

Safety edges SL



EN | Product information

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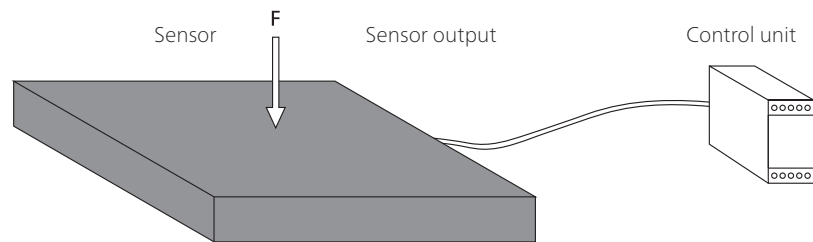
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Definitions

Pressure-sensitive protection device

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

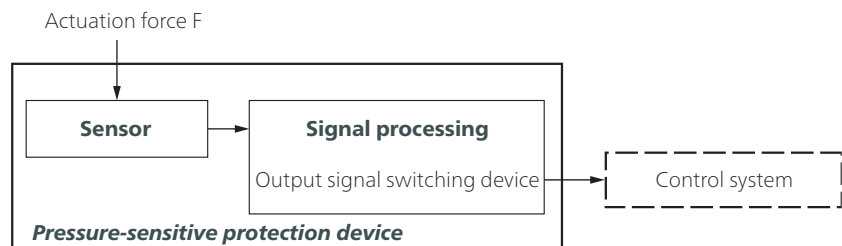


Sensor

The sensor is the part of the pressure-sensitive protection device that generates a signal when the actuation force F is applied. Mayser safety systems feature a sensor whose actuation area is deformed locally.

Signal processing

The signal processing unit 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 the part of the signal processing unit which is connected to the forwarding control system and which transmits safety output signals such as STOP.



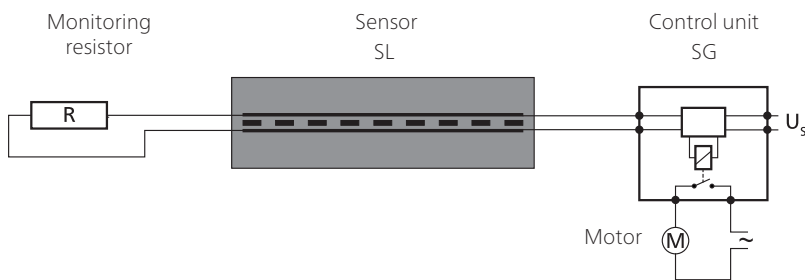
Tip: Terms are defined in ISO 13856-2 Section 3.

Criteria for selecting the sensor type

- Category according to ISO 13849-1
- Performance level of the pressure-sensitive protection device
= at least PL_r
- Temperature range
- Degree of protection in accordance with IEC 60529:
IP67 is standard for safety edges.
Higher degrees of protection must be checked individually.
- Environmental influences such as swarf, oil, coolant, outdoor use...
- Finger detection necessary?

Tip: For further sensor selection criteria, see ISO 13856-2 Annex C and Annex E.

Operation principle of 2-wire technology



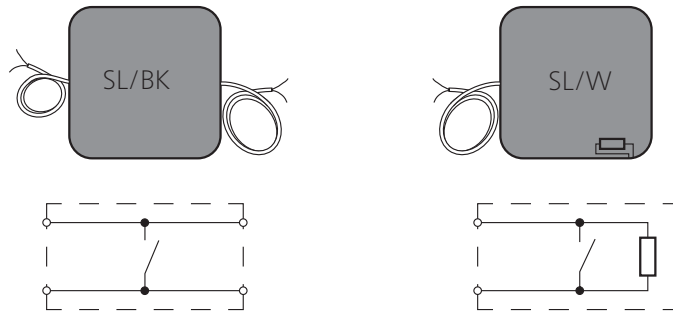
The monitoring resistor must be compatible with the control unit. The standard type is 8k2.

For your safety:

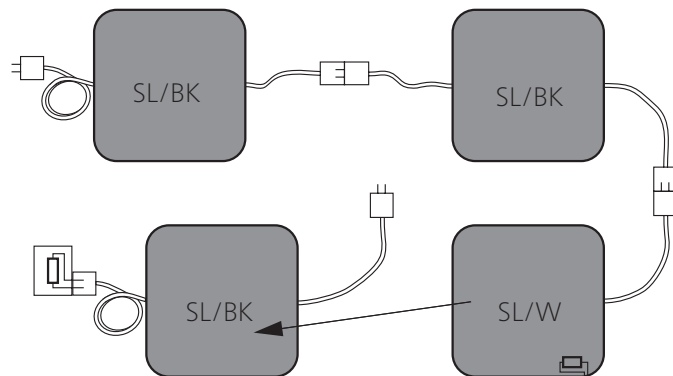
The sensor and connection cables are constantly monitored to ensure they are functioning correctly. Monitoring relies on controlled bridging of the contact surfaces with a monitoring resistor (closed-circuit principle).

Types

- SL/BK With cables on both sides for use as a through sensor or with an external monitoring resistor for use as an end sensor
- SL/W With an integrated monitoring resistor for use as an end sensor



Sensor combination

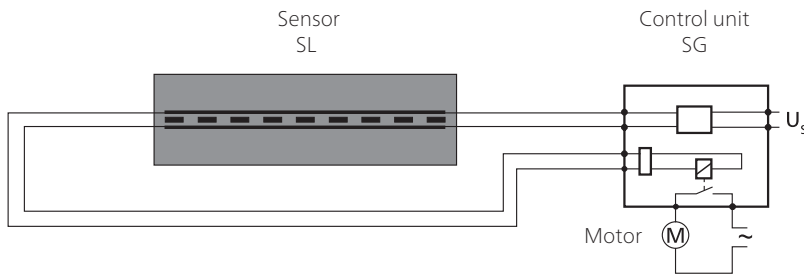


Version with external resistor, therefore no variety of models

Combination:

- Connection of more than one sensor
- Only one control unit required
- Safety edges can be combined to achieve custom lengths and angles

Operation principle of 4-wire technology



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

For your safety:

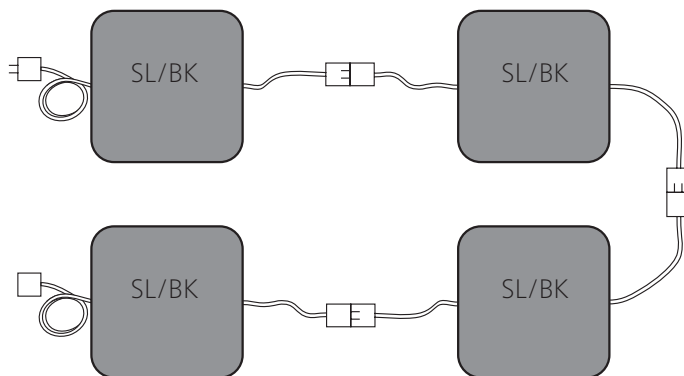
The sensor and connection cables are constantly monitored to ensure they are functioning correctly. Monitoring relies on signal transmission feedback – without a monitoring resistor.

Types

SL/BK With cables on both sides for use as a through sensor



Sensor combination



Combination:

- Connection of more than one sensor
- Only one control unit required
- Safety edges can be combined to achieve custom lengths and angles

Subject to technical modifications.

Safety

Intended use

A safety edge detects a person or part of the body when pressure is applied to the effective actuation area. It is a linear tripping device. Its purpose is to prevent possible hazardous situations that could affect someone within a danger zone, such as shearing and pinching edges. Typical areas of application are door and gate systems, and 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 rating as well as
- correct installation.

For additional application guidance, please refer to ISO 13856-2 Annex E.

Due to the design, the actuation area is actually smaller than it looks because of the non-sensitive edges. Once these have been allowed for, what remains is the effective actuation area (see chapter *Effective actuation area*).

Limits

- No more than 10 /BK-type sensors can be connected to one control unit.
- No more than 9 /BK-type sensors and 1 /W-type sensor can be connected to one control unit.

