF_D$ (pressure-sensitive protection device)	222 a
$MTTF_D$ (sensor)	761 a
B_{10D} (sensor)	4×10^6
n_{op} (acceptance)	52560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 14 m
Cable length (min./max.)	2 m / 100 m
Bend radii, minimum	
B1 / B2 / B3 / B4	750 / 750 / 750 / 750 mm
Operating speed (min. / max.)	10 mm/s / 200 mm/s
max. load capacity	600 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95 % (non-condensing)
Operating temperature	-10 to +55 °C
Storage temperature	-30 to +70 °C
Weight	0.8 kg/m
Electrical operating conditions	
Number of sensors type BK	max. 10 in series
Switching voltage (max.)	DC 24 V
Switching current (max.)	10 mA
Connection cable	Ø 3.7 mm TPE 2×0.22 mm²
Dimensional tolerances	
Length as per	ISO 3302 L2
Profile section as per	ISO 3302 E2
Aluminium profile	EN 755-9

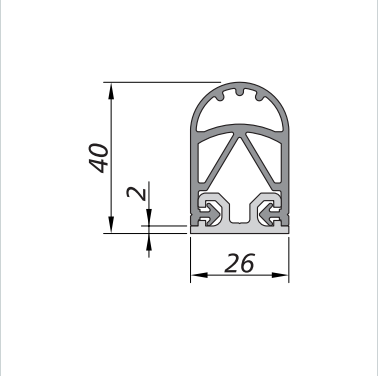
Bend radii:



291117 v2.02

Dimensions and distances

GP 38-2 EPDM (1:2)



Test conditions
according to ISO 13856-2

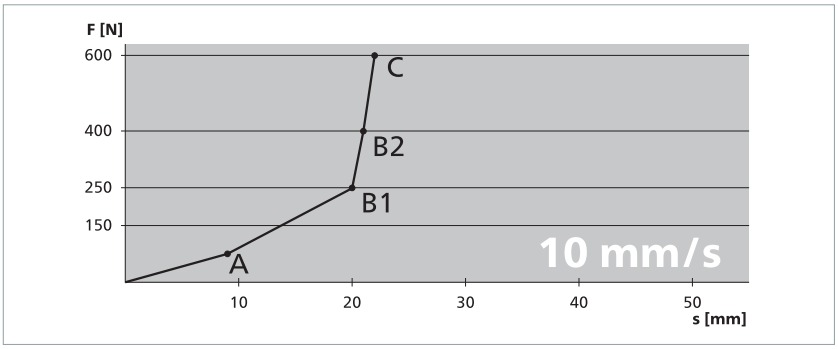
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

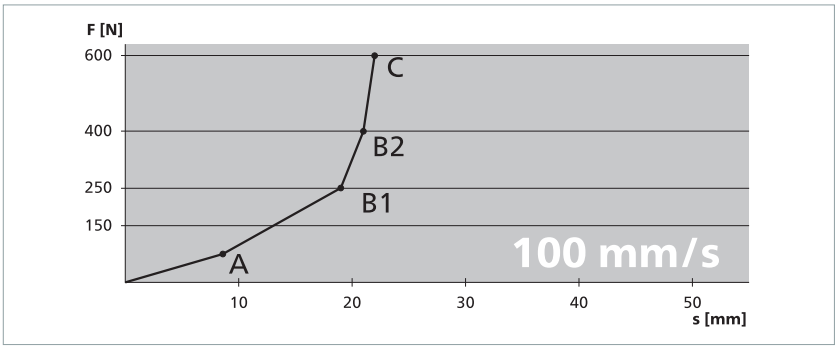
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

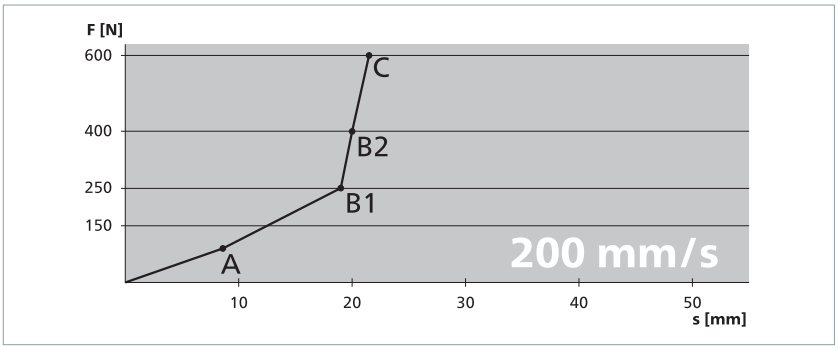
Actuation force	72 N
Response time	910 ms
Actuation distance (A)	9.1 mm
Overtravel distance	
up to 250 N (B1)	10.8 mm
up to 400 N (B2)	11.8 mm
up to 600 N (C)	12.9 mm
Total deformation	22 mm



Actuation force	83 N
Response time	86 ms
Actuation distance (A)	8.6 mm
Overtravel distance	
up to 250 N (B1)	10.5 mm
up to 400 N (B2)	12.1 mm
up to 600 N (C)	13.6 mm
Total deformation	22.2 mm



Actuation force	93
Response time	44 ms
Actuation distance (A)	8.8 mm
Overtravel distance	
up to 250 N (B1)	10.1 mm
up to 400 N (B2)	11.5 mm
up to 600 N (C)	12.7 mm
Total deformation	21.5 mm



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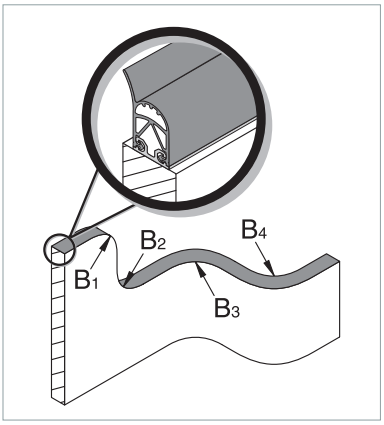
Technical data

GP 38L-2 EPDM

Normally open safety edge SL NO consisting of sensor, aluminium profile C 26and control unit SG-EFS 1X4 ZK2/1.

Testing basis	
ISO 13856-2	
Switching characteristics at v_{test} = 200 mm/s	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	17 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	60°
Response time	84 ms
Finger detection	yes
Safety classifications	
ISO 13856: reset function	with/witout
ISO 13849-1:2015	Category 3 PL d
$MTTF_D$ (pressure-sensitive protection device)	222 a
$MTTF_D$ (sensor)	761 a
B_{10D} (sensor)	4×10^6
n_{op} (acceptance)	52560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 14 m
Cable length (min./max.)	2 m / 100 m
Bend radii, minimum	
B1 / B2 / B3 / B4	750 / 750 / 750 / 750 mm
Operating speed	
(min. / max.)	10 mm/s / 200 mm/s
max. load capacity	600 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95 % (non-condensing)
Operating temperature	+5 to +55 °C
Storage temperature	-30 to +70 °C
Weight	0.9 kg/m
Electrical operating conditions	
Number of sensors type BK	max. 10 in series
Switching voltage (max.)	DC 24 V
Switching current (max.)	10 mA
Connection cable	Ø 3.7 mm TPE 2× 0.22 mm^2
Dimensional tolerances	
Length as per	ISO 3302 L2
Profile section as per	ISO 3302 E2
Aluminium profile	EN 755-9

Bend radii:



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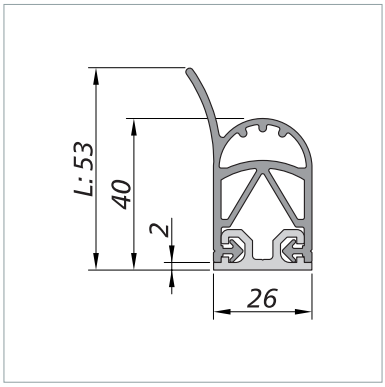
Dimensions and distances

GP 38L-2 EPDM (1:2)



Test conditions
according to ISO 13856-2

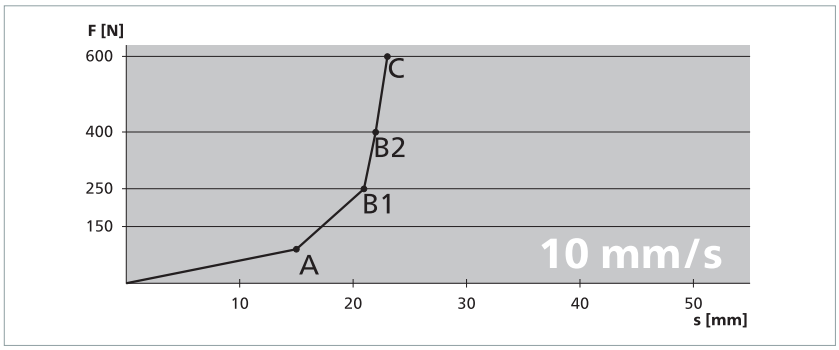
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

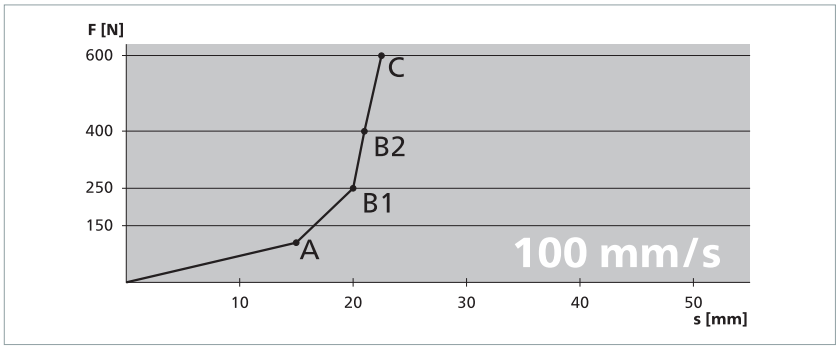
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

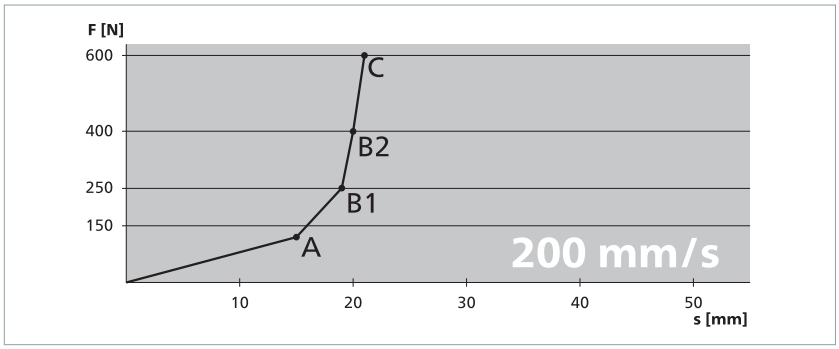
Actuation force	85 N
Response time	1470 ms
Actuation distance (A)	14.7 mm
Overtravel distance	
up to 250 N (B1)	6.1 mm
up to 400 N (B2)	7.4 mm
up to 600 N (C)	8.6 mm
Total deformation	23.3 mm



Actuation force	108 N
Response time	153 ms
Actuation distance (A)	15.3 mm
Overtravel distance	
up to 250 N (B1)	4.8 mm
up to 400 N (B2)	5.9 mm
up to 600 N (C)	7.2 mm
Total deformation	22.5 mm



Actuation force	120 N
Response time	73.5 ms
Actuation distance (A)	14.7 mm
Overtravel distance	
up to 250 N (B1)	4.2 mm
up to 400 N (B2)	5.1 mm
up to 600 N (C)	6.1 mm
Total deformation	20.8 mm



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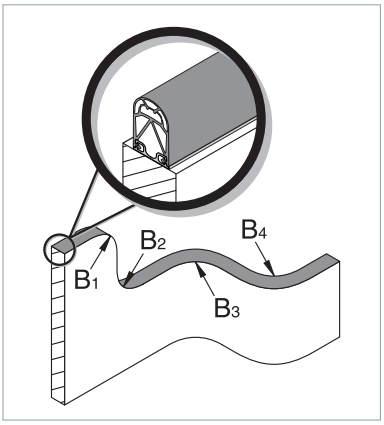
Technical data

GP 58-2 EPDM

Normally open safety edge SL NO consisting of sensor, aluminium profile C 36 and control unit SG-EFS 1X4 ZK2/1.

Testing basis	
ISO 13856-2	
Switching characteristics at v_{test} = 200 mm/s	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	12 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	60°
Response time	70 ms
Finger detection	yes
Safety classifications	
ISO 13856: reset function	with/witout
ISO 13849-1:2015	Category 3 PL d
$MTTF_D$ (pressure-sensitive protection device)	222 a
$MTTF_D$ (sensor)	761 a
B_{10D} (sensor)	4× 10^6
n_{op} (acceptance)	52560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 14 m
Cable length (min./max.)	2 m / 100 m
Bend radii, minimum	
B1 / B2 / B3 / B4	750 / 750 / 750 / 750 mm
Operating speed (min. / max.)	10 mm/s / 200 mm/s
max. load capacity	600 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95 % (non-condensing)
Operating temperature	0 to +55 °C
Storage temperature	-30 to +70 °C
Weight	1.3 kg/m
Electrical operating conditions	
Number of sensors type BK	max. 10 in series
Switching voltage (max.)	DC 24 V
Switching current (max.)	10 mA
Connection cable	Ø 3.7 mm TPE 2× 0.22 mm^2
Dimensional tolerances	
Length as per	ISO 3302 L2
Profile section as per	ISO 3302 E2
Aluminium profile	EN 755-9

Bend radii:



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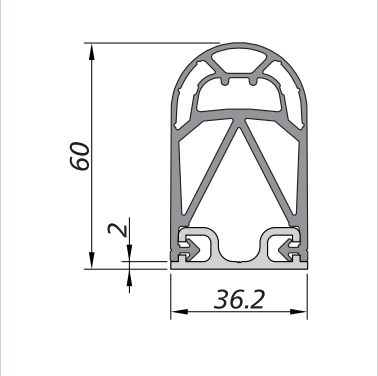
Dimensions and distances

GP 58-2 EPDM (1:2)



Test conditions
according to ISO 13856-2

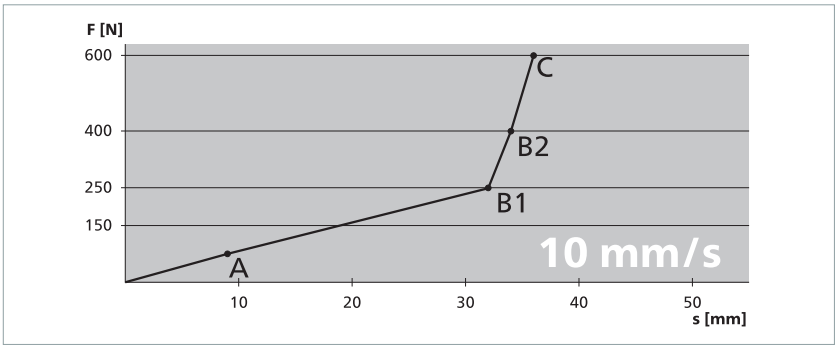
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

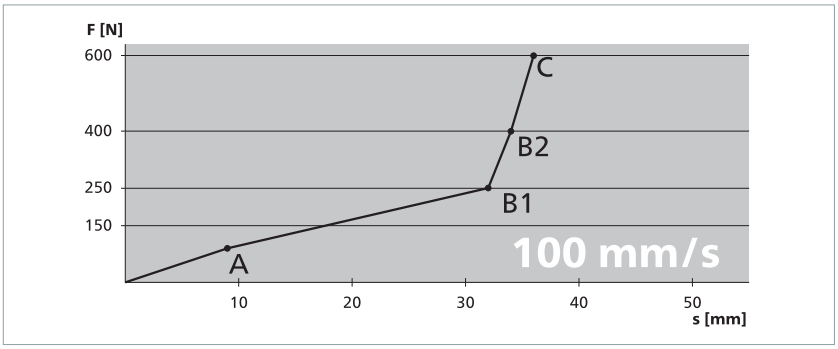
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

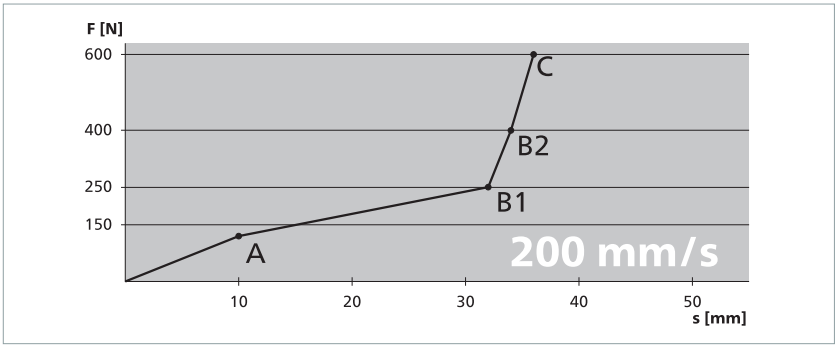
Actuation force	79 N
Response time	800 ms
Actuation distance (A)	8 mm
Overtravel distance	
up to 250 N (B1)	24.4 mm
up to 400 N (B2)	26.2 mm
up to 600 N (C)	28.8 mm
Total deformation	36.8 mm



Actuation force	99 N
Response time	87 ms
Actuation distance (A)	8.7 mm
Overtravel distance	
up to 250 N (B1)	23.1 mm
up to 400 N (B2)	25.2 mm
up to 600 N (C)	27.7 mm
Total deformation	36.4 mm



Actuation force	115 N
Response time	60 ms
Actuation distance (A)	9.8 mm
Overtravel distance	
up to 250 N (B1)	22 mm
up to 400 N (B2)	24.2 mm
up to 600 N (C)	26.3 mm
Total deformation	36.1 mm



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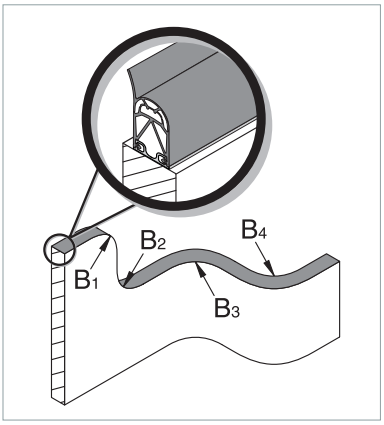
Technical data

GP 58L-2 EPDM

Normally open safety edge SL NO consisting of sensor, aluminium profile C 36 and control unit SG-EFS 1X4 ZK2/1.

Testing basis	
ISO 13856-2	
Switching characteristics at v_{test} = 200 mm/s	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	12 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	60°
Response time	70 ms
Finger detection	yes
Safety classifications	
ISO 13856: reset function	with/witout
ISO 13849-1:2015	Category 3 PL d
$MTTF_D$ (pressure-sensitive protection device)	222 a
$MTTF_D$ (sensor)	761 a
B_{10D} (sensor)	4×10^6
n_{op} (acceptance)	52560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 14 m
Cable length (min./max.)	2 m / 100 m
Bend radii, minimum	
B1 / B2 / B3 / B4	750 / 750 / 750 / 750 mm
Operating speed (min. / max.)	10 mm/s / 200 mm/s
max. load capacity	600 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95 % (non-condensing)
Operating temperature	0 to +55 °C
Storage temperature	-30 to +70 °C
Weight	1.3 kg/m
Electrical operating conditions	
Number of sensors type BK	max. 10 in series
Switching voltage (max.)	DC 24 V
Switching current (max.)	10 mA
Connection cable	Ø 3.7 mm TPE 2× 0.22 mm^2
Dimensional tolerances	
Length as per	ISO 3302 L2
Profile section as per	ISO 3302 E2
Aluminium profile	EN 755-9

Bend radii:



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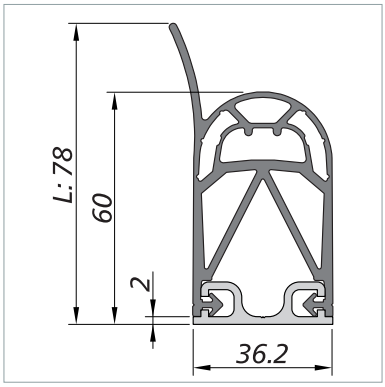
Dimensions and distances

GP 58L-2 EPDM (1:2)



Test conditions
according to ISO 13856-2

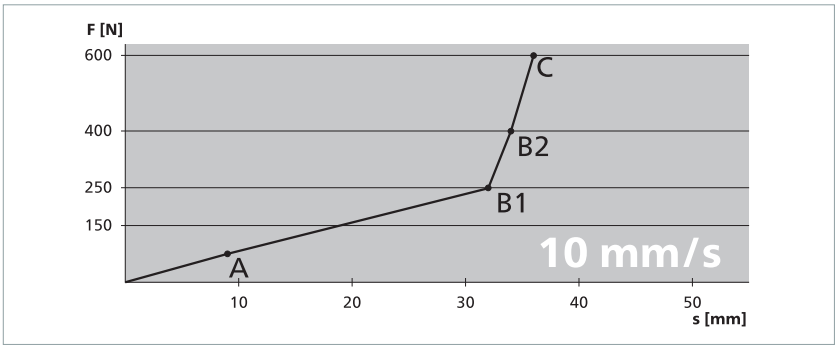
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

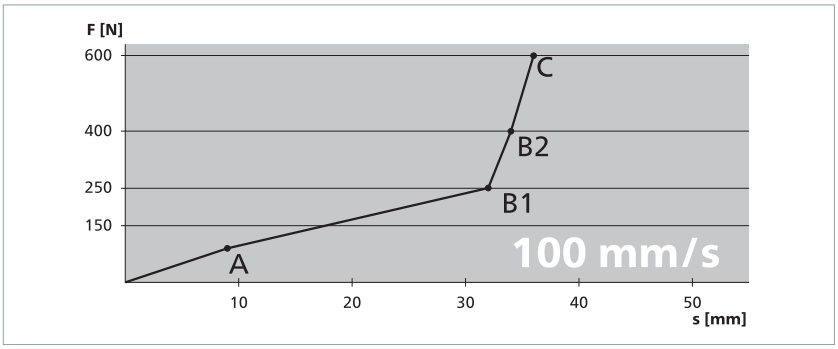
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

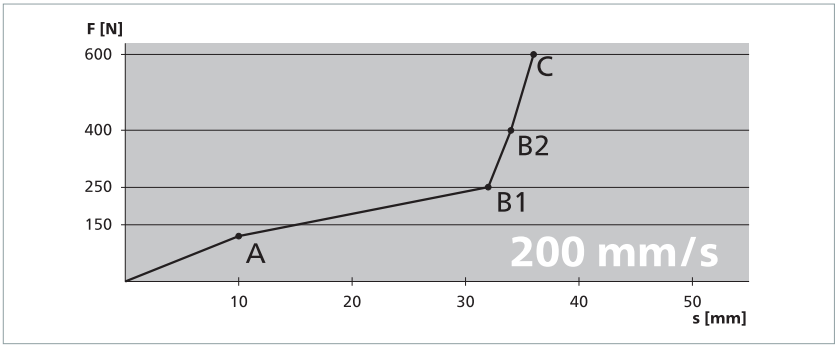
Actuation force	79 N
Response time	800 ms
Actuation distance (A)	8 mm
Overtravel distance	
up to 250 N (B1)	24.4 mm
up to 400 N (B2)	26.2 mm
up to 600 N (C)	28.8 mm
Total deformation	36.8 mm



Actuation force	99 N
Response time	87 ms
Actuation distance (A)	8.7 mm
Overtravel distance	
up to 250 N (B1)	23.1 mm
up to 400 N (B2)	25.2 mm
up to 600 N (C)	27.7 mm
Total deformation	36.4 mm



Actuation force	115 N
Response time	60 ms
Actuation distance (A)	9.8 mm
Overtravel distance	
up to 250 N (B1)	22 mm
up to 400 N (B2)	24.2 mm
up to 600 N (C)	26.3 mm
Total deformation	36.1 mm



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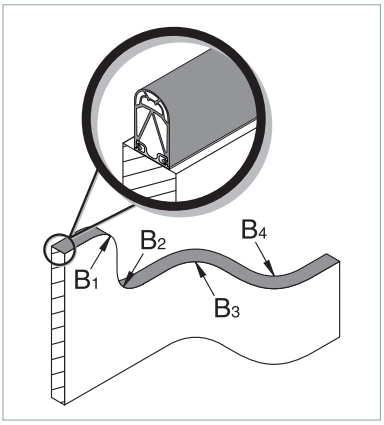
Technical data

GP 68-2 EPDM

Normally open safety edge SL NO consisting of sensor, aluminium profile C 36 and control unit SG-EFS 1X4 ZK2/1.

Testing basis	
ISO 13856-2	
Switching characteristics at v_{test} = 200 mm/s	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	11 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	60°
Response time	56 ms
Finger detection	yes
Safety classifications	
ISO 13856: reset function	with/witout
ISO 13849-1:2015	Category 3 PL d
$MTTF_D$ (pressure-sensitive protection device)	222 a
$MTTF_D$ (sensor)	761 a
B_{10D} (sensor)	4×10^6
n_{op} (acceptance)	52560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 14 m
Cable length (min./max.)	2 m / 100 m
Bend radii, minimum	
B1 / B2 / B3 / B4	750 / 750 / 750 / 750 mm
Operating speed	
(min. / max.)	10 mm/s / 200 mm/s
max. load capacity	600 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95 % (non-condensing)
Operating temperature	0 to +55 °C
Storage temperature	-30 to +70 °C
Weight	1.4 kg/m
Electrical operating conditions	
Number of sensors type BK	max. 10 in series
Switching voltage (max.)	DC 24 V
Switching current (max.)	10 mA
Connection cable	Ø 3.7 mm TPE 2×0.22 mm²
Dimensional tolerances	
Length as per	ISO 3302 L2
Profile section as per	ISO 3302 E2
Aluminium profile	EN 755-9

Bend radii:



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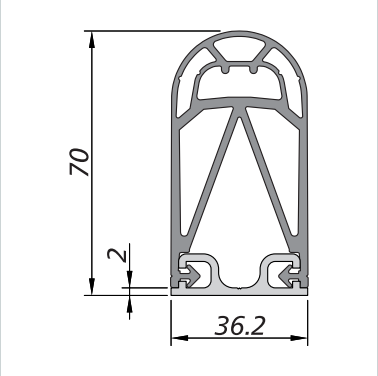
Dimensions and distances

GP 68-2 EPDM (1:2)



Test conditions
according to ISO 13856-2

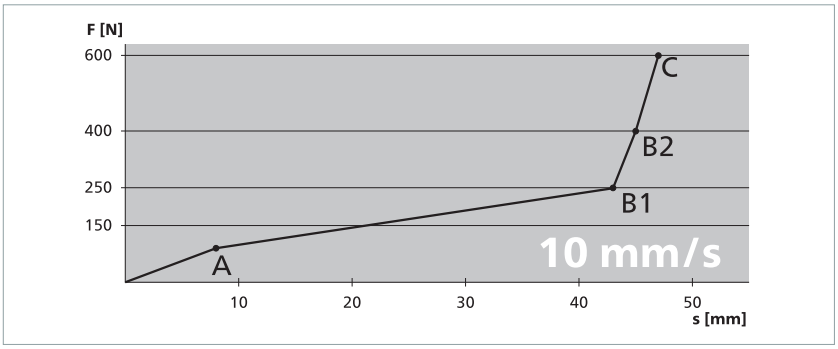
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

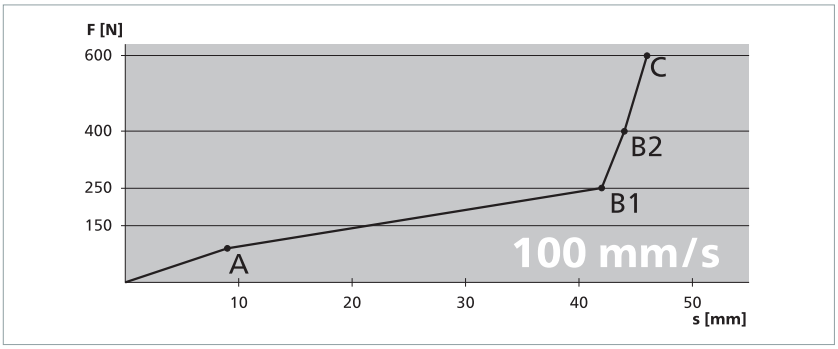
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

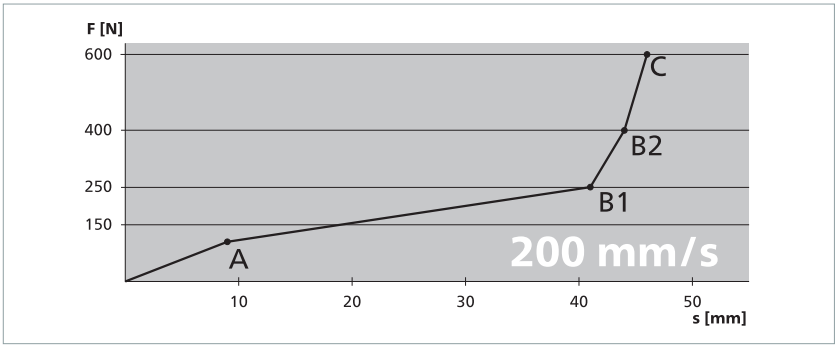
Actuation force	84 N
Response time	830 ms
Actuation distance (A)	8.3 mm
Overtravel distance	
up to 250 N (B1)	34.5 mm
up to 400 N (B2)	36.8 mm
up to 600 N (C)	38.8 mm
Total deformation	47.1 mm



Actuation force	96 N
Response time	91 ms
Actuation distance (A)	9.1 mm
Overtravel distance	
up to 250 N (B1)	32.6 mm
up to 400 N (B2)	36.6 mm
up to 600 N (C)	37.3 mm
Total deformation	46.4 mm



Actuation force	105 N
Response time	46 ms
Actuation distance (A)	9.2 mm
Overtravel distance	
up to 250 N (B1)	32.2 mm
up to 400 N (B2)	34.8 mm
up to 600 N (C)	37.3 mm
Total deformation	45.8 mm



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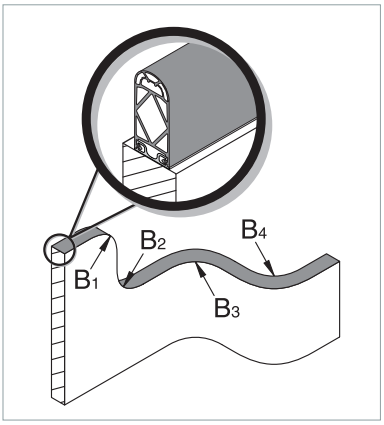
Technical data

GP 88-2 EPDM

Normally open safety edge SL NO consisting of sensor, aluminium profile c 36 and control unit SG-EFS 1X4 ZK2/1.

Testing basis	
ISO 13856-2	
Switching characteristics at v_{test} = 200 mm/s	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	14 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	90° (Finger protection: 60°)
Response time	70 ms
Finger detection	yes
Safety classifications	
ISO 13856: reset function	with/witout
ISO 13849-1:2015	Category 3 PL d
$MTTF_D$ (pressure-sensitive protection device)	222 a
$MTTF_D$ (sensor)	761 a
B_{10D} (sensor)	4× 10^6
n_{op} (acceptance)	52560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 14 m
Cable length (min./max.)	2 m / 100 m
Bend radii, minimum	
B1 / B2 / B3 / B4	750 / 750 / 750 / 750 mm
Operating speed	
(min. / max.)	10 mm/s / 200 mm/s
max. load capacity	600 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95 % (non-condensing)
Operating temperature	0 to +55 °C
Storage temperature	-30 to +70 °C
Weight	1.6 kg/m
Electrical operating conditions	
Number of sensors type BK	max. 10 in series
Switching voltage (max.)	DC 24 V
Switching current (max.)	10 mA
Connection cable	Ø 3.7 mm TPE 2× 0.22 mm^2
Dimensional tolerances	
Length as per	ISO 3302 L2
Profile section as per	ISO 3302 E2
Aluminium profile	EN 755-9

Bend radii:



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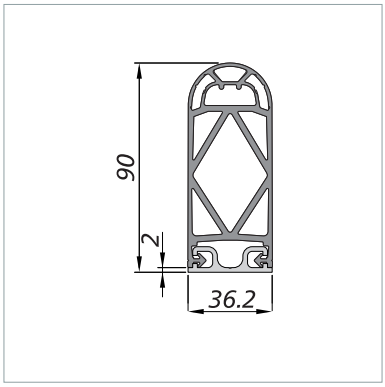
Dimensions and distances

GP 88-2 EPDM (1:3)



Test conditions
according to ISO 13856-2

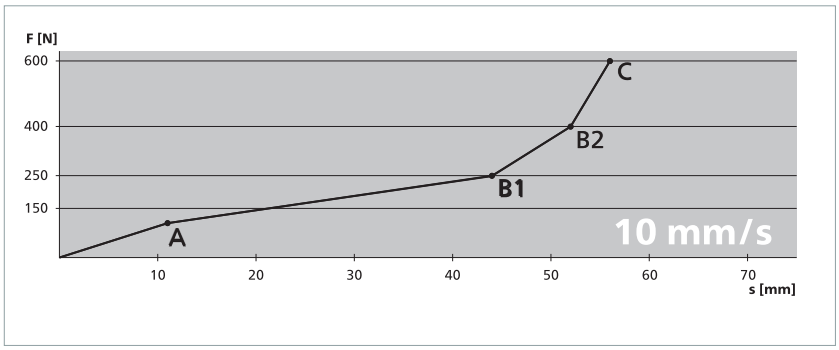
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

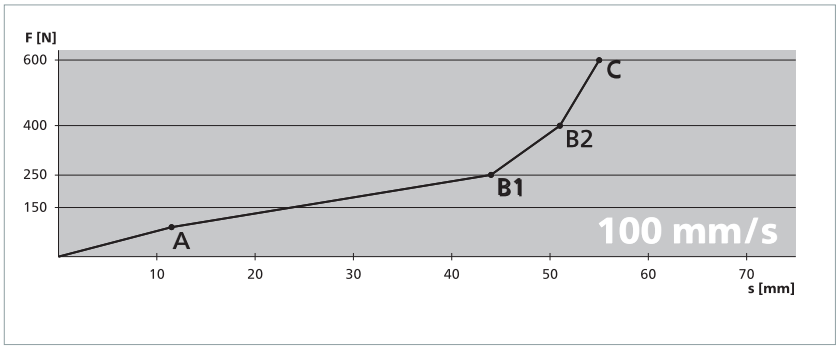
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

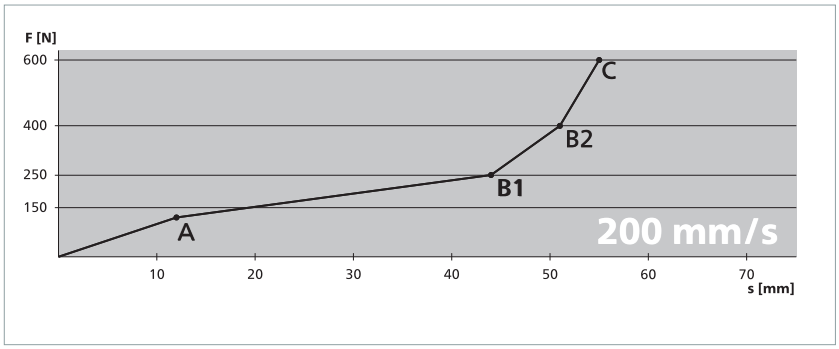
Actuation force	106 N
Response time	1100 ms
Actuation distance (A)	11 mm
Overtravel distance	
up to 250 N (B1)	33.7 mm
up to 400 N (B2)	41.3 mm
up to 600 N (C)	45.9 mm
Total deformation	56.9 mm



Actuation force	111 N
Response time	114 ms
Actuation distance (A)	11.4 mm
Overtravel distance	
up to 250 N (B1)	33.1 mm
up to 400 N (B2)	40 mm
up to 600 N (C)	43.7 mm
Total deformation	55.1 mm



Actuation force	127 N
Response time	60 ms
Actuation distance (A)	12 mm
Overtravel distance	
up to 250 N (B1)	32 mm
up to 400 N (B2)	38.9 mm
up to 600 N (C)	42.9 mm
Total deformation	54.9 mm



291117 v2.02

MAYSER®

Request for quotation

Fax:
+49 731 2061-222

Submitted by

Company

Department

Surname, first name

P.O. Box | Postcode | Town/city

Street | Postcode | Town/city

Phone | Fax | E-mail

⇩ Please do not write in this column! ⇩
For internal notes only

Area of application

(e.g. door and gate systems, machine closing edges, textile machines, local public transport, ...)

Environmental conditions

❑ dry ❑ water ❑ oil
❑ aggressive substances: ❍ Coolant, type: _____
❍ Solvent, type:_____
❍ other: _____
❑ room temperature ❑ other: from _____ °C to_____ °C

Mechanical conditions

❑ The stopping distance of the system is max._____ mm
❑ sensitive ends ❑ non-sensitive ends allowed
❑ cable exit version ____
❑ number of monitoring circuits: ____ ❑ SG- _____

Pinching and shearing edges to be protected:

(Sketch incl. mounting possibility and cable routing)

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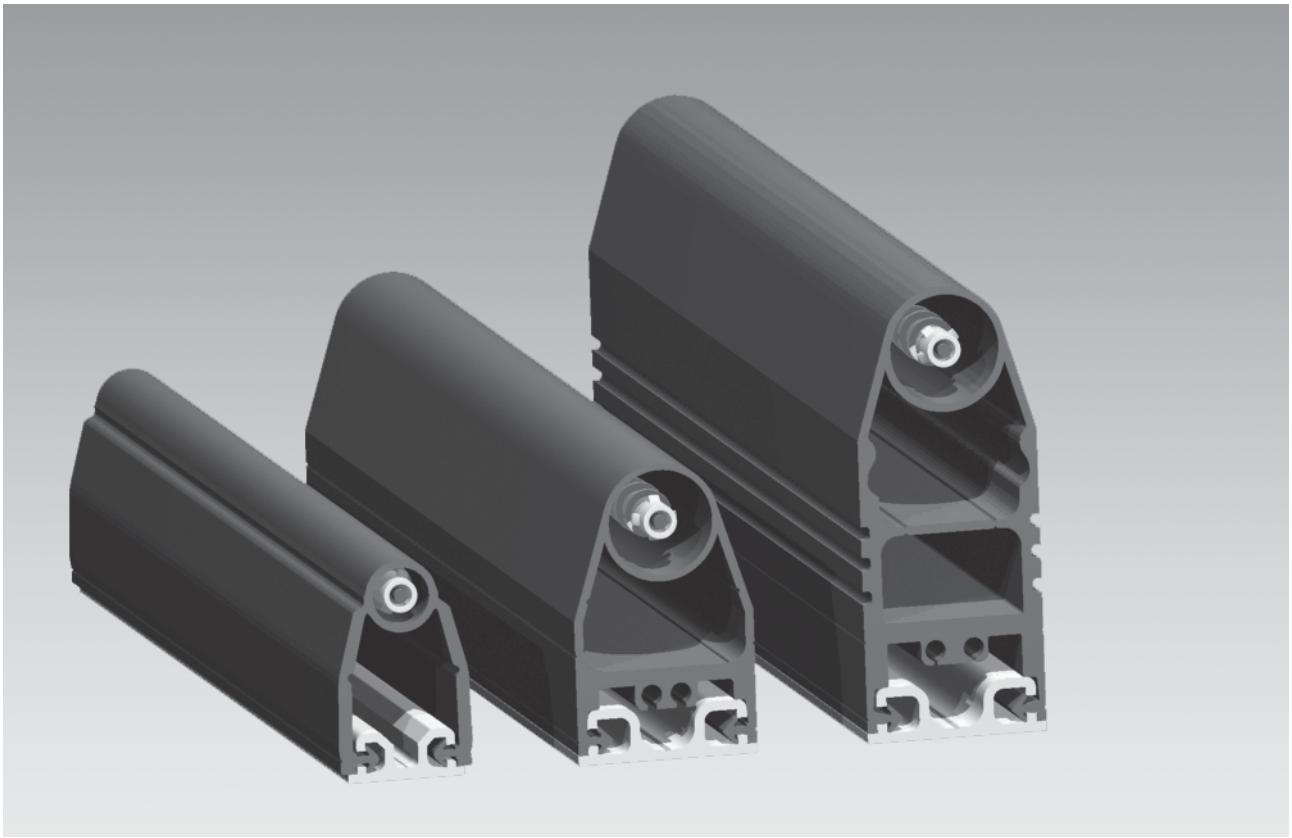
Product information



Normally Closed Safety Edges SL/NC II

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Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.
Always observe the safety instructions on the following pages under **ATTENTION**. Only use the product for the purpose described in the product information.