Exclusions

The sensors are not suitable for:

- Detecting fingers.
- Performing a sealing function. Constant actuation of sensors can result in permanent damage.

Exception: The L version with an attached lip seal.

The lip seal can be in full contact with the closing edge, which allows it to repel wind and water.

Other safety aspects

The following safety aspects relate to pressure-sensitive protection devices consisting of a sensor and a control unit.

Performance Level (PL)

The PL has been determined using the procedure defined by ISO 13849-1.

Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contacts in the case of pressure-sensitive protection devices according to ISO 13856. In this case, the diagnostic coverage (DC) is not calculated or taken into account when determining the PL. Assuming a high $MTTF_D$ value for the control unit, a performance level of up to PL d can be achieved by the safety edge system (pressure-sensitive protection device) as a whole.

Is the protection device suitable?

First, the integrator must decide what PL_r is required for the hazard.

After that, they must select the protection device.

Finally, the integrator needs to check whether the category and PL of the selected protection device are appropriate.

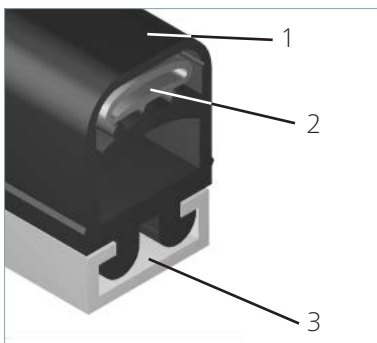
Risk and safety assessment

For the risk and safety assessment of your machine, we recommend ISO 12100 "Safety of machinery — General principles for design".

Without reset function

When a protection device without reset function is used (automatic reset), the reset function must be provided in some other way.

Design



The safety edge SL consists of a sensor (1 to 3) –
(1) rubber profile GP,
(2) switch element,
(3) aluminium profile –
and an evaluating control unit SG.

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Subject to technical modifications.

Effective actuation area

The parameters X , Y , Z , L_{WB} and the angle α describe the effective actuation area.

For the effective actuation area, the following applies:

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

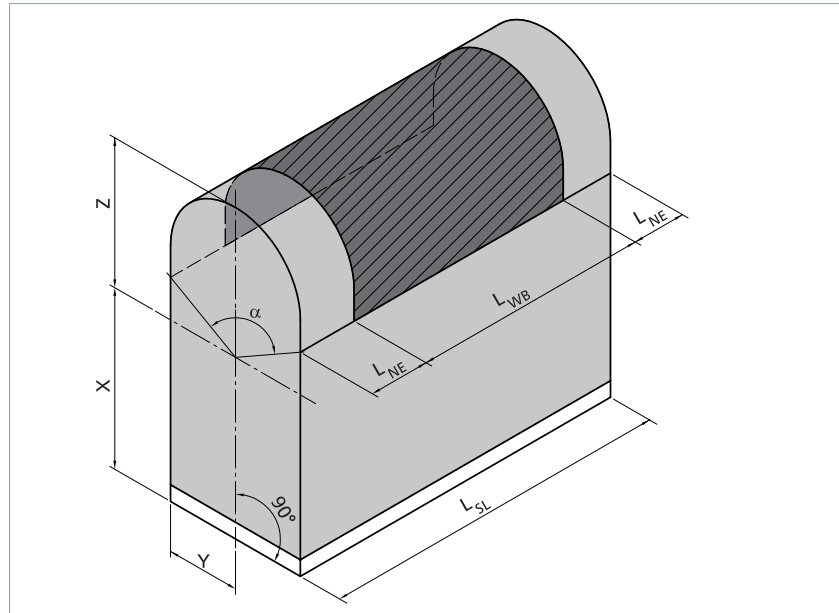
Parameters:

L_{WB} = effective actuation length

L_{SL} = overall length of safety edge

L_{NE} = non-sensitive length at the end of the safety edge

α = effective actuation angle



	GP 15-1	GP 22-1	GP 39-1	GP 39L-1	GP 50(L)-1	GP 60-1	GP 120-1
							
Aluminium profile	C 15	C 25	C 25	C 25	C 35	C 35	C 35
α	70°	70°	110°	120°	90°	110°	120°
L_{NE}	35 mm	35 mm	35 mm	35 mm	35 mm	35 mm	35 mm
Y	9.5 mm	12.5 mm	13 mm	14.5 mm	17.5 mm	18 mm	18 mm
X	14 mm	15 mm	33 mm	33 mm	40.5 mm	54.5 mm	110 mm
Z	7 mm	9 mm	7 mm	7 mm	21.5 mm	21.5 mm	19 mm
X + Z	21 mm	24 mm	40 mm	40 mm	62 mm	76 mm	129 mm

At 70°, the effective actuation angle α of GP 15-1 and GP 22-1 falls below the requirements of ISO 13856-2 and EN 12978.

Installation position

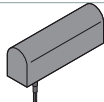
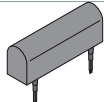
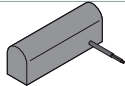
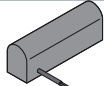
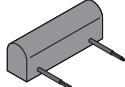
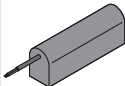
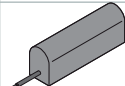
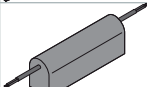
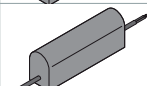
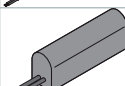
The installation position can be selected as required, i.e. all installation positions from A to D as per ISO 13856-2 are possible.

Subject to technical modifications.

Connection

Cable exits

- With cable sleeves in some cases
- L-type (L) rubber profiles: the rubber lip is always located on the left-hand side when the product is viewed from the end
- Other designs (e.g. shorter non-sensitive ends) available on request

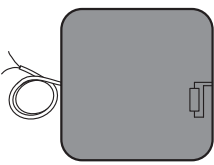
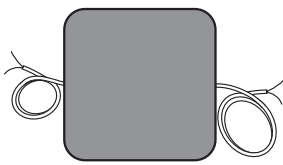
Cable exit (CE)		SL GP					
		15-1	22-1	39 (L)-1	50 (L)-1	60-1	120-1
At the bottom Distance betw. CE & end = 25 mm in each case; versions with cable sleeves							
Version 11: SL/W				●	●	●	●
Version 5: SL/BK				●	●	●	●
At the side Distance betw. CE & end = 25 mm in each case; versions without cable sleeves							
Version 12: SL/W				●	●	●	
Version 13: SL/W				●	●	●	
Version 14: SL/BK				●	●	●	
Axial exit at end Versions without cable sleeves							
Version 9: SL/W		●	●	●	●	●	●
Version 10: SL/W				●	●	●	●
Version 1: SL/BK		●	●	●	●	●	●
Version 3: SL/BK				●	●	●	●
Version 4: SL/BK				●	●	●	●

● = available

Subject to technical modifications.

Cable connection

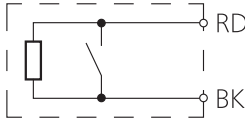
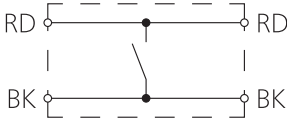
- Standard cable lengths
L = 2.0 m / 5.0 m / 10 m
- Maximum total cable length to the control unit
 $L_{max} = 100\text{ m}$
- Cable ends: stripped wires
Option: Cable ends available with plug and coupling

/W-type sensor with 1 line	/BK-type sensor with 2 lines
<ul style="list-style-type: none">• As an individual /W-type sensor or a /W-type end sensor• Integrated resistor• Two-wire cables	<ul style="list-style-type: none">• As a /BK-type through sensor• Without resistor• 2 two-wire cables
	

Wire colours

Colour coding

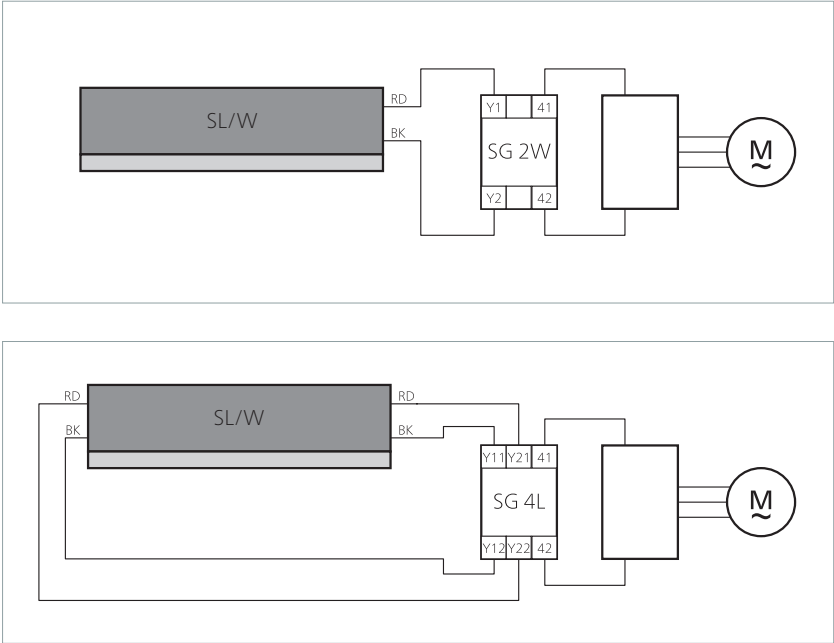
BK Black
RD Red

/W-type sensor with 1 line	/BK-type sensor with 2 lines
	

Connection examples

Key:
SG 2W Evaluation with 2-wire technology
SG 4L Evaluation with 4-wire technology

Subject to technical modifications.



Sensor surface

Resistance

The resistance ratings listed below (at a room temperature of 23 °C) depend on the sensor having an undamaged surface.

Physical resistance

Rubber profile GP	EPDM	NBR	CR
UV resistance	Yes	Yes	Yes

Chemical resistance

The sensor is broadly 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 the results of tests carried out in our laboratory. You must always conduct your own practical tests to verify that our products are suitable for your specific area of application.

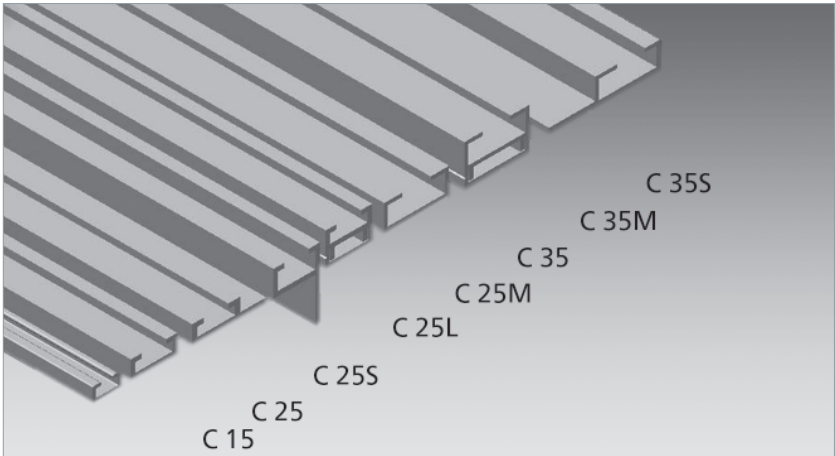
Explanation of symbols:

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

Chemical resistance	EPDM	NBR	CR
Acetone	+	±	+
Formic acid	+	+	+
Ammonia	+	+	+
Petrol	–	+	+
Brake fluid	±	±	±
Chloride solutions	+	+	+
Diesel oil	–	+	+
Greases	–	+	+
Household/sanitary cleaners	+	+	+
Isopropanol	+	+	+
Cooling lubricant	–	+	+
Metal working oil	–	+	+
Methanol	+	+	±
Oils	–	+	+
Ozone and weather conditions	+	–	+
Hydrochloric acid 10%	+	+	+
Ethyl alcohol (ethanol)	+	+	+
Carbon tetrachloride	–	+	+
Water and frost	+	–	+
Hydrogen peroxide 10%	+	+	–

Mounting

The sensors are mounted directly onto the main and secondary closing edges that present a danger. They are fixed using special aluminium profiles. The profiles are fastened with screws or rivets.




Material properties

- AlMgSi0.5 F22
- Wall thickness:
 - at least 2.0 mm
 - C 15: at least 1.7 mm
- Extruded
- Hot hardened
- Tolerances as per EN 755-9

Subject to technical modifications.

Aluminium profiles:




Overview of combinations

Sensor profile foot		C 15	C 25 C 25M C 25S C 25L	C 25 C 25M C 25S C 25L	C 35 C 35M C 35S	C 35 C 35M C 35S	C 35 C 35M C 35S
Snap-in foot (middle)	...-1 	GP 15-1	GP 22-1	GP 39(L)-1	GP 50(L)-1	GP 60-1	GP 120-1

Aluminium profiles: Mounting types


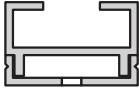
Standard profile

First the aluminium profile must be mounted onto the closing edge and then the sensor profile clipped into the aluminium profile.

C 15	C 25	C 35
		



Two-part profile, type M

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.

C 25M	C 35M
	

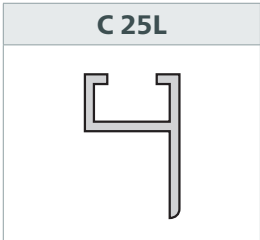
Flange profile, type S

Final assembly is also possible when the sensor profile is already clipped into the aluminium profile.

C 25S	C 35S
	

Angle profile, type L

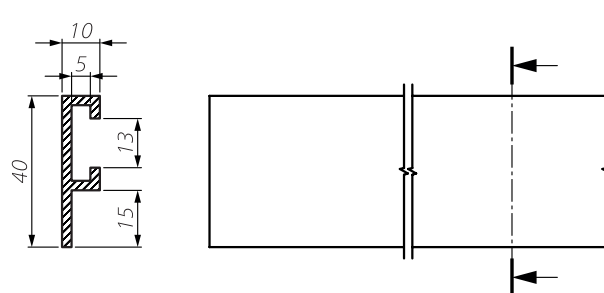
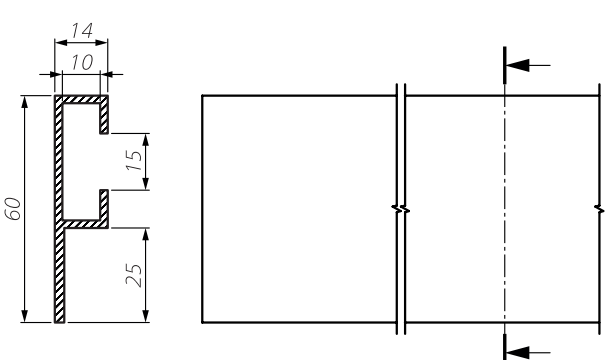
If the closing edge should not or must not have assembly holes, this “round-the-corner” solution is suitable. Final assembly is also possible when the sensor profile is already clipped into the aluminium profile.

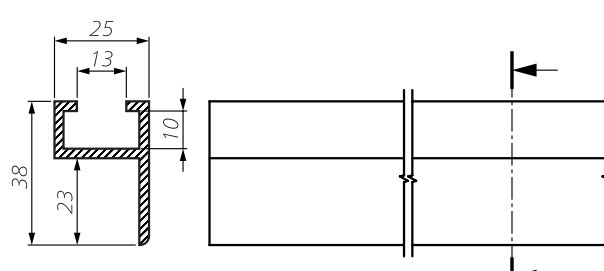


Aluminium profiles: Dimensions

Standard profile		1:2
C 15		
C 35		
Two-part profile, type M		1:2
C 25M		

Subject to technical modifications.