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Definitions

See Definitions and Operation Principles in chapter 1 of the Mayser catalogue.

Intended use

A Safety Edge detects a person or part of the body when pressure is applied to the actuation area. It is a linear tripping device. Its task is to avoid possible hazardous situations for a person within a danger zone, such as shearing and pinching edges. Typical areas of application are door and gate systems, moving parts on machines, platforms and lifting devices.
Safe operation of a Safety Edge depends entirely on
- the surface condition of the mounting surface,
- the correct selection of the size and resistance value as well as
- correct installation.

Tip
See ISO 13856-2 Appendix E.

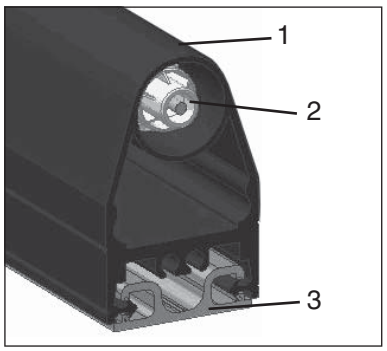
Limits

A maximum of 10 SL/NC (Normally Closed) Safety Edges may be connected to one signal processing.

Exclusion

The normally closed Safety Edge is not suitable:
- for detecting fingers
- for areas of application with high levels of vibration
- for doors/gates per EN 12978 (applies only to GP 48)

Design



The Normally Closed Safety Edge SL/NC II consists of
(1) Rubber profile GP,
(2) Contact chain made of connected positive break normally closed contacts and
(3) Aluminium profile C 26 or C 36.

The positive break contact chain simultaneously carries out the functions of the sensor, signal processing and output signal switching device. Therefore, a special control unit is not necessary.

ATTENTION
If automatic start-up or restart represents a danger, a corresponding reset function (e.g. start button) must be integrated in the downstream control

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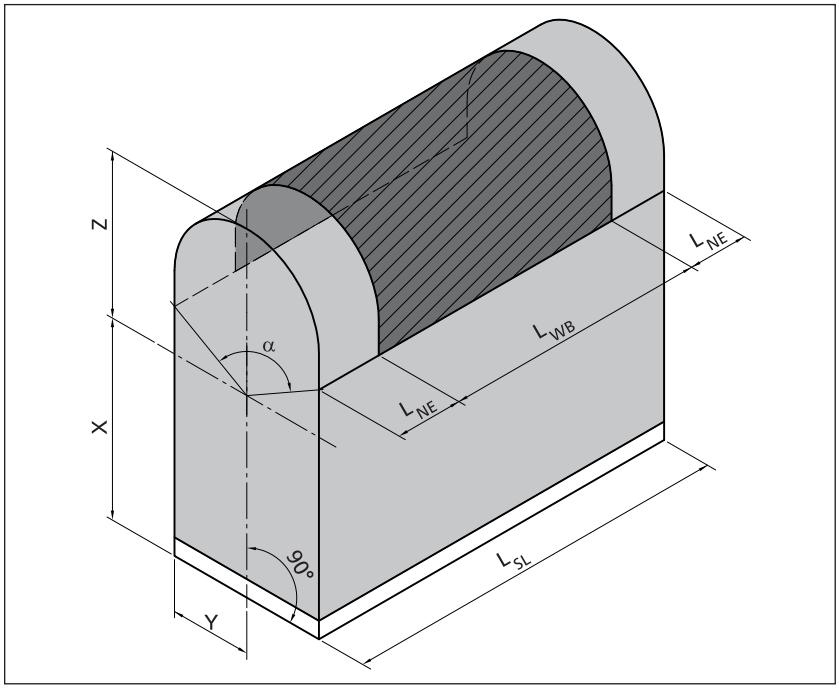
Tip
For the risk and safety assessment of your machine, we recommend ISO 12100 "Safety of machinery – Basic concepts, general principles for design."

The downstream control must comply with at least ISO 13849-1 category 3 and have inputs for the reliable evaluation of the status of the normally closed Safety Edge.

Effective actuation area

The parameters X, Y, Z, L_{NE} and the angle α describe the effective actuation area.
For the effective actuation area, the following applies:

$$L_{WB} = L_{SL} - 2\times L_{NE}$$



Parameters:
- L_{WB} = Effective actuation length
- L_{SL} = Overall length of the Safety Edge
- L_{NE} = Non-sensitive length at the end of the Safety Edge
- α = Effective actuation angle

ATTENTION
The effective actuation angle α (60°) for **GP 48** falls below the requirements of ISO13856-2. Per EN 12978 not suitable for doors/gates.

SL/NC II	GP 48	GP 65	GP 100
α	60°	90°	90°
L_{NE}	50 mm	50 mm	40 mm
X	40 mm	52 mm	85 mm
Y	13 mm	18 mm	18 mm
Z	8 mm	13 mm	14 mm

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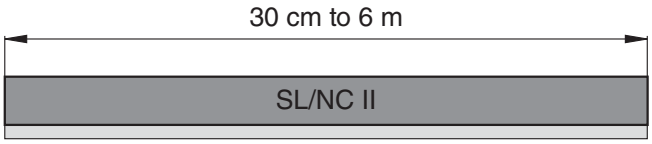
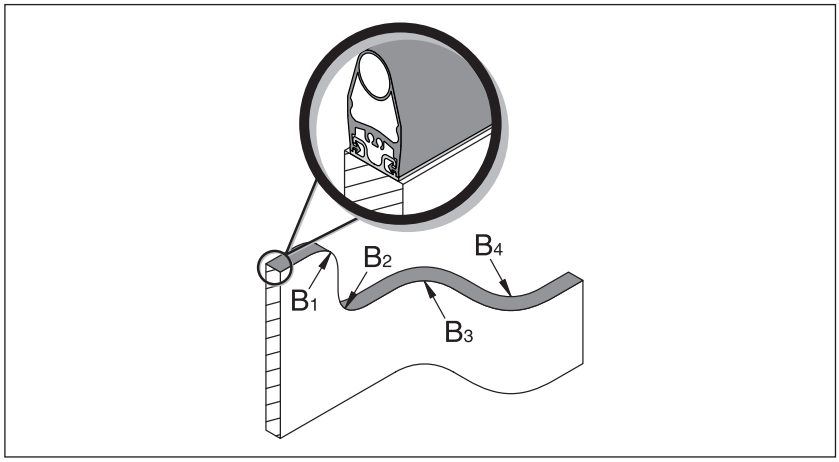
Subject to technical modifications

Available lengths



Bend angles and bend radii

Bend angles
Bend angles are not possible on the normally closed Safety Edge SL/NC II.



Bend radii
Normally closed Safety Edges with a bend radius are only possible with the aluminium profiles C 36 and C 36S. The aluminium profile must be prepared for this at our plant.

Biegeradius min.	GP 48	GP 65	GP 100
B_1	750 mm	750 mm	750 mm
B_2	750 mm	750 mm	750 mm
B_3	–	–	–
B_4	–	–	–

Note:
Bend angles and bend radii are not part of the EC design tests

Installation position

The installation position can be selected as required, i.e. all installation positions A to D as per ISO 13856-2 are possible.

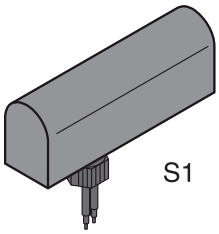
ATTENTION
No pressure may be exerted on the NC Safety Edge in non-operative mode.

Subject to technical modifications

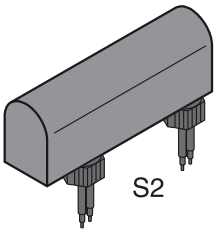
Connection

Cable exits

90° exit
Distance to front end each 60 mm

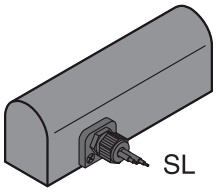


Standard (S1)

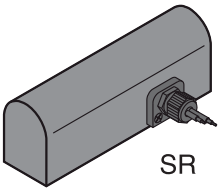


S2: 2 cables

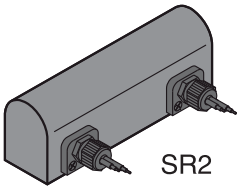
Lateral exit
Distance to front end each 60 mm



SL: lateral exit left



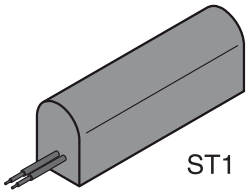
SR: lateral exit right



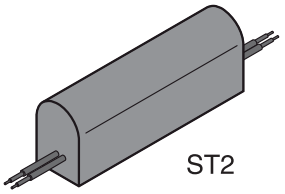
SR2: 2 cables

ATTENTION
Axial cable exits (ST1/ST2) must be laid free of tension. A tensile load of max. 50 N apply to cables through cable screw connection.

Axial exit
without PG-screw connection



ST1



ST2: 2 cables

In the case of several sensors connected in sequence, we recommend version S2, SR2 or ST2. These versions provide an additional line in the rubber profile for feedback to the control.

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Cable connection

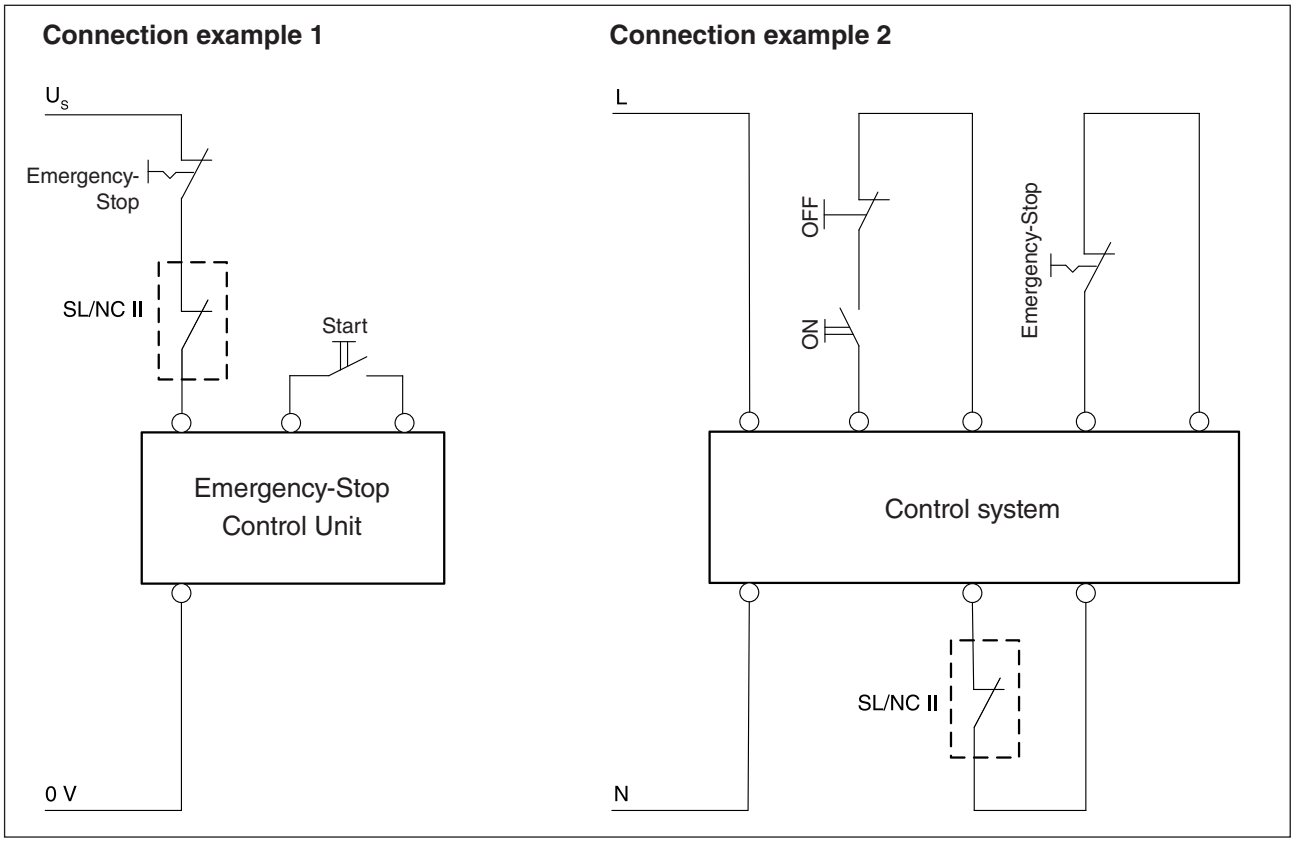
- Cable: Ø 3.3 mm PVC, 1× 0.5 mm²; double insulated, short-circuit-proof, highly flexible
- Cable length: 1.5 m
  Option: up to max. 200 m
- Cable ends: wires stripped
  Option: Cable ends available with plug and coupling

ATTENTION
It must be ensured that the lines to the downstream control are double insulated

Connection examples

Connection example 1
Normally Closed Safety Edge in series with Emergency-Stop button on Emergency-Stop Control Unit. Connecting voltage: DC.

Connection example 2
Normally Closed Safety Edge directly connected to control up to PL e as per ISO 13849-1. Connecting voltage: AC.



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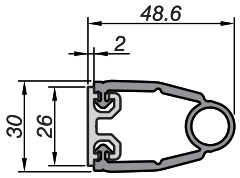
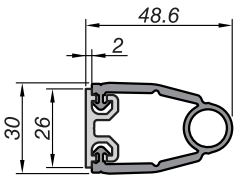
Rubber profiles

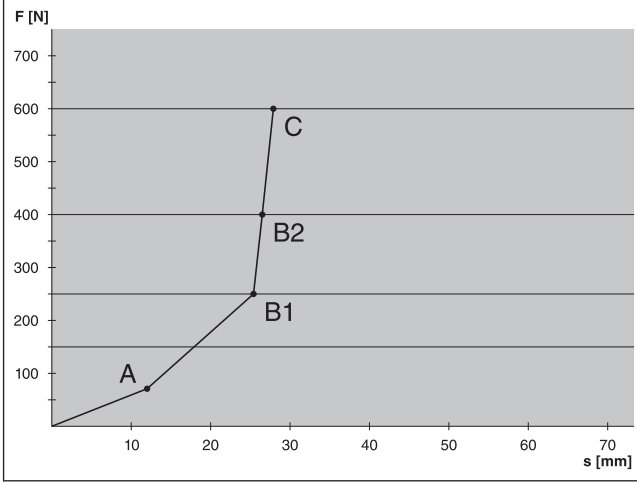
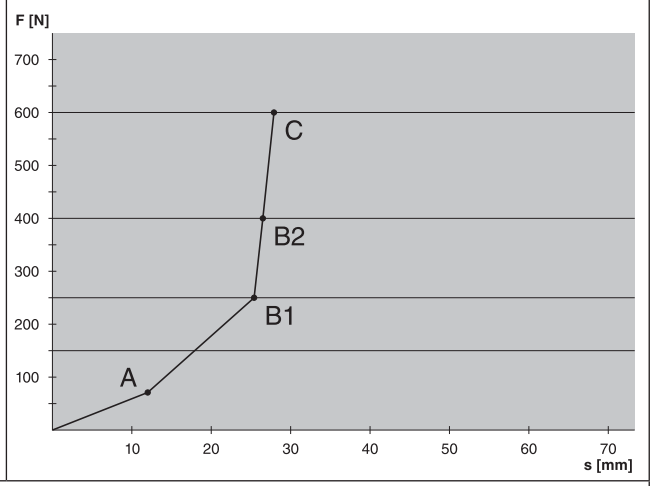
GP 48

Note:
Dimensional tolerances as per ISO 3302 E2/L2.

GP 48 NBR		GP 48 EPDM	
			
Actuation force:	< 150 N	Actuation force:	< 150 N
Response time		Response time	
at 10 mm/s	1100 ms	at 10 mm/s	1100 ms
at 200 mm/s	60 ms	at 200 mm/s	60 ms
Actuation distance (A)		Actuation distance (A)	
at 10 mm/s	11 mm	at 10 mm/s	11 mm
at 200 mm/s	12 mm	at 200 mm/s	12 mm
Overtravel distance up to 250 N (B1)		Overtravel distance up to 250 N (B1)	
at 10 mm/s	13 mm	at 10 mm/s	13 mm
at 200 mm/s	11 mm	at 200 mm/s	11 mm

Note:
Test piece (cylinder): Ø 80 mm.
Values apply at +20 °C.

Force-distance ratios

SL/NC II GP 48 NBR	SL/NC II GP 48 EPDM
	

Installation position B, temperature +20 °C, measurement point c3, test piece (cylinder) Ø 80 mm
A: Actuation distance (200 mm/s), B1/B2/C: total deformation (10 mm/s) at 250 N / 400 N / 600 N

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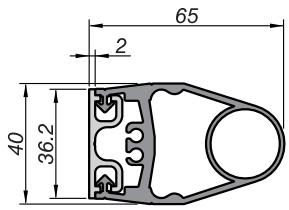
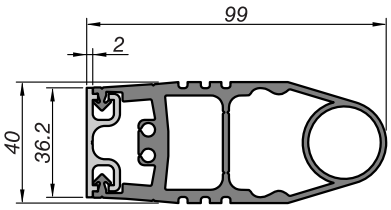
Subject to technical modifications

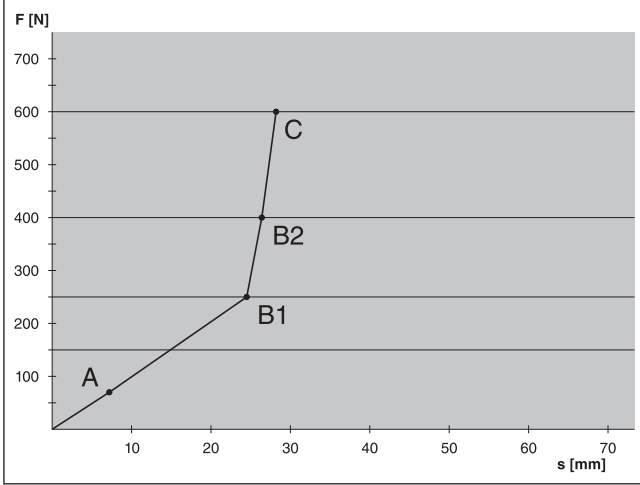
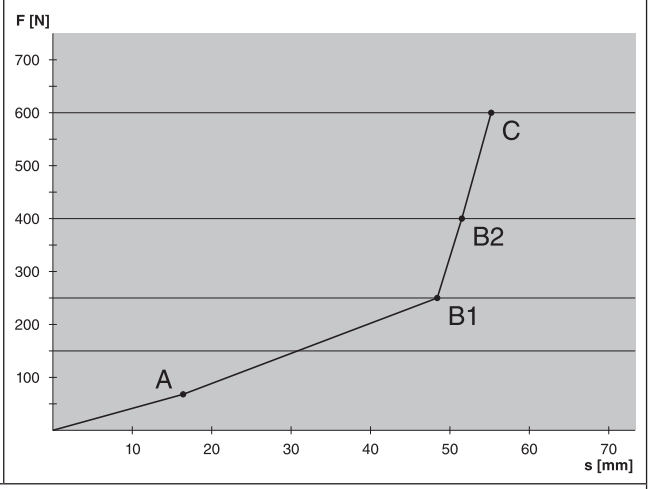
GP 65 and GP 100

GP 65 EPDM		GP 100 EPDM	
			
Actuation force:	< 150 N	Actuation force:	< 150 N
Response time		Response time	
at 10 mm/s	900 ms	at 10 mm/s	1300 ms
at 200 mm/s	40 ms	at 200 mm/s	85 ms
Actuation distance (A)		Actuation distance (A)	
at 10 mm/s	9 mm	at 10 mm/s	13 mm
at 200 mm/s	8 mm	at 200 mm/s	17 mm
Overtravel distance up to 250 N (B1)		Overtravel distance up to 250 N (B1)	
at 10 mm/s	16 mm	at 10 mm/s	31 mm
at 200 mm/s	16 mm	at 200 mm/s	26 mm

Note:
Dimensional tolerances as per ISO 3302 E2/L2.

Note:
Test piece (cylinder): Ø 80 mm.
Values apply at +20 °C.

Force-distance ratios

SL/NC II GP 65 EPDM	SL/NC II GP 100 EPDM
	

Installation position B, temperature +20 °C, measurement point c3, test piece (cylinder) Ø 80 mm
A: Actuation distance (200 mm/s), B1/B2/C: total deformation (10 mm/s) at 250 N / 400 N / 600 N

Subject to technical modifications

Physical resistance

Rubber Profile GP	EPDM	NBR
Degree of protection (IEC 60529)	IP67	IP67
Hardness per Shore A	65 ±5	70 ±5

Chemical resistance

The Safety Edge is resistant to normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

The values in the table are results of tests carried out in our laboratory to the best of our knowledge and belief. The suitability of our products for your special area of application must always be verified with your own practical tests.

Rubber Profile GP	EPDM	NBR
Acetone	+	±
Formic acid	+	+
Ammonia	+	+
Petrol	-	+
Brake fluid	±	±
Chloride solutions	+	+
Diesel oils	-	+
Greases	-	+
Household-/sanitary cleaners	+	+
Isopropyl alcohol	+	+
Cooling lubricant	-	+
Metal working oil	-	+
Methyl alcohol	+	+
Oils	-	+
Ozone and weather conditions	+	-
Hydrochloric acid 10 %	+	+
Spirit (ethyl alcohol)	+	+
Carbon tetrachloride	-	+
Hydrogen peroxide 10 %	+	+
Water and frost	+	-

Explanation of symbols:
+ = resistant
± = limited resistance
- = not resistant

Note:
Tests are carried out at room temperature (+23 °C).

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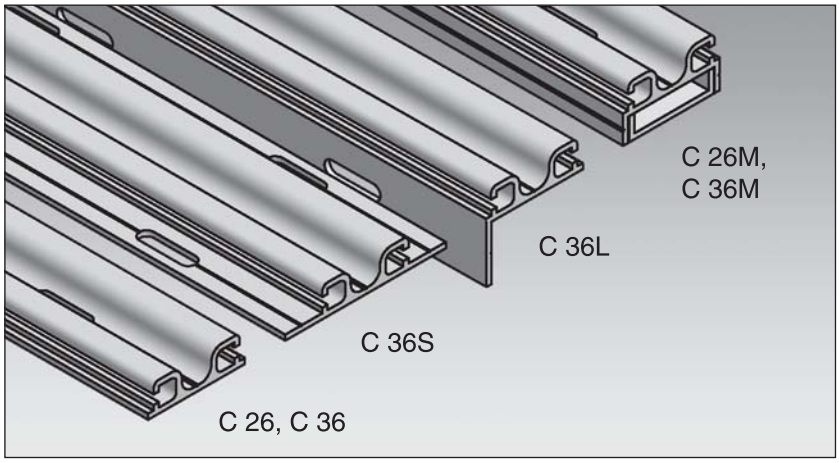
Subject to technical modifications

Fixing rails

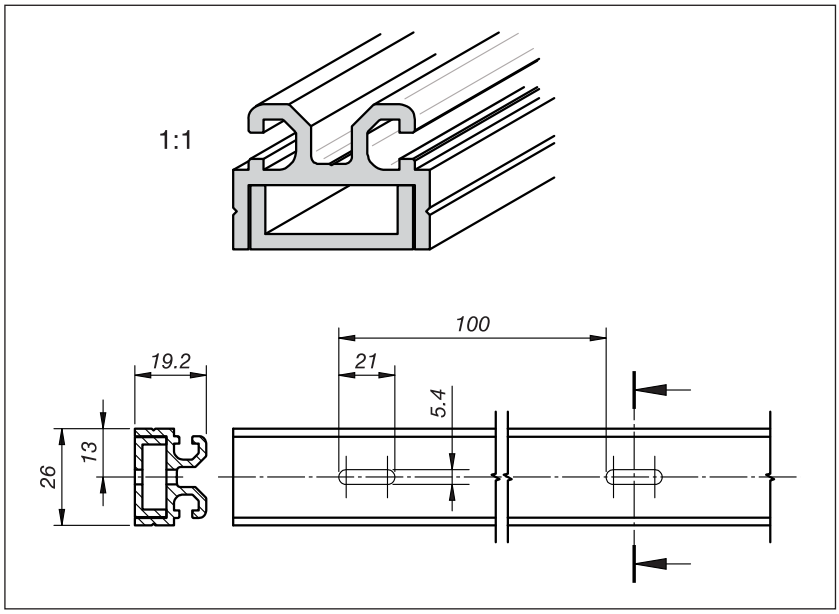
Normally closed Safety Edges SL/NC II are mounted directly to the dangerous main and secondary closing edges. The C26 and C 36 ranges of aluminium profiles are used for mounting. The aluminium profiles are mounted with M5 screws or rivets.



Material properties

- AlMgSi0.5 F22
- Wall thickness 2 mm
- Tolerances as per EN 755-9
- extruded
- hot hardened

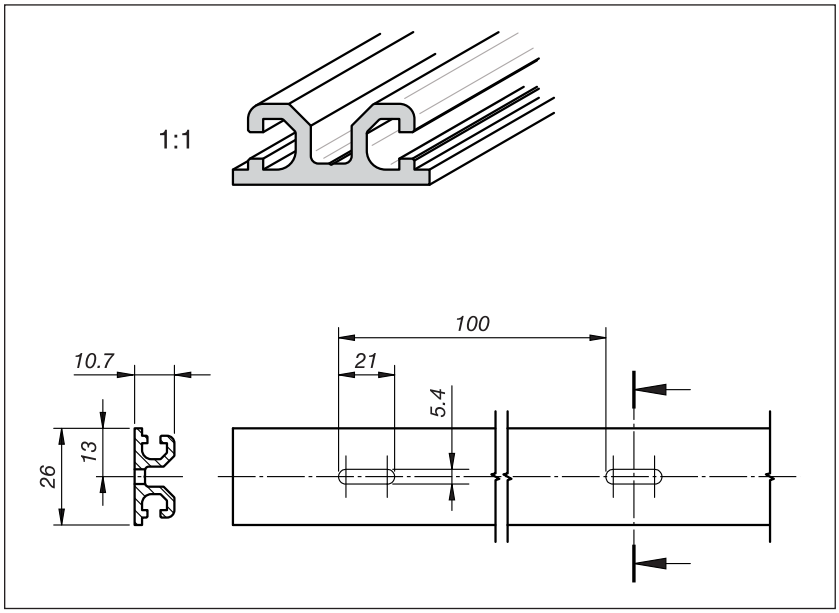
Aluminium profile C 26M



Two-part profile for GP 48:
For convenient assembly and disassembly. The rubber profile is clipped into the upper section and the upper section inserted in the installed lower section and fastened.

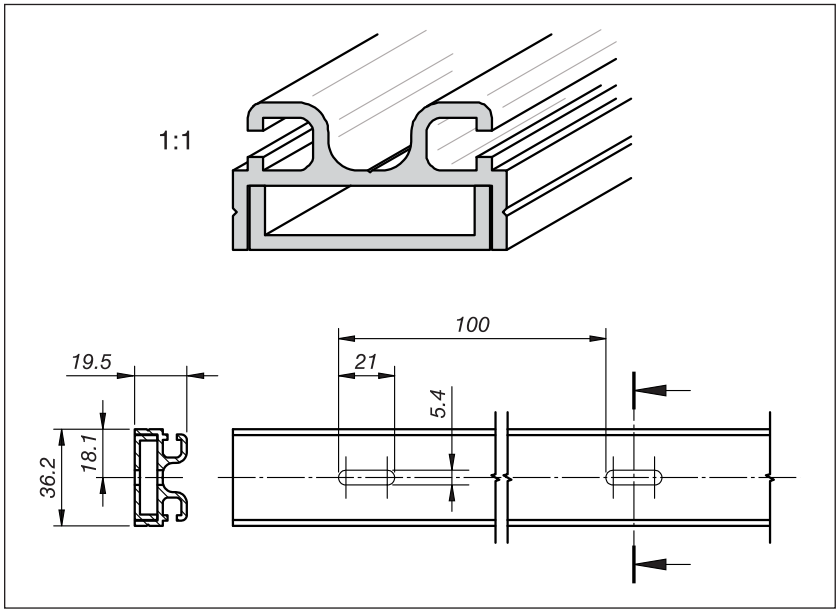
Subject to technical modifications

Aluminium profile C 26



Standard profile for GP 48:
The aluminium profile must first be installed on the closing edge and the rubber profile can than be clipped into the aluminium profile.

Aluminium profile C 36M



Two-part profile for GP 65 and GP 100:
For convenient assembly and disassembly. The rubber profile is clipped into the upper section and the upper section inserted in the installed lower section and fastened.

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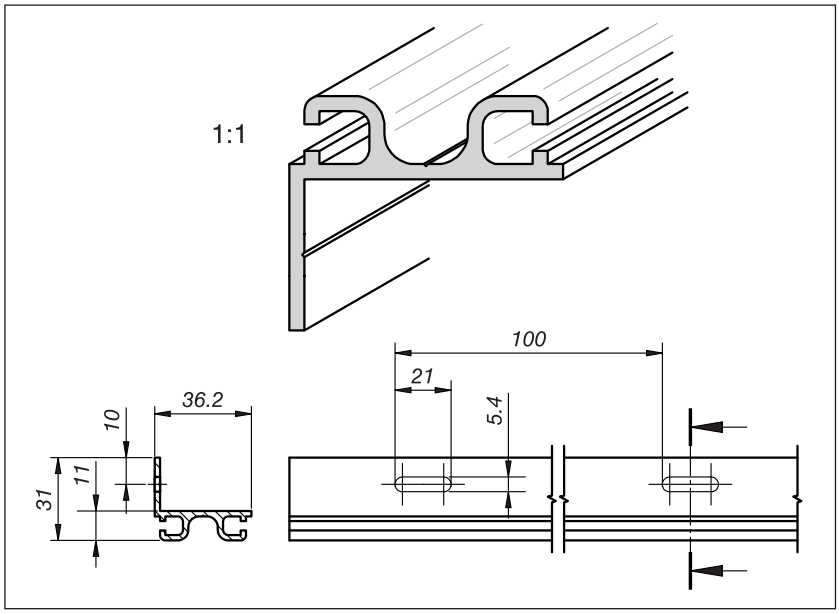
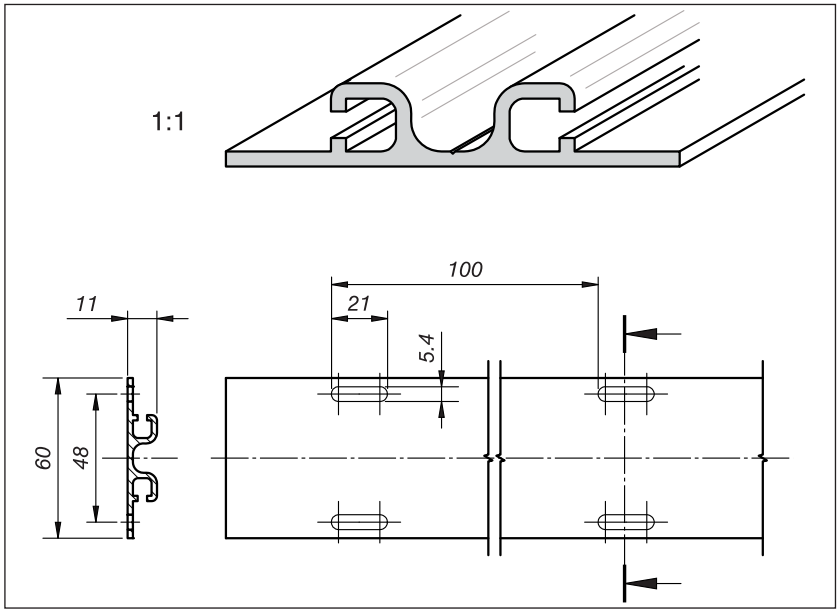
Subject to technical modifications

Aluminium profile C 36L



Angle profile for GP 65 and GP 100:
If the closing edge should or must not have assembly holes, this angle solution is suitable. Final assembly is also possible when the rubber profile is already clipped into the aluminium profile.

Aluminium profile C 36S



Flange profile for GP 65 and GP 100:
Final assembly is also possible when the rubber profile is already clipped into the aluminium profile.

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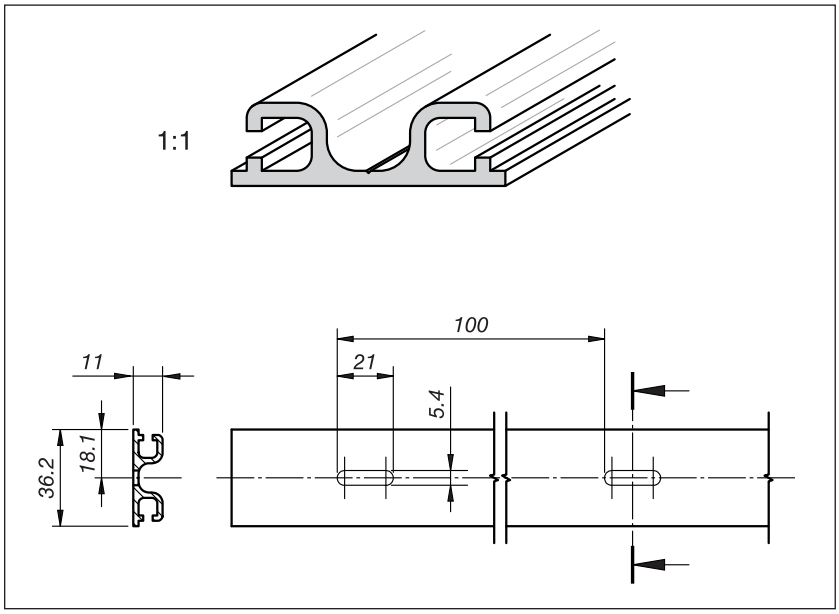
Subject to technical modifications

Aluminium profile C 36



Standard profile for GP 65 and GP 100:
The aluminium profile must first be installed on the closing edge and the rubber profile can than be clipped into the aluminium profile.

Aluminium-profiles: Overview of combinations

Explanation of symbols:
● = Standard
○ = Option

	C 26M	C 26	C 36M	C 36L	C 36S	C 36
GP 48	○	●				
GP 65			○	○	○	●
GP 100			○	○	○	●

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Subject to technical modifications

SL/NC II: The right selection

Calculation for selection of the Safety Edge height

The stopping distance of the dangerous movement is calculated using the following formula:

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$

In accordance with EN 13856-2 appendix C, the minimum overtravel distance of the Safety Edge is calculated using the following formula:

$s = s_1 \times C$ where: $C = 1.2$

A suitable Safety Edge profile can now be selected based on the result. Overtravel distances of normally closed Safety Edges: see "Rubber profiles", chapter "Dimensions and operating distances".

s_1 = Stopping distance of the dangerous movement [mm]
v = Velocity of the dangerous movement [mm/s]
T = Follow-through time of the complete system [s]
t_1 = Response time Safety Edge
t_2 = Stopping time of the machine
s = Minimum overtravel distance of the Safety Edge so that the pinching force does not exceed a limit value [mm]
C = Safety factor; if components susceptible to failures (braking system) exist in the system, a higher factor must be selected.

Calculation examples

Calculation example 1
The dangerous movement on your machine has a velocity of v = 10 mm/s and can be brought to a standstill within t_2 = 250 ms. The relatively low velocity suggests that a short overtravel distance is to be expected. Therefore the Safety Edge SL/NC II GP 48 NBR could be sufficient. The response time of the Safety Edge is t_1 = 1100 ms.

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$
$s_1 = 1/2 \times 10$ mm/s $\times$ (1100 ms + 250 ms)
$\mathbf{s_1} = 1/2 \times 10$ mm/s $\times$ 1.35 s **= 6.75 mm**

$s = s_1 \times C$ where: $C = 1.2$
s = 6.75 mm $\times$ 1.2 **= 8.1 mm**

The Safety Edge must have a minimum overtravel distance of s = 8.1 mm. The selected SL/NC II GP 48 NBR has an overtravel distance of at least 13 mm. This is more than the required 8.1 mm.
Result: The SL/NC II GP 65 EPDM is **suitable** for this case.

Calculation example 2
The same conditions as in calculation example 1 with the exception of the velocity of the dangerous movement. This is now v = 100 mm/s.

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$
$s_1 = 1/2 \times 100$ mm/s $\times$ (120 ms + 250 ms)
$\mathbf{s_1} = 1/2 \times 100$ mm/s $\times$ 0.37 s **= 18.5 mm**

$s = s_1 \times C$ where: $C = 1.2$
s = 18.5 mm $\times$ 1.2 **= 22.2 mm**

The Safety Edge must have a minimum overtravel distance of s = 22.2 mm. The selected SL/NC II GP 48 NBR has an overtravel

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distance of at least 12 mm. This is less than the required 22.2 mm.
Result: The SL/NC II GP 48 NBR is **not suitable** for this case.

Calculation example 3
The same conditions as in calculation example 2. Instead of SL/NC II GP 48 NBR the SL/NC II GP 100 EPDM is selected. The response time of the Safety Edge is t_1 = 170 ms.

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$
$s_1 = 1/2 \times 80$ mm/s $\times$ (170 ms + 250 ms)
$\mathbf{s_1} = 1/2 \times 80$ mm/s $\times$ 0.42 s **= 21 mm**

$s = s_1 \times C$ where: C = 1.2

Tip:
See appendix C and E of ISO 13856-2 for further selection criteria.

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Subject to technical modifications

Accessories

Extension kit

For extension of connection cable by customer (contents: double insulated wire, crimp connector and heat-shrinkable sleeves)

Extension kit 5 m	1003870
Extension kit 10 m	1003871

Wiring aids

Diode	1003872
Special resistor 1k2	1003873
Special resistor 8k2	1003874

Conformity

The CE symbol indicates that this Mayser product complies with the relevant EC directives and that the stipulated conformity assessments have been carried out. The design type of this Mayser product complies with the EC Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC.

Certificates

UL certification	U8V 10 31146 006

Technical data

Normally Closed Safety Edge SL/NC II consisting of sensor and aluminium profile from the profile range C 26.

	GP 48 NBR	**GP 48 EPDM**
Testing basis	ISO 13856-2	ISO 13856-2
Switching characteristics at v_{test} = 200 mm/s		
Switching operations at 0.1 A Actuation force Actuation distance Response time Effective actuation angle	> 5× 10^4 < 150 N 12 mm 60 ms 60°	> 5× 10^4 < 150 N 12 mm 60 ms 60°
Safety classifications		
EN 1760: Reset ISO 13849-1:2006 for systems design up to B_{10d}	without Category 1 Category 3 2× 10^6	without Category 1 Category 3 2× 10^6
Mechanical operating conditions		
Sensor length (min./max.) Cable length (min./max.) Operating velocity (min./max.) Max. load capacity (Impuls) IEC 60529: Degree of protection Max. humidity (23 °C) Operating temperature Storage temperature Weight (incl. C 26)	30 cm / 6 m 1.5 m / 200 m 10 mm/s to 200 mm/s 600 N IP67 95% (non-condensing) +5 to +55 °C -20 to +80 °C 1.0 kg/m	30 cm / 6 m 1.5 m / 200 m 10 mm/s to 200 mm/s 600 N IP67 95% (non-condensing) +5 to +55 °C -20 to +80 °C 1.0 kg/m
Electrical operating conditions		
Switching voltage (PELV) Switching current Contact fuse protection, external Connection cable	max. 48 V DC max. 48 V AC 50/60 Hz max. 0.2 A 250 mA inert Ø 3.3 mm PVC 1× 0.5 mm²	max. 48 V DC max. 48 V AC 50/60 Hz max. 0.2 A 250 mA inert Ø 3.3 mm PVC 1× 0.5 mm²
Chemical resistance		
	The sensor is resistant to normal chemical influences over an exposure period of 24 hours (see page 10).	
Maintenance, service		
Maintenance Monitoring Inspection	The Safety Edge is maintenance-free. Possible via external control. • Depending on the amount of use, the Safety Edges are to be checked regularly for correct operation and visible signs of damage by manual operation or by applying the relevant test piece (cylinder). • The correct position of the rubber profile in the aluminium profile is to be checked.	
Dimensional tolerances		
Rubber profile Aluminium profile	ISO 3302 E2/L2 EN 755-9	ISO 3302 E2/L2 EN 755-9

Subject to technical modifications

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Technical data

Normally Closed Safety Edge SL/NC II consisting of sensor and aluminium profile from the profile range C 36.

	GP 65 EPDM	**GP 100 EPDM**
Testing basis	ISO 13856-2	ISO 13856-2
Switching characteristics at v_{test} = 200 mm/s		
Switching operations at 0.1 A Actuation force Actuation distance Response time Effective actuation angle	> 5× 10^4 < 150 N 8 mm 40 ms 90°	> 5× 10^4 < 150 N 17 mm 85 ms 90°
Safety classifications		
EN 1760: Reset ISO 13849-1:2006 for systems design up to B_{10d}	without Category 1 Category 3 2× 10^6	without Category 1 Category 3 2× 10^6
Mechanical operating conditions		
Sensor length (min./max.) Cable length (min./max.) Operating velocity (min./max.) Max. load capacity(Impuls) IEC 60529: Degree of protection Max. humidity (23 °C) Operating temperature Storage temperature Weight (incl. C 36)	30 cm / 6 m 1.5 m / 200 m 10 mm/s to 200 mm/s 600 N IP67 95% (non-condensing) -10 °C to +55 °C -20 °C to +80 °C 1.9 kg/m	300 mm / 6000 mm 1.5 m / 200 m 10 mm/s to 200 mm/s 600 N IP67 95% (non-condensing) -10 °C to +55 °C -20 °C to +80 °C 2.1 kg/m
Electrical operating conditions		
Switching voltage (PELV) Switching current Contact fuse protection, external Connection cable	max. 48 V DC max. 48 V AC 50/60 Hz max. 0.2 A 250 mA inert Ø 3.3 mm PVC 1× 0.5 mm^2	max. 48 V DC max. 48 V AC 50/60 Hz max. 0.2 A 250 mA inert Ø 3.3 mm PVC 1× 0.5 mm^2
Chemical resistance		
	The sensor is resistant to normal chemical influences over an exposure period of 24 hours (see page 10).	
Maintenance, service		
Maintenance Monitoring Inspection	The Safety Edge is maintenance-free. Possible via external control. • Depending on the amount of use, the Safety Edges are to be checked regularly for correct operation and visible signs of damage by manual operation or by applying the relevant test piece (cylinder). • The correct position of the rubber profile in the aluminium profile is to be checked.	
Dimensional tolerances		
Rubber profile Aluminium profile	ISO 3302 E2/L2 EN 12020-2	ISO 3302 E2/L2 EN 12020-2

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MAYSER®

Request for quotation

Fax:

+49 731 2061-222

From

Company

Department

Name, first name

P. O. Box | Post code | City

Street | Post code | City

Phone | Fax | E-mail

⇩ Please keep free ⇩
For internal use only

Area of application

(e.g. door and gate systems, machine closing edges, textile machines, local public transport, ...)

Environmental conditions

❑ dry ❑ water ❑ oil

❑ aggressive sub-stances:
❍ Coolant, type: _____
❍ Solvent, type:_____
❍ other: _____

❑ room temperature ❑ other: from _____ °C to _____°C

Mechanical conditions

❑ The stopping distance of the system is max. ____ mm

❑ cable exit version ____

❑ number of monitoring circuits: ____ ❑ SG- _____

Pinching and shearing edges to be protected:

(Sketch incl. mounting possibility and cable routing)

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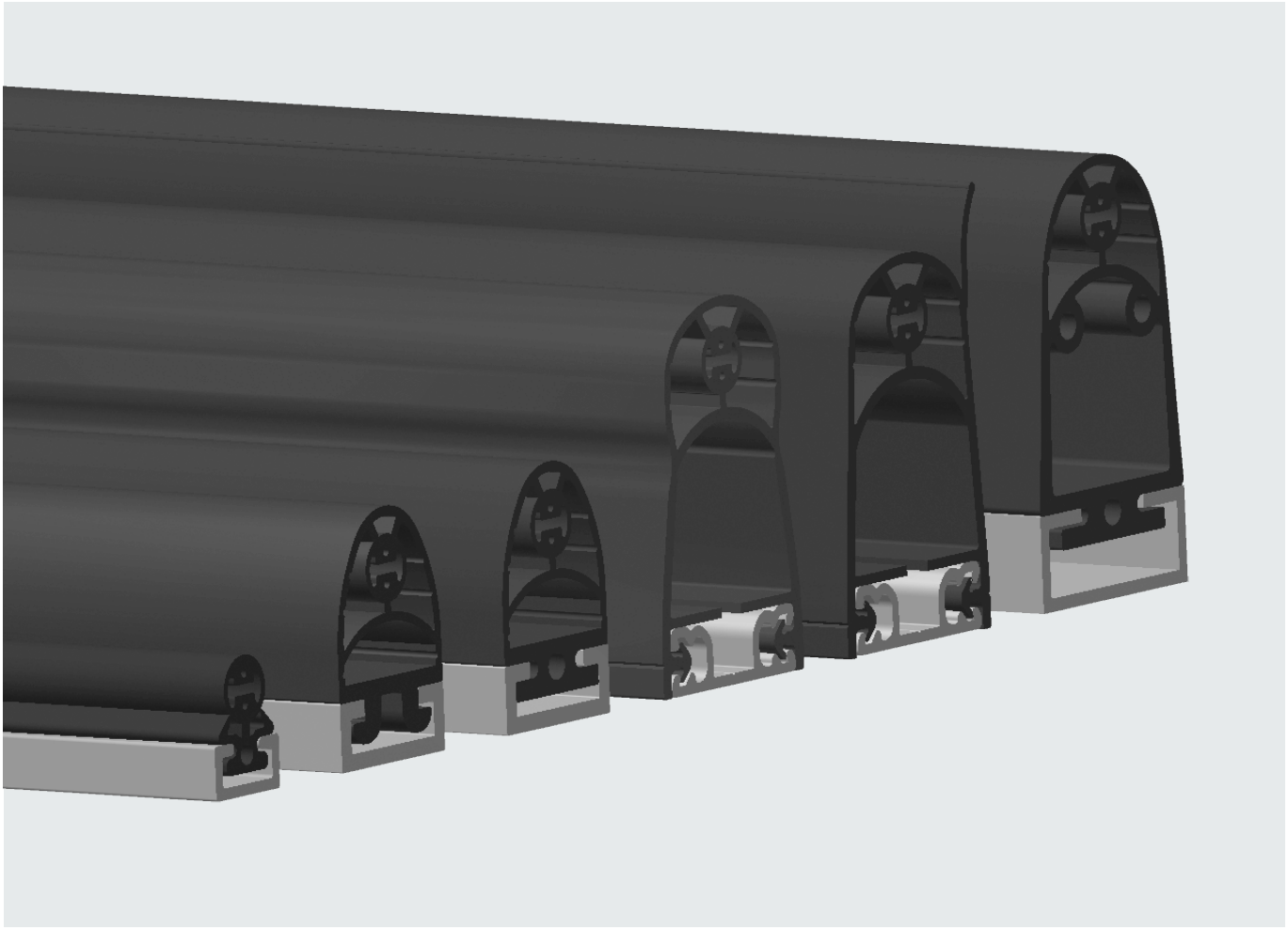
Innovative by tradition.



DIY sensor profiles

EN | Product information

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Important information

Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.

Always observe the safety instructions on the following pages under **ATTENTION.** Only use the product for the purpose described in the product information.

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Subject to technical modifications.

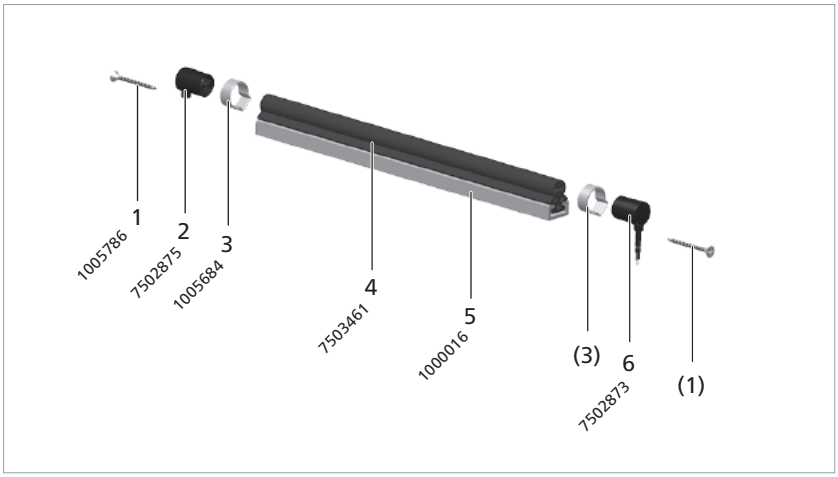
Overview

Contact profile – Sensor profile

The semi-finished contact profile (4) is cut to length and assembled with the other components. The functioning product is then called a sensor profile.

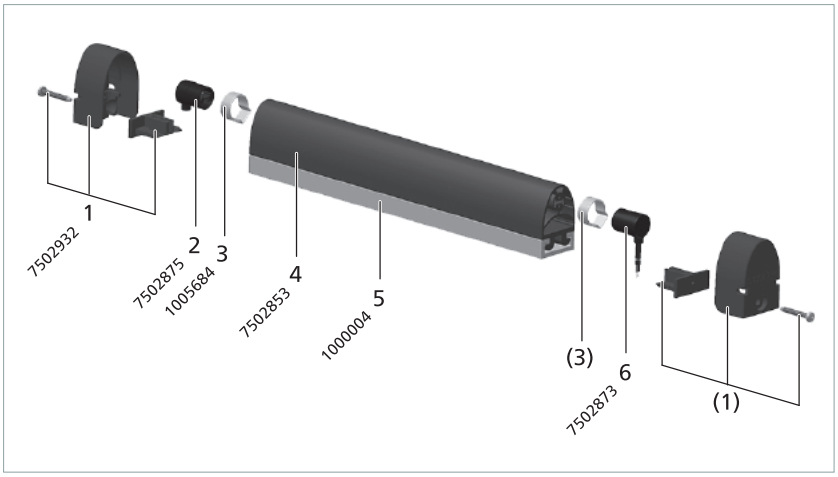
SP 17-3 without end caps

1 Countersunk tapping screw
2 Closing plug with resistor
3 Ear clamp
4 Contact profile
5 Aluminium profile
6 Closing plug with cable



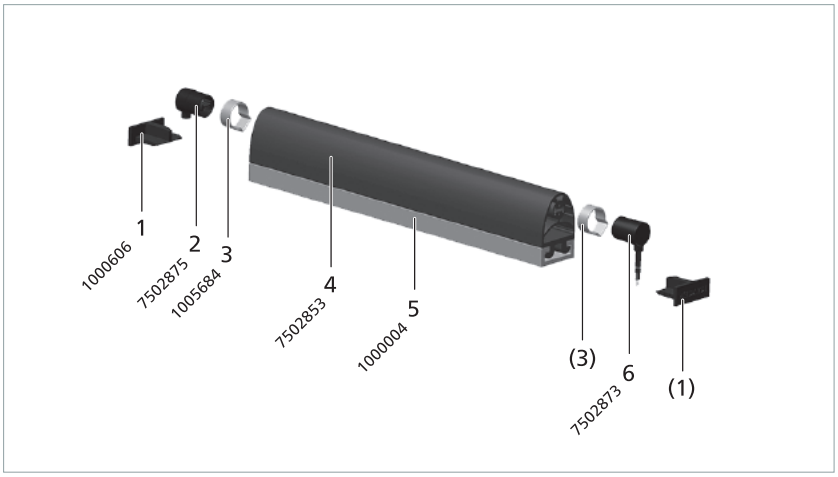
SP 37-1 with end caps

1 Set of end caps
2 Closing plug with resistor
3 Ear clamp
4 Contact profile
5 Aluminium profile
6 Closing plug with cable



SP 37-1 without end caps

1 End stoppers
2 Closing plug with resistor
3 Ear clamp
4 Contact profile
5 Aluminium profile
6 Closing plug with cable



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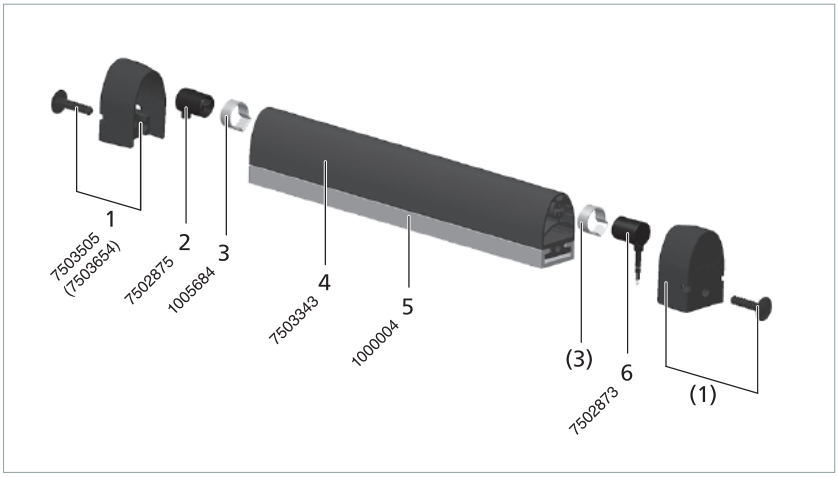
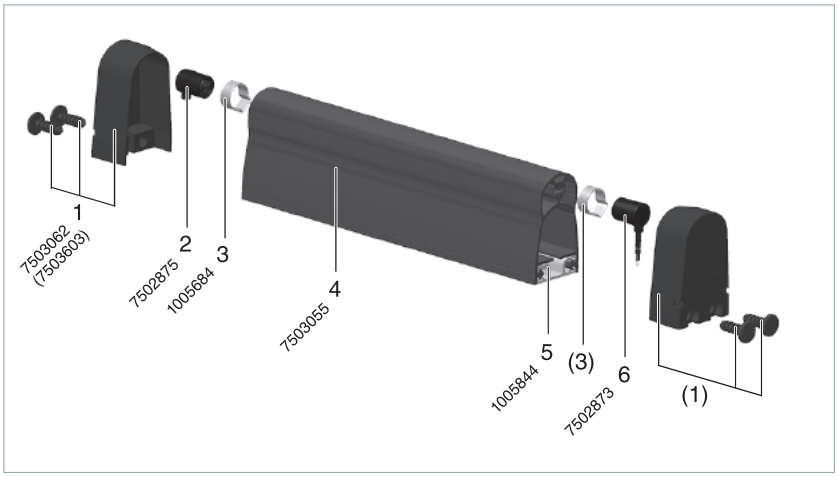


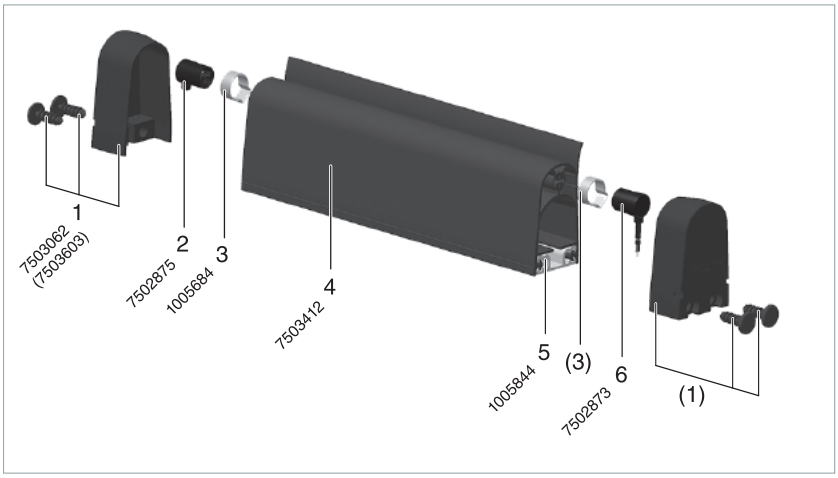
SP 37-3 with end caps

1 Set of end caps
2 Closing plug with resistor
3 Ear clamp
4 Contact profile
5 Aluminium profile
6 Closing plug with cable



SP 57-2 with end caps

1 Set of end caps
2 Closing plug with resistor
3 Ear clamp
4 Contact profile
5 Aluminium profile
6 Closing plug with cable



SP 57L-2 with end caps

1 Set of end caps
2 Closing plug with resistor
3 Ear clamp
4 Contact profile
5 Aluminium profile
6 Closing plug with cable

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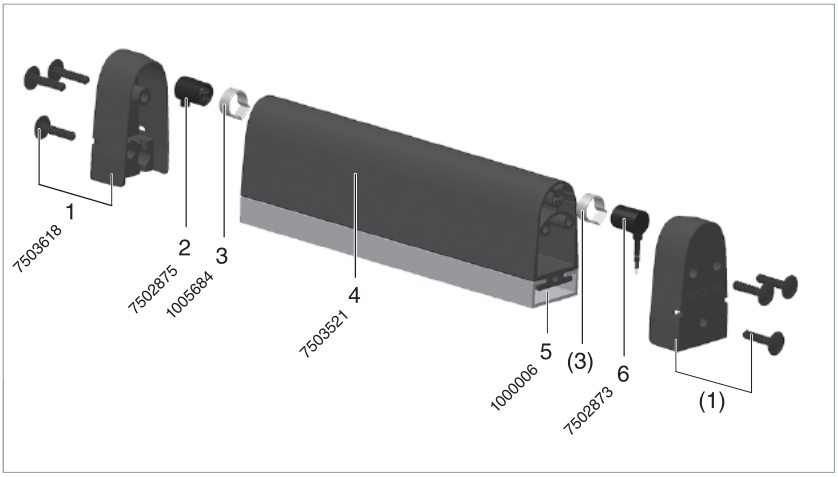
Subject to technical modifications.

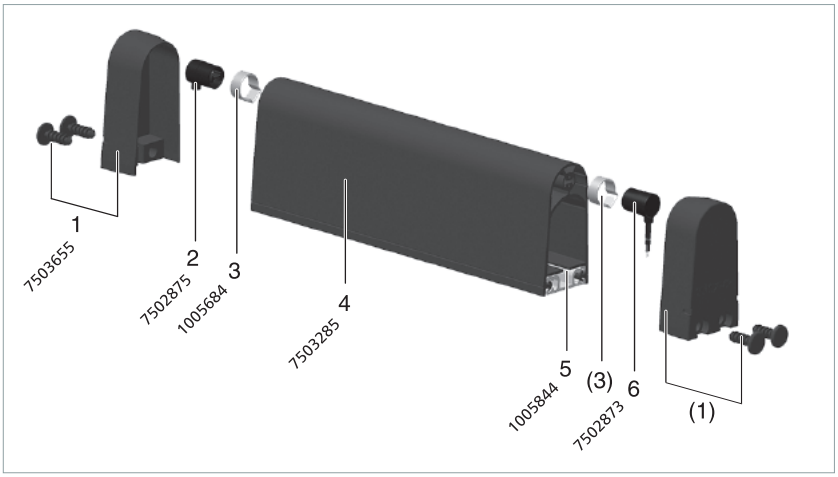
SP 57-3 with end caps

1 Set of end caps
2 Closing plug with resistor
3 Ear clamp
4 Contact profile
5 Aluminium profile
6 Closing plug with cable



SP 67-2 with end caps

1 Set of end caps
2 Closing plug with resistor
3 Ear clamp
4 Contact profile
5 Aluminium profile
6 Closing plug with cable



Materials list

Part No.	Designation	Packing unit
7503461	Contact profile SP 17-3 TPE	80 m
7502853	Contact profile SP 37-1 TPE	30 m
7503343	Contact profile SP 37-3 TPE "black"	30 m
7503534	Contact profile SP 37-3 TPE "red"	30 m
7503055	Contact profile SP 57-2 TPE	30 m
7503412	Contact profile SP 57L-2 TPE	30 m
7503521	Contact profile SP 57-3 TPE	25 m
7503285	Contact profile SP 67-2 TPE	30 m
7502875	Closing plug with resistor 8k2	10 pc.
7502873	Closing plug with PUR cable 2.5 m, angled 90°	10 pc.

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Part No.	Designation	Packing unit
1005684	Ear clamp for closing plug	20 pc.
7502932	End cap set "hard" for SP 37-1: each containing 2 **hard** end caps, fixing stoppers and screw 3.9×25	10 pc.
7503008	End cap set "soft" for SP 37-1: each containing 2 **soft** end caps, fixing stoppers and screw 3.9×25	10 pc.
7503505	End cap set "soft" for SP 37-3 "black": each containing 2 **soft** end caps and pine tree clip	10 pc.
7503654	End cap set "soft" for SP 37-3 "red": each containing 2 **soft** end caps and pine tree clip	10 pc.
7503062	End cap set "soft" for SP 57(L)-2: each containing 2 **soft** end caps, fixing stoppers and 4 screws 5×20	10 pc.
7503603	End cap set "soft" for SP 57(L)-2 with clip: each containing 2 **soft** end caps and 4 pine tree clips	10 pc.
7503618	End cap set "soft" for SP 57-3: each containing 2 **soft** end caps and 6 pine tree clips	10 pc.
7503655	End cap set "soft" for SP 67-2: each containing 2 **soft** end caps and 4 pine tree clips	10 pc.
1005786	Countersunk tapping screw 3.5×25 for SP 17-3	20 pc.
1000016	Aluminium profile C 15	6 m
1000854	Aluminium profile C 25M, upper section	6 m
1000855	Aluminium profile C 25M, lower section	6 m
1000012	Aluminium profile C 25S	6 m
1000004	Aluminium profile C 25	6 m
1005844	Aluminium profile C 30	6 m
1000006	Aluminium profile C 35	6 m
1001223	End stopper for C 25M, for SP without end caps	1 pc.
1000606	End stopper for C 25 or C 25S, for SP without end caps	1 pc.
1004988	Scissors with stop, cutting length 87 mm	1 pc.
7502868	Assembly aid SH3	1 pc.
1005741	Notching pliers Knipex 7742115	1 pc.
1005729	Vice-grip pliers Knipex System Oetiker 1099	1 pc.

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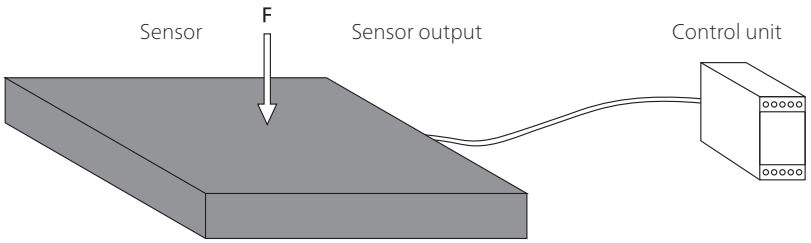
Definitions

Pressure-sensitive protection device

A pressure-sensitive protection device consists of pressure-sensitive sensor(s), signal processing and output signal switching device(s). The control unit is made up of the signal processing and output signal switching device(s). The pressure-sensitive protection device is triggered when the sensor is activated.



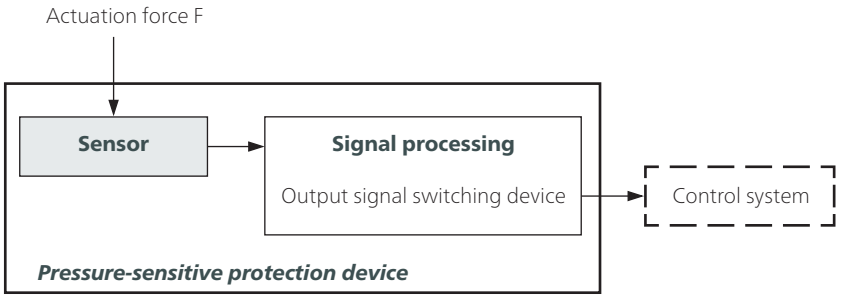
Note:
See also chapter 3 **Terms** in ISO 13856-2.

Sensor

The sensor is the part of the pressure-sensitive protection device that generates a signal when the actuating force F is applied. Mayser safety systems have a sensor whereby the actuating surface is deformed locally.

Signal processing

The signal processing is the part of the pressure-sensitive protection device that converts the output signal of the sensor and controls the status of the output signal switching device. The output signal switching device is that part of the signal processing which is connected to the machine controls and transmits safety output signals such as STOP.



The cut-to-size SP sensor profile is typically used as a safety edge sensor.

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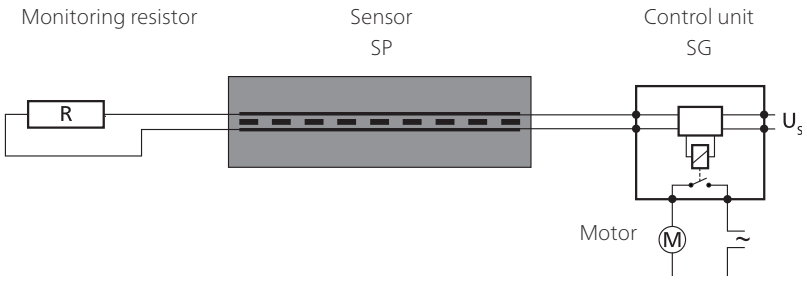
Subject to technical modifications.

Criteria for selecting the sensor type

- B_{10D}-value according to ISO 13849-1
- Performance level of pressure-sensitive protection device = at least PL_r
- Temperature range
- Degree of protection in accordance with IEC 60529:
  IP65 is the standard for safety edges.
  Higher degrees of protection must be checked individually.
- Environmental influences such as swarf, oil, coolant, outdoor use...
- Finger detection necessary?

ATTENTION:
In the idle state, no pressure must be applied to the sensors.

Operation principle 2-wire-technology



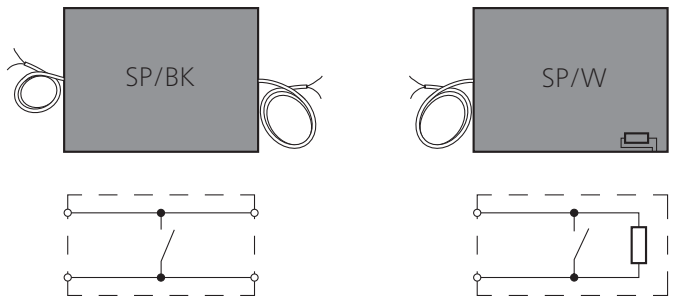
The monitoring resistor must be compatible with the control unit.
Standard value is 8k2.

For your safety:
Sensor and connecting cables are constantly monitored for function.
Monitoring is carried out by controlled bridging of the contact surfaces with a monitoring resistor (closed current principle).

Design

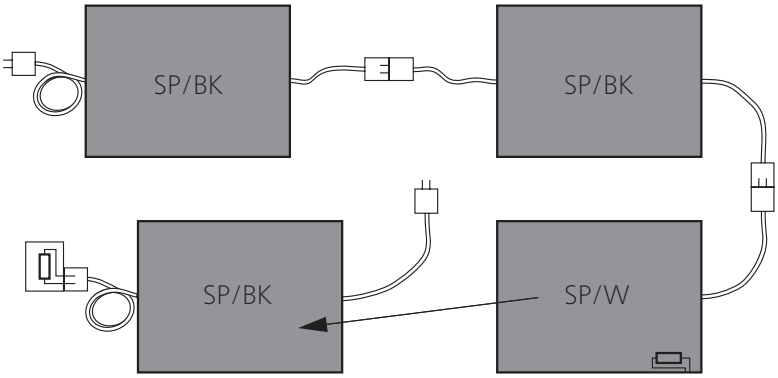
SP/BK with cables on both sides as a through sensor or as an end sensor with external monitoring resistor

SP/W as an end sensor with integrated monitoring resistor



Subject to technical modifications.

Combination of sensors



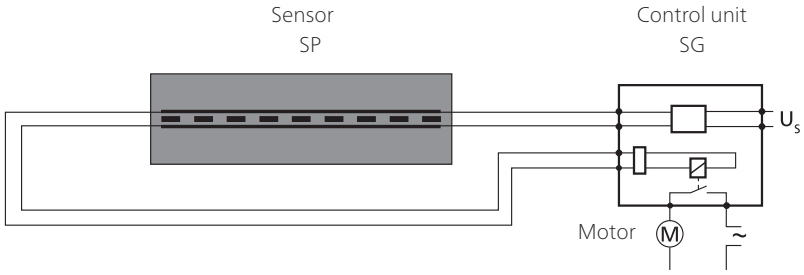
Model with external resistor, thus avoiding variety in type

Combination:

- Connection of more than one sensor
- Only one control unit required
- Safety edge design with custom lengths and angles

Operation principle 4-wire-technology

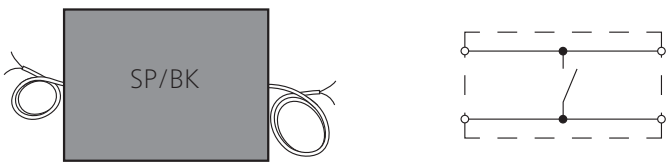
Note:
The 4-wire technology can be used only together with control unit SG-EFS 104/4L.



For your safety:
Sensor and connecting cables are constantly monitored for function. This is possible because of signal transmission feedback – without monitoring resistor.

Design

SP/BK with cables on both sides as a through sensor



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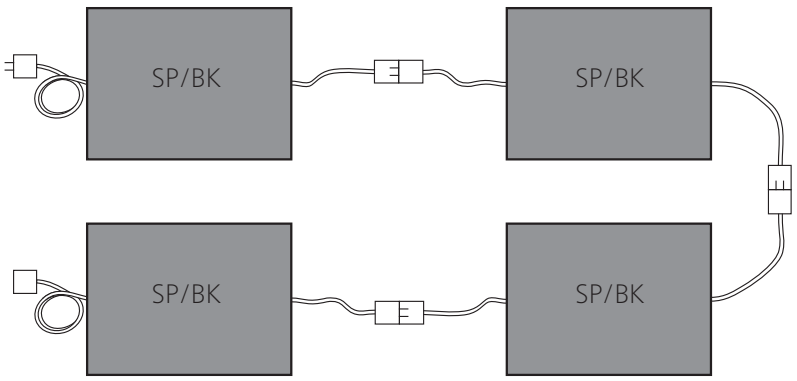
Subject to technical modifications.

Combination of sensors



Combination:

- Connection of more than one sensor
- Only one control unit required
- Safety edge design with custom lengths and angles

Intended use

A safety edge detects a person or part of the body when pressure is applied to the actuation area. It is a linear tripping device. Its task is to avoid possible hazardous situations for a person within a danger zone, such as shearing and pinching edges.
Typical areas of application are door and gate systems, moving parts on machines, platforms and lifting devices.
Safe operation of a safety edge depends entirely on

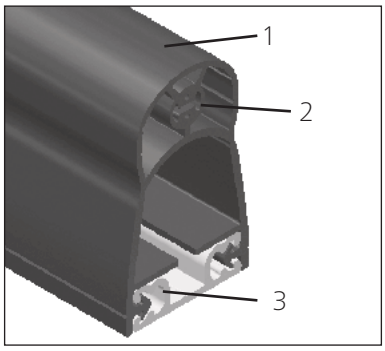
- the surface condition of the mounting surface,
- the correct selection of the size and resistance as well as
- correct installation.

Tip:
See Annex E of ISO 13856-2.

Limits

- max. 3 sensors type BK on one control unit
- max. 2 sensors type BK and 1 sensor type W on one control unit

Design



The normally open Safety edge SP consists of
one sensor (1 to 3)
(1) Contact profile,
(2) Integrated normally open safety element,
(3) Aluminium profile C 25 or C 30 and an evaluating control unit SG.

Tip
For the risk and safety assessment of your machine, we recommend ISO 12100 "Safety of machinery – Basic concepts, general principles for design".

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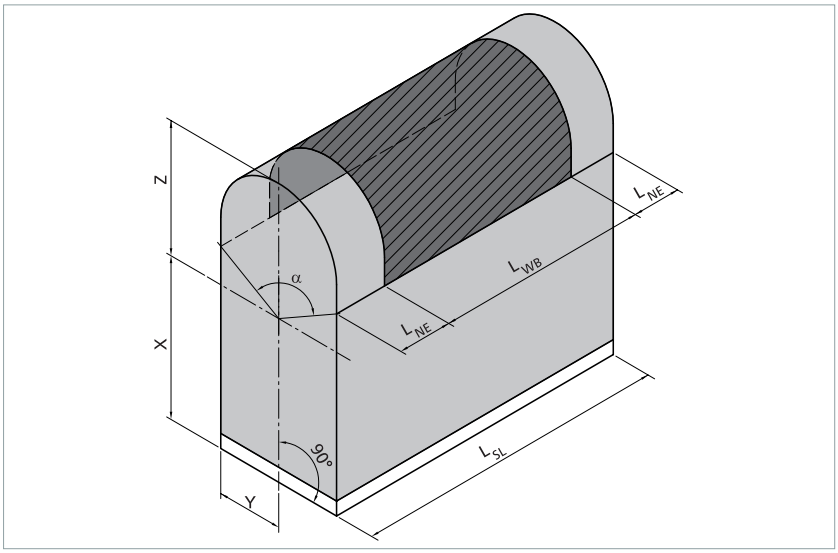
Subject to technical modifications.

Effective actuation area

The parameters X, Y, Z, L_{NE} and the angle α describe the effective actuation area.
For the effective actuation area, the following applies:

$$L_{WB} = L_{SP} - 2 \times L_{NE}$$



Parameters:
L_{WB} = effective actuation length
L_{SP} = total length of sensor profile
L_{NE} = non-sensitive length at end of sensor profile
α = effective actuation angle

	SP 17-3 [1]	SP 37-1 [2]	SP 37-1 [3]	SP 37-1 [1]	SP 37-3 [3]	SP 57-2 [3]	SP 57L-2 [3]	SP 57-3 [3]	SP 67-2 [3]
α	90°	100°	100°	120°	100°	90°	90°	90°	90°
L_{NE}	60 mm	60 mm	20 mm	20 mm	20 mm	10 mm[7]	10 mm [7]	10 mm [7]	20 mm [7]
X	7.3 mm	28 mm [4]	28 mm [4]	28 mm [4]	28 mm [4]	44 mm	44 mm	52 mm [6]	57,3 mm
Y	6.7 mm	12.5 mm	12.5 mm	12.5 mm	12.5 mm	17 mm	17 mm	17.5 mm	17 mm
Z	5 mm	9 mm	9 mm	9 mm	9 mm	12 mm	12 mm [5]	12 mm	10 mm

[1] without end cap [2] with hard end cap [3] with soft end cap [4] aluminium profile C 25 included
[5] without lip [6] aluminium profile C 35 included [7] for finger protection

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Subject to technical modifications.

Installation position

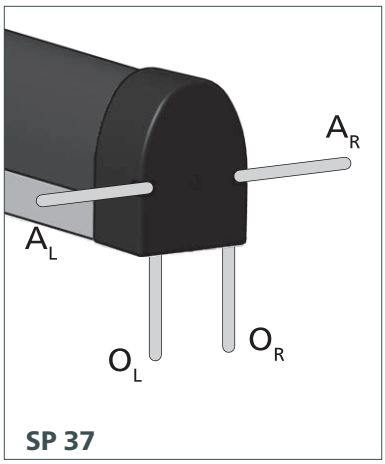
The installation position can be selected as required, i.e. all installation positions A to D as per ISO 13856-2 are possible.

Connection

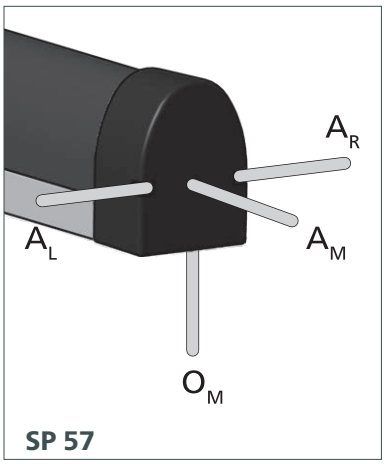
Cable exits

Depending on the end cap, there are 6 possible cable exits.

A = axial
O = orthogonal
L = left
M = middle
R = right

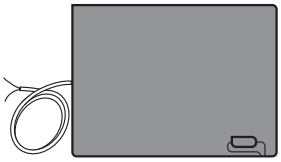


SP 37



SP 57

Cable connection



Sensor type W
- As an individual sensor type W or an end sensor type W
- Integrated resistor
- 2-wire cable (Ø 2.9 mm PUR, 2× 0.25 mm² Cu)

Sensor type BK with 2 lines
- As a feed-through sensor type BK
- Without resistor
- 2 two-wire cable (Ø 2.9 mm PUR, 2× 0.25 mm² Cu)

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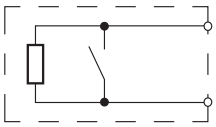
Subject to technical modifications.