Flange profile, type S		1:2
C 25S		
C 35S		

Angle profile, type L		1:2
C 25L		

SL: Making 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 time of the complete system [s]
- t_1 = Safety edge response time
- t_2 = Stopping time of the machine
- s = Minimum overtravel distance of the safety edge to ensure that the stipulated 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:

$$s_1 = 1/2 \times v \times T \quad \text{where: } T = t_1 + t_2$$

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

$$s = s_1 \times C \quad \text{where: } C = 1.2$$

A suitable safety edge profile can now be selected based on the result. For details of the overtravel distances for safety edge profiles, see chapter *Technical data*.

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 $t_2 = 190$ ms. The relatively low velocity suggests that a short overtravel distance is to be expected. Therefore, the normally closed safety edge SL GP 39-1 EPDM might be sufficient. The response time of the safety edge is $t_1 = 435$ ms.

$$s_1 = 1/2 \times v \times T \quad \text{where: } T = t_1 + t_2$$

$$s_1 = 1/2 \times 10 \text{ mm/s} \times (435 \text{ ms} + 190 \text{ ms})$$

$$s_1 = 1/2 \times 10 \text{ mm/s} \times 0.625 \text{ s} = \mathbf{3.1 \text{ mm}}$$

$$s = s_1 \times C \quad \text{where: } C = 1.2$$

$$s = 3.1 \text{ mm} \times 1.2 = \mathbf{3.8 \text{ mm}}$$

The safety edge must have a minimum overtravel distance of $s = 3.8$ mm. The selected SL GP 39-1 EPDM has an overtravel distance of at least 10.9 mm. This is more than the required 3.8 mm.

Result: The SL GP 39-1 EPDM is **suitable** for this case.

Calculation example 2

The same conditions apply as in calculation example 1 with the exception of the velocity of the dangerous movement. This is now $v = 100 \text{ mm/s}$. As a result, the response time of the safety edge is reduced to $t_1 = 59 \text{ ms}$.

$$s_1 = 1/2 \times v \times T \quad \text{where: } T = t_1 + t_2$$

$$s_1 = 1/2 \times 100 \text{ mm/s} \times (59 \text{ ms} + 190 \text{ ms})$$

$$s_1 = 1/2 \times 100 \text{ mm/s} \times 0.249 \text{ s} = \mathbf{12.5 \text{ mm}}$$

$$s = s_1 \times C \quad \text{where: } C = 1.2$$

$$s = 12.5 \text{ mm} \times 1.2 = \mathbf{15.0 \text{ mm}}$$

The safety edge must have a minimum overtravel distance of $s = 15.0 \text{ mm}$. The selected SL GP 39-1 EPDM has an overtravel distance of at least 7.7 mm . This is less than the required 15.0 mm .

Result: The SL GP 39-1 EPDM is **not suitable** for this case.

Calculation example 3

The same conditions as in calculation example 2. Instead of the SL GP 39-1 EPDM, the SL GP 120-1 EPDM is selected. The response time of the safety edge is $t_1 = 95 \text{ ms}$.

$$s_1 = 1/2 \times v \times T \quad \text{where: } T = t_1 + t_2$$

$$s_1 = 1/2 \times 100 \text{ mm/s} \times (95 \text{ ms} + 190 \text{ ms})$$

$$s_1 = 1/2 \times 100 \text{ mm/s} \times 0.285 \text{ s} = \mathbf{14.3 \text{ mm}}$$

$$s = s_1 \times C \quad \text{where: } C = 1.2$$

$$s = 14.3 \text{ mm} \times 1.2 = \mathbf{17.2 \text{ mm}}$$

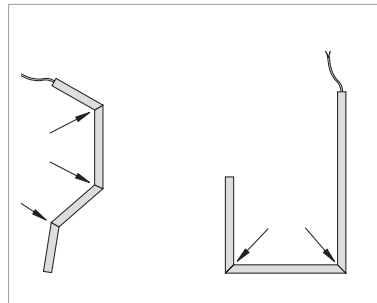
The safety edge must have a minimum overtravel distance of $s = 17.2 \text{ mm}$. With a velocity of 100 mm/s , the selected SL GP 120-1 EPDM has an overtravel distance of at least 17.7 mm . This is more than the required 17.2 mm .

Result: The SL GP 120-1 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
- Resistance to high temperatures:
 - short-term (< 15 min) up to +80 °C
 - long-term up to +55 °C
 - with degree of protection: IP50
- Resistance to low temperatures:
 - long-term down to –20 °C
- Angled safety edges with sensitive zones in the corner areas
- Safety edges GP 39-1, GP 50-1, GP 60-1 and GP 120-1 can be supplied with sensitive ends



Maintenance and cleaning

The sensors are virtually maintenance-free.
The control unit also monitors the sensor at the same time.

Regular inspection

Depending on the operational demands, the sensors must be inspected at regular intervals (at least monthly)

- for proper functioning,
- for damage and
- for correct mounting.

Cleaning

If the sensors become dirty, they can be cleaned with a mild cleaning product.

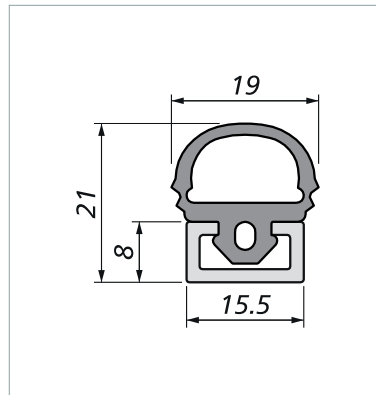
Technical data

GP 15-1 NBR

Safety edge	SL/W GP 15-1 NBR with SG-EFS 104/2W
Testing basis	In accordance with ISO 13856-2
Switching characteristics at $v_{\text{test}} = 10 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 139 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	2.8 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	±35°
Response time	295 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192 a
MTTF _D (sensor)	761 a
B _{10D} (sensor)	4 × 10 ⁶
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	
B ₁ / B ₂ / B ₃ / B ₄	Not possible
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	Not possible
Operating velocity	10 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	–10 to +50 °C
Storage temperature	–10 to +50 °C
Weight (without / with aluminium profile C 15)	0.14 / 0.28 kg/m
Electrical operating conditions	
Connection cable	Ø 3.8 mm TPU, 2 × 0.25 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Dimensions and distances

GP 15-1 NBR (1:1)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

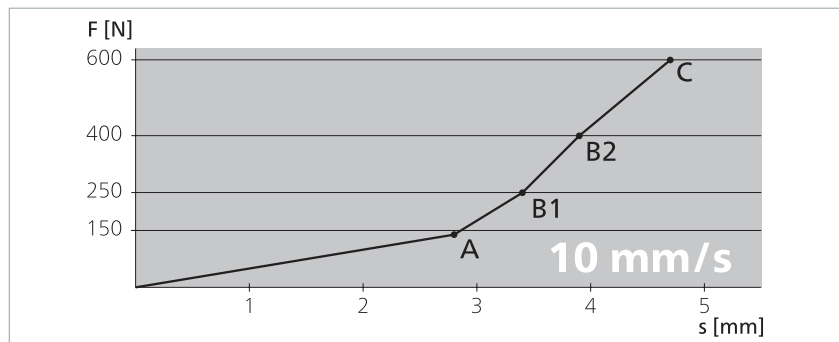
according to ISO 13856-2

- 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.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	139 N
Response time	280 ms
Actuation distance (A)	2.8 mm
Overtravel distance	
Up to 250 N (B1)	0.6 mm
Up to 400 N (B2)	1.1 mm
Up to 600 N (C)	1.9 mm
Total deformation	4.7 mm