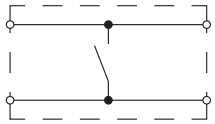
Wire colours

Sensor type W



Colour coding
RD Red BK Black

Sensor type BK with 2 lines



Contact profiles

Physical resistance

Sensor Profile SP	TPE
IEC 60529: Degree of protection UV-resistance	IP67 +

Explanation of symbols:
+ = resistant

Chemical resistance

The sensor is resistant against normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

The values in the table are results of tests carried out in our laboratory. The suitability of our products for your special area of application must always be verified with your own practical tests.

Explanation of symbols:
+ = resistant
± = resistant to a certain extent
- = not resistant

Material	TPE
Acetone	-
Formic acid	-
Armor All	+
Car shampoo	+
Petrol	-
Brake fluid	+
Buraton	+
Butanol	-
Sodium hypochlorite	-
Disinfectant 1 %	+
Diesel	-
Acetic acid 10 %	-
Ethanol	+
Ethyl acetate	-
Ethylene glycol	+
Greases	±
Anti-frost agent	+
Skin cream	+
Icidine	+
Incidine	+
Incidine plus	+
Cooling lubricant	-
Plastic cleaner	+
Lyso FD 10	+
Metal working oil	-
Microbac	+
Microbac forte	+
Minutil	+
Saline solution 5 %	+
White spirit (ethyl alcohol)	+
Terralin	+
Centring oil	-

Note:
Tests are carried out at room temperature (+23 °C).

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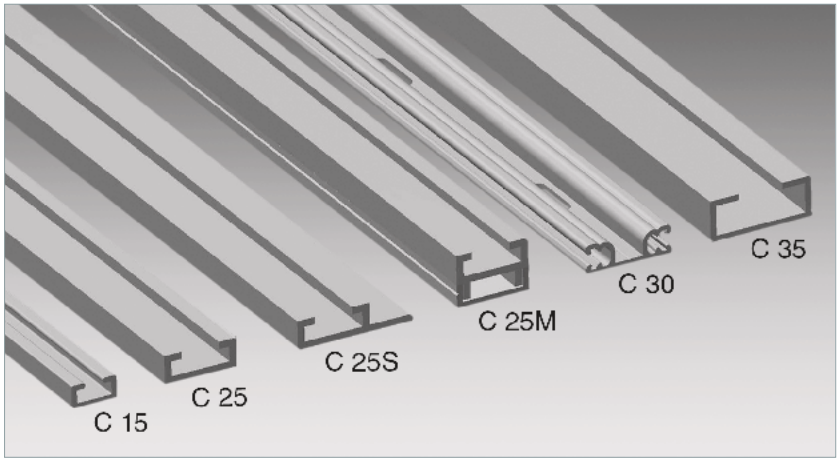
Subject to technical modifications.

Attachment

Sensor Profiles SP are mounted directly onto the main and secondary closing edges that present a danger. They are mounted using the aluminium profile C 15, the aluminium profiles from the C 25 aluminium profile range and also the C 30 aluminium profile. Mount the aluminium profiles with M5 screws or rivets.



Material properties

- AlMgSi0.5 F22
- Wall thickness at least 2 mm
  C 30: at least 1.5 mm
  C 15: at least 1.7 mm
- Hot hardened
- Extruded
- Tolerances as per EN 755-9

Aluminium profiles:

Overview of combinations

Aluminium profiles for		SP 17-3	SP 37-1	SP 37-3	SP 57-2	SP 57L-2	SP 57-3	SP 67-2
Snap-in foot (middle)	...-1	–	C 25, C 25M, C 25S	–	–	–	–	–
Clip bar (outside)	...-2	–	–		C 30	C 30	–	C 30
T-foot (middle)	...-3	C 15	–	C 25, C 25M, C 25S	–	–	C 35	–

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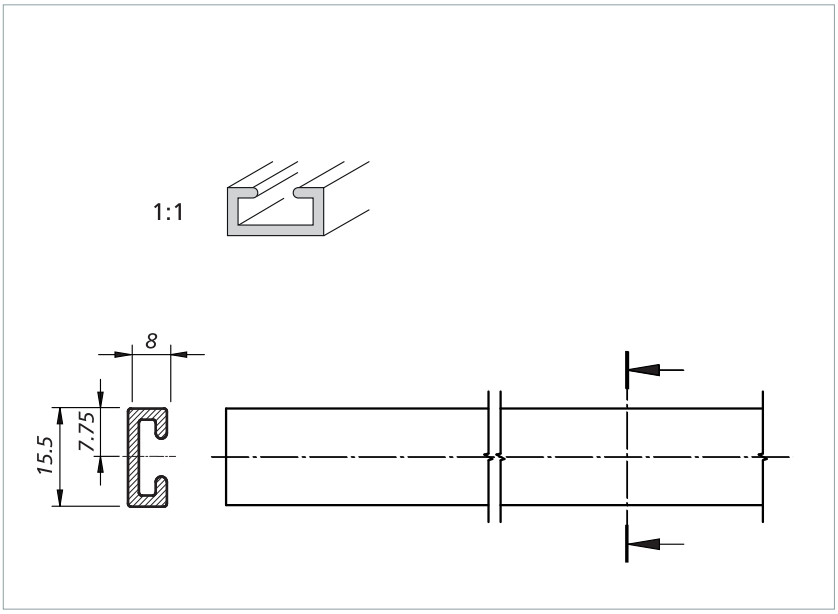
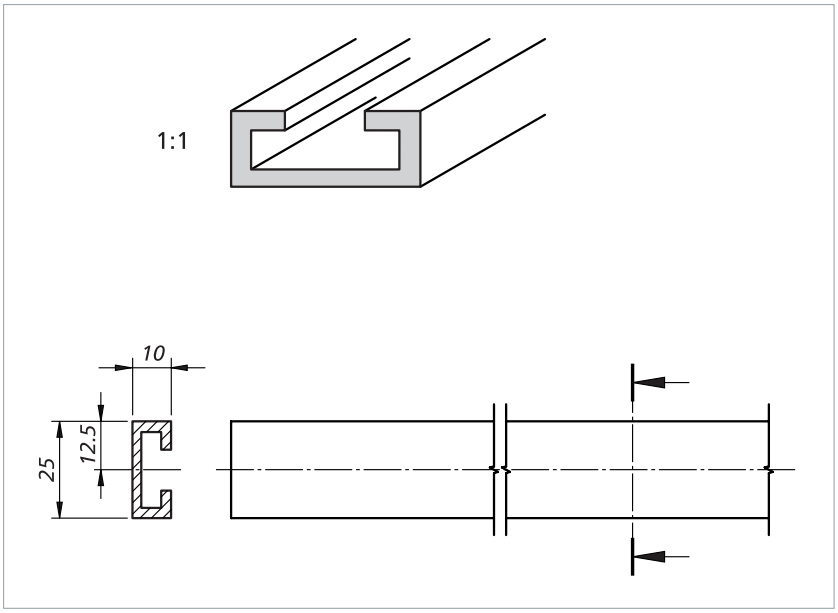
Subject to technical modifications.

Aluminium profile C 15



Standard profile for SP 17-3:
First the aluminium profile must be mounted onto the closing edge and then the sensor profile clipped into the aluminium profile.

Aluminium profile C 25



Standard profile for SP 37-1 and SP 37-3:
First the aluminium profile must be mounted onto the closing edge and then the sensor profile clipped into the aluminium profile.

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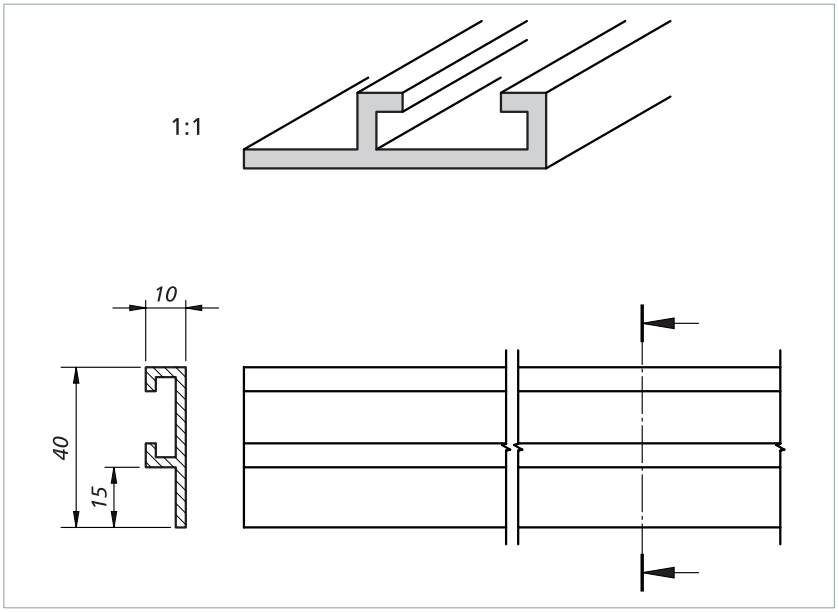
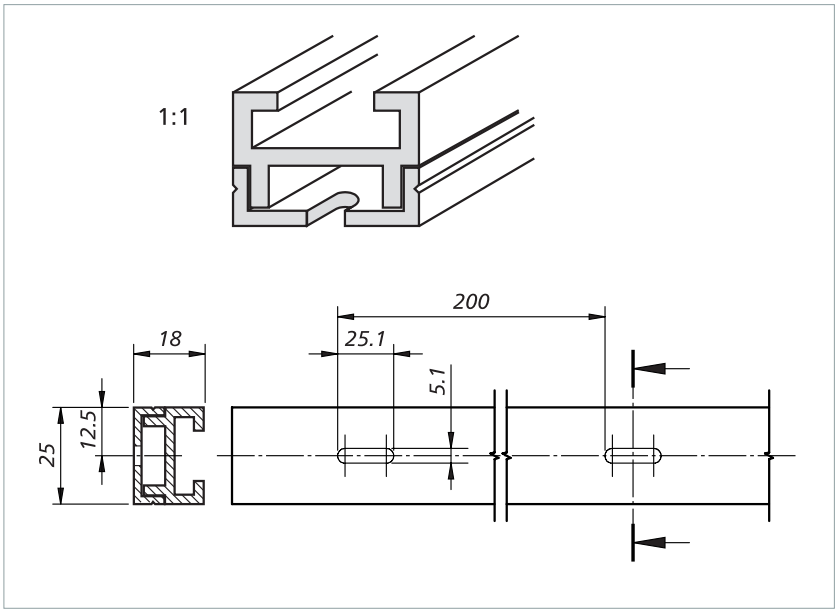
Subject to technical modifications.

Aluminium profile C 25S



Flange profile for SP 37-1 and SP 37-3:
Final assembly is also possible when the sensor profile is already clipped into the aluminium profile.
Due to the flange, **no hard end caps** can be installed here. Soft end caps must be cut in.

Aluminium profile C 25M



Two-part profile for SP 37-1 and SP 37-3:
For convenient assembly and disassembly. The sensor profile is clipped into the upper section and the upper section inserted into the installed lower section and fastened.

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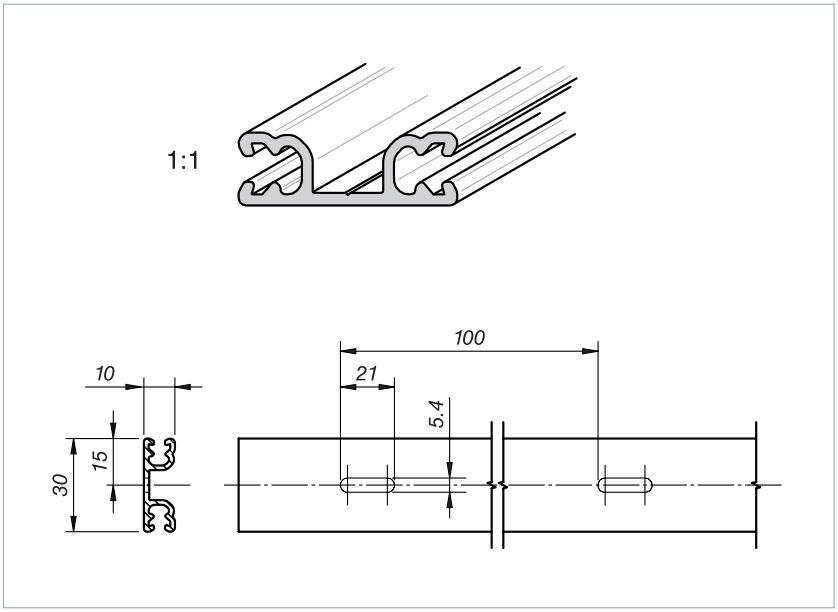
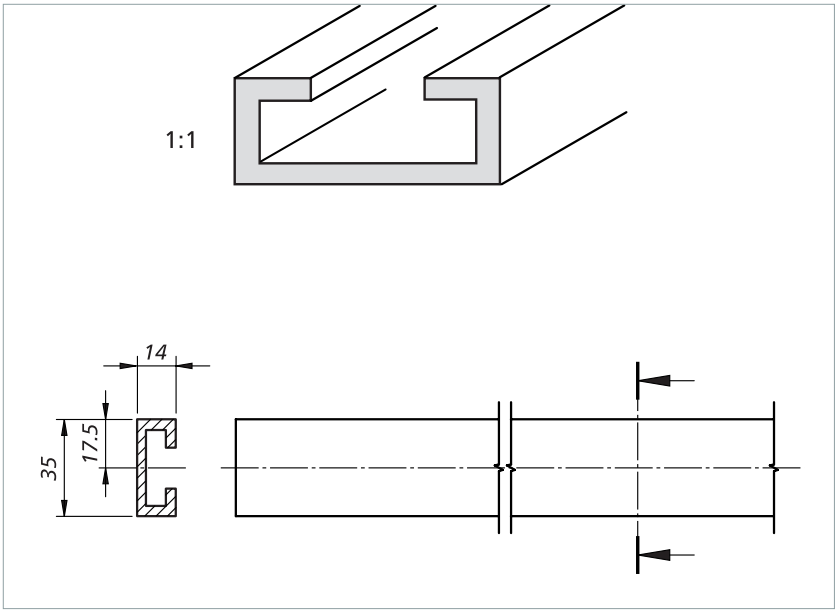
Subject to technical modifications.

Aluminium profile C 30



Standard profile for SP 57(L)-2:
First the aluminium profile must be mounted onto the closing edge and then the sensor profile clipped into the aluminium profile.

Aluminium profile C 35



Standard profile for SP 57-3:
First the aluminium profile must be mounted onto the closing edge and then the sensor profile clipped into the aluminium profile.

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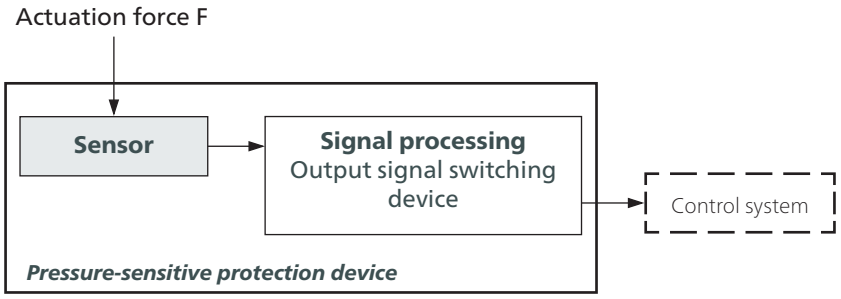
Subject to technical modifications.

Marking

Cut-to-size sensor profiles can be used as sensors for pressure-sensitive protection devices. Depending on the signal processing (control unit), safeguards up to PL d according to ISO 13849-1 are possible.



If you combine sensors with Control Units and thereby release pressure-sensitive safeguards onto the market, observe the basic regulations in ISO 13856.
Apart from technical requirements, this applies in particular also to marking and information for use.

Tip: The Safety Edges are marked according to ISO 13856-2 Chapter 5, and the necessary selection and user information is provided according to ISO 13856-2 Chapter 6.

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Safety aspects

Without reset function
When a safeguard without reset function is used (automatic reset), the reset function must be made available in some other way.

Performance Level (PL)
The PL was determined during a simplified procedure according to ISO 13849-1.
Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contact by pressure-sensitive equipment according to ISO 13856. In this case the sensor will no longer be taken into account in determining the PL. The entire pressure sensitive safety edge (Pressure-sensitive protection device) system can reach a maximum of PL d.

Is the safeguard appropriate?
The PL required for the hazard must be decided by the integrator. This is followed by the choice of safeguard.
Finally, the integrator needs to check whether the category and PL of the safeguard chosen are appropriate.

Maintenance and cleaning

The sensor is maintenance-free.
The control unit also monitors the sensor.

Regular inspection
Depending on the utilisation, sensors need to be inspected at regular intervals (at least monthly)

- for functionality: by activating or applying the respective test sample.
- for damage: by a visual check.
- for fit between rubber and aluminium profile: by a visual check.

Cleaning
If necessary, clean the sensor with a mild cleaning agent.

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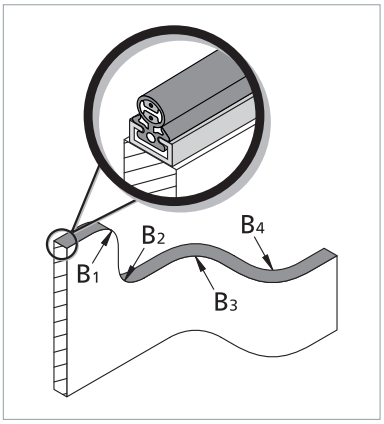
Technical data

SK SP 17-3 TPE

Sensor profile SP manufactured without end caps,
with resistor for 2-wire technology (Type SP/W8k2)
or without resistor for 4-wire technology (Type SP/BK).

Testing basis	
EN 12978, ISO 13849-1, ISO 13856-2	
Switching characteristics at v_{test} = 10 mm/s	
Switching operations	10,000
Actuation force	
Test piece (rod) Ø 20 mm	< 50 N
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	1.5 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	± 45°
Finger detection	yes
Safety classifications	
ISO 13849-1: B_{10D}	2× 10^6
Mechanical operating conditions	
Sensor length (min./max.)	10 cm / 80 m
Cable length (min./max.)	10 cm / 200 m
Bend radii, minimum	
B_1 / B_2 / B_3 / B_4	200 / 200 / 50 / 50 mm
Operating speed (min. / max.)	10 mm/s / 10 mm/s
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Operating temperature	-25 to +55 °C
short term (15 min)	-40 to +80 °C
Weight (without/with aluminium profile)	0.12 / 0.26 kg/m
Electrical operating conditions	
Terminal resistance	8k2 ±1 %
Rated power (max.)	250 mW
Contact transition resistance	< 400 Ohm (per sensor)
Number of sensors type BK	max. 3 in series
Switching voltage (max.)	DC 24 V
Switching current (min./max.)	1 mA / 10 mA
Connection cable	Ø 2.9 mm PUR 2× 0.25 mm^2
Dimensional tolerances	
Length according to	ISO 3302 L2
Profile section according to	ISO 3302 E2

Bend radii:



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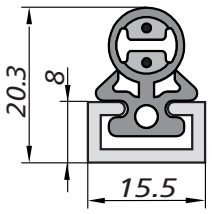
Dimensions and distances

SP 17-3 TPE (1:1)



Test conditions
according to ISO 13856-2

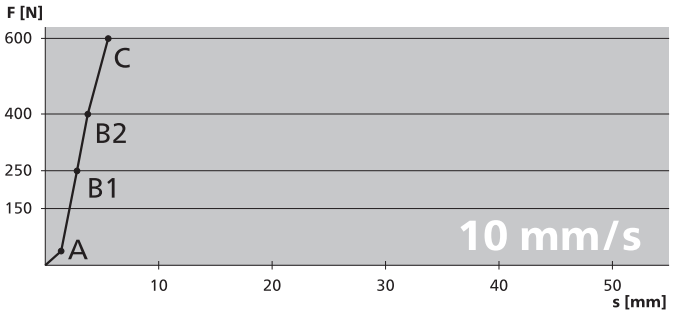
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All the data given here has been verified by
Mayser GmbH & Co. KG.

Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Actuation force	38 N
Response time	140 ms
Actuation distance (A)	1.4 mm
Overtravel distance	
up to 250 N (B1)	1.4 mm
up to 400 N (B2)	2.3 mm
up to 600 N (C)	4.1 mm
Total deformation	5.5 mm

Force-distance ratios



281117 v3.01

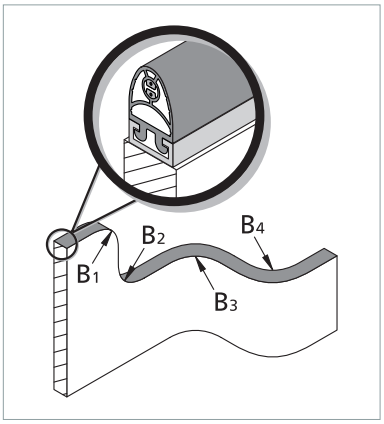
Technical data

SK SP 37-1 TPE

Sensor profile SP manufactured with or without end caps,
with resistor for 2-wire technology (Type SP/W8k2)
or without resistor for 4-wire technology (Type SP/BK).

Testing basis	
EN 12978, ISO 13849-1, ISO 13856-2	
Switching characteristics at v_{test} = 100 mm/s	
Switching operations	10,000
Actuation force	
Test piece (rod) Ø 20 mm	< 50 N
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	1.5 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	± 50°
Finger detection	yes
Safety classifications	
ISO 13849-1: B_{10D}	2× 10^6
Mechanical operating conditions	
Sensor length (min./max.)	10 cm / 30 m
Cable length (min./max.)	10 cm / 200 m
Bend radii, minimum	
B_1 / B_2 / B_3 / B_4	500 / 500 / 200 / 200 mm
Operating speed	
(min. / max.)	10 mm/s / 200 mm/s
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Operating temperature	-25 to +55 °C
short term (15 min)	-40 to +80 °C
Weight (without/with aluminium profile)	0.32 / 0.62 kg/m
Electrical operating conditions	
Terminal resistance	8k2 ±1 %
Rated power (max.)	250 mW
Contact transition resistance	< 400 Ohm (per sensor)
Number of sensors type BK	max. 3 in series
Switching voltage (max.)	DC 24 V
Switching current (min./max.)	1 mA / 10 mA
Connection cable	Ø 2.9 mm PUR 2× 0.25 mm^2
Dimensional tolerances	
Length according to	ISO 3302 L2
Profile section according to	ISO 3302 E2

Bend radii:



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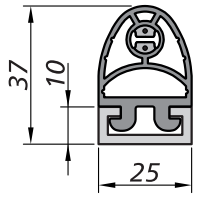
Dimensions and distances

SP 37-1 TPE (1:2)



Test conditions
according to ISO 13856-2

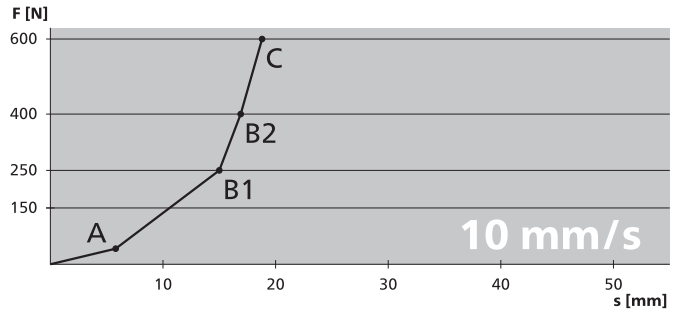
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

Note:
Dimensional tolerances according to ISO 3302 E2/L2.

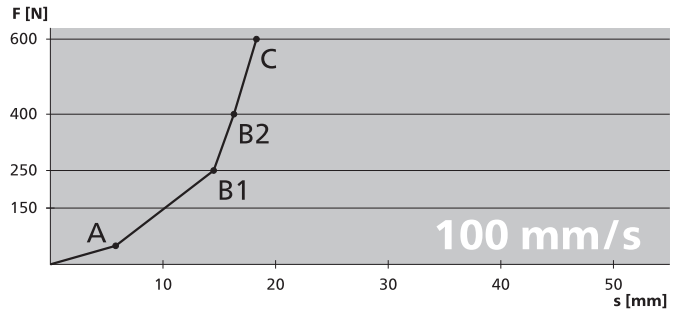
All data stated here is documented in EC design type test certificates.

Force-distance ratios

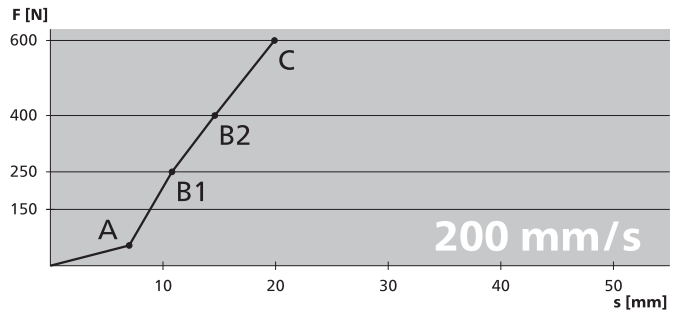
Actuation force	42 N
Response time	580 ms
Actuation distance (A)	5.8 mm
Overtravel distance	
up to 250 N (B1)	9.2 mm
up to 400 N (B2)	11.1 mm
up to 600 N (C)	13.0 mm
Total deformation	18.8 mm



Actuation force	50 N
Response time	58 ms
Actuation distance (A)	5.8 mm
Overtravel distance	
up to 250 N (B1)	8.7 mm
up to 400 N (B2)	10.5 mm
up to 600 N (C)	12.5 mm
Total deformation	18.3 mm



Actuation force	54 N
Response time	35 ms
Actuation distance (A)	7.0 mm
Overtravel distance	
up to 250 N (B1)	3.8 mm
up to 400 N (B2)	7.6 mm
up to 600 N (C)	12.9 mm
Total deformation	19.9 mm



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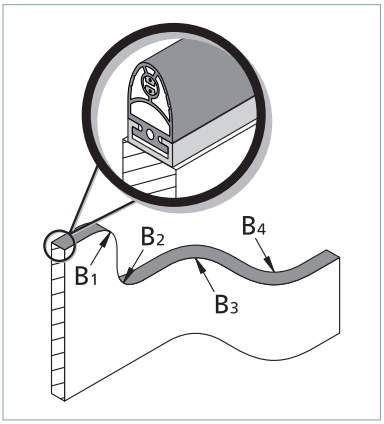
Technical data

SK SP 37-3 TPE

Sensor profile SP manufactured with end caps,
with resistor for 2-wire technology (Type SP/W8k2)
or without resistor for 4-wire technology (Type SP/BK).

Testing basis	
EN 12978, ISO 13849-1, ISO 13856-2	
Switching characteristics at v_{test} = 100 mm/s	
Switching operations	10,000
Actuation force	
Test piece (rod) Ø 20 mm	< 50 N
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	6 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	± 50°
Finger detection	yes
Safety classifications	
ISO 13849-1: B_{10D}	2× 10^6
Mechanical operating conditions	
Sensor length (min./max.)	10 cm / 30 m
Cable length (min./max.)	10 cm / 200 m
Bend radii, minimum	
B_1 / B_2 / B_3 / B_4	500 / 500 / 200 / 200 mm
Operating speed (min. / max.)	10 mm/s / 200 mm/s
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Operating temperature	-25 to +55 °C
short term (15 min)	-40 to +80 °C
Weight (without/with aluminium profile)	0.32 / 0.62 kg/m
Electrical operating conditions	
Terminal resistance	8k2 ±1 %
Rated power (max.)	250 mW
Contact transition resistance	< 400 Ohm (per sensor)
Number of sensors type BK	max. 3 in series
Switching voltage (max.)	DC 24 V
Switching current (min./max.)	1 mA / 10 mA
Connection cable	Ø 2.9 mm PUR 2× 0.25 mm^2
Dimensional tolerances	
Length according to	ISO 3302 L2
Profile section according to	ISO 3302 E2

Bend radii:



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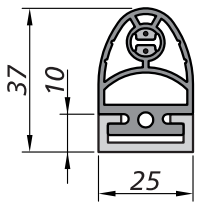
Dimensions and distances

SP 37-3 TPE (1:2)



Test conditions
according to ISO 13856-2

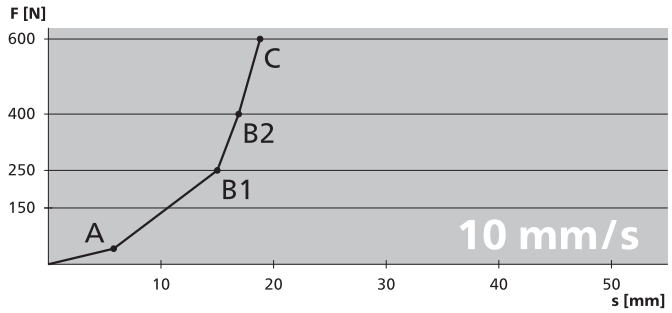
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

Note:
Dimensional tolerances according to ISO 3302 E2/L2.

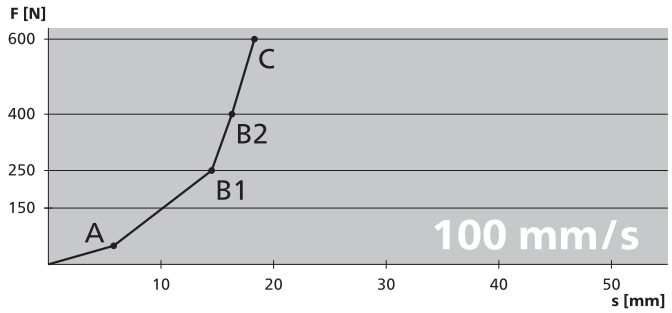
All data stated here is documented in EC design type test certificates.

Force-distance ratios

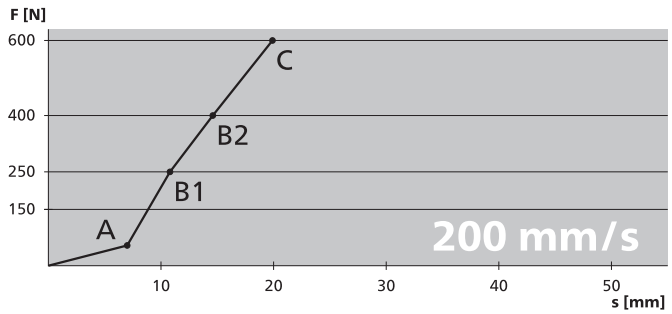
Actuation force	42 N
Response time	580 ms
Actuation distance (A)	5.8 mm
Overtravel distance	
up to 250 N (B1)	9.2 mm
up to 400 N (B2)	11.1 mm
up to 600 N (C)	13.0 mm
Total deformation	18.8 mm



Actuation force	50 N
Response time	58 ms
Actuation distance (A)	5.8 mm
Overtravel distance	
up to 250 N (B1)	8.7 mm
up to 400 N (B2)	10.5 mm
up to 600 N (C)	12.5 mm
Total deformation	18.3 mm



Actuation force	54 N
Response time	35 ms
Actuation distance (A)	7.0 mm
Overtravel distance	
up to 250 N (B1)	3.8 mm
up to 400 N (B2)	7.6 mm
up to 600 N (C)	12.9 mm
Total deformation	19.9 mm



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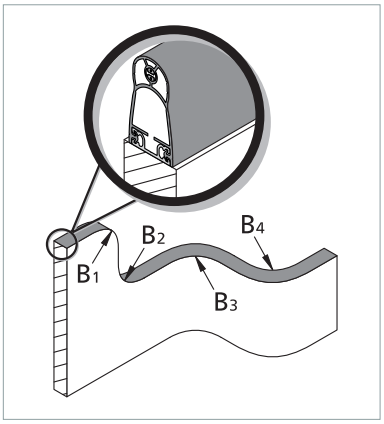
Technical data

SK SP 57-2 TPE

Sensor profile SP manufactured with end caps,
with resistor for 2-wire technology (Type SP/W8k2)
or without resistor for 4-wire technology (Type SP/BK).

Testing basis	
EN 12978, ISO 13849-1, ISO 13856-2	
Switching characteristics at v_{test} = 100 mm/s	
Switching operations	10,000
Actuation force	
Test piece (rod) Ø 20 mm	< 50 N
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	8 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	± 45°
Finger detection	yes
Safety classifications	
ISO 13849-1: B_{10D}	2× 10^6
Mechanical operating conditions	
Sensor length (min./max.)	10 cm / 30 m
Cable length (min./max.)	10 cm / 200 m
Bend radii, minimum	
B_1 / B_2 / B_3 / B_4	1000 / 1000 / 200 / 200 mm
Operating speed	
(min. / max.)	10 mm/s / 200 mm/s
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Operating temperature	-25 to +55 °C
short term (15 min)	-40 to +80 °C
Weight (without/with aluminium profile)	0.40 / 0.70 kg/m
Electrical operating conditions	
Terminal resistance	8k2 ±1 %
Rated power (max.)	250 mW
Contact transition resistance	< 400 Ohm (per sensor)
Number of sensors type BK	max. 3 in series
Switching voltage (max.)	DC 24 V
Switching current (min./max.)	1 mA / 10 mA
Connection cable	Ø 2.9 mm PUR 2× 0.25 mm^2
Dimensional tolerances	
Length according to	ISO 3302 L2
Profile section according to	ISO 3302 E2

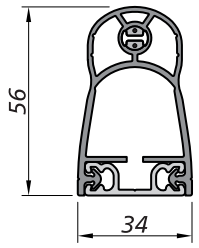
Bend radii:



281117 v3.01

Dimensions and distances

SP 57-2 TPE (1:2)



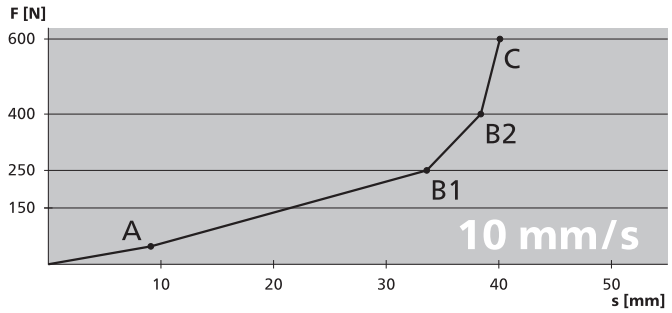
Test conditions
according to ISO 13856-2
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

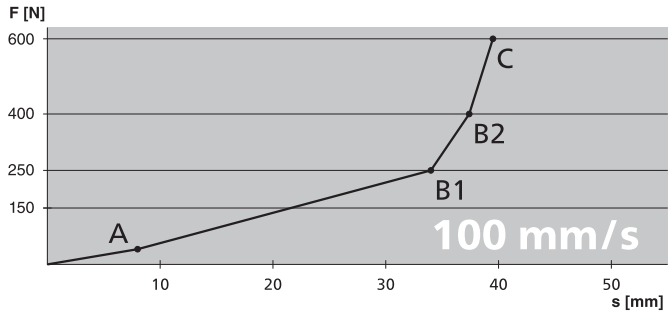
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

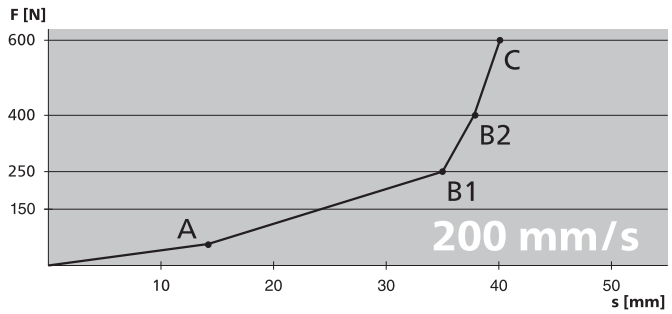
Actuation force	48 N
Response time	910 ms
Actuation distance (A)	9.1 mm
Overtravel distance	
up to 250 N (B1)	24.5 mm
up to 400 N (B2)	29.3 mm
up to 600 N (C)	31.0 mm
Total deformation	40.1 mm



Actuation force	41 N
Response time	80 ms
Actuation distance (A)	8.0 mm
Overtravel distance	
up to 250 N (B1)	26.0 mm
up to 400 N (B2)	29.4 mm
up to 600 N (C)	31.5 mm
Total deformation	39.5 mm



Actuation force	58 N
Response time	71 ms
Actuation distance (A)	14.2 mm
Overtravel distance	
up to 250 N (B1)	20.8 mm
up to 400 N (B2)	23.7 mm
up to 600 N (C)	25.9 mm
Total deformation	40.1 mm



281117 v3.01

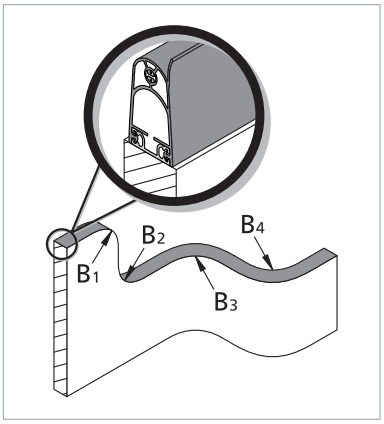
Technical data

SK SP 57L-2 TPE

Sensor profile SP manufactured with end caps,
with resistor for 2-wire technology (Type SP/W8k2)
or without resistor for 4-wire technology (Type SP/BK).

Testing basis	
EN 12978, ISO 13849-1, ISO 13856-2	
Switching characteristics at v_{test} = 100 mm/s	
Switching operations	10,000
Actuation force	
Test piece (rod) Ø 20 mm	< 50 N
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	8 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	± 45°
Finger detection	yes
Safety classifications	
ISO 13849-1: B_{10D}	2× 10^6
Mechanical operating conditions	
Sensor length (min./max.)	10 cm / 30 m
Cable length (min./max.)	10 cm / 200 m
Bend radii, minimum	
B_1 / B_2 / B_3 / B_4	1000 / 1000 / 200 / 200 mm
Operating speed	
(min. / max.)	10 mm/s / 200 mm/s
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Operating temperature	-25 to +55 °C
short term (15 min)	-40 to +80 °C
Weight (without/with aluminium profile)	0.45 / 0.75 kg/m
Electrical operating conditions	
Terminal resistance	8k2 ±1 %
Rated power (max.)	250 mW
Contact transition resistance	< 400 Ohm (per sensor)
Number of sensors type BK	max. 3 in series
Switching voltage (max.)	DC 24 V
Switching current (min./max.)	1 mA / 10 mA
Connection cable	Ø 2.9 mm PUR 2× 0.25 mm^2
Dimensional tolerances	
Length according to	ISO 3302 L2
Profile section according to	ISO 3302 E2

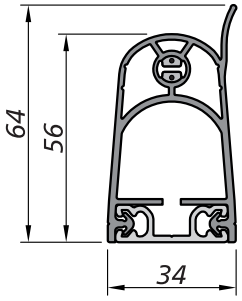
Bend radii:



281117 v3.01

Dimensions and distances

SP 57L-2 TPE (1:2)



Test conditions
according to ISO 13856-2

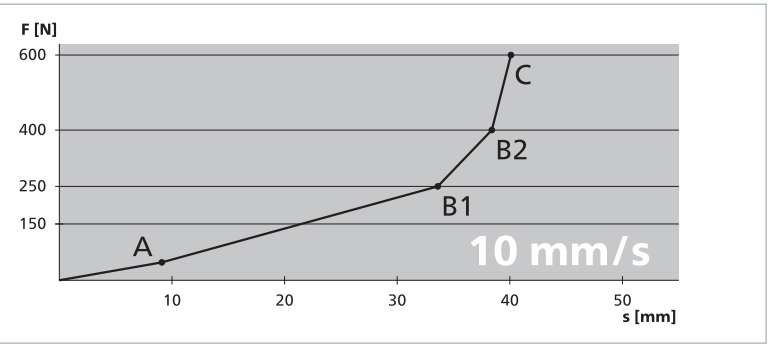
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit
- Lip not taken into account

All data stated here is documented in EC design type test certificates.

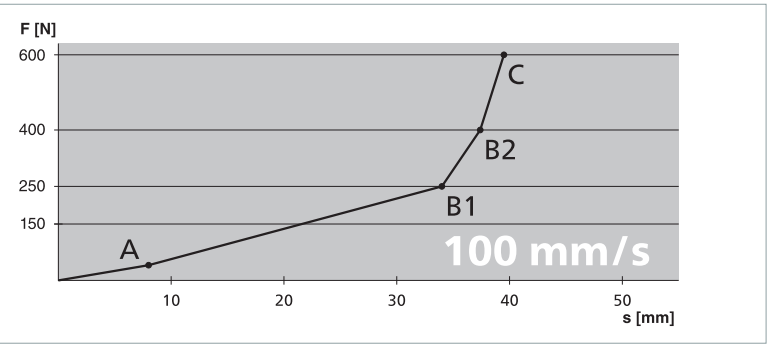
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

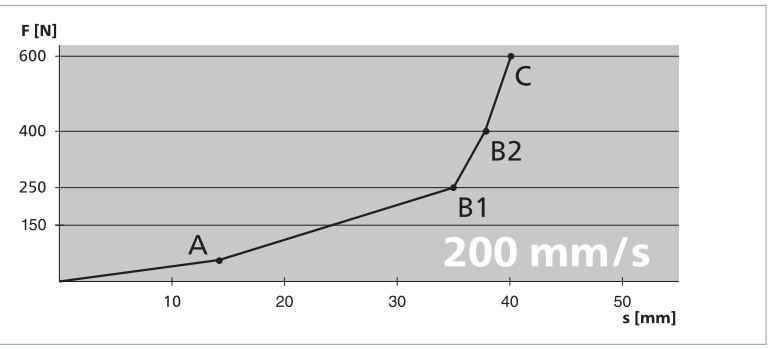
Actuation force	48 N
Response time	910 ms
Actuation distance (A)	9.1 mm
Overtravel distance	
up to 250 N (B1)	24.5 mm
up to 400 N (B2)	29.3 mm
up to 600 N (C)	31.0 mm
Total deformation	40.1 mm



Actuation force	41 N
Response time	80 ms
Actuation distance (A)	8.0 mm
Overtravel distance	
up to 250 N (B1)	26.0 mm
up to 400 N (B2)	29.4 mm
up to 600 N (C)	31.5 mm
Total deformation	39.5 mm



Actuation force	58 N
Response time	71 ms
Actuation distance (A)	14.2 mm
Overtravel distance	
up to 250 N (B1)	20.8 mm
up to 400 N (B2)	23.7 mm
up to 600 N (C)	25.9 mm
Total deformation	40.1 mm



281117 v3.01

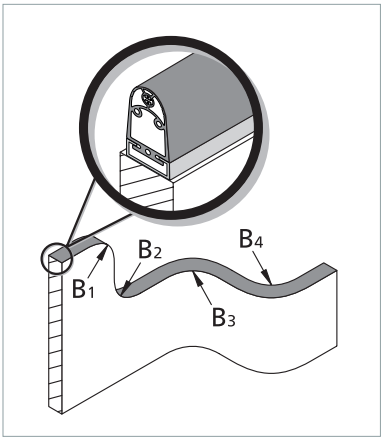
Technical data

SK SP 57-3 TPE

Sensor profile SP manufactured with end caps,
with resistor for 2-wire technology (Type SP/W8k2)
or without resistor for 4-wire technology (Type SP/BK).

Testing basis	
EN 12978, ISO 13849-1, ISO 13856-2	
Switching characteristics at v_{test} = 100 mm/s	
Switching operations	10,000
Actuation force	
Test piece (rod) Ø 20 mm	< 50 N
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	8 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	± 45°
Finger detection	yes
Safety classifications	
ISO 13849-1: B_{10D}	2× 10^6
Mechanical operating conditions	
Sensor length (min./max.)	10 cm / 25 m
Cable length (min./max.)	10 cm / 200 m
Bend radii, minimum	
B_1 / B_2 / B_3 / B_4	1000 / 1000 / 200 / 200 mm
Operating speed	
(min. / max.)	10 mm/s / 200 mm/s
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Operating temperature	-25 to +55 °C
short term (15 min)	-40 to +80 °C
Weight (without/with aluminium profile)	0.53 / 0.93 kg/m
Electrical operating conditions	
Terminal resistance	8k2 ±1 %
Rated power (max.)	250 mW
Contact transition resistance	< 400 Ohm (per sensor)
Number of sensors type BK	max. 3 in series
Switching voltage (max.)	DC 24 V
Switching current (min./max.)	1 mA / 10 mA
Connection cable	Ø 2.9 mm PUR 2× 0.25 mm^2
Dimensional tolerances	
Length according to	ISO 3302 L2
Profile section according to	ISO 3302 E2

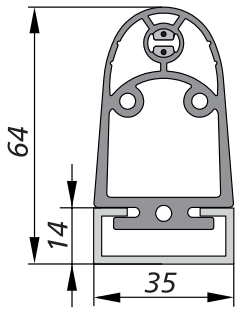
Bend radii:



281117 v3.01

Dimensions and distances

SP 57-3 TPE (1:2)



Test conditions
according to ISO 13856-2

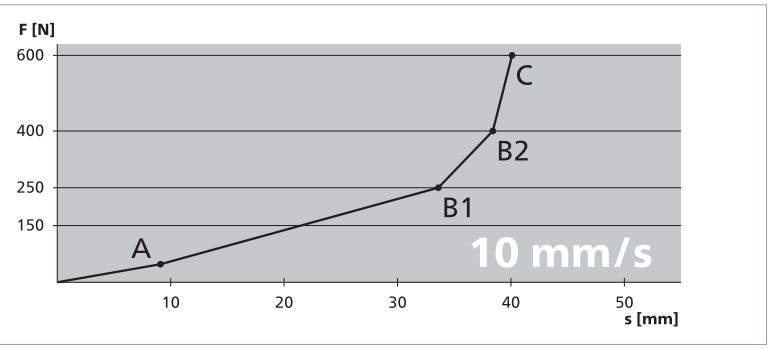
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

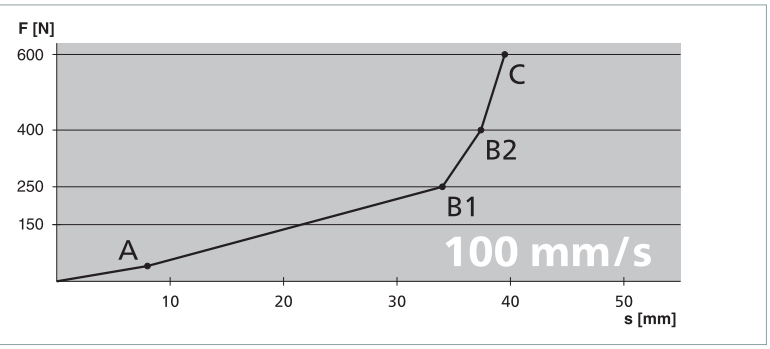
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

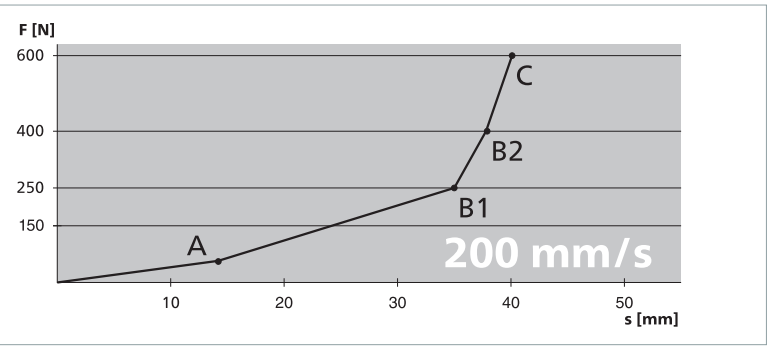
Actuation force	48 N
Response time	910 ms
Actuation distance (A)	9.1 mm
Overtravel distance	
up to 250 N (B1)	24.5 mm
up to 400 N (B2)	29.3 mm
up to 600 N (C)	31.0 mm
Total deformation	40.1 mm



Actuation force	41 N
Response time	80 ms
Actuation distance (A)	8.0 mm
Overtravel distance	
up to 250 N (B1)	26.0 mm
up to 400 N (B2)	29.4 mm
up to 600 N (C)	31.5 mm
Total deformation	39.5 mm



Actuation force	58 N
Response time	71 ms
Actuation distance (A)	14.2 mm
Overtravel distance	
up to 250 N (B1)	20.8 mm
up to 400 N (B2)	23.7 mm
up to 600 N (C)	25.9 mm
Total deformation	40.1 mm



281117 v3.01

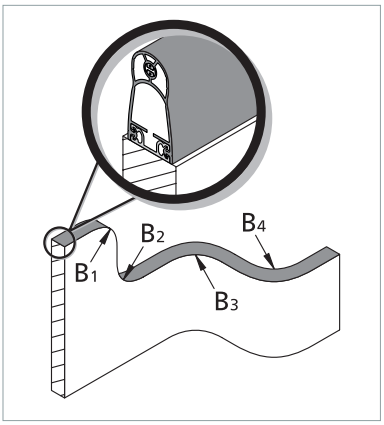
Technical data

SK SP 67-2 TPE

Sensor profile SP manufactured with end caps,
with resistor for 2-wire technology (Type SP/W8k2)
or without resistor for 4-wire technology (Type SP/BK).

Testing basis	
EN 12978, ISO 13849-1, ISO 13856-2	
Switching characteristics at v_{test} = 100 mm/s	
Switching operations	10,000
Actuation force	
Test piece (rod) Ø 20 mm	< 50 N
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	11 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	± 50°
Finger detection	yes
Safety classifications	
ISO 13849-1: B_{10D}	2× 10^6
Mechanical operating conditions	
Sensor length (min./max.)	10 cm / 30 m
Cable length (min./max.)	10 cm / 200 m
Bend radii, minimum	
B_1 / B_2 / B_3 / B_4	1000 / 1000 / 200 / 200 mm
Operating speed	
(min. / max.)	10 mm/s / 200 mm/s
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Operating temperature	-25 to +55 °C
short term (15 min)	-40 to +80 °C
Weight (without/with aluminium profile)	0.46 / 0.76 kg/m
Electrical operating conditions	
Terminal resistance	8k2 ±1 %
Rated power (max.)	250 mW
Contact transition resistance	< 400 Ohm (per sensor)
Number of sensors type BK	max. 3 in series
Switching voltage (max.)	DC 24 V
Switching current (min./max.)	1 mA / 10 mA
Connection cable	Ø 2.9 mm PUR 2× 0.25 mm^2
Dimensional tolerances	
Length according to	ISO 3302 L2
Profile section according to	ISO 3302 E2

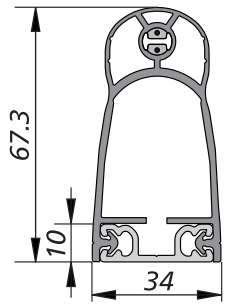
Bend radii:



281117 v3.01

Dimensions and distances

SP 67-2 TPE (1:2)



Test conditions
according to ISO 13856-2

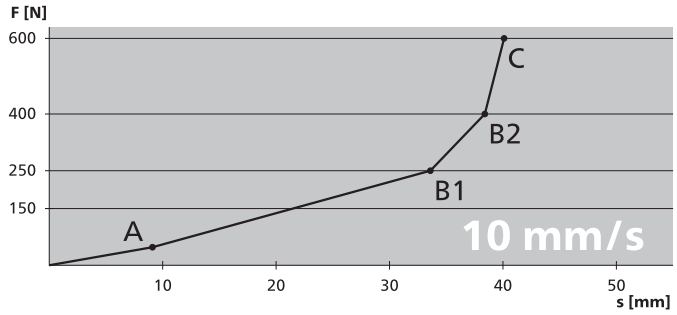
- Installation position B
- Temperature +20 °C
- Measurement point c3
- Test sample 1 with Ø 80 mm
- without control unit

All data stated here is documented in EC design type test certificates.

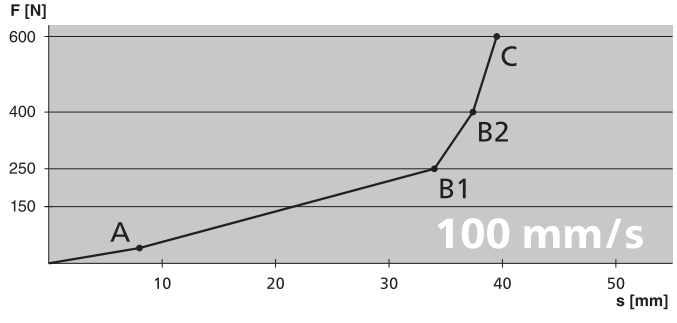
Note:
Dimensional tolerances according to ISO 3302 E2/L2.

Force-distance ratios

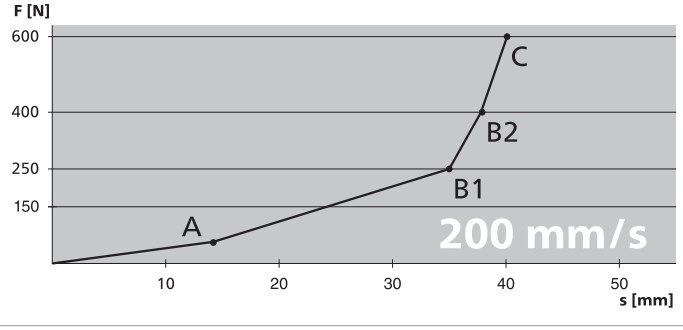
Actuation force	41 N
Response time	880 ms
Actuation distance (A)	8.8 mm
Overtravel distance	
up to 250 N (B1)	35.7 mm
up to 400 N (B2)	37.9 mm
up to 600 N (C)	41 mm
Total deformation	49.8 mm



Actuation force	42 N
Response time	101 ms
Actuation distance (A)	10.1 mm
Overtravel distance	
up to 250 N (B1)	35.4 mm
up to 400 N (B2)	37.8 mm
up to 600 N (C)	39.8 mm
Total deformation	49.9 mm



Actuation force	45 N
Response time	51.5 ms
Actuation distance (A)	10.3 mm
Overtravel distance	
up to 250 N (B1)	36.5 mm
up to 400 N (B2)	39.4 mm
up to 600 N (C)	41.3 mm
Total deformation	51.6 mm



281117 v3.01

MAYSER®

Product Information Miniature Safety Edges

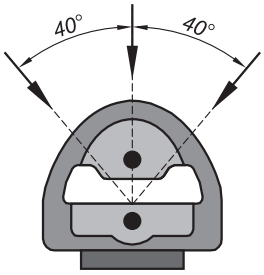
Miniature Safety Edges ...

Miniature Safety Edges (EKS) – the "invisible" protection against trapping and nipping

Tiny dimensions, enormous reliability.
The Miniature Safety Edges are the result of consistent further development and miniaturisation of our Safety Edges which are well known for their reliability in safety applications. Endowed with the same safety and reliability features, the Miniature Safety Edges also have a visual advantage: absolutely tiny and the profile comes in almost any shape and size.

... inside values

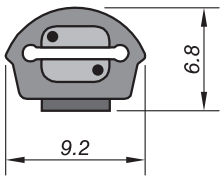
- The heart of the Miniature Safety Edges is the switching chamber which is integrated in the profile. A small amount of pressure to the Miniature Safety Edge suffices to short-circuit two conductive areas which are separated from each other. A sure signal for the evaluating unit connected up.
- Electrically, the Miniature Safety Edge works on the closed circuit principle, i.e. a break in connection is recognized, the danger- bringing movement is brought to a halt.



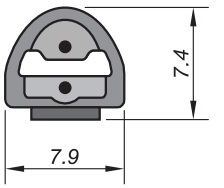
EKS 011

... outside values

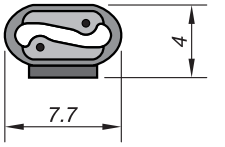
- In addition to the three standard shapes depicted we can also provide customized profiles.
- The design of the Miniature Safety Edge can be practically effortlessly adapted to suit the surroundings.
- The Miniature Safety Edge is in its element in places where only very short overtravel distances are possible.
- Thanks to the minimal dimensions (see to the right) the Miniature Safety Edge can be intregrated into its surroundings in an optimal way.



EKS 002



EKS 011



EKS 026

Mayser GmbH & Co. KG P.O. Box 3048 89020 Ulm Germany Phone +49 731 2061-0 Fax +49 731 2061-222

Product Information Miniature Safety Edges

Miniature Safety Edges (EKS) – the "invisible" protection against trapping and nipping

... diverse uses

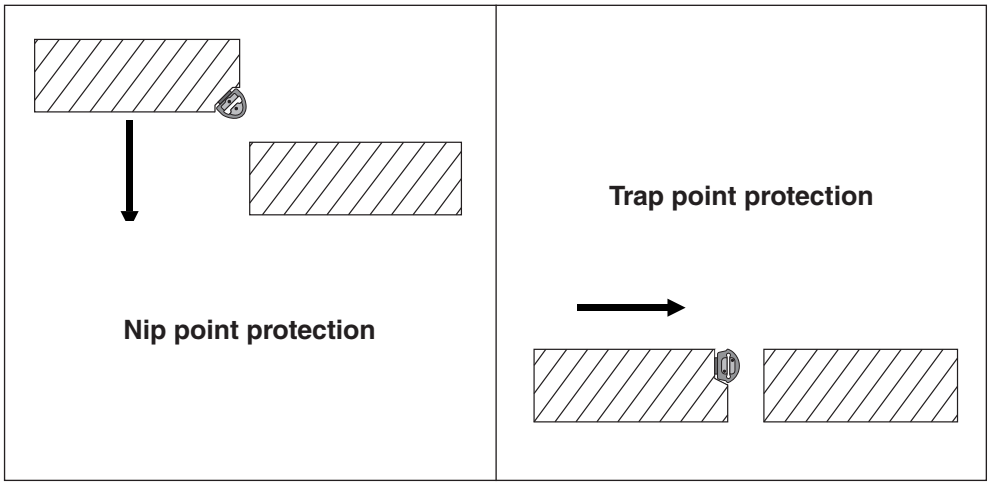
Medical Technology
- Diagnostic equipment
- Radiation apparatus
- Electrically adjustable tables/chairs
- Movable protective hoods
- Rehabilitation equipment (Sports Medicine)

Elevator doors
Bus doors and electric roof lights (finger protection)

Electrically operated screens
- Cash dispensers
- Skylights
- Glass sliding doors

Electrically adjustable furniture
- Computer tables
- Recliners
- Electrically operated writing boards

... sure performance



... technichal details

Distinctive features
- thermoplastic elastomer
- customized TPE-covering
- environment-friendly
- can be recycled

Electrical operating conditions
- max. voltage 24 V DC
- max. current 10 mA

Protection class
- IP65

Operating characteristics
- Response angle: > 90° (depends on shape of profile!)
- Actuating distance: ≤ 1,0 mm
- Actuating force: < 25 N (Test piece: Ø 200 mm)
- Actuating force: < 15 N (Test piece: Ø 4 mm)

Application temperatures
- 40 °C to + 80 °C
(short-time exposure to temperatures up to + 95 °C also possible)

Mayser GmbH & Co. KG P.O. Box 3048 89020 Ulm Germany Phone +49 731 2061-0 Fax +49 731 2061-222

061008 v1.5

Technical Data

Miniature Safety Edge consisting of sensor type EKS 0XX TPE

Miniature Safety Edges

(Illustration scale 1:1)

1	**Protection class**	**IP65**						
2	**Switching operations**							
	Test piece Ø 10 mm / F=100 N	> 100,000						
3	**Actuating force, actuating distance and response angle**							
3.1	Actuating force	EKS 002		EKS 011		EKS 026		
	v_{test}= 50 mm/min	23 °C	- 25 °C	23 °C	- 25 °C	23 °C	- 25 °C	
	Test piece Ø 4 mm	< 10 N	< 15 N	< 15 N	< 30 N	< 10 N	< 20 N	
	Test piece Ø 200 mm	< 20 N	< 25 N	< 25 N	< 50 N	< 15 N	< 35 N	
3.2	Actuating distance							
	v_{test}= 50 mm/min	23 °C		23 °C		23 °C		
	Test piece Ø 80 mm cyl.	< 1.5 mm		< 2 mm		< 1 mm		
3.3	Response angle	< 60°		< 80°		< 80°		
4	**Mechanical operating and application conditions**							
4.1	Sensor length (min./max.)	70 mm / 150 m		70 mm / 150 m		70 mm / 150 m		
4.2	Bending radii							
	Convex profile curvature	> 50 mm		> 120 mm		> 80 mm		
	Concave profile curvature	> 80 mm		> 150 mm		> 50 mm		
	Across the profile axis	> 120 mm		> 20 mm		> 120 mm		
4.3	Tensile load, cable	max. 60 N		max . 50 N		max. 20 N		
4.4	Working temperature	-25 °C to +80 °C		-25 °C to +80 °C		-25 °C to +80 °C		
	Permissible short term exposure	-40 °C to +100 °C		-40 °C to +100 °C		-40 °C to +100 °C		
5	**Electric operating conditions**							
5.1	End resistor (standard)	1.2 kΩ ±1%		1.2 kΩ ±1%		1.2 kΩ ±1%		
	Performance	max. 250 mW		max. 250 mW		max. 250 mW		
5.2	Transition resistance	< 400 Ω (under load)		< 400 Ω (under load)		< 400 Ω (under load)		
5.3	Electric rating	without end resistor		without end resistor		without end resistor		
	Voltage	max. 24 V DC		max. 24 V DC		max. 24 V DC		
	Current	max. 10 mA		max. 10 mA		max. 10 mA		
		min. 1 mA		min. 1 mA		min. 1 mA		
5.3	Connecting cable	Ø 3.7 mm		Ø 3.4 mm		Ø 1,4 mm per strand		
		2x 0.25 mm²		2x 0.25 mm²		2× 0.35 mm²		
	Class according to IEC 60228	5		6		-		

6 Application using acrylic-foam-adhesive tape

Peel strength 15 N/cm

Applied to:	using promoter	without promoter
ABS	+	-
Aluminium	+	+
Aluminium, anodised	+	-
Wood: native	-	-
Wood: varnished, veneer or laminated	+	-
PA6	+	-
PA66	+	+
PE, HDPE	-	-
PMMA	+	+
PP	+	-
PS, CAB	-	-
PVC	+	+
SAN	+	-
Steel, stainless steel	+	+

Tests carried out at 23 °C (room temperature).

Note: check with adhesion tests before serial use whether bonding is possible on the selected installation surface.

Key to symbols:
+ = OK
- = not OK

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Miniature Safety Edges

7 Behaviour in fire

According to DIN 75200 — 40 mm/min
Compliance with — StVZO, TA 29, BMW N601 21.0

8. Dimensions tolerances — length according to DIN ISO 3302 L2
section according to DIN ISO 3302 E2

9. Chemical resistance

Miniature Safety Edge EKS	**TPE**
Material characteristics	
Shore A hardness	55 ±5
Chemical resistance	
Acetone	-
Formic acid	-
Armor All	+
Carwash agent	+
Fuel	-
Brake fluid	±
Buraton	+
Butanol	-
Chlorinated bleaching lye	-
Disinfectant 1 %	+
Diesel	-
Acetic acid 10 %	-
Ethyl alcohol	+
Ethyl acetate	-
Ethylene glycol	+
Greases	±
Antifreeze	+
Skin cream	+
Icidin	+
Incidin	+
Incidin plus	+
Cooling lubricants	-
Plastics cleaning agent	+
Lyso FD 10	+
Metal processing oil	-
Microbac	+
Microbac forte	+
Minutil	+
Saline solution 5 %	+
Spirit (ethyl alcohol)	+
Terralin	+
UV-resistance	+
Centering oil	-

Tests carried out at 23 °C (room temperature).

Key to symbols
+ = resistant
± = limited resistance
- = not resistant

The data given are results of tests which were carried out in our laboratory to the best of our knowledge and belief. We cannot accept any obligations being deduced from them. You must always test the suitability of our products for your special application purpose under practical conditions.

Subject to technical modifications.

Technical Data

Miniature Safety Edges

Miniature Safety Edge consisting of sensor type EKS 01X TPE

1. Protection class **IP65**

2. Switching opertions
Test piece Ø 10 mm / F=100 N > 100.000

		EKS 014		EKS 015	
3.	**Actuating force, actuating distance and response angle**				
3.1	Actuating force				
	Test speed v_{test}	50 mm/min		100 mm/min	
	Test temperature	23 °C	-25 °C	23 °C	-25 °C
	Testing basis:				
	74/60/EWG and FMVSS118				
	Test piece Ø 200 mm	< 25 N	< 50 N	–	–
	Test piece Ø 4 mm	< 15 N	< 30 N	–	–
	Testing basis:				
	EN 1760-2				
	Test piece 1 Ø 80 mm cyl.	–	–	< 25 N	<110N
	Test piece 3 Ø 20 mm	–	–	< 15 N	< 25 N
3.2	Actuating distance				
	Test speed v_{test}	50 mm/min		100 mm/min	
	Test temperature	23 °C		23 °C	
	Test piece 1 Ø 80 mm cyl.	< 2 mm		2 mm	
3.3	Response angle	< 80°		< 40°	
4.	**Mechanical operating and application conditions**				
4.1	Sensor length (min./max.)	70 mm / 150 m		70 mm / 150 m	
4.2	Bending radii				
	Convex profile curvature	> 120 mm		> 800 mm	
	Concave profile curvature	> 150 mm		>1000 mm	
	Across the profile axis	> 20 mm		> 200 mm	
4.3	Working temperature	- 40 °C to + 80 °C		- 40 °C to + 80 °C	
	Permissible short term exposure	- 40 °C to +100 °C		- 40 °C to +100 °C	
5.	**Electric operating conditions**				
5.1	End resistor (standard)	1.2 kΩ ±1%		1.2 kΩ ±1%	
	Performance	max. 250 mW		max. 250 mW	
5.2	Transition resistance	< 400 Ω (under load)		< 400 Ω (under load)	
5.3	Electric rating	without end resistor		without end resistor	
	Voltage	max. 24 V DC		max. 24 V DC	
	Current	max. 20 mA		max. 20 mA	
		min. 1 mA		min. 1 mA	
5.4	Connecting cable	Ø 3.4 mm		Ø 3.7 mm	
		2x 0.25 mm²		2x 0.25 mm²	
	Class according to VDE 0295	6		5	
6.	**Application with clip-in foot**				
	Clip-in foot width	3.5 mm		7 mm	
	Al-rail type	C10		C15	

7. Dimensions tolerances **Length according to ISO 3302 L2**
Cross section according to ISO 3302 E2

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Miniature Safety Edges

8. Chemical resistance

Miniature Safety Edge EKS 01X	TPE
Material characteristics	
Shore A hardness	55 ±5
Chemical resistance	
Acetone	-
Formic caid	-
Armor All	+
Carwash agent	+
Fuel	-
Brake fluid	±
Buraton	+
Butanol	-
Chlorinated bleaching lye	-
Disinfectant 1 %	+
Diesel	-
Acetic acid 10 %	-
Ethyl alcohol	+
Ethyl acetate	-
Ethylene glycol	+
Greases	±
Antifreeze	+
Skin cream	+
Icidin	+
Incidin	+
Incidin plus	+
Cooling lubricants	-
Plastics cleanging agent	+
Lyso FD 10	+
Metal processing oil	-
Microbac	+
Microbac forte	+
Minutil	+
Saline solution 5 %	+
Spirit (ethyl alcohol)	+
Terralin	+
UV-resistance	+
Centering oil	-

Tests carried out at 23 °C (room temperature).

Key to symbols:
+ = resistant
± = limited resistance
- = not resistant

The data given are results of tests carried out in our laboratory to the best of our knowledge and belief. We cannot accept any obligations being deduced from them. You must always test the suitability of our products for your special application under practical conditions.

Subject to technical modifications.

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220605

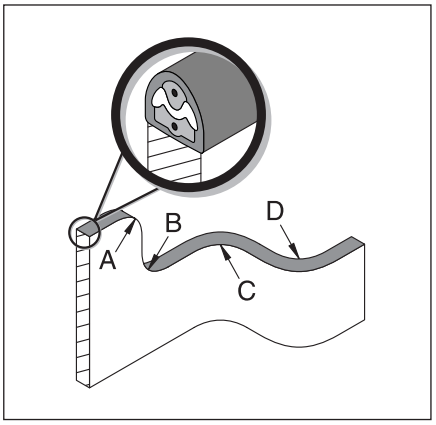
Miniature Safety Edges

Technical Data

Miniature Safety Edge consisting of sensor type EKS 030 TPE

1	**Protection class**	**IP65**	
2	**Switching operations**		
	Test piece Ø 10 mm / F=100 N	> 100 000	
3	**Actuating force, actuating distance and response angle**		
3.1	Actuating force	EKS 030	
	v_{test}= 50 mm/min	23 °C	-25 °C
	Test piece Ø 4 mm	< 15 N	< 25 N
	Test piece Ø 200 mm	< 20 N	< 40 N
3.2	Actuating distance		
	v_{test} = 50 mm/min	23 °C	
	Test piece Ø 80 mm	< 2,0 mm	
3.3	Response angle	< 100°	
4	**Mechanical operating and application conditions**		
4.1	Sensor length (min./max.)	70 mm / 150 m	
4.2	Bending radii, minimum		
	A / B / C / D	70 / 60 / 30 / 30 mm	
4.3	Tensile load, cable	max. 40 N	
4.4	Working temperature	-25 °C to +80 °C	
	Permissible short term exposure	-40 °C to +100 °C	
5	**Electric operating conditions**		
5.1	End resistor (standard)	1.2 kΩ ±1%	
	Performance	max. 250 mW	
5.2	Transition resistance	< 400 Ω (under load)	
5.3	Electric rating	without end resistor	
	Voltage	max. 24 V DC	
	Current	max. 10 mA min. 1 mA	
5.4	Connecting cable	Ø 4.1 mm 2× 0.35 mm²	

Bending radii:



6 Application using acrylic-foam-adhesive tape

Peel strength 15 N/cm

Applied to:	using promoter	without promoter
ABS	+	-
Aluminium	+	+
Aluminium: anodised	+	-
Wood: native	-	-
Wood: varnished, veneer or laminated	+	-
PA6	+	-
PA66	+	+
PE, HDPE	-	-
PMMA	+	+
PP, SAN	+	-
PS, CAB	-	-
PVC	+	+
Steel, stainless steel	+	+

Tests carried out at 23 °C (room temperature).

Note: check with adhesion tests before serial use whether bonding is possible on the selected installation surface.

Key to symbols:
+ = OK
- = not OK

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Miniature Safety Edges

7 Behaviour in fire

According to DIN 75200 — 40 mm/min
Compliance with — StVZO, TA 29, BMW N601 21.0

8 Dimensions tolerances — length according to ISO 3302 L2
section according to ISO 3302 E2

9 Chemical resistance

Miniature Safety Edge EKS	**TPE**
Material characteristics	
Shore A hardness	52 ±5
Chemical resistance	
Acetone	-
Formic acid	-
Armor All	+
Carwash agent	+
Fuel	-
Brake fluid	±
Buraton	+
Butanol	-
Chlorinated bleaching lye	-
Disinfectant 1 %	+
Diesel	-
Acetic acid 10 %	-
Ethyl alcohol	+
Ethyl acetate	-
Ethylene glycol	+
Greases	±
Antifreeze	+
Skin cream	+
Icidin	+
Incidin	+
Incidin plus	+
Cooling lubricants	-
Plastics cleaning agent	+
Lyso FD 10	+
Metal processing oil	-
Microbac	+
Microbac forte	+
Minutil	+
Saline solution 5 %	+
Spirit (ethyl alcohol)	+
Terralin	+
UV-resistance	+
Centering oil	-

Tests carried out at 23 °C (room temperature).

Key to symbols:
+ = resistant
± = limited resistance
- = not resistant

The data given are results of tests which were carried out in our laboratory to the best of our knowledge and belief. We cannot accept any obligations being deduced from them. You must always test the suitability of our products for your special application purpose under practical conditions.

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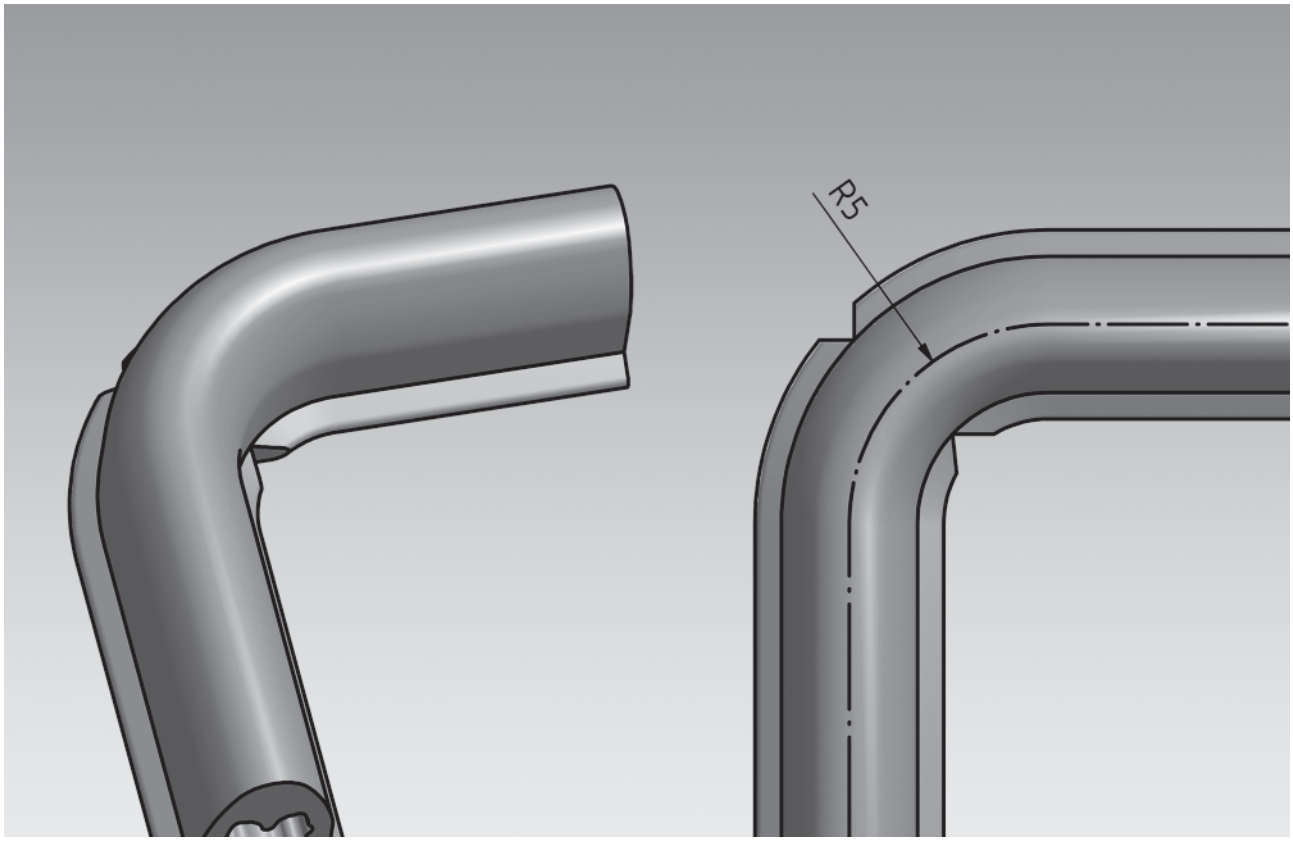
Product Information



Miniature Safety Edge EKS 038

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Important information
Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.
Always observe the safety instructions on the following pages under **ATTENTION.** Only use the product for the purpose described in the product information.

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Definitions

Miniature Safety Edges are sensors for tactile protective devices.
A suitable Control Unit is required for evaluation of the signals.

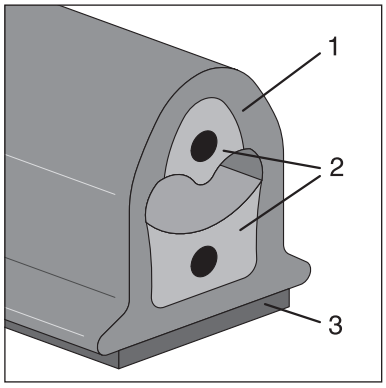
Intended use

A Miniature Safety Edge detects a person or part of the body when pressure is applied to the actuation area. It is part of a linear tripping device. The task of the protective device is to avoid potential hazardous situations for a person within a danger zone such as shearing or pinching edges.
Typical application areas are automatic windows, covers on machines, medical diagnostic equipment and height-adjustable furniture.
Safe operation of a Miniature Safety Edge depends entirely on
- the surface condition of the mounting surface,
- the correct selection of the size and resistance,
- correct installation as well as
- selection of the suitable Control Unit according to ISO 13849-1.

Limits

A maximum of 5 Miniature Safety Edges may be connected to one Control Unit.

Design



The Miniature Safety Edge EKS 038 consists of
(1) insulating TPE-covering,
(2) conductive contact layers with embedded wires and
(3) self-adhesive acrylic foam on the base of profile.