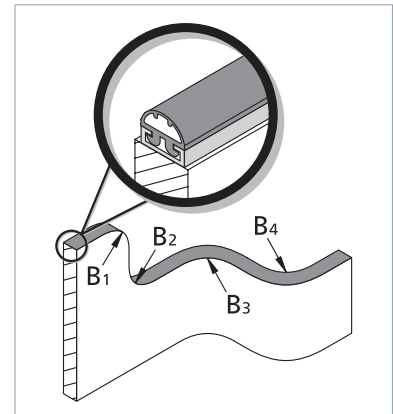


Technical data

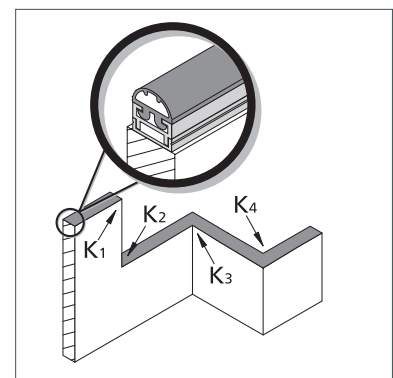
GP 22-1 NBR

Safety edge	SL/W GP 22-1 NBR with SG-EFS 104/2W
Testing basis	In accordance with ISO 13856-2
Switching characteristics at $v_{\text{test}} = 10 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 60 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	3.1 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	±35°
Response time	325 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192a
MTTF _D (sensor)	761a
B _{10D} (sensor)	4 × 10 ⁶
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	With C 25 only
B ₁ / B ₂ / B ₃ / B ₄	300 / 350 / 300 / 300 mm
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	25° / 10° / 90° / 90°
Operating velocity	10 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	+5 to +40 °C
Storage temperature	+5 to +40 °C
Weight (without / with aluminium profile C 25)	0.26 / 0.58 kg/m
Electrical operating conditions	
Connection cable	Ø 3.8 mm TPU, 2 × 0.25 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Bend radii:

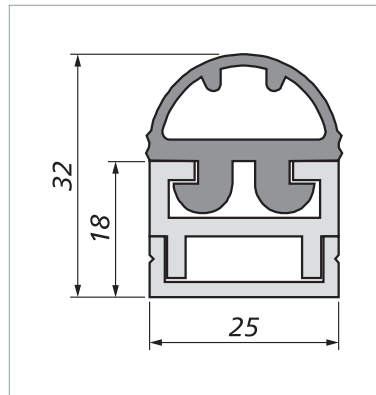


Bend angles:



Dimensions and distances

GP 22-1 NBR (1:1)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

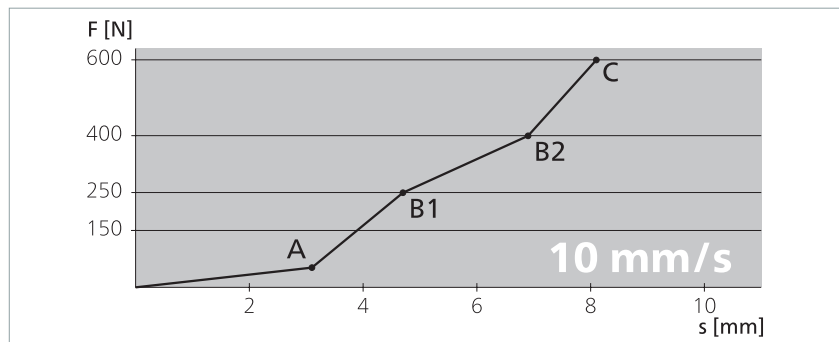
according to ISO 13856-2

- 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.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	60 N
Response time	310 ms
Actuation distance (A)	3.1 mm
Overtravel distance	
Up to 250 N (B1)	1.6 mm
Up to 400 N (B2)	3.8 mm
Up to 600 N (C)	5.0 mm
Total deformation	8.1 mm

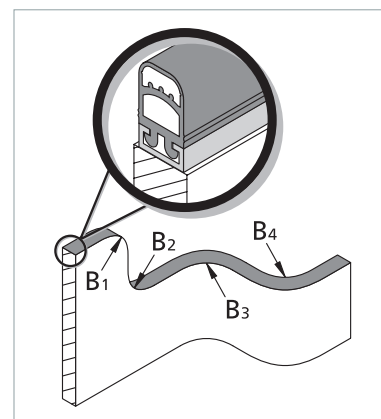


Technical data

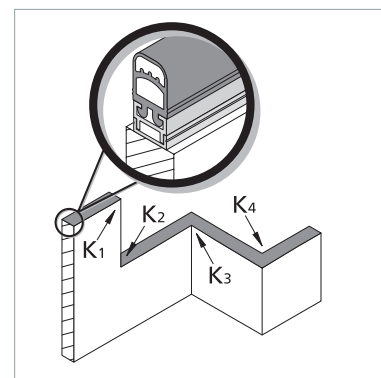
GP 39-1 NBR

Safety edge	SL/W GP 39-1 NBR with SG-EFS 104/2W
Testing basis	EN 12978, ISO 13849-1, ISO 13856-2
Switching characteristics at $v_{\text{test}} = 100 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	3.5 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	±55°
Response time	50 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192 a
MTTF _D (sensor)	761a
B _{10D} (sensor)	4 × 10 ⁶
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	With C 25 only
B ₁ / B ₂ / B ₃ / B ₄	300 / 350 / 300 / 300 mm
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	20° / 10° / 90° / 90°
Operating velocity	
(min. / max.)	10 mm/s / 100 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	–10 to +50 °C
Storage temperature	–10 to +50 °C
Weight (without / with aluminium profile C 25)	0.51 / 0.83 kg/m
Electrical operating conditions	
Connection cable	Ø 3.8 mm TPU, 2 × 0.25 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Bend radii:

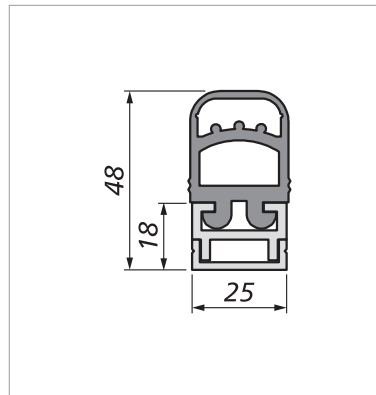


Bend angles:



Dimensions and distances

GP 39-1 NBR (1:2)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

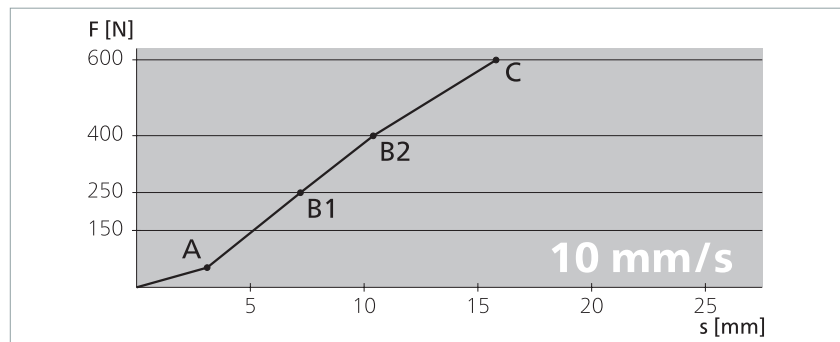
according to ISO 13856-2

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

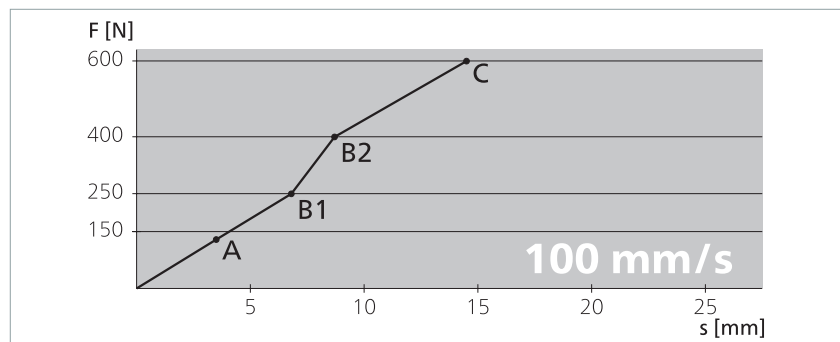
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	52 N
Response time	310 ms
Actuation distance (A)	3.1 mm
Overtravel distance	
Up to 250 N (B1)	4.1 mm
Up to 400 N (B2)	7.3 mm
Up to 600 N (C)	12.7 mm
Total deformation	15.8 mm



Test velocity	100 mm/s
Actuation force	129 N
Response time	35 ms
Actuation distance (A)	3.5 mm
Overtravel distance	
Up to 250 N (B1)	3.3 mm
Up to 400 N (B2)	5.2 mm
Up to 600 N (C)	11.0 mm
Total deformation	14.5 mm

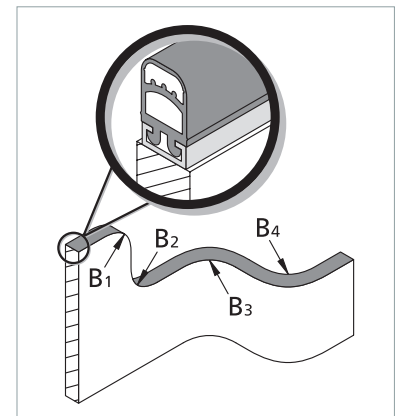


Technical data

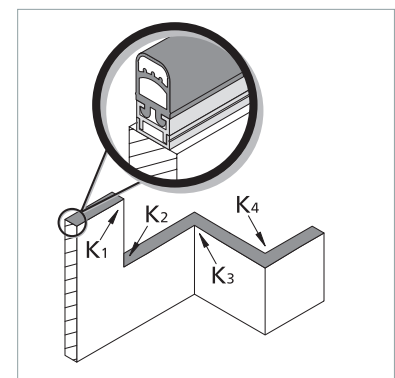
GP 39-1 EPDM

Safety edge	SL/W GP 39-1 EPDM with SG-EFS 104/2W
Testing basis	EN 12978, ISO 13849-1, ISO 13856-2
Switching characteristics at $v_{\text{test}} = 100 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	4.4 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	$\pm 40^\circ$
Response time	59 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192 a
MTTF _D (sensor)	761 a
B _{10D} (sensor)	4×10^6
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	With C 25 only
B ₁ / B ₂ / B ₃ / B ₄	300 / 350 / 300 / 300 mm
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	20° / 10° / 90° / 90°
Operating velocity	
(min. / max.)	10 mm/s / 100 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	-20 to +55 °C
Storage temperature	-20 to +55 °C
Weight (without / with aluminium profile C 25)	0.43 / 0.75 kg/m
Electrical operating conditions	
Connection cable	Ø 3.7 mm TPE, 2 × 0.22 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Bend radii:

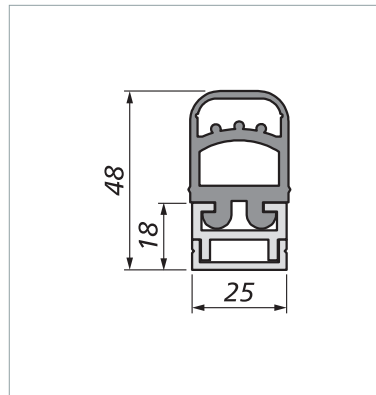


Bend angles:



Dimensions and distances

GP 39-1 EPDM (1:2)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

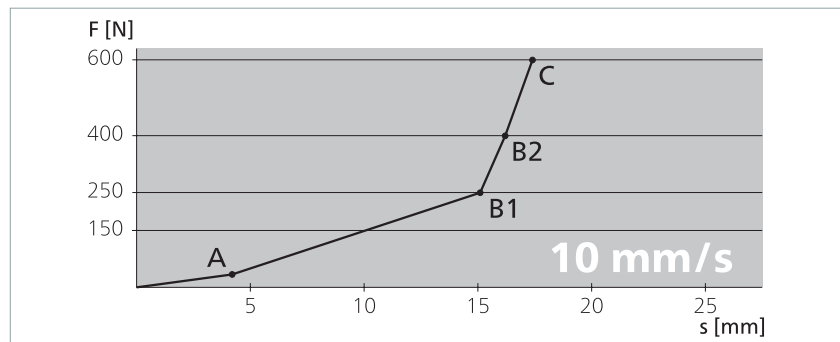
according to ISO 13856-2

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

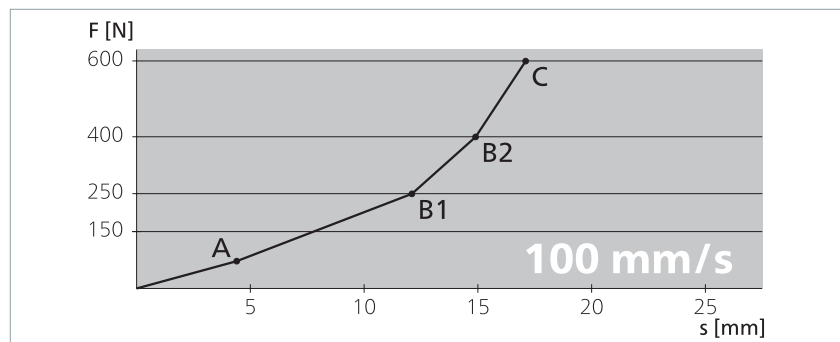
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	34 N
Response time	420 ms
Actuation distance (A)	4.2 mm
Overtravel distance	
Up to 250 N (B1)	10.9 mm
Up to 400 N (B2)	12.0 mm
Up to 600 N (C)	13.2 mm
Total deformation	17.4 mm



Test velocity	100 mm/s
Actuation force	72 N
Response time	44 ms
Actuation distance (A)	4.4 mm
Overtravel distance	
Up to 250 N (B1)	7.7 mm
Up to 400 N (B2)	10.5 mm
Up to 600 N (C)	12.7 mm
Total deformation	17.1 mm

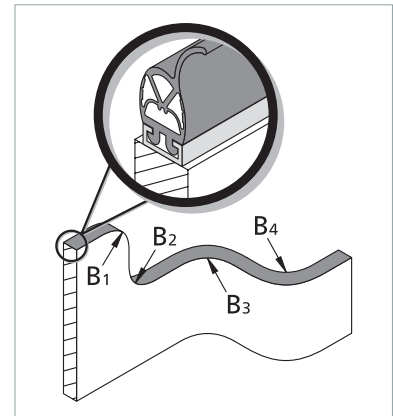


Technical data

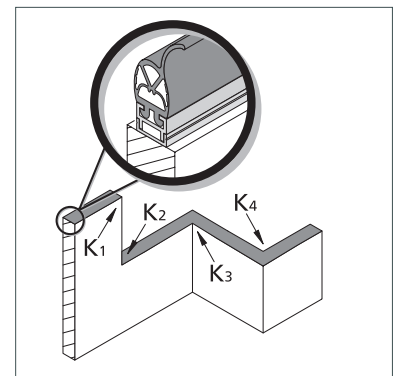
GP 39L-1 EPDM

Safety edge	SL/W GP 39L-1 EPDM with SG-EFS 104/2W
Testing basis	EN 12978, ISO 13849-1, ISO 13856-2
Switching characteristics at $v_{\text{test}} = 100 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	18.9 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	±60°
Response time	204 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192 a
MTTF _D (sensor)	761 a
B _{10D} (sensor)	4 × 10 ⁶
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	With C 25 only
B ₁ / B ₂ / B ₃ / B ₄	300 / 350 / 300 / 300 mm
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	20° / 10° / 90° / 90°
Operating velocity	
(min. / max.)	10 mm/s / 100 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	–20 to +55 °C
Storage temperature	–20 to +55 °C
Weight (without / with aluminium profile C 25)	0.52 / 0.84 kg/m
Electrical operating conditions	
Connection cable	Ø 3.7 mm TPE, 2 × 0.22 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Bend radii:

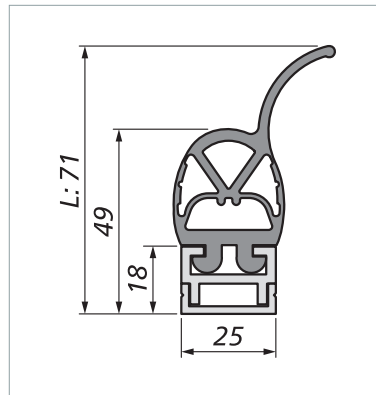


Bend angles:



Dimensions and distances

GP 39L-1 EPDM (1:2)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

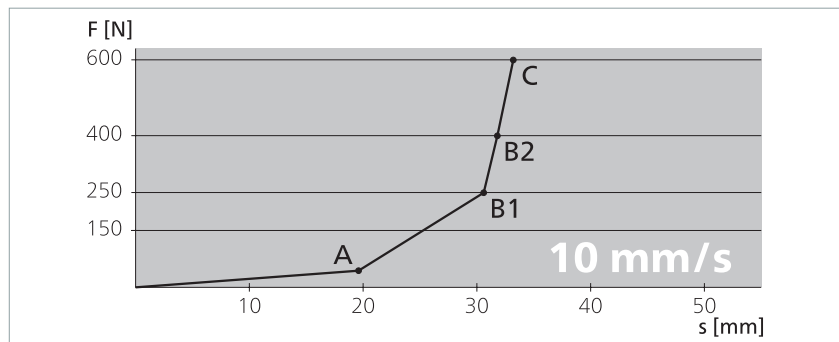
according to ISO 13856-2

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

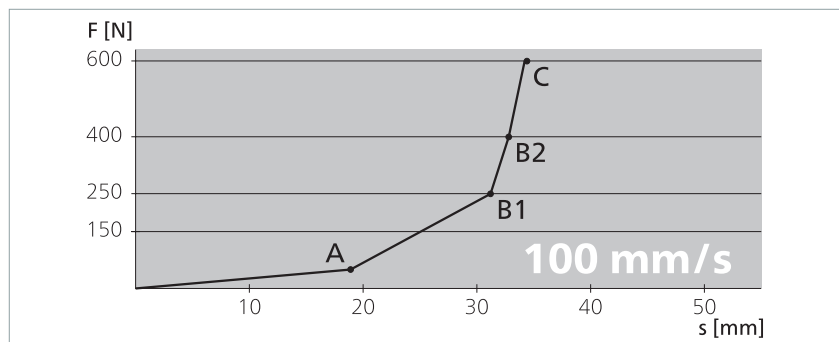
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	44 N
Response time	1960 ms
Actuation distance (A)	19.6 mm
Overtravel distance	
Up to 250 N (B1)	11.0 mm
Up to 400 N (B2)	12.2 mm
Up to 600 N (C)	13.6 mm
Total deformation	33.2 mm



Test velocity	100 mm/s
Actuation force	50 N
Response time	189 ms
Actuation distance (A)	18.9 mm
Overtravel distance	
Up to 250 N (B1)	12.3 mm
Up to 400 N (B2)	13.9 mm
Up to 600 N (C)	14.5 mm
Total deformation	34.4 mm

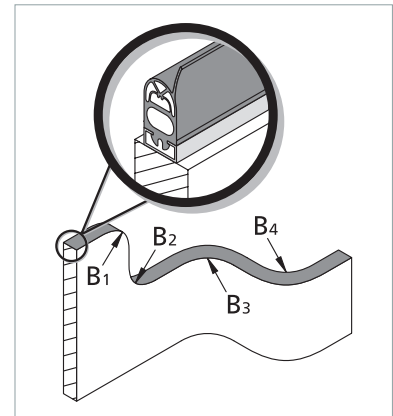


Technical data

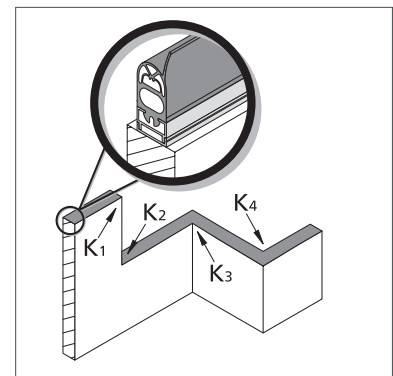
GP 50(L)-1 EPDM

Safety edge	SL/W GP 50(L)-1 EPDM with SG-EFS 104/2W
Testing basis	EN 12978, ISO 13849-1, ISO 13856-2
Switching characteristics at $v_{\text{test}} = 100 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	6.3 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	±45°
Response time	78 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192 a
MTTF _D (sensor)	761 a
B _{10D} (sensor)	4 × 10 ⁶
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	With C 35 only
B ₁ / B ₂ / B ₃ / B ₄	400 / 450 / 550 / 550 mm
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	15° / 10° / 90° / 90°
Operating velocity	
(min. / max.)	10 mm/s / 100 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	–20 to +55 °C
Storage temperature	–20 to +55 °C
Weight (without / with aluminium profile C 35)	1.1 / 1.5 kg/m
Electrical operating conditions	
Connection cable	Ø 3.7 mm TPE, 2 × 0.22 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Bend radii:

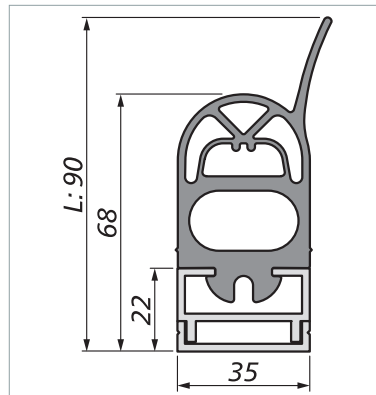


Bend angles:



Dimensions and distances

GP 50(L)-1 EPDM (1:2)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

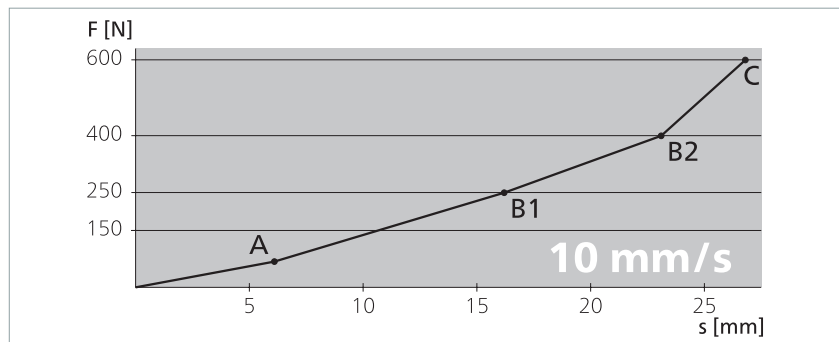
according to ISO 13856-2

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

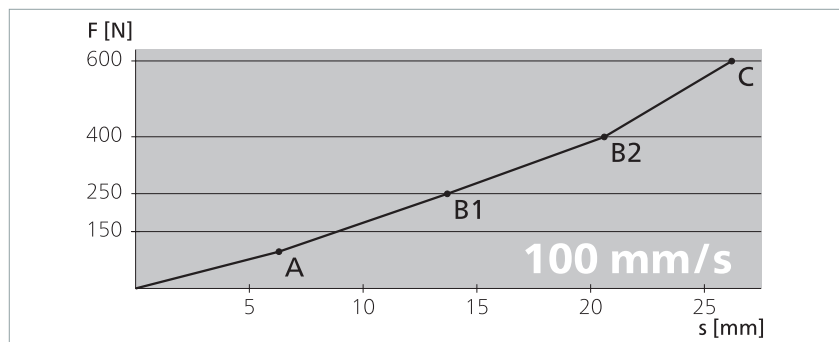
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	68 N
Response time	610 ms
Actuation distance (A)	6.1 mm
Overtravel distance	
Up to 250 N (B1)	10.1 mm
Up to 400 N (B2)	17.0 mm
Up to 600 N (C)	20.7 mm
Total deformation	26.8 mm



Test velocity	100 mm/s
Actuation force	97 N
Response time	63 ms
Actuation distance (A)	6.3 mm
Overtravel distance	
Up to 250 N (B1)	7.4 mm
Up to 400 N (B2)	14.3 mm
Up to 600 N (C)	19.9 mm
Total deformation	26.2 mm