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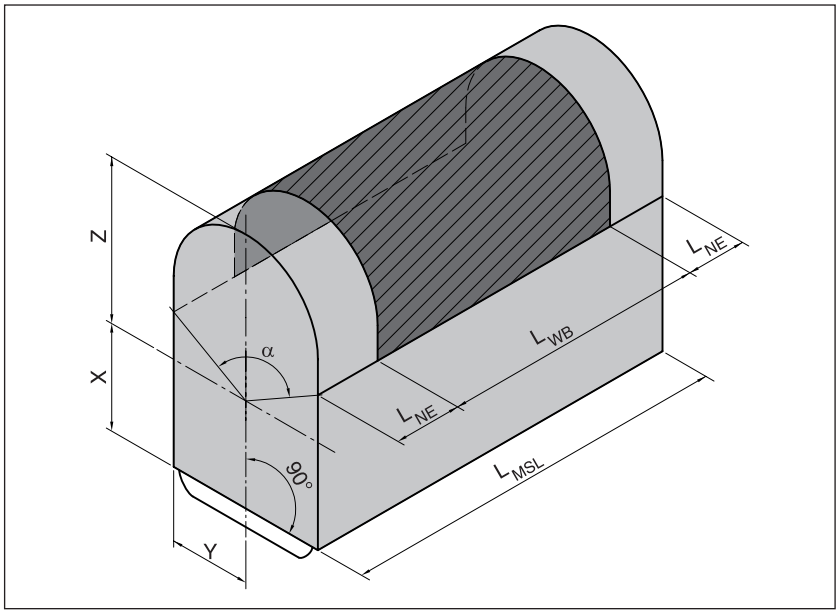
Effective actuation area

The parameters X, Y, Z, L_{NE} and angle α describe the effective actuation area.
For the effective actuation area, the following applies:

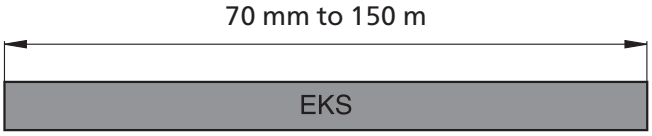
$$L_{WB} = L_{MSL} - 2 \times L_{NE}$$

Parameters:
- L_{WB} = effective actuation length
- L_{MSL} = overall length of the Miniature Safety Edge
- L_{NE} = non-sensitive length at the end
- α = effective actuation angle



MSL	EKS 038			
α	60°			
L_{NE}	10 mm			
X	2 mm			
Y	2.65 mm			
Z	2.9 mm			

Available lengths



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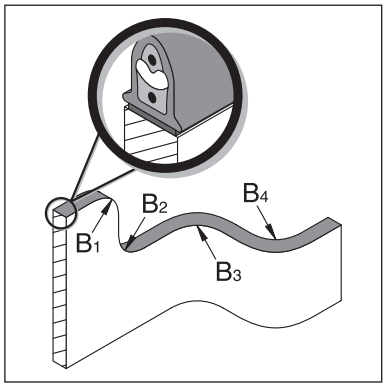
Bend angles and bend radii

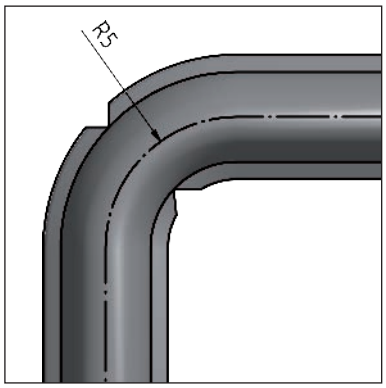
Bend angles

Bend angles are not possible on the Miniature Safety Edge.

Bend radius



Bend radius min.	EKS 038
B_1	500 mm
B_2	300 mm
B_3	15 mm
B_4	15 mm



Small 90° bends can also be implemented: Small bend radii up to 5 mm are possible for B_3 and B_4 with two opposite cuts in the protruding parts of the profile base.

Installation position

The installation position can be selected as required.

CAUTION
No pressure must be exerted on the Miniature Safety Edge in non-operative mode.

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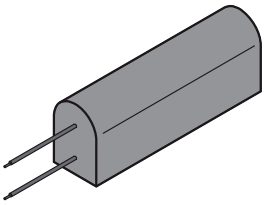
Connection

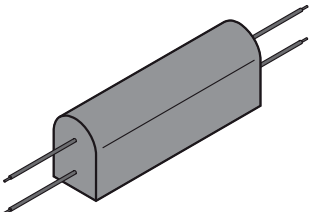
Cable exits

Tip
With more than one sensor connected one behind the other, we recommend the BK versions.

Axial exit



Version: EKS 038/W



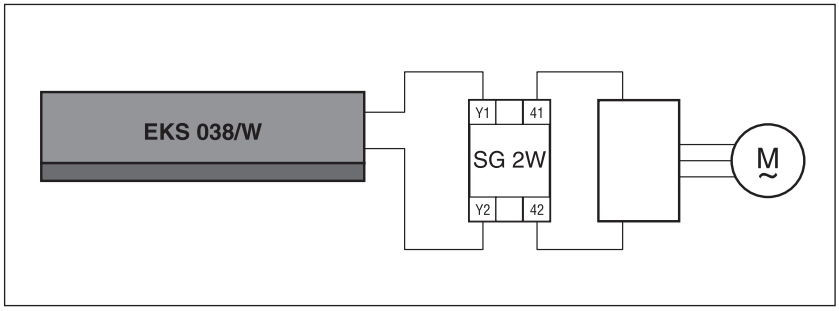
Version: EKS 038/BK

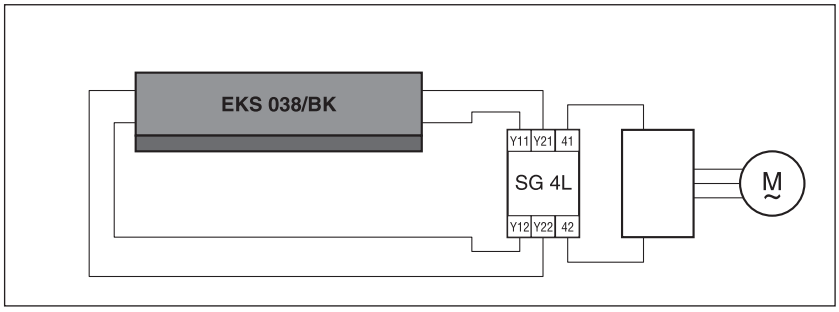
Cable connection

CAUTION
The cables must be laid free of tension.

- Cable: 0.35 mm² per strand, Ø 1.4 mm, black
- Cable length: 2.0 m
  Option: to max. 200 m
- Cable ends: strands stripped
  Option: cable ends available with plug and coupling

Connection example





Key:

SG 2W	2-wire-technology evaluation
SG 4L	4-wire-technology evaluation
	Y11, Y12 lower cables; Y21, Y22 upper cables

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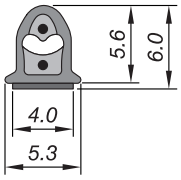
Profiles

Dimensions and operating paths

EKS 038	
	
Actuation force: < 50 N Actuation distance: < 1.2 mm	

Physical resistance

Miniature Safety Edges EKS	TPE
Degree of protection (IEC 60529)	IP65
Hardness as per Shore A	50 ±5
Behaviour in fire (DIN 75200)	approx. 40 mm/min

060217 v1.4c

Chemical resistance

The Miniature Safety Edge is resistant against normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

The values in the table are results of tests carried out in our laboratory to the best of our knowledge and belief. The suitability of our products for your special area of application must always be verified with your own practical tests.

Explanation of symbols:
+ = resistant
± = resistant to a certain extent
- = not resistant

Miniature Safety Edge EKS	TPE
Acetone	-
Formic acid	-
Armor All	+
Car shampoo	+
Buraton	+
Butanol	-
Sodium hypochlorite	-
Disinfectant	+
Acetic acid 10 %	-
Ethanol	+
Ethyl acetate	-
Ethylene glycol	+
Window cleaner	
Alcohol-based	+
Alkaline cleaner	+
Neutral cleaner	+
Greases	±
Volatile softeners	-
Anti-frost agent	+
Skin cream	+
Icidine	+
Incidine	+
Incidine plus	+
Plastic cleaner	+
Lyso FD 10	+
Metal working oil	-
Microbac	+
Microbac forte	+
Minutil	+
Saline solution 5 %	+
Spirit (ethyl alcohol)	+
Terralin	+
UV-resistance	+
Centring oil	-

Note:
Tests are carried out at room temperature (+23 °C).

060217 v1.4c

Attachment

Per acrylic-foam adhesive tape

Requirements
For ideal bonding, the bonding surface must be
+ clean
+ dry
+ smooth.

Avoid
- very uneven
- sharp-edged bonding surfaces.

Recommended working temperature: +15 to +25°C.

Note:
Check with adhesion tests before serial use whether bonding is possible on the selected installation surface.

Bonding with ... on ...	with Primer	without Primer
ABS	1	-
Aluminium: natural	1	+
Aluminium: anodised	1 / 3	-
Aluminium: powder-coated	1	-
CAB	-	-
Glass	4 / 5	-
Wood: natural	-	-
Wood: glazed, varnished	2	-
Wood: veneered, light weight building board	2	-
PA6, PA66	3	-
PE, HDPE	-	-
PMMA	1	-
PP	1	-
PS	-	-
PVC	2	-
SAN	1	-
Steel, stainless steel	1 / 3	-

Explanation of symbols:
+ = suitable
- = not suitable
1 = Primer 4298UV
2 = Primer 4297
3 = Multiprimer
4 = Silan Primer
5 = Primer 4299

Note:
Tests are carried out at room temperature (+23 °C).

Preparation
Only applies to bend radii < 15 mm.

1. Measure bend locations and mark on both sides.

2. Carefully cut into both profile sides at the markings, making sure you only cut the projecting part.

CAUTION
Damage to the rest of the TPE-covering renders the Miniature Safety Edge unusable. Dispose of faulty Miniature Safety Edge.

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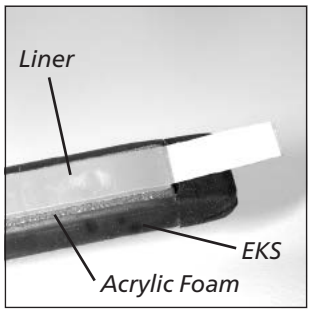
Bonding



1. Clean and degrease bonding surface (e.g. with isopropanol).
2. Apply primer as thinly as possible to complete bonding surface with brush.
3. Air dry primer for approx.10 minutes.
4. Remove 10 to 15 cm of liner from acrylic foam.
5. Place on bonding surface and press on firmly, without any tensile stress.
6. Repeat items 4. and 5. until EKS is completely bonded.
7. Maximum adhesion is achieved after 24 hrs.

Note:
If tensile stress is applied, the EKS can become several millimetres longer.

Tip:
For long straight sections, an extended try square may be useful for alignment.

Installation accessories

Part no.	Designation	Pack. unit
7500462	Primer 4298 type 3M, 125 ml, in can	1 pc.
7501995	Primer 4297 type 3M, 125 ml, in can	1 pc.
1003360	Multiprimer, 250 ml 24-P	1 pc.

ATTENTION
Smaller winding diameters cause separation of the liner and therefore damage to the self-adhesive acrylic foam.

Storage

Correct storage of the Miniature Safety Edge requires a winding diameter of at least 600 mm.

060217 v1.4c

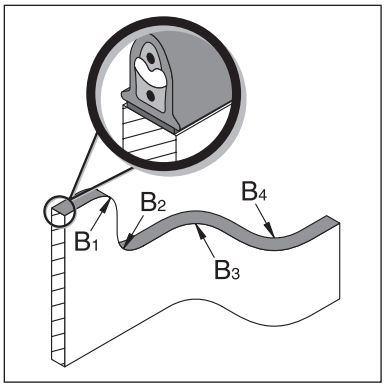
Technical data

Miniature Safety Edge EKS 038 cut-to-size
with resistor (type W) or
without resistor (type BK).

1:1

Switching characteristics at v_{test} = 50 mm/min		
Switching operations	> 1× 10^5	
Actuating force	**+23 °C**	**-25 °C**
Test piece (rod) Ø 4 mm	< 15 N	< 25 N
Test piece (rod) Ø 200 mm	< 35 N	< 50 N
Actuating distance		
Test piece (cylinder) Ø 80 mm	< 1.2 mm	
Actuation angle		
Test piece (cylinder) Ø 80 mm	± 30°	
Safety classifications		
B_{10d} as per ISO 13849-1	2× 10^6	
Mechanical operating conditions		
Sensor length (min./max.)	70 mm / 150 m	
Cable length (min./max.)	2 / 200 m	
Attachment	Using acrylic-foam adhesive	
Peel force	15 N/cm	
Bend radii, minimum		
B_1 / B_2 / B_3 / B_4	500 / 300 / 15 / 15 mm	
IEC 60529: Degree of protection	IP65	
Operating temperature	-25 °C to +80 °C	
short-term (15 min)	-40 °C to +100 °C	
Electrical operating conditions		
Terminal resistance	1k2 ± 5%	
Output	max. 250 mW	
Contact transition resistance	< 400 Ohm (per sensor)	
More than one sensor	max. 5 in series	
Electrical rating		
Voltage	max. 24 V DC	
Current (min./max.)	1 mA / 10 mA	
Connection cable	Ø 1.4 mm per strand 2× 0.35 mm²	
Control Unit (recommendation)		
ISO 13849-1 Cat. 3	SG-EFS 104/2W (type W)	
ISO 13849-1 Cat. 3	SG-EFS 104/4L (type BK)	
Chemical resistance		
The Miniature Safety Edge is resistant against normal chemical influences over a period of exposure of 24 hrs (see p. 8).		
Dimensional tolerances		
Length as per	ISO 3302 L2	
Profile section as per	ISO 3302 E2	

Bend radii:



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Request for quotation

From:

Fax:

+49 731 2061-222

Company

Department

Name, first name

P. O. Box | Post code | City

Street | Post code | City

Phone | Fax | E-mail

Area of application

(e.g.. window construction, medical technology, machine closing edges, public transport, ...)

⇩ Please keep free! ⇩
For internal use only

Mechanical conditions

EKS _____

❍ Type BK
❍ Type W with resistor _____ kΩ

Length: _____ m
Packing unit: _____ units

Attachment per:
❍ Bonding
❍ Snap-in foot

❑ Angle piece construction: ____ × per EKS

❑ Cable length: ____ m (standard: 2.0 m)

❑ Number of monitoring circuits: ____

❑ SG- _____

Pinching and shearing edges to be protected:
(Diagram incl. mounting possibility and cable routing)

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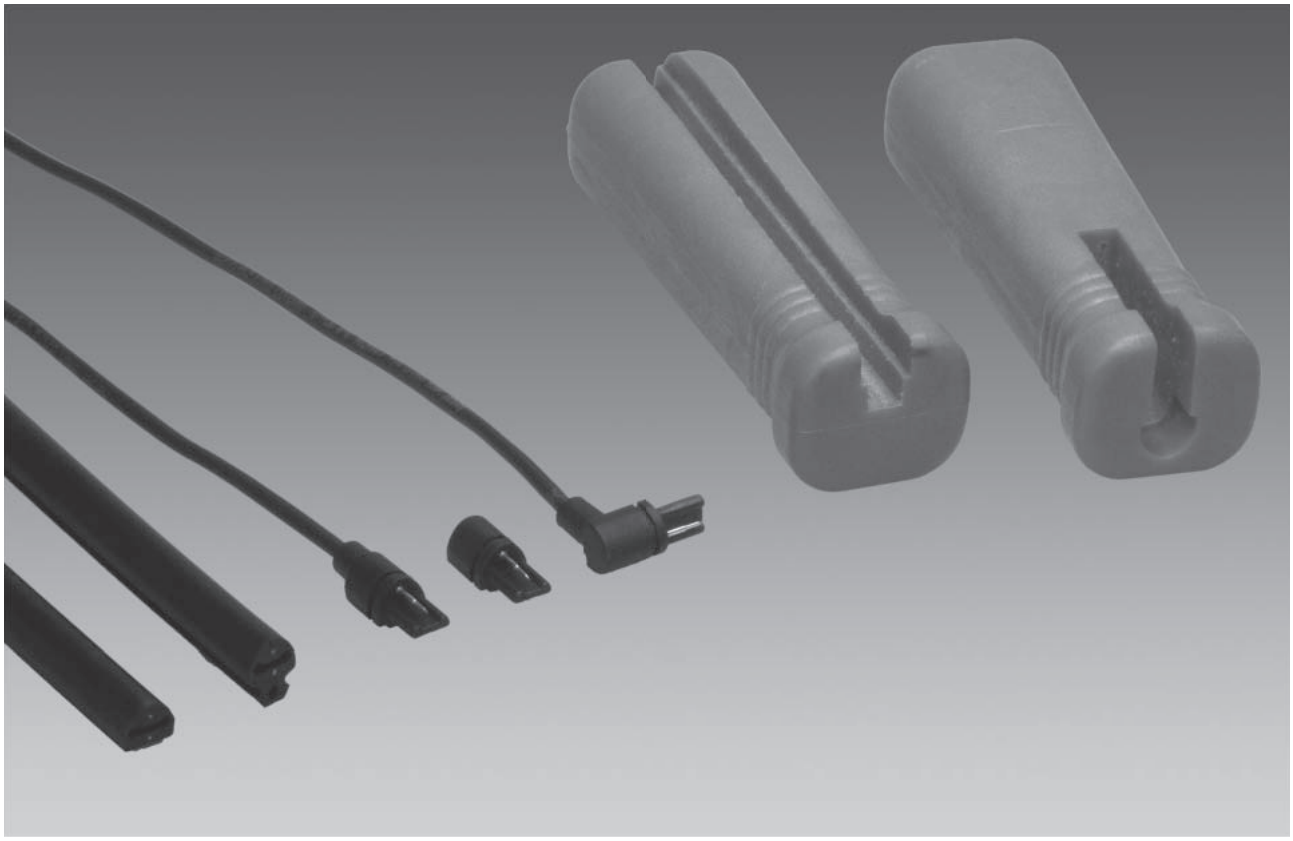
Product information



DIY Miniature Safety Edges

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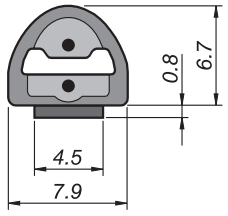
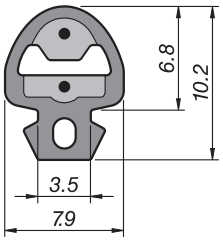
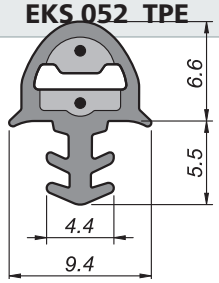
160117 v1.5

Materials list

Part no.	Designation	Pack. unit
7502395	Contact tube EKS 011, self-adhesive	50 m
7502394	Contact tube EKS 014, with snap-in foot	50 m
7502773	Contact tube EKS 052, with clamp foot	45 m
1004580	End piece with resistor 1k2	50 pc.
1004747	End piece with resistor 2k2	50 pc.
1005835	End piece with resistor 8k2	50 pc.
1004579	End piece with PVC cable 2.5 m, axial	50 pc.
1004581	End piece with PVC cable 2.5 m, angled 90°	50 pc.
1003436	Aluminium profile C 10 for EKS 014 with snap-in foot	6 m
1004988	Scissors with stop	1 pc.
7502412	Assembly aid set	1 pc.
1004987	Special adhesive Contact VA 250 Black, 12 g, for IP64	1 pc.
7501995	Primer 4297 type 3M, 125 ml, in can	1 pc.

Contact tubes

Dimensions

EKS 011 TPE	EKS 014 TPE	EKS 052 TPE
		
Actuating force: < 50 N actuating distance at 50 mm/s < 2 mm	Actuating force: < 50 N actuating distance at 50 mm/s < 2 mm	Actuating force: < 50 N actuating distance at 50 mm/s < 2 mm

Notes: Dimensional tolerances as per ISO 3302 E2/L2.

Subject to technical modifications.

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Physical resistance

Miniature Safety Edge EKS	TPE
IEC 60529: Degree of protection	IP40
Hardness as per Shore A	50 ±5

Notes:
Higher degrees of protection up to IP64 are possible using special adhesive (part no. 1004987).

Chemical resistance

Miniature Safety Edge EKS	TPE
Acetone	-
Formic acid	-
Armor All	+
Car shampoo	+
Petrol	-
Brake fluid	+
Buraton	+
Butanol	-
Sodium hypochlorite	-
Disinfectant	+
Diesel	-
Acetic acid 10 %	-
Ethanol	+
Ethyl acetate	-
Ethylene glycol	+
Greases	±
Anti-frost agent	+
Skin cream	+
Icidine	+
Incidine	+
Incidine plus	+
Cooling lubricant	-
Plastic cleaner	+
Lyso FD 10	+
Metal working oil	-
Microbac	+
Microbac forte	+
Minutil	+
Saline solution 5 %	+
White spirit (ethyl alcohol)	+
Terralin	+
UV-resistance	+
Centring oil	-

Explanation of symbols:
+ = resistant
± = limited resistance
- = not resistant

Notes:
Tests are carried out at room temperature (+23 °C).

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Subject to technical modifications.

The Safety Element is resistant against normal chemical influences such as diluted acids and alkalis as well as alcohol over an exposure period of 24 hrs.

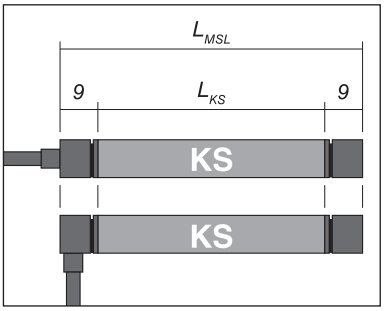
The values in the table are results of tests carried out in our laboratory to the best of our knowledge and belief. The suitability of our products for your special area of application must always be verified with your own practical tests.

DIY in 3 steps

These instructions describe cutting the contact tube to the required length, application of the end pieces and final testing. The end product is a Miniature Safety Edge EKS 011, EKS 014 or EKS 052 with degree of protection IP40.

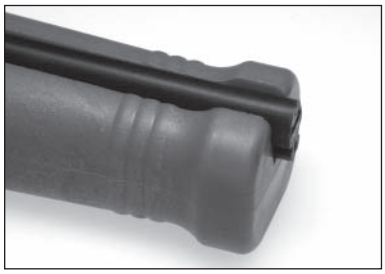
1. Cutting to length

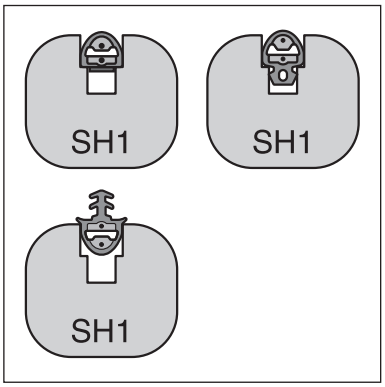
- Measure contact tube (KS) to length and mark.
  The following applies: $L_{KS} = L_{MSL} - 18$ mm
  where:
  L_{KS} = length of contact tube
  L_{MSL} = length of Miniature Safety Edge
- Place contact tube against stop of the scissors and cut off at marking.



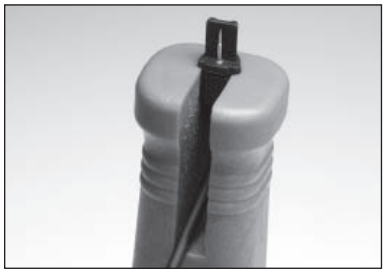
2. Insertion

- Insert contact tube in assembly aid SH1 so that the
  contact tube protrudes 2 to 3 mm beyond the edge.





- Insert cable end piece in assembly aid SH2.



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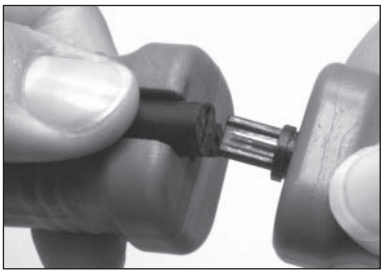
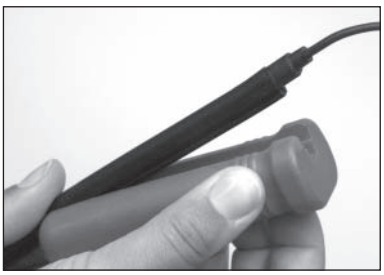
Subject to technical modifications.

Tip
For a better bond between the end piece and the end of the contact tube, brush with a thin layer of special adhesive (part no. 1004987). When finished, wipe away any excess adhesive from assembly aid.



- Fix contact tube in assembly aid SH1 by pressing firmly with thumb.
- Insert end piece straight into contact tube with assembly aid SH2 and press firmly against assembly aid SH1 until the air gap between the end piece and the contact tube disappears.

Tip
Use leverage effect – with slight pressure on contact tube at the end of the handle.



- Loosely detach assembly aid SH2 and remove semi-finished Miniature Safety Edge.
- Assemble the other end of the contact tube with a resistor end piece in the same way.

3. Check

- Visual check for flush connection of the end pieces all round.
- Check operation with multimeter: Are set values met?

Set values:

Miniature Safety Edge not activated

EKS/W with 1k2:	1.2 kOhm ±10%
EKS/W with 2k2:	2.2 kOhm ±5%
EKS/W with 8k2:	8.2 kOhm ±3%
EKS/BK:	> 20 MOhm
Continuity test per channel:	< (5 + (L_{KS} × 0.5/m)) Ohm

Miniature Safety Edge activated

all EKS:	< 400 Ohm

Miniature Safety Edge may be irreparably damaged!

➔ No tensile load may be applied to the cable.

➔ Do not pull Miniature Safety Edge into an outer profile.

➔ Clip EKS 014 into aluminium profile C 10, do not pull in.

➔ No pressure may be exerted on the contact tube in non-operative mode.

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Subject to technical modifications.

Attachment

Per acrylic-foam adhesive tape

e.g. EKS 011

Requirements

For ideal bonding, the bonding surface must be

+ clean
+ dry
+ smooth.

Avoid

- very uneven
- sharp-edged bonding surfaces.

Recommended working temperature: +15 to +25°C.

Note:

Check with adhesion tests before serial use whether bonding is possible on the selected installation surface.

Bonding with ... on ...	with Primer	without Primer
ABS	1	-
Aluminium: natural	1	+
Aluminium: anodised	1 / 3	-
Aluminium: powder-coated	1	-
CAB	-	-
Glass	4 / 5	-
Wood: natural	-	-
Wood: glazed, varnished	2	-
Wood: veneered, light weight building board	2	-
PA6, PA66	3	-
PE, HDPE	-	-
PMMA	1	-
PP	1	-
PS	-	-
PVC	2	-
SAN	1	-
Steel, stainless steel	1 / 3	-
Tests are carried out at room temperature (+23 °C).		

Explanation of symbols:
+ = suitable
- = not suitable
1 = Primer 4298UV
2 = Primer 4297
3 = Multiprimer
4 = Silan Primer
5 = Primer 4299

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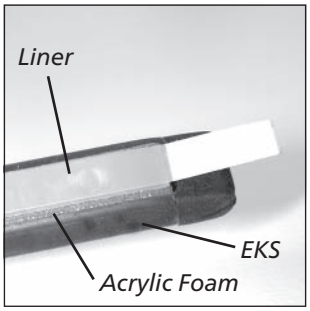
Subject to technical modifications.



Bonding

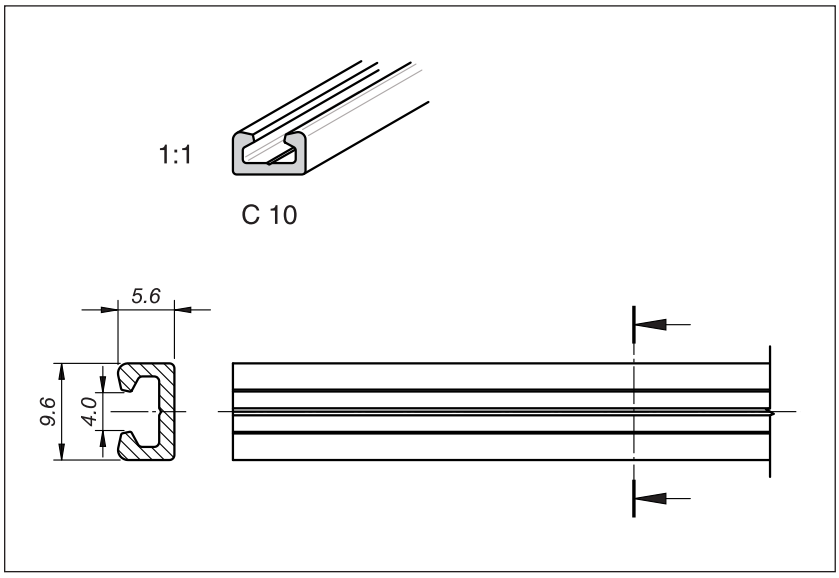
1. Clean and degrease bonding surface. (e.g. with isopropanol)
2. Apply primer as thinly as possible to complete bonding surface with brush.
3. Air dry primer for approx.10 minutes.
4. Remove 10 to 15 cm of liner from acrylic foam.
5. Place on bonding surface and press on firmly, without any tensile stress.
6. Repeat items 4. and 5. until EKS is completely bonded.
7. Maximum adhesion is achieved after 24 hrs.

Note:
If tensile stress is applied, the EKS can become several millimetres longer.

Per snap-in foot e.g. EKS 014

The Miniature Safety Edge is clipped into an aluminium profile.

Aluminium profile C 10



Standard profile for EKS 014:
First the aluminium profile must be mounted onto the closing edge and then the Miniature Safety Edge clipped into the aluminium profile.

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Subject to technical modifications.

Requirements

To ensure optimum fixing, the aluminium profile must be

+ compatible (e.g. C 10 for EKS 014, C 15 for EKS 015)
+ clean
+ smooth.

Avoid

- drilling dust
- sharp-edged burrs on holes.

Recommended aids: sliding agents and seam rollers.

Note on aids:

- Brush aluminium profile and snap-in foot with a volatile **sliding agent** (e.g. water with washing-up liquid).
- **Seam roller** for pushing in.

Clipping

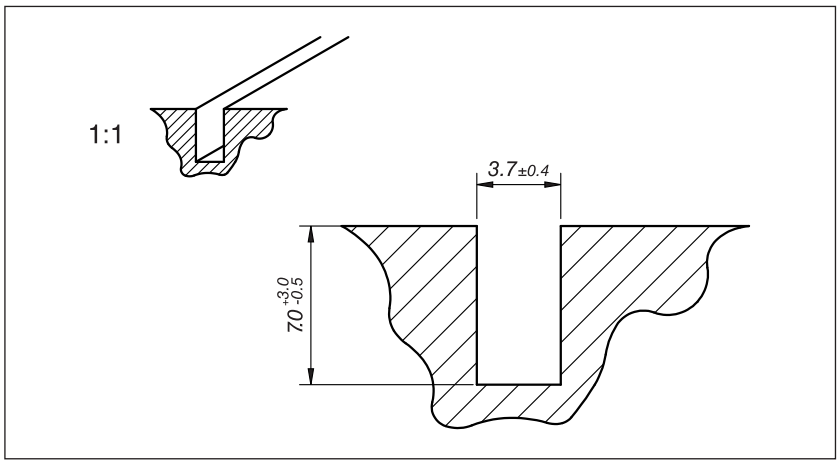
1. Fix aluminium profile with countersunk screws, e.g. M2×2.5.

2. Clip Miniature Safety Edge with snap-in foot into the aluminium profile.

Per clamp foot

e.g. EKS 052

The Miniature Safety Edge is pressed into a groove.



Requirements

To ensure optimum fixing, the groove must be

+ manufactured for an exact fit
+ clean
+ smooth.

Avoid

- dirt
- sharp-edged burrs.

Recommended aids: seam roller.

Clamping

➔ Press the clamp foot into the groove until the Miniature Safety Edge is evenly inserted.

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Subject to technical modifications.

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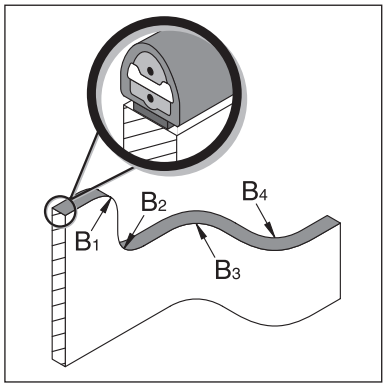
Technical data DIY EKS 011

Miniature Safety Edge EKS 011
manufactured with resistor for 2-wire technology
or without resistor for 4-wire technology.

Bend radii:



Note:
Higher degrees of protection up to IP64 and a tensile load on the cable of up to 60 N are possible using special adhesive (part no. 1004987).

Switching characteristics at v_{test} = 50 mm/min		
Switching operations		
Test piece (rod) Ø 10 mm, F = 100 N	> 1× 10^5	
Actuating force	**+23 °C**	**-25 °C**
Test piece (rod) Ø 4 mm	< 15 N	< 30 N
Test piece (rod) Ø 200 mm	< 25 N	< 50 N
Actuating distance		
Test piece (cylinder) Ø 80 mm	< 2.0 mm	
Actuation angle		
Test piece (cylinder) Ø 80 mm	± 40°	
Safety classifications		
ISO 13849-1: B_{10d}	2× 10^6	
Mechanical operating conditions		
Acrylic foam		
Peel force	15 N/cm	
Bend radii, minimum		
B_1 / B_2 / B_3 / B_4	120 / 150 / 20 / 20 mm	
Tensile load, cable (max.)	20 N	
IEC 60529: Degree of protection	IP40	
Operating temperature	-25 to +80 °C	
temporary (15 min)	-40 to +100 °C	
Behaviour in fire		
as per DIN 75200	approx. 40 mm/min	
Electrical operating conditions		
Terminal resistance 1k2/2k2	± 10%/± 5%	
Switching capacity (max.)	250 mW	
Contact transition resistance	< 400 Ohm (per sensor)	
More than one sensor	max. 3 in series	
Electrical rating		
Voltage (max.)	DC 24 V	
Current (min./max.)	1 mA / 10 mA	
Connection cable	Ø 2.7 mm PVC 2× 0.25 mm^2	
Chemical resistance		
The sensor is resistant against normal chemical influences over a period of exposure of 24 hrs (see p. 4).		
Dimensional tolerances		
Length as per	ISO 3302 L2	
Profile section as per	ISO 3302 E2	

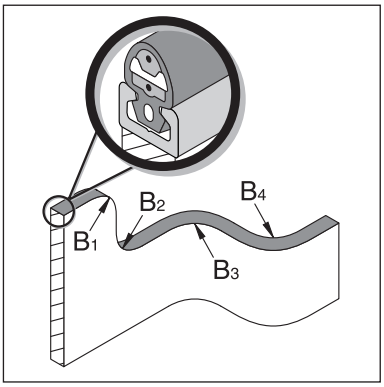
010916 v1.4

Technical data DIY EKS 014

Miniature Safety Edge EKS 014
manufactured with resistor for 2-wire technology
or without resistor for 4-wire technology.

Switching characteristics at v_{test} = 50 mm/min		
Switching operations		
Test piece (rod) Ø 10 mm, F = 100 N	> 1× 10^5	
Actuating force	**+23 °C**	**-25 °C**
Test piece (rod) Ø 4 mm	< 15 N	< 30 N
Test piece (rod) Ø 200 mm	< 25 N	< 50 N
Actuating distance		
Test piece (cylinder) Ø 80 mm	< 2.0 mm	
Actuation angle		
Test piece (cylinder) Ø 80 mm	± 40°	
Safety classifications		
ISO 13849-1: B_{10d}	2× 10^6	
Mechanical operating conditions		
Snap-in foot width	3.5 mm	
Aluminium profile (recommended)	C 10	
Bend radii, minimum		
B_1 / B_2 / B_3 / B_4	120 / 150 / 20 / 20 mm	
Tensile load, cable (max.)	20 N	
IEC 60529: Degree of protection	IP40	
Operating temperature	-25 to +80 °C	
temporary (15 min)	-40 to +100 °C	
Behaviour in fire		
as per DIN 75200	approx. 40 mm/min	
Electrical operating conditions		
Terminal resistance 1k2/2k2	± 10%/± 5%	
Switching capacity (max.)	250 mW	
Contact transition resistance	< 400 Ohm (per sensor)	
More than one sensor	max. 3 in series	
Electrical rating		
Voltage (max.)	DC 24 V	
Current (min./max.)	1 mA / 10 mA	
Connection cable	Ø 2.7 mm PVC 2× 0.25 mm^2	
Chemical resistance		
The sensor is resistant against normal chemical influences over a period of exposure of 24 hrs (see p. 4).		
Dimensional tolerances		
Length as per	ISO 3302 L2	
Profile section as per	ISO 3302 E2	

Bend radii:



Note:
Higher degrees of protection up to IP64 and a tensile load on the cable of up to 60 N are possible using special adhesive (part no. 1004987).

010916 v1.4

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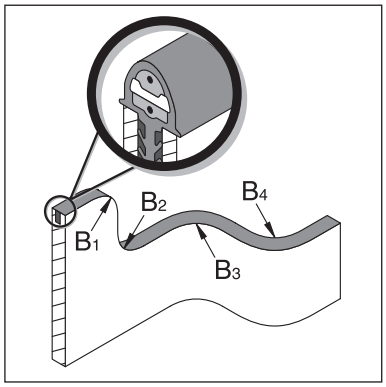
Technical data DIY EKS 052

Miniature Safety Edge EKS 052
manufactured with resistor for 2-wire technology
or without resistor for 4-wire technology.

Switching characteristics at $v_{Prüf}$ = 50 mm/min		
Switching operations		
Test piece (rod) Ø 10 mm, F = 100 N	> 1× 10^5	
Actuating force	**+23 °C**	**-25 °C**
Test piece (rod) Ø 4 mm	< 15 N	< 30 N
Test piece (rod) Ø 200 mm	< 25 N	< 50 N
Actuating distance		
Test piece (cylinder) Ø 80 mm	< 2.0 mm	
Actuation angle		
Test piece (cylinder) Ø 80 mm	± 40°	
Safety classifications		
ISO 13849-1: B_{10d}	2× 10^6	
Mechanical operating conditions		
Groove width for clamp foot	3.7 ±0.4 mm	
Bend radii, minimum		
B_1 / B_2 / B_3 / B_4	120 / 150 / 20 / 20 mm	
Tensile load, cable (max.)	20 N	
IEC 60529: Degree of protection	IP40	
Operating temperature	-25 to +80 °C	
temporary (15 min)	-40 to +100 °C	
Behaviour in fire		
as per DIN 75200	approx. 40 mm/min	
Electrical operating conditions		
Terminal resistance 1k2/2k2	±10% / ±5%	
Switching capacity (max.)	250 mW	
Contact transition resistance	< 400 Ohm (per sensor)	
More than one sensor	max. 3 in series	
Electrical rating		
Voltage (max.)	DC 24 V	
Current (min./max.)	1 mA / 10 mA	
Connection cable	Ø 2.7 mm PVC 2× 0.25 mm^2	
Chemical resistance		
The sensor is resistant against normal chemical influences over a period of exposure of 24 hrs (see p. 4).		
Dimensional tolerances		
Length as per	ISO 3302 L2	
Profile section as per	ISO 3302 E2	

Bend radii:



Note:
Higher degrees of protection up to IP64 and a tensile load on the cable of up to 60 N are possible using special adhesive (part no. 1004987).

Subject to technical modifications.

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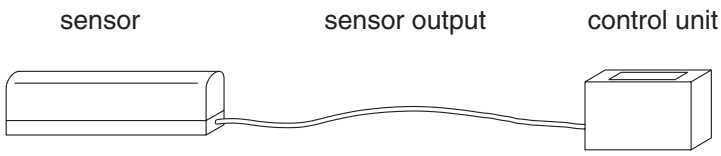
Proven Safety

Safety Bumpers 3.1.1 Product Range

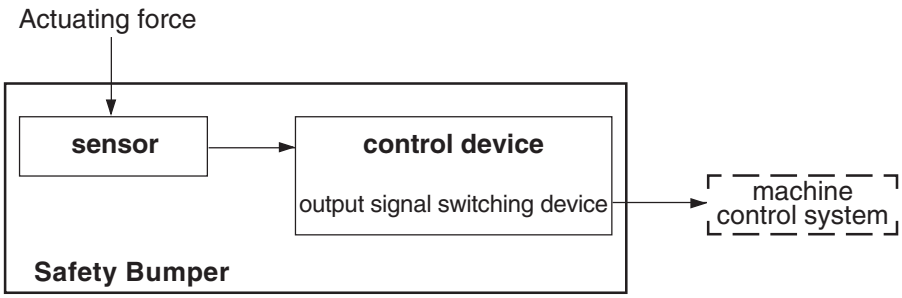
Safety Bumper
Safety Bumpers are protective devices comprising sensor(s), control device and output signal switching device(s).



The control unit is made up of control device and output signal switching device(s).

Sensor
The sensor is that part of the Safety Bumper to which the actuating force is applied in order to produce a control command.

Control device
The control device is that part of the Safety Bumper, which reacts to the status of the sensor and which produces those output signals which are transmitted to the machine control system.
The output signal switching device is that part of the control device which is connected to the machine control system and transmits safety output signals.



The following points should be considered when choosing the sensors:
- temperature range
- response time
- protection class (standard: IP65)
- environmental considerations (oil, coolant, ...)

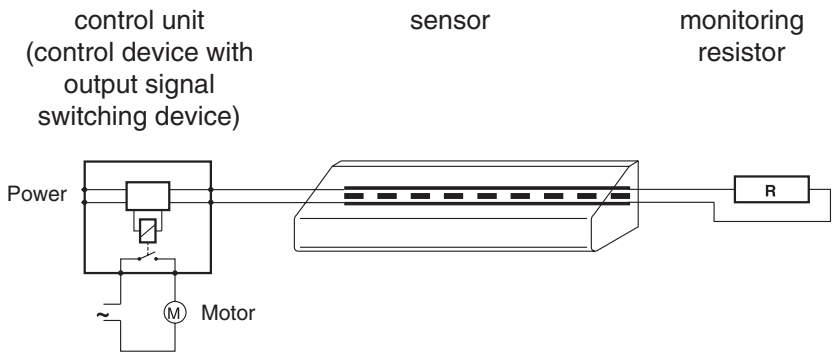
PLEASE NOTE:
The certification of design becomes invalid if our products are used in combination with control units or sensors which do not comply with the tested types.

Subject to technical modifications.

Mayser GmbH & Co. KG Postfach 13 62 88153 Lindenberg Germany Phone +49 8381 507-0 Fax +49 8381 507-217

Safety Bumpers 3.2.1 Product Range

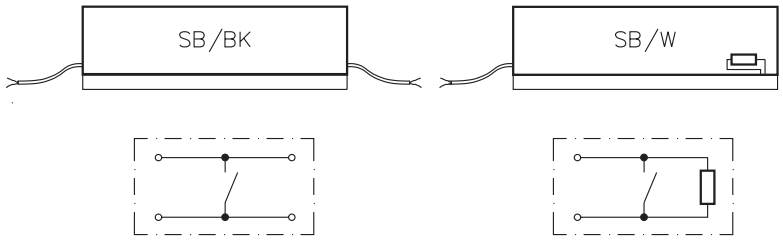
2-wire-connection system (with monitoring resistor)



The Safety Bumper comprises sensor control device and output signal switching device.
The control device and the output signal switching device are combined in the control unit.

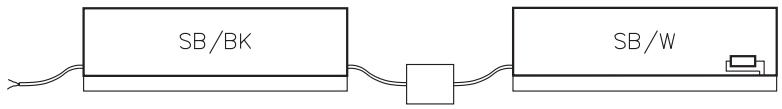
Types

SB/BK	through sensor with cable exit on both sides or for connecting up an external monitoring resistor
SB/W	with integrated monitoring resistor

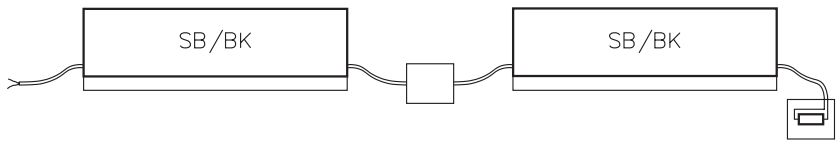


For your safety:
The sensor and the connecting cable are constantly monitored for function.
A control function is attained by bridging the conductive areas with a monitoring resistor.

Combination of sensors



Combinations:
- connection of several sensors
- connection to Safe Edges and Safety Mats possible
- only one control unit necessary



Model with external resistor, thus avoiding variety in type

Cable connection (standard)

- Cable: LiYY Ø 5 mm; 2x 0.25 mm² Cu
- length of cable: 2 m
  customized lengths possible
- cable ends without plug/socket connection
  option: cable ends can be supplied with plug/socket connection

Subject to technical modifications.

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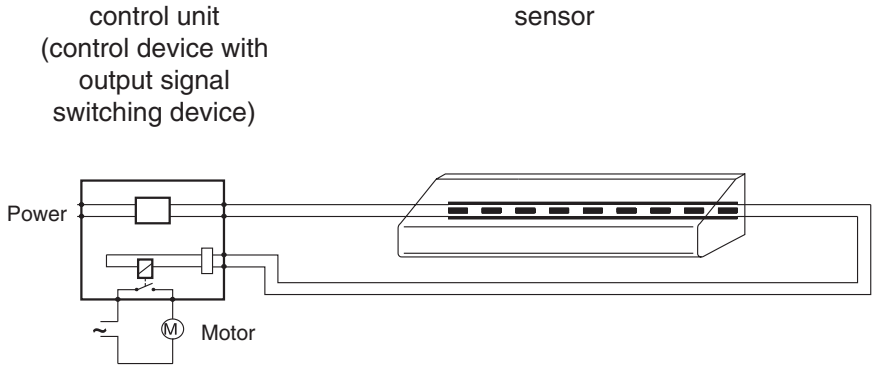
Safety Bumpers 3.2.2 Product Range

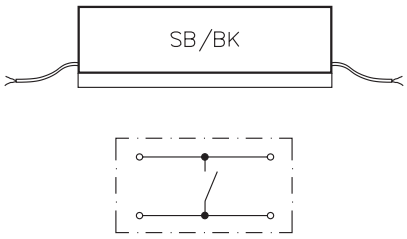
4-wire-connection system (without monitoring resistor)



The Safety Bumper comprises sensor control device and output signal switching device.
The signal processing and the output signal switching device are combined in the control unit.

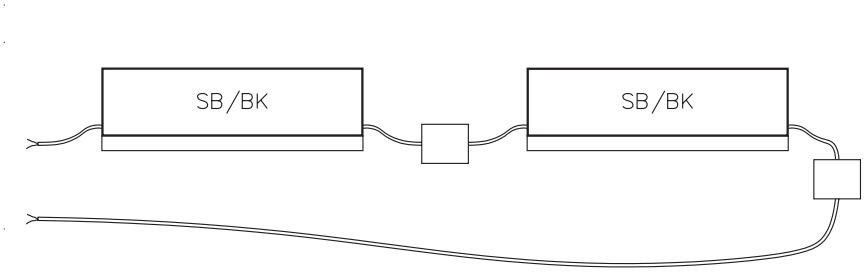
Type

SB/BK through sensor with cables on both ends



For your safety:
The sensor and the connecting cable are constantly monitored for function.
The monitoring resistor is not required due to signal transmission feedback

Combination of sensors



Combinations:
- connection of several sensors
- connection to Safe Edges and Safety Mats possible
- only one control unit necessary

Cable connection (standard)

- cabel: LiYY Ø 5 mm; 2x 0.25 mm² Cu
- length of cable: 2 m
  customized lengths possible
- cable ends without plug/socket connection
  option: cable ends can be supplied with plug/socket connection

Note:
The 4-wire-connection system can only be applied using the control unit SG-SUE 41X4 NA.

Subject to technical modifications.

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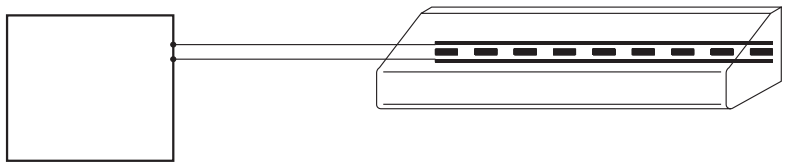
Safety Bumpers 3.2.3 Product Range

Micro switch system (Break contact principle)

The Safety Bumper comprises only the sensor.
The sensor can be connected either by means of a follow-up safety system or directly into the machine control system.

machine relay control

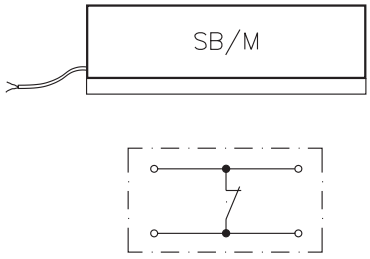
sensor



Prerequisite: The follow-up system must be in accordance with category 3 as per EN 954-1.

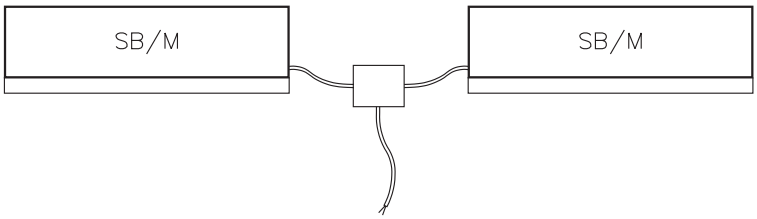
Type

SB/Micro with integrated break contact principle



For your safety:
The break contact principle monitors the system for a break in connection.
The switch contacts are force guided.

Combination of sensors



Combinations:
- connection of several sensors
- no control unit needed

Cable connection (standard)

- cable: 4 GKWG-AX 1x 1.5 mm²
- length of cable: 2 m
  customized lengths possible
- cable ends without plug/socket connection

Subject to technical modifications.

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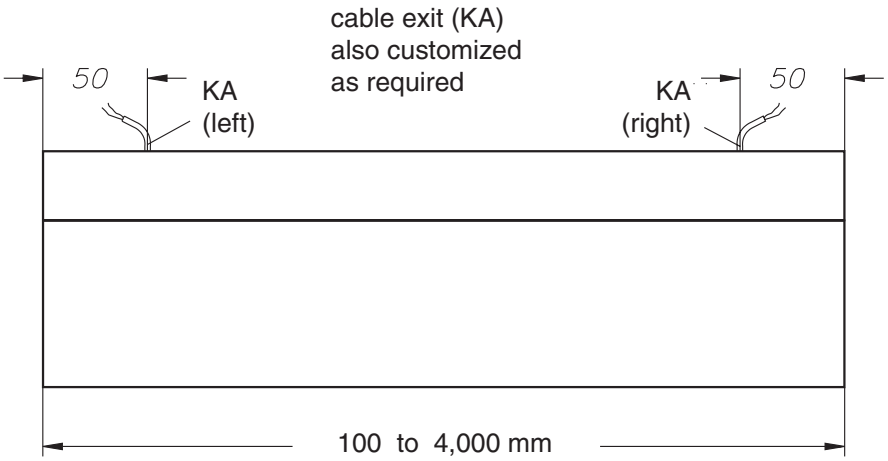
Safety Bumpers 3.3.1
Product Range

Standard System

Lengths available

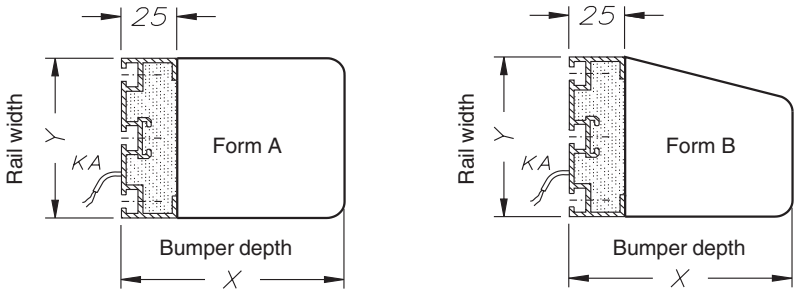
The sensors can be supplied in lengths ranging from 100 to 4,000 mm.
Special designs are available on enquiry.



Forms available

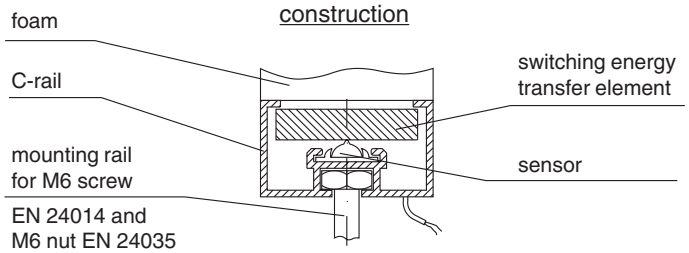
Standard sensors are available in 2 forms:

Form A	parallel form	at Y = 40
Form B	cone shaped form	at Y = 100; 150; 200



Design lay-out / Mounting

All-purpose mounting with M 6 screws or nuts in continuous grooves in the C-rail.



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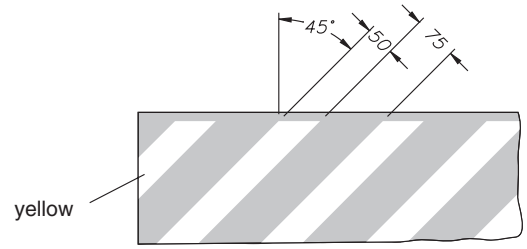
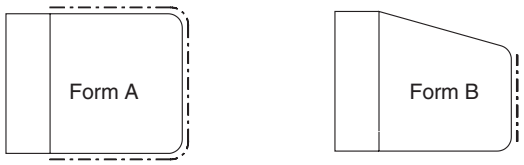
Safety Bumpers 3.4.1 Product Range

Standard System

Colour

- deep black (similar to RAL 9005) or
- deep black with yellow stripes (similar to RAL 1021)





The yellow stripes are applied to the area indicated by the chain-dotted line.

Skin

- environmental-friendly PUR-skin with good mechanical properties
- protection class IP 65

Chemical resistance

The following resistances are only given (at a room temperature of 23 °C) on condition that the bumper-skin is undamaged and intact.

Chemical Resistance	Skin
Acetone	±
Formic acid	-
Ammonia	+
ASTM-Oil No.1/ 2/ 3	+
Petroleum	±
Brake fluid	-
Diesel oil	+
Ethyl acetate	-
Isopropyl alcohol	+
Methanol	+
Hydrochloric acid 10 %	+
Hydrosulfuric acid 50 %	±
Spirit (ethyl alcohol)	+
Carbon tetrachloride	±
Rolling oil	+
Water	+
Hydrogen peroxide 10%	+
Household and sanitary cleaning agents	+

Key to symbols:
+ = resistant
± = limited resistance
- = not resistant

The data given are results of tests which were done in our laboratory to the best of our knowledge and belief. We cannot accept any obligations being deduced from them. You must always test the suitability of our products for your special application purpose under practical conditions.

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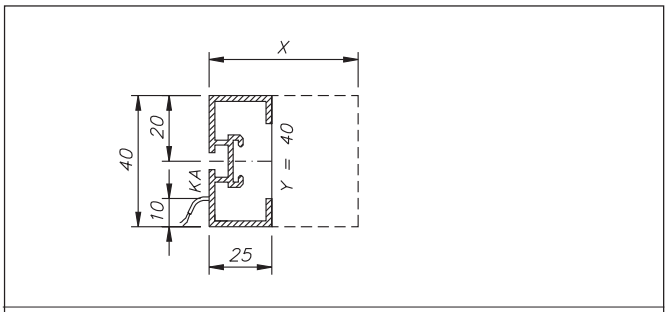
Standard System

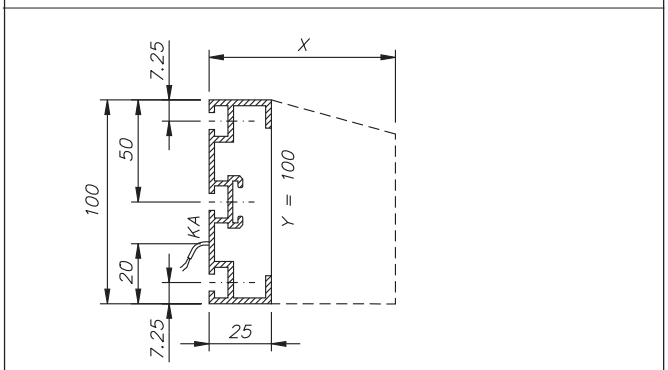
Dimensions of aluminium mounting rail

Safety Bumpers 3.5.1 Product Range



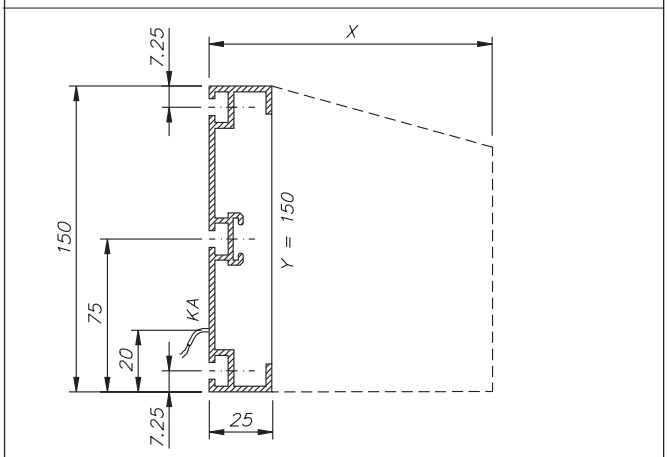
Form: **A**
Rail width: **Y = 40**

Bumper depth available: **X = 60 to 150**



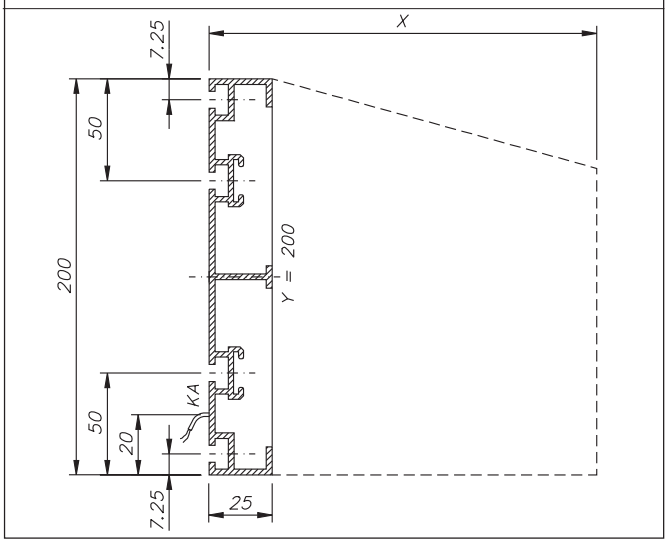
Form: **B**
Rail width: **Y = 100**

Bumper depth available: **X = 60 to 200**



Form: **B**
Rail width: **Y = 150**

Bumper depth available: **X = 60 to 300**



Form: **B**
Rail width: **Y = 200**

Bumper depth available: **X = 60 to 500**

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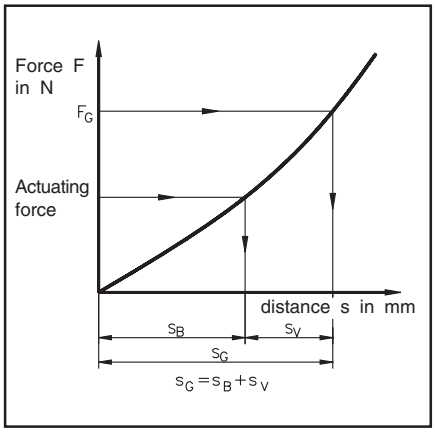
Safety Bumpers 3.6.1 Product Range

Standard System

Technical Details

Form	Y	X	Actuating force F_G [N]	Reaction distance S_B [mm]	Total deformation up to 250 N S_G [mm]
A	40	120	70	20	80
A	40	150	70	20	100
B	100	100	70	20	50
B	100	200	70	20	80
B	150	250	70	20	100
B	150	300	80	30	120
B	200	350	80	30	120
B	200	450	80	40	150



The force F_G represents a limit force up to which a sensor deforms and/ or up to which it may continue to be moved.

In this connection it is assumed that no danger will arise for humans while this force is being applied.

The suggested standard value for an adult is F_G = 250 N.

Example:
Chosen Bumper:
Form B; Y=150, X=300
The contact is triggered at a reaction distance of 30 mm.
90 mm braking distance now remains (at a limit force of 250 N) until the AGV comes to a halt.

mm tolerances:	± 10 mm
N tolerances:	± 10 N
Test piece:	Ø 80 mm
Test speed:	100 mm/s

Formula for calculating the total deformation distance:

S_V [mm] = overtravel

$$S_G = S_B + S_V$$

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Customized designs

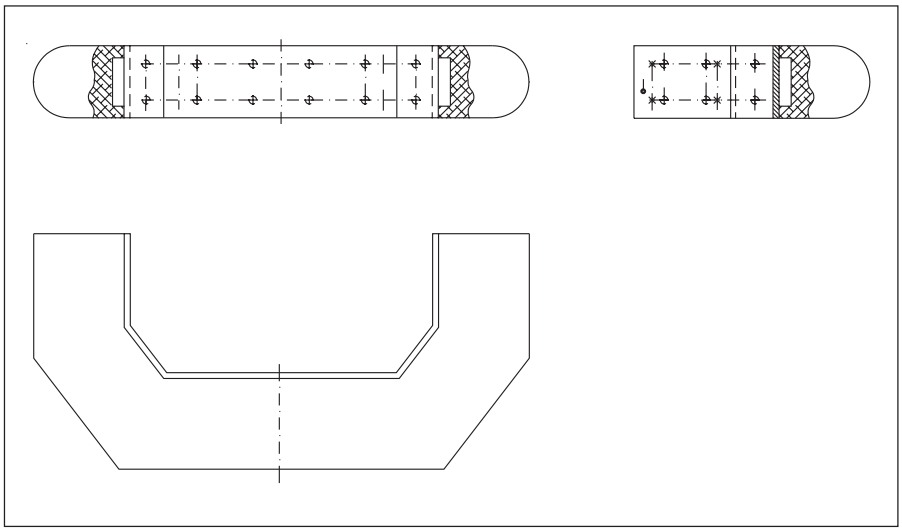
Types

The Safety Bumpers can be supplied in various shapes and sizes for special applications.

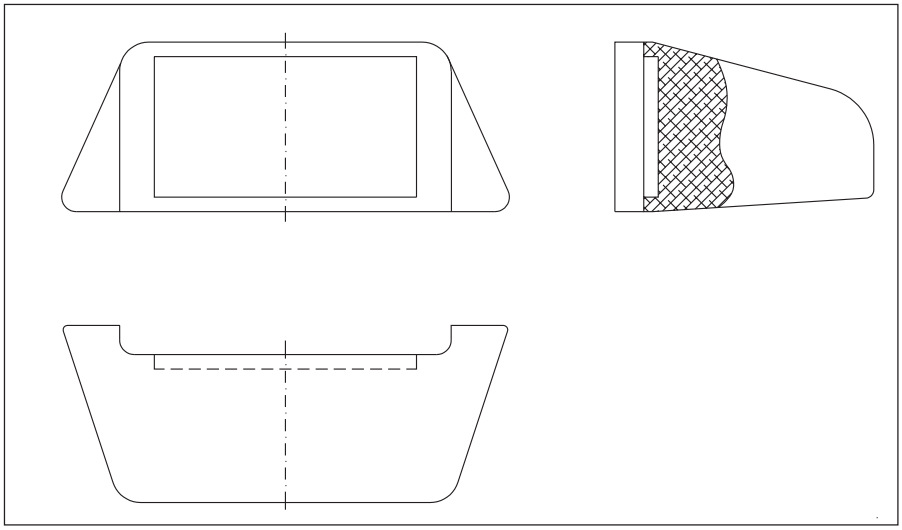
Forms: U-shaped, L-shaped, ...
Surface:
- various skins and colours (single colour, striped, ...)
- protective coverings for high mechanical loads
- heat resistant casings

Special solutions for use in hazardous locations possible.
Customized mounting rail can be accomodated.

Practical examples



U-shape



Trapezium-shape

Special designs
If you need special shapes or special monitoring devices, get in touch with Mayser's project engineers directly.

Mayser Safety System
We make progress safe!

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Data sheet

Safety Bumpers 3.9.1 Product Range

Safety Bumpers comprising sensors SB/W and SB/BK
with al-mounting rail and control unit SG-EFS 1X4 ZK2/1
Sensor dimensions: 1000 x 150 x 210 mm *)

1.	Protection class sensor	IP 65 IP 54 *)	
2.	Switching operations sensor	> 10^5 > 10^4 *)	
3.	Switching times		
3.1	Response time	22 ms	
	Test speed	100 mm/s	
3.2	Control command reset	manual or automatic	
4.	Actuating force, deformation distance, Safety Bumper switching area		
	Testing basis: GS-BE-17		
	Test piece	Ø 80 mm	45 x 400 mm
4.1	Actuating force	< 150 N	< 600 N
4.2	Deformation distances s_V at 100 mm/s	96 mm *)	
4.3	Sensitive switching area WB	90° *)	
5.	Behaviour in fault instance	One-fault-safety *)	
	Category as per EN 954-1	3	
6.	Operating and environmental conditions		
6.1	Ambient temperature		
	Sensor	- 20 °C to + 55 °C *)	
7.	Operation –Maintenance		
7.1	Maintenance	The sensor is maintenance free.	
7.2	Monitoring	The control unit aids monitoring	
7.3	Expert inspection (once per year) as per ZH 1/494	• Both LEDs must light when the sensor is not activated. • Both relays deenergize when the sensor is activated; both LEDs go out. • This test must be undertaken to various parts of the sensor.	
8.	Chemical resistance	The sensor is resistant to customary chemical influences such as diluted acids, alkaline solutions and alcohol for an exposure duration of 24 hours.	
9.	Bumper Repair Kit (accessories)	Damages to the foam body can lead to functional impairment. The damage can be repaired using the Bumper Repair Kit.	

All given data marked with *) are verified by EEC-type-examination certificates.

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Request for quotation sheet (page 1 of 2)

Safety Bumper 7.10

From:

Company

Department

Name, first name

P. O. Box Post code City

Street Post code City

Phone Fax E-mail

All properties marked * are standard features.

Quantity: _____

Please use a separate RFQ sheet for each Bumper type!

⇩ Please keep free ⇩
For internal use only

Application:

❑ AGV ❑ doors + gates ❑ moving machine part

❑ medical

❑ others _____

Stopping distance:

max. _____ mm

essential information: please complete

moving speed: _____ m/s

stopping time: _____ s

Environmental conditions:

❑ dry * ❑ water ❑ oil / lubricant

❑ dust (wood) ❑ explosives area category: _____

❑ aggressive substances: ❍ cutting oil: _____

❍ solvent: _____

❍ paint: _____

❍ others: _____

ambient temperature: from ____ °C to ____ °C

Forms and shapes:

Shapes:	Cross section:	Mounting position:
❑ straight *	❑ A	❑ horizontal *
❑ L-form horizontal *	❑ B	❑ vertical
❑ L-form vertical *		❑ hanging
❑ U-form horizontal *	Radii:	❑ standing
❑ U-form vertical *	❑ longitudinal edges	
❑ plane surface		
❑ cylindric		
❑ ring / circular		

please turn

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Request for quotation sheet (page 2 of 2)

Dimensions:

length: _____ mm

height Y: _____ mm

depth X: _____ mm

Colour and marking:

Base colour:
- ❑ black *
- ❑ _____

Stripes:
- ❑ yellow *
- ❑ _____

Hatching:
- ❑ 45° *
- ❑ 45° fishbone

❑ symbol "No step"

Electrical type:

❑ SB/BK ❑ SB/W ❑ SB/M

❑ non-active/dummy

Cable:

❑ 2000 mm * ❑ other length: _____ mm

❑ plug ❑ socket

Cable exit:

❑ right * ❑ left ❑ central

❑ at the side ❑ top ❑ bottom

Mounting plate:

❑ C40 * ❑ C100 * ❑ C150 *

❑ C200 * ❑ aluminium 3 mm

❑ other: _____

Fixing:

❑ for C40, C100, C150, C200 with screw/nut M6 *

❑ clinch nut ❑ stud bolt ❑ _____

Protected area:
(pls. attach sketch or CAD-data incl. way of mounting and cable layout if possible)

⇩ Please keep free! ⇩
For internal use only

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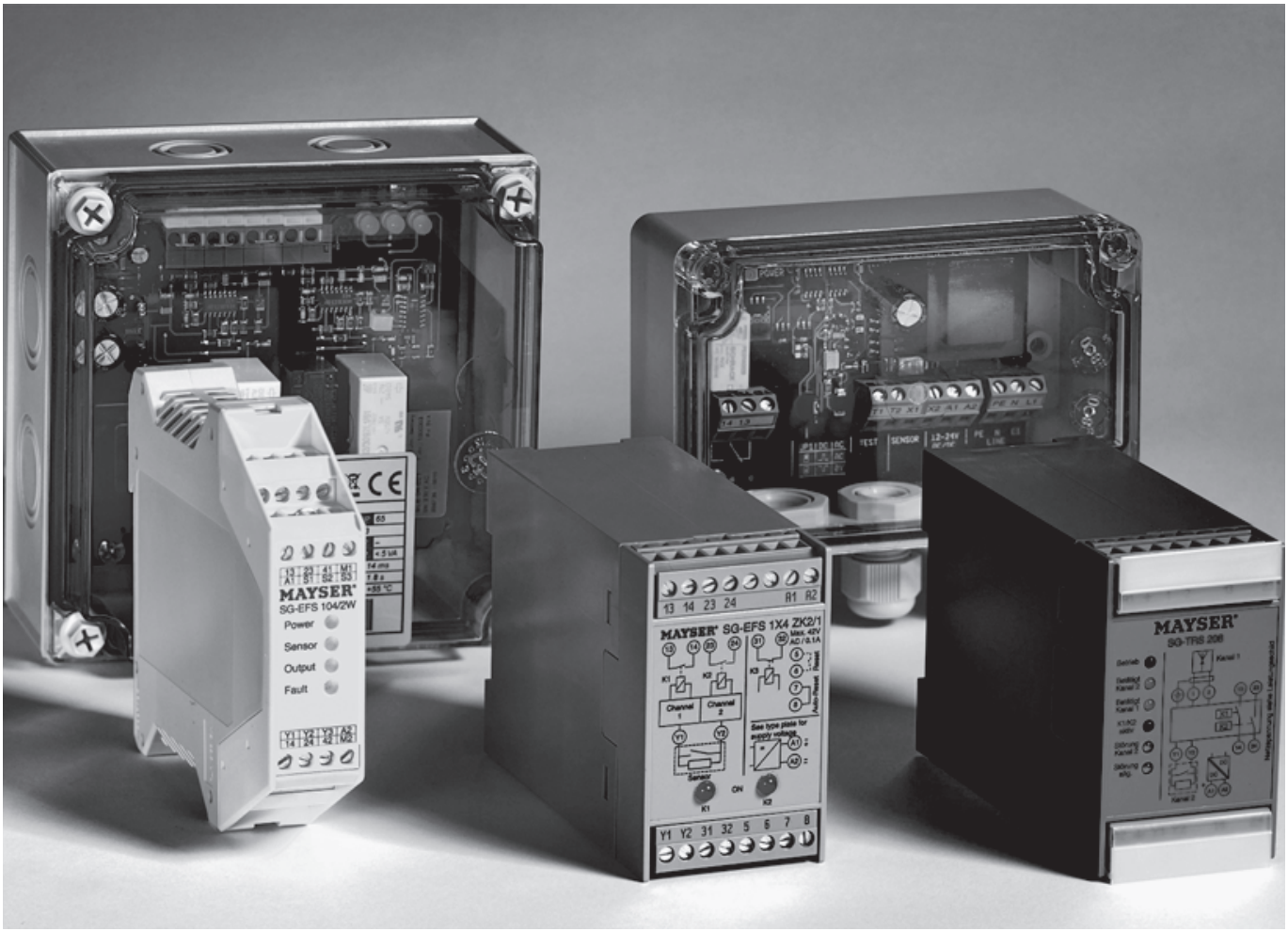

Control units SG

EN | Overview

Mayser GmbH & Co. KG
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GERMANY
Phone: +49 731 2061-0
Fax: +49 731 2061-222
E-mail: info.ulm@mayser.com
Internet: www.mayser.com

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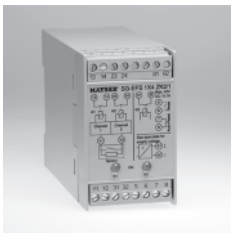
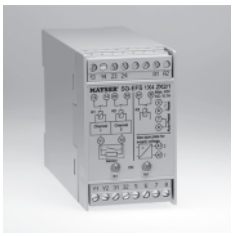
Type	 SG-EFS 104/4L	 SG-EFS 104/2W	 SG-EFS 1X4 ZK2/1	 SG-EFS 1X4 ZK2/1 8k2
Safety classifications				
ISO 13856: Reset function	with/without	with/without	with/without	with/without
ISO 13849-1:2006	Category 3 PL e	Category 3 PL d	Category 3 PL e	Category 3 PL e
$MTTF_D$	73 years	257 years	313 years	313 years
DC_{avg}	90 %	60 %	90 %	90 %
B_{10D} [× 10^6]	0,4	1,8	2	2
Times				
Reaction time	< 30 ms	< 15 ms	< 10 ms	< 10 ms
Re-start time	< 500 ms	< 50 ms	< 190 ms	< 190 ms
Control unit-Inputs				
Sensor types	SM, SL, MSL, SB	SM, SL, MSL, SB	SM, SL, MSL, SB	SM, SL, MSL, SB
Type of monitoring	4-wire technoloy	Monitoring resistor 1k2 or 8k2	Monitoring resistor 1k2	Monitoring resistor 8k2
Monitoring circuit	1	1	1	1
Further Inputs				
Control unit-Outputs				
Switching channels	1× 3-channel	1× 2-channel	1× 2-channel	1× 2-channel
Switching voltage (min. / max.)	– / 5 A	– / 4 A	10 mA / 2 A	10 mA / 2 A
Switching capacity (max.)	1150 VA / 120 W	1000 VA / 96 W	500 VA / 48 W	500 VA / 48 W
Further Outputs	1 signal circuit	1 signal circuit, 2 signal outputs	1 signal circuit	1 signal circuit
Mechanical operating conditions				
Mounting	Mounting rail IEC 60715	Mounting rail IEC 60715	Mounting rail IEC 60715	Mounting rail IEC 60715
IEC 60529: Degree of protection	IP20	IP20	IP20	IP20
Operating temperature	-25 to +55 °C	-25 to +55 °C	-20 to +50 °C	-20 to +50 °C
Dimensions (W × H × D)	22,5 × 99 × 114,5 mm	22,5 × 99 × 114,5 mm	45 × 75 × 105 mm	45 × 75 × 105 mm
Variants	**SG-EFS 104/4L**	**SG-EFS 104/2W**	**SG-EFS 104 ZK2/1**	**SG-EFS 104 ZK2/1 8k2**
Part number	1004128	1005196	1000841	1003100
Connecting voltage U_S	AC/DC 24 V	AC/DC 24 V	AC / DC 24 V	AC/DC 24 V
Power consumption P	< 7 VA / < 3 W	< 4 VA / < 3 W	< 5 VA / < 3 W	< 5 VA / < 3 W
			SG-EFS 114 ZK2/1	
			1001272	
			AC 115 V	
			< 7 VA	
			SG-EFS 134 ZK2/1	**SG-EFS 134 ZK2/1 8k2**
			1000842	7500354
			AC 230 V	AC 230 V
			< 7 VA	< 7 VA

260917 v4.00

			
SG-SLE X4-0X1	**SG-RST 204**	**SG-RST 153**	**SG-RS 204**
without Category 3 PL e 279 years 90 % 2	without Category 3 PL e 306 years 90 % 2	without Category 2 PL c 33 years 90 % 0,18	without Category 1 PL c 155 years – 1
< 14 ms < 1,8 s	< 20 ms < 50 ms	< 5 ms < 50 ms	< 15 ms < 20 ms
SM, SL, MSL, SB Monitoring resistor 22k1 4	SM, SL, MSL, SB Monitoring resistor 8k2 2	SM, SL, MSL, SB Monitoring resistor 8k2 1 1× Test signal	SL, MSL Monitoring resistor 1k2 2
1× 2-channel 10 mA / 2 A 500 VA / 48 W 1 reverse travel command	2× 2-channel – / 2 A 500 VA / 48 W —	1× 2-channel – / 2 A 500 VA / 48 W —	1× 2-channel 10 mA / 2 A 250 VA / 48 W —
Wall-mounted / PCB without enclosure IP65 / IP00 -20 to +55 °C 125 × 125 × 75mm / 107 × 99 × 41,5 mm	Mounting rail IEC 60715 IP20 -20 to +55 °C 45 × 75 × 105 mm	Wall-mounted IP65 -30 to +55 °C 120 × 107 × 55 mm	Mounting rail IEC 60715 IP20 -25 to +60 °C 22,5 × 75 × 105 mm
SG-SLE X4-051 1000305 AC/DC 24 V < 5 VA / < 3 W **SG-SLE X4-021** 1000307 AC 230 V < 5 VA	**SG-RST 204** 1006265 DC 24 V < 5 W	**SG-RST 153** 1004931 AC/DC 12 bis 24 V < 1,5 VA / < 1,5 W **SG-RST 153** 8104931 AC 230 V < 3 VA	**SG-RS 204** 1001825 DC 12 V < 1 W **SG-RS 204** 1001414 AC/DC 24 V < 4 VA / < 2 W

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Signal transmission system WLS

EN | Product information

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Fax: +49 731 2061-222
E-mail: info.ulm@mayser.com
Internet: www.mayser.com

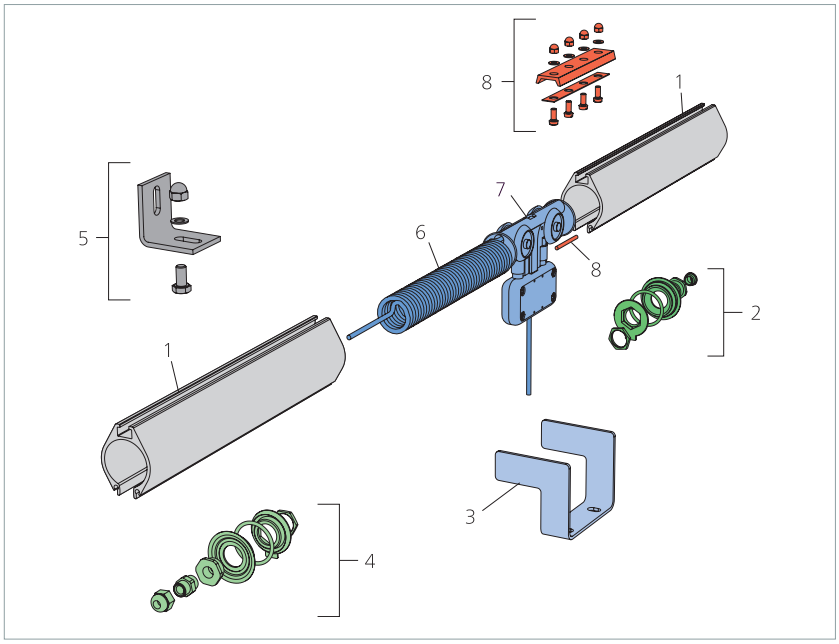
Areas of application

The WLS signal transmission system is used as a protective conduit for cables in doors and gates. When it comes to making danger areas safe, the system is especially suitable for safe transmission of signals between tactile sensors e.g. safety edges and the control module.

Examples:

- Vertical and horizontal gates
- Machine hoods and windows
- Conservatories
- Sun blinds
- Moulding and textile machines

System design



Pos.	Part No.	Designation	Comment
1	10038-06 ... -09	Profile tube WLS	aluminium anodised; 2, 3, 4 and 6 m
2	1003792	WLS-sealing cap	closed
3	1003771	Carrying fork for WLS	
4	1003791	WLS-sealing cap	PG7
6		Spiral cable	4× 0.14 mm²
7		Carriage	
8	1003802	Tube connector for WLS	galvanised
7 + 6	75015-13 ... -24	Spiral cable with carriage	4× 0.14 mm²

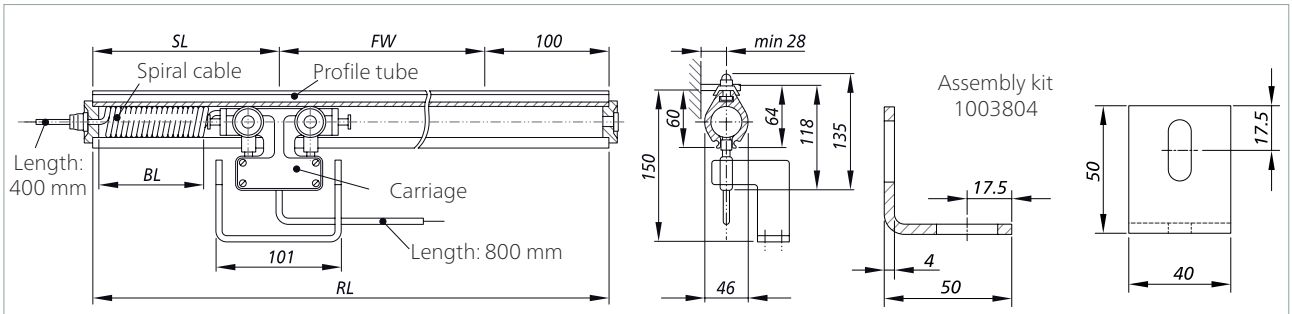
Accessories			
5	1003804	Fastening parts for WLS	incl. nuts and screws

051017 v2.00

Operation

The system consists of an aluminium profile tube and a specially designed, abrasion-resistant and extremely dimensionally stable spiral cable with carriage. When the carriage is put into motion the cable is stretched inside the profile tube and returns to its original position when the carriage goes back. The system components were designed to co-ordinate with each other and can be used in gates both indoors and outdoors. The WLS is suitable for gates in high-frequency operation.

Dimensions and part numbers



WLS complete	WLS-kit, no profile tube	Spiral cable with carriage	Max. runway	Profile tube length	Storage length	Block length
Part No.	**Part No.**	**Part No.**	**FW [m]**	**RL [m]**	**SL [m]**	**BL [m]**
7501482	7501501	7501513	1.5	2	0.3	0.12
7501483	7501502	7501514	1.6 ... 2.5	3	0.4	0.29
7501484	7501502	7501514	2.6 ... 3.5	4	0.4	0.29
7501485	7501503	7501515	3.6 ... 4.3	5 = 2+3	0.6	0.46
7501486	7501503	7501515	4.4 ... 5.3	6	0.6	0.46
7501487	7501504	7501516	5.4 ... 6.1	7 = 3+4	0.8	0.63
7501488	7501504	7501516	6.2 ... 7.1	8 = 4+4	0.8	0.63
7501489	7501505	7501517	7.2 ... 8.0	9 = 3+6	0.9	0.80
7501490	7501505	7501517	8.1 ... 9.0	10 = 4+6	0.9	0.80
7501491	7501506	7501518	9.1 ... 9.8	11 = 3+4+4	1.05	0.96
7501492	7501506	7501518	9.9 ... 10.8	12 = 6+6	1.05	0.96
7501493	7501506	7501518	10.9 ... 11.8	13 = 3+4+6	1.05	0.96
7501494	7501507	7501519	11.9 ... 12.6	14 = 2+6+6	1.25	1.13
7501495	7501507	7501519	12.7 ... 13.6	15 = 3+6+6	1.25	1.13
7501496	7501508	7501520	13.7 ... 15.3	17 = 2+3+6+6	1.60	1.48
7501497	7501509	7501521	15.4 ... 17.1	19 = 3+4+6+6	1.80	1.65
7501498	7501510	7501522	17.2 ... 19.0	21 = 3+6+6+6	1.90	1.78
7501499	7501511	7501523	19.1 ... 20.9	23 = 2+3+6+6+6	2.00	1.85
7501500	7501512	7501524	21.0 ... 23.5	26 = 2+6+6+6+6	2.40	2.28
Quantity buyers and dealers: please send us your request for quotation.						

051017 v2.00

Technical data

Cable	special, wear-free, double insulated spiral cable
Number of wires/cross-section	4× 0.14 mm^2
Operating voltage	max. 48 V AC/DC
Max. load (at +25 °C)	max. 1.5 A eff.
Temperature range	-20 to +80 °C
Moving speed	40 m/min
Runway lengths	1.5 m to 23.5 m
System lengths	2.0 m to 26.0 m in fixed lengths: 2, 3, 4 and 6 m
Conduit rail	aluminium, anodized, warp resistant

At a glance

- Robust, simple, proven construction
- Quick and easy installation due to low number of components in modular form
- Maintenance-free
- Short envelope delay to meet the dynamic force and time parameters in accordance with EN 12453 and EN 12445

051017 v2.00

MAYSER®

Innovative by tradition.

Cable conduit rails KLS 77 V2

EN | Product information

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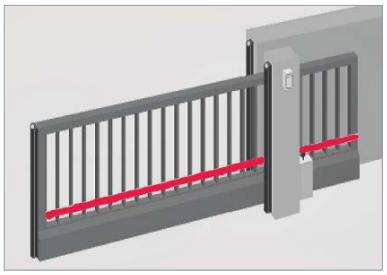
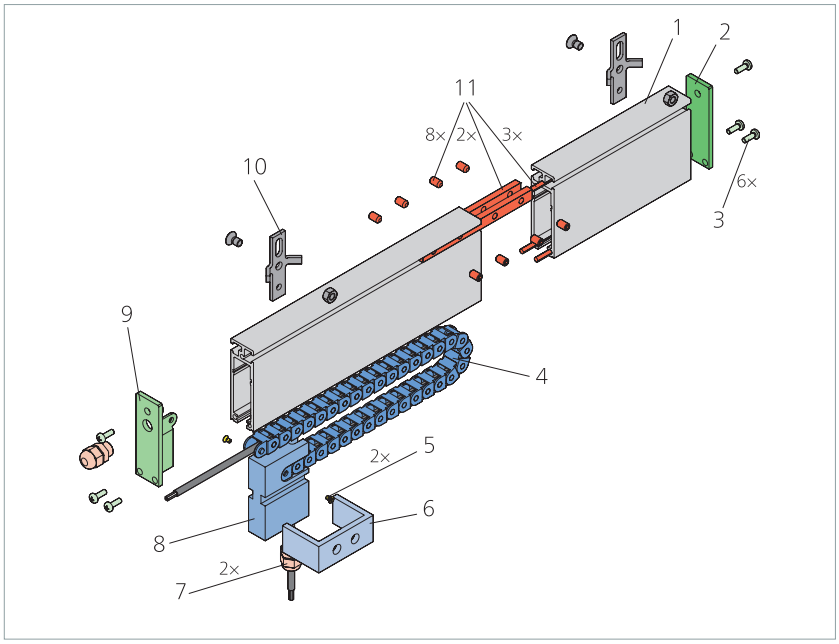
Areas of application



Signal transmission from pressure sensitive sensors to the drive control – this is the specialist area of the KLS 77 V2 cable conduit rail. It is found on vertical or horizontal moving doors and gates and on machines and equipment guided or moved in a straight line where closing edges are protected by pressure sensitive sensors.
The KLS 77 V2 is therefore an important component for safety equipment on automated gates and machine parts. Simple, robust and safe.

System design



Pos.	Part No..	Designation	Comment
1	1003885	Conduit rail for KL 77 V2	Aluminium anodised
2	7501910	End cap, closed	POM, black
3	1004191	Fillister head self-tapping screw 4.8×13	for end caps
4	1004032	Sliding chain for KLS 77 V2	PA, wear-resistant
5	1004168	Countersunk screw 3×5	for fastening of sliding chain
6	1004136	Carrying fork for KLS 77 V2	Aluminium
7	1003748	Cable screw connection PG7	PA, black
8	7501873	Sliding carriage for KLS 77 V2	POM, black
9	7501874	End cap with cable exit	POM, black
10	7501663	Fastening parts for KLS 77 V2	incl. screw and hexagon nut
11	7501662	Profile connector kit for KLS 77 V2	for KLS 77 V2 > 6 m

Accessories			
	1003900	Clamping profile for PG7	für 1× Kaweflex
		Replacement parts kit, assembled	Pos. 4 + 5 + 7 + 8 + 9 + Kabel

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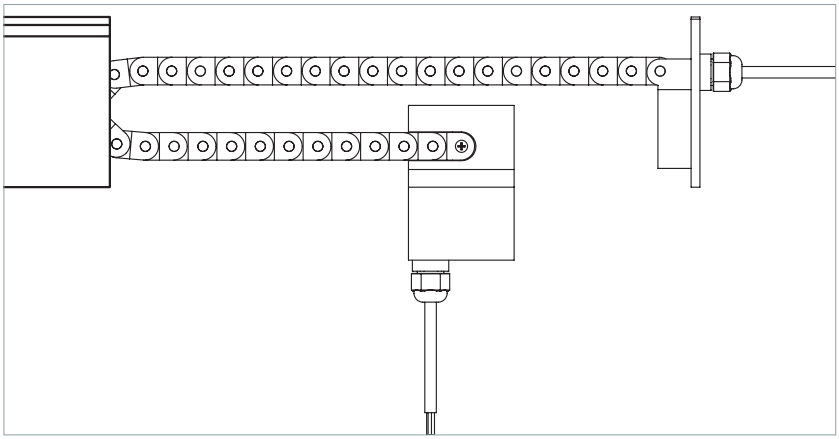
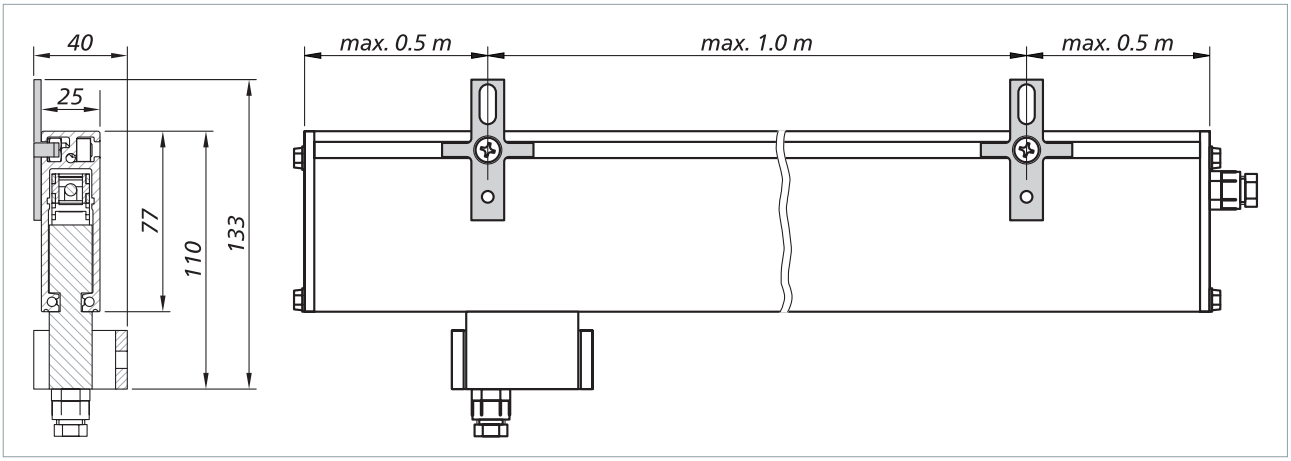
Operation

The cable which transmits the signal lies well protected in a wear-resistant sliding chain. Cable screw connections on the end cap and sliding carriage fix the cable. Guidance and protection of the sliding chain are provided by a robust aluminium profile. For simple connection, the KLS 77 V2 has a cable overhang of approx. 1 m (standard) on both sides.



Dimensions



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Technical data

Cable	1× Chainflex round cable	1× Kaweflex ribbon cable	1× Chainflex round cable
Number of wires/ cross-section	4× 0.5 mm² / Ø 5.5 mm	4× 0.25 mm² / 6.8× 1.6 mm	8× 0.25 mm² / Ø 6.5 mm
Operating voltage	max. 50 V AC / max. 120 V DC	max. 48 V AC/DC	max. 48 V AC/DC
Max. load (at +25 °C)	max. 5.0 A eff.	max. 1.5 A eff.	max. 1.5 A eff.
Temperature range	-30 to +70 °C		
Moving speed	40 m/min		
Runway lengths	1.0 m bis 11.8 m		
System lengths	Runway length + 200 mm		

At a glance

- Robust, simple, proven construction
- Space-saving geometry
- Quick and easy installation due to low number of components in modular form
- Maintenance-free
- Short envelope delay to meet the dynamic force and time parameters in accordance with EN 12453 and EN 12445

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Product information

Ultrasonic Industrial Sensor USi

	Master	Slave
USi-PP	1005632 *	1005633 *
USi-IP	1005899 *	1005900 *
USi-UP	1005901 *	1005902 *

* plus Sensor 1005264

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Important information
Read through the product information carefully. It contains important information on operation, safety and maintenance of the product. Retain the product information for later reference.
Always observe the safety instructions on the following pages under **ATTENTION.** Only use the product for the purpose described in the product information.

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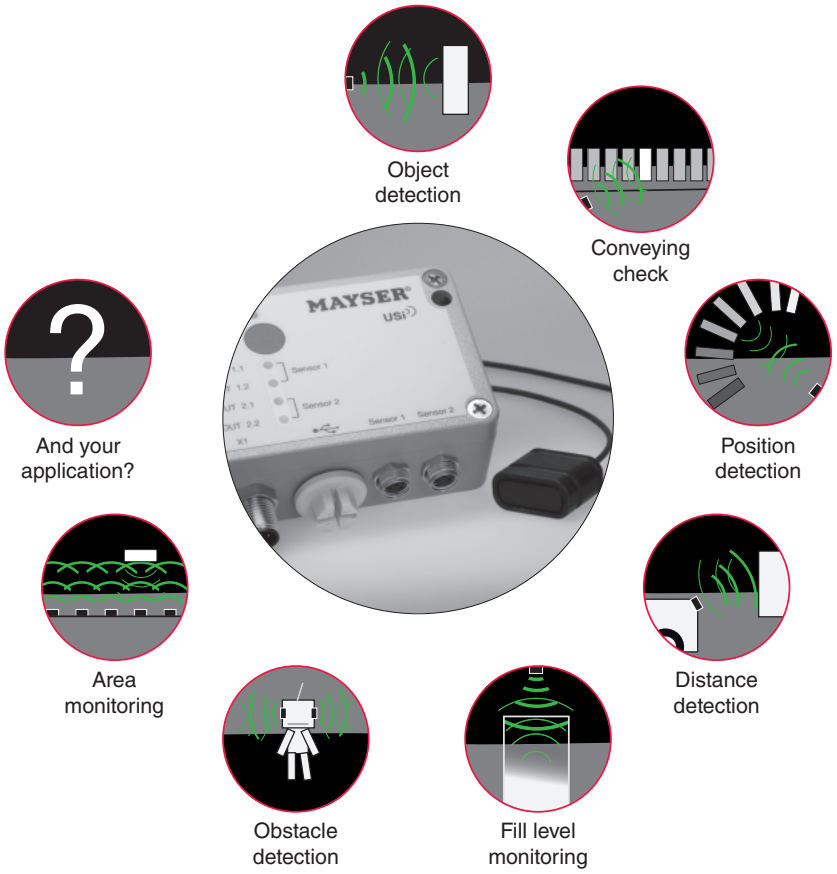
One USi – countless possibilities

The ultrasonic industrial sensor USi is an extremely versatile sensor. The range of possible applications is almost unlimited. Here is a small selection:



Free positioning, flexible parameterisation and a high protection type – there seem to be no limits for the USi.
Only the use as a protective device is excluded.

Optimised for Medium air

The ultrasonic industrial sensor USi is designed for industrial use in the medium air. In this instance the USi works accurately and with high repeatability.
The USi is impervious to

- Dirt build-up, dirt accumulation on the transducer surface
- Humidity and condensation
- Airflow

If necessary, the transmission intensity can even be adjusted:

- lower, in order to prevent transverse reflections at short distances
- higher, in order to detect small objects at long distances

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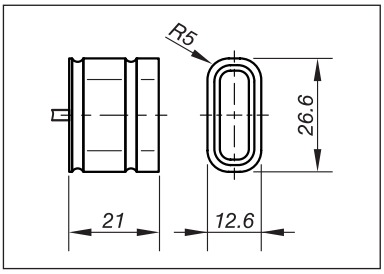
Special features of the USi

Separate sensory system

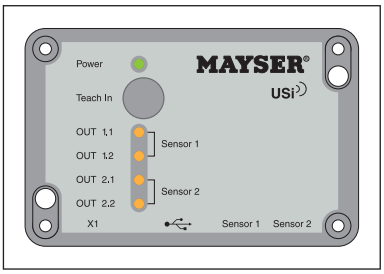
The Ultrasonic transducer and the signal processing are two separate units. The advantages:

+ very small sensors (ultrasonic transducers) for maximum flexibility.



+ robust signal evaluation unit in aluminium die casting for maximum performance.

+ only one signal evaluation unit for two sensors.



Simple parameter assignment

Parameter assignment of the USi is quick and easy with the parameter assignment software (optional). Connect the USi to the computer with the USB cable, start the software, alter the parameters with mouse and keyboard and transfer all settings to the USi with one single mouse-click – it could hardly be any easier.

Real teach in

Whereas with other sensors “teach in” simply means teaching in the switch point, the USi takes a holistic approach to “teach in”: the complete environment within the detection field is taught in.

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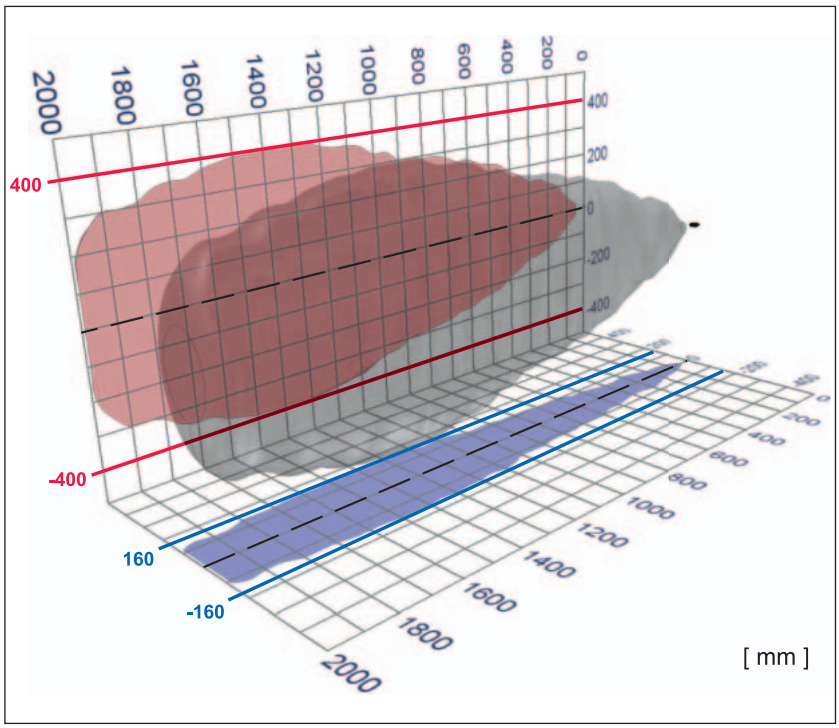
Subject to technical modifications.

Special sound field geometry

The sonic lobe of the USi is very elliptic – a clear advantage, if detection is required in confined environments.

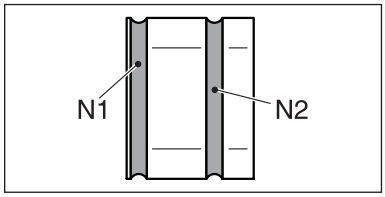


Note:
The representations refer to the USi in the condition as supplied. Measurement object: steel rod with Ø 10 mm. If parameters have been changed or if a different measurement object is used, the representations will change accordingly.

Mobile sensor system

The USi can even detect objects which approach or move away from it at relatively high speed. The USi easily copes with speeds of up to 2 m/s. Conversely this means that the USi is suitable for applications on mobile equipment.

Freedom of installation



Attachment of the sensor (ultrasonic transducer) is solved pragmatically. Both the position and the type of mounting fixture can be freely selected as long as one condition is met: the sensor may only be fixed via the O-Rings (optional) which lie in the grooves N1 and N2.
At the same time, the O-Rings are used for acoustic decoupling.

The evaluation unit can be mounted in any position both by surface installation and with the mounting rail adapter (optional) on a 35 mm mounting rail as per IEC 60715.

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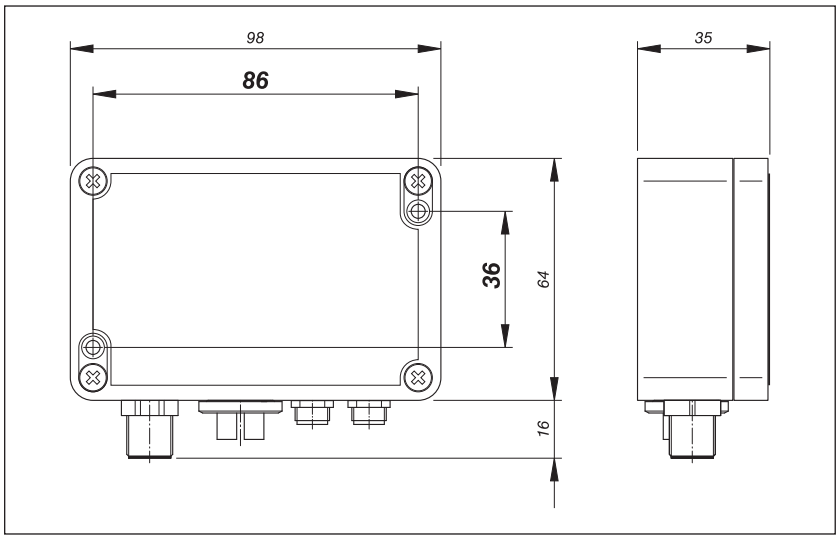
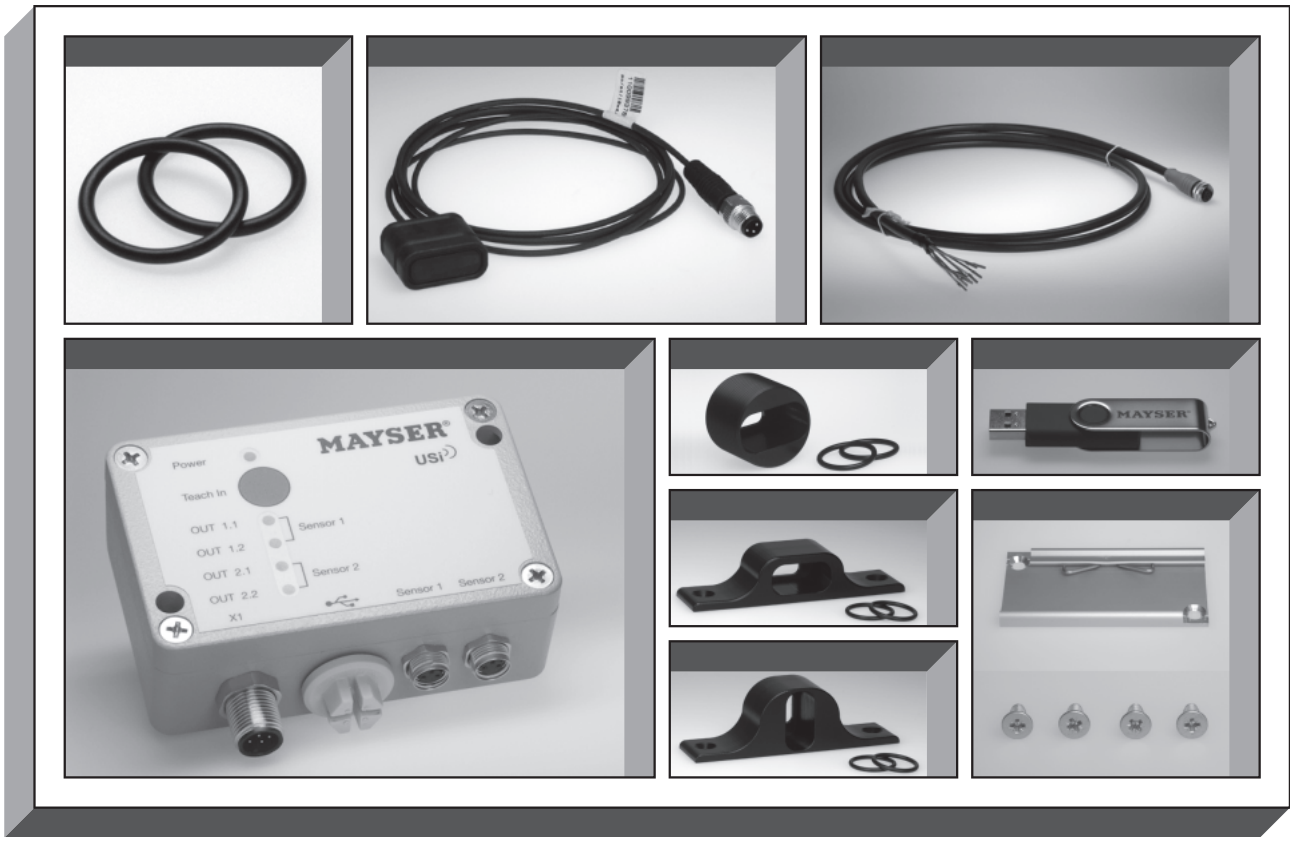


Modular principle

Possible applications for the USi are as varied as life itself. It is therefore only logical that the sensor system is not offered in rigid sets but as a flexible modular system.



It is therefore possible to deliver exactly what you need for your application. Nothing more, but also nothing less.

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How the USi works

Multitool

The USi is not just an ultrasonic sensor. It is a reflex switch, a reflex barrier and a sonic barrier in one. Connected with further USis, a multisensor system can even be set up. And disturbance variables are less daunting with the diagnostic function of the parameter assignment software (optional).

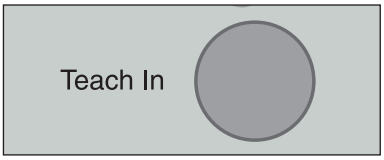
Tool	Configuration	Operation
Reflex switch	Standard	Objects are detected as present or absent.
Reflex barrier	1 sensor and 1 object which represents the limit of the reflex barrier	If the taught-in object is detected, the reflex barrier is free.
Sonic barrier	2 sensors and parameter assignment software (optional)	Sensors are aligned frontally with each other. One sensor is set as a transmitter and the other as a receiver.
Analogue distance measurement	USi-IP or USi-UP	An analogue current signal (IP) or voltage signal (UP) is present at output 1.1.
Multisensor	1 USi master and up to 24 USi slaves	The master synchronises all connected slaves. Mutual interference is thus excluded.
Diagnostics equipment	Parameter assignment software (optional)	The diagnostic function facilitates trouble-shooting if a USi is affected by interference variables.

1 button – 4 functions

Four functions can be carried out with just one button.

1. Teach in environment (teach in)
2. Adjusting switch points
3. Logoff/logon sensor
4. Restore factory settings

The LEDs are used for display and navigation through the various menus.



4 outputs

Up to four outputs are available per evaluation unit.

	Sensor 1	Sensor 2
Switch point SP1	OUT 1.1	OUT 2.1
Switch point SP2	OUT 1.2	OUT 2.2

The outputs are preset as normally open contacts. With the parameter assignment software (optional), they can also be operated as normally closed contacts or switched “off” completely.

Subject to technical modifications.

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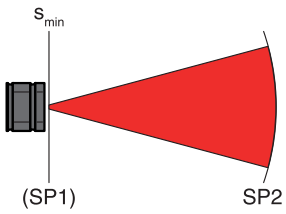
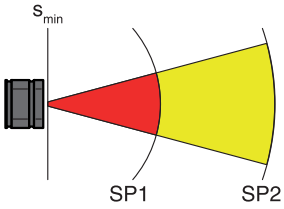
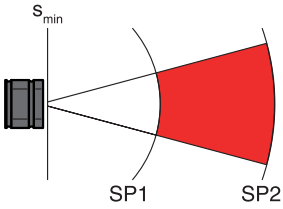
Do you need a change-over contact? – No problem.
Simply combine the two outputs which are assigned to a sensor, e.g. OUT 1.1 as normally open contact and OUT 1.2 as normally closed contact.

	Outputs		
Type	**Digital**	**Analogue**	**Total**
USi-PP	PNP	-	4× PNP
USi-IP	PNP	4 to 20 mA	3× PNP 1× I [A]
USi-UP	PNP	0 to 10 V	3× PNP 1× U [V]
	Detect	**Measure**	

3 operating modes

The USi offers three operating modes:

Operating mode “1 Range” Detect + Measure	**Operating mode “2 Ranges” Detect**	**Operating mode Window Detect + Measure**
		
Standard operating mode The detection field extends virtually from the sensor to the switch point SP2.	If switch point SP1 selection is larger than 1 cm, the USi-PP automatically changes to operating mode “2 Ranges”. The sensor-distant detection field (yellow) from SP1 to SP2 could then be used as a pre-warning field.	As for operating mode “2 Ranges”, except the sensor-proximal detection field (white) up to switch point SP1 is suppressed. If switch point SP1 is selected larger than 1 cm, USi-IP and USi-UP automatically change to operating mode Window In the case of USi-PP, the operating mode Window with the parameter assignment software (optional) can be selected.

Which is the right one for your application?
Remember: two sensors per evaluation unit can be evaluated. This leaves scope for unusual applications such as “Operating mode 4 Ranges”.

And all this with flexible switch point pre-settings from 10 to 2500 mm, where switch point SP1 is always smaller than SP2.

Flexibility goes a decisive step further: both sensors can be parameterised independently of each other. Naturally conveniently via one and the same interface of the parameter assignment software (optional).

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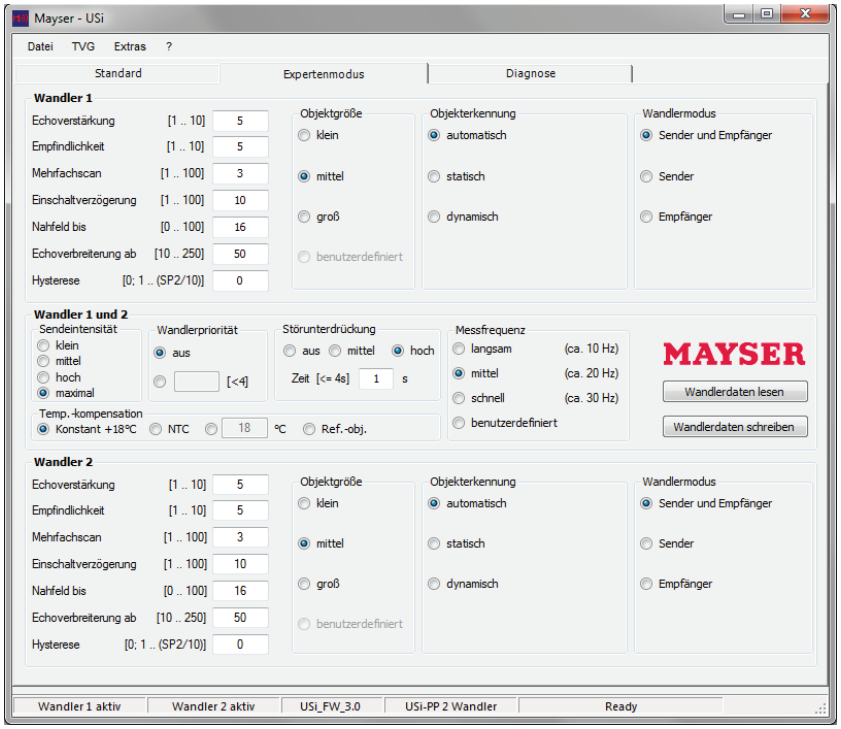
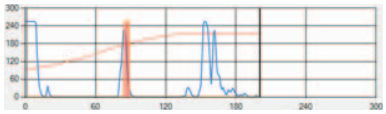
Subject to technical modifications.

Parameterisation with a clear structure

The parameter assignment software (optional) is clearly structured and clearly divided into the areas standard, expert mode and diagnostics.
In the ***Standard*** tab, you can change the basic settings. In the ***Expert mode*** tab, you can directly configure the individual parameters.

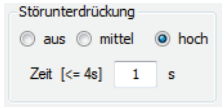


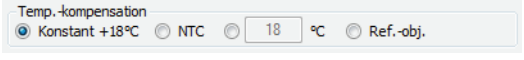
The ***Diagnostics*** tab helps you to find and estimate disturbance variables as well as configure special applications: visualisation of the complete measurement distance serves as both feedback and help at the same time.
All settings can be carried out quickly and intuitively and stored on the computer. Or you can upload settings already saved from the computer.
Sounds easy? Well, it is!



Built-in intelligence

Unobtrusively integrated intelligence makes the USi an understated ultrasonic sensor. Included in the features of the USi are automatic **interference suppression**, time-varied gain (**TVG**) of the input signal and continuous **temperature compensation**.



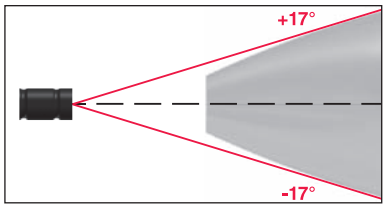


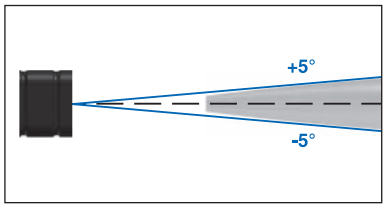
210115 v1.2

Subject to technical modifications.

Technical data

The “type” information refers to the USi in the condition supplied to the customer. If parameters are changed, these values change. The thereby potential bandwidth is indicated by “... to ...”





USi-PP / USi-IP / USi-UP	
Testing basis	IEC 60947-5-2, IEC 60204-1
Connecting voltage U_S	
Voltage tolerance	DC 15 to 30 V, reverse polarity protection
Rated current	typically 80 mA (40 to 150 mA)
Power consumption	< 2.5 W (without load)
Detection functions	
Ultrasonic frequency	103 kHz
Measurement frequency	typically 20 Hz (2 to 250 Hz)
Measurement distance, max.	
Switch	typically 2000 mm (10 to 2500 mm)
Sensor (USi-IP / -UP)	typically 2000 mm (100 to 2500 mm)
Blind zone	
Switch	10 mm
Sensor (USi-IP / -UP)	100 mm
Opening angle	
horizontal	±17°
vertical	±5°
Object detection	
Size (min.)	typically 10 mm (up to 1 mm)
Speed (max.)	typically 2 m/s (up to 2.5 m/s)
Times	
Reaction time t_a	typically 150 ms (3 to 500 ms)
Reactivation time t_w	typically 500 ms (3 to 50000 ms)
Switch frequency	typically 1.5 Hz (0.02 to 111 Hz)
Outputs	
Type: short-circuit-proof	NO contact, NC contact, off
Output 1.1 (OUT 1.1)	USi-PP: Power FET PNP USi-IP: DC 4 to 20 mA USi-UP: DC 0 to 10 V
Outputs 1.2 to 2.2	Power FET PNP
Switching current (max.)	200 mA per output
Switching voltage (max.)	DC 30 V
Mechanical operating conditions	
	Evaluation Unit / Sensor
IEC 60529: protection class	IP65 / IP69K
Weight	250 g / 25 g
max. humidity (23 °C)	99%
Operating temperature	-25 to +80 °C
Storage temperature	-40 to +85 °C
Dimensions (W × H × D mm)	98 × 80 × 35 / 12.6 × 26.6 × 21

ATTENTION!
Strong fluctuations in temperature within very short periods of time cannot counter balance the integrated temperature compensation.

Subject to technical modifications.

210115 v1.2

Parts list

	Designation	Part number
	USi-**PP** Master evaluation unit, **Master** can be used as a stand-alone unit **Slave** can be used as a stand-alone unit	 1005632 1005633
	USi-**IP** Master evaluation unit, **Master** can be used as a stand-alone unit **Slave** can be used as a stand-alone unit	 1005899 1005900
	USi-**UP** Master evaluation unit, **Master** can be used as a stand-alone unit **Slave** can be used as a stand-alone unit	 1005901 1005902
	Sensor ultrasonic transducer ps/mt/18x4/m with 1.5 m cable	1005264
	Extension cable for ultrasonic transducer sensor cut-to-size including M8 socket and M8 plug Length: 1.5 m	1005903
	O-Ring set 18×2.5 mm, consisting of: 2× O-Ring 18.0 × 2.5 mm, for clamping version	7502819
	O-Ring set 17.5×2 mm, consisting of: 2× O-Ring 17.5 × 2.0 mm, for integrated version	7502820

Subject to technical modifications.

	Designation	Part number
	Enclosure Set M30 for ultrasonic transducer, consisting of: 1× M30 enclosure 2× O-Ring 14.0 × 2.0 mm	7502704
	Enclosure set horizontal for ultrasonic transducer, consisting off: 1× Enclosure horizontal 2× O-Ring 17.5 × 2.0 mm	7502905
	Enclosure set vertical for ultrasonic transducer, consisting of: 1× Enclosure vertical 2× O-Ring 17.5 × 2.0 mm	7502906
	Mounting rail adapter set for USi, for evaluation unit on 35 mm mounting rail, consisting of: 1× Aluminium adapter 4× screws SK M5×10 self-cutting	7502767
	Unit cable M12x8 / USi, cut-to-size incl. lead ferrules and ready-to-connect shielding braid Length: 2 m	1005433
	Parameter assignment software for USi 1× on USB flash drive	7502768

210115 v1.2

Subject to technical modifications.