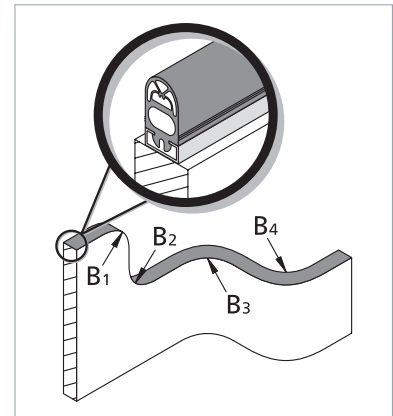


Technical data

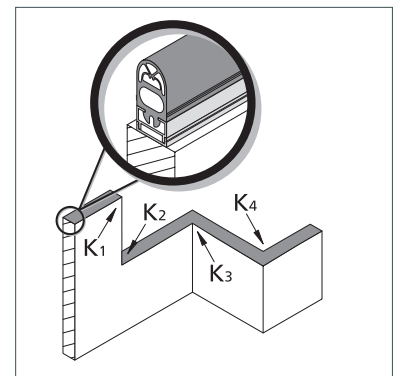
GP 50-1 CR

Safety edge	SL/W GP 50-1 CR with SG-EFS 104/2W
Testing basis	EN 12978, ISO 13849-1, ISO 13856-2
Switching characteristics at $v_{\text{test}} = 100 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	4.8 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	±45°
Response time	63 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192 a
MTTF _D (sensor)	761 a
B _{10D} (sensor)	4 × 10 ⁶
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	With C 35 only
B ₁ / B ₂ / B ₃ / B ₄	400 / 450 / 550 / 550 mm)
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	15° / 10° / 90° / 90°
Operating velocity	
(min. / max.)	10 mm/s / 100 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	–20 to +55 °C
Storage temperature	–20 to +55 °C
Weight (without / with aluminium profile C 35)	1.05 / 1.45 kg/m
Electrical operating conditions	
Connection cable	Ø 3.8 mm TPU, 2 × 0.25 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Bend radii:

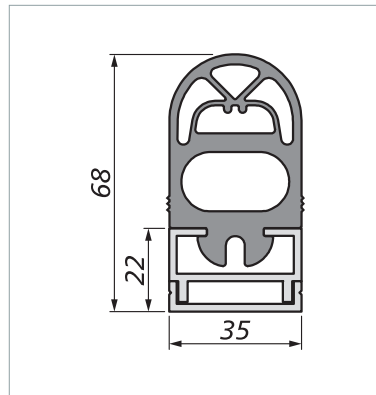


Bend angles:



Dimensions and distances

GP 50-1 CR (1:2)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

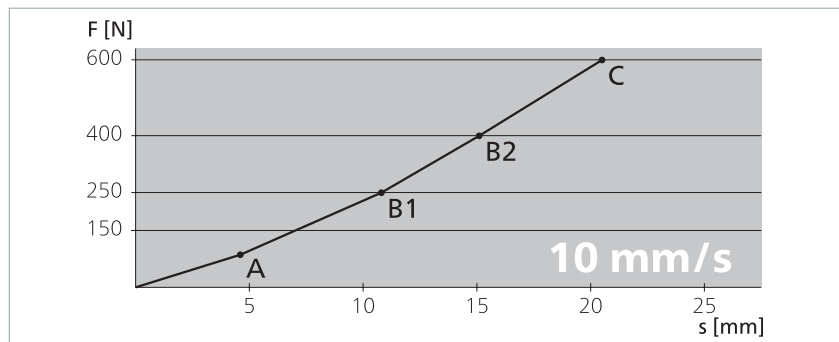
according to ISO 13856-2

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

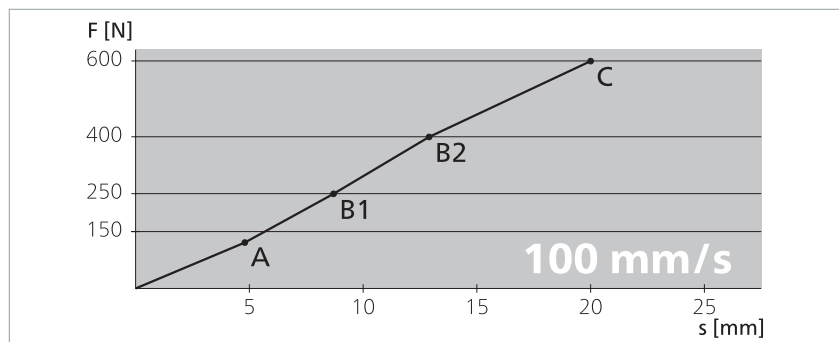
All the data given here has been
verified by Mayser GmbH & Co.
KG.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	86 N
Response time	460 ms
Actuation distance (A)	4.6 mm
Overtravel distance	
Up to 250 N (B1)	6.2 mm
Up to 400 N (B2)	10.5 mm
Up to 600 N (C)	15.9 mm
Total deformation	20.5 mm



Test velocity	100 mm/s
Actuation force	121 N
Response time	48 ms
Actuation distance (A)	4.8 mm
Overtravel distance	
Up to 250 N (B1)	3.9 mm
Up to 400 N (B2)	8.1 mm
Up to 600 N (C)	15.2 mm
Total deformation	20.0 mm

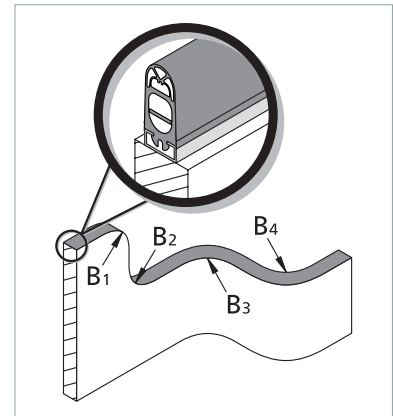


Technical data

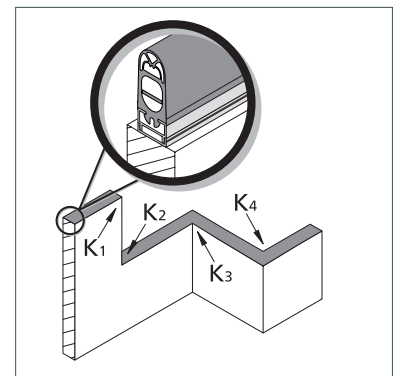
GP 60-1 EPDM

Safety edge	SL/W GP 60-1 EPDM with SG-EFS 104/2W
Testing basis	EN 12978, ISO 13849-1, ISO 13856-2
Switching characteristics at $v_{\text{test}} = 100 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	5.5 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	±60°
Response time	70 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192 a
MTTF _D (sensor)	761 a
B _{10D} (sensor)	4 × 10 ⁶
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	With C 35 only
B ₁ / B ₂ / B ₃ / B ₄	450 / 550 / 550 / 550 mm
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	15° / 10° / 90° / 90°
Operating velocity	
(min. / max.)	10 mm/s / 100 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	–20 to +55 °C
Storage temperature	–20 to +55 °C
Weight (without / with aluminium profile C 35)	1.16 / 1.56 kg/m
Electrical operating conditions	
Connection cable	Ø 3.7 mm TPE, 2 × 0.22 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Bend radii:

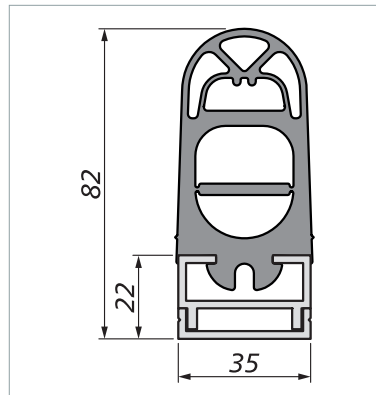


Bend angles:



Dimensions and distances

GP 60-1 EPDM (1:2)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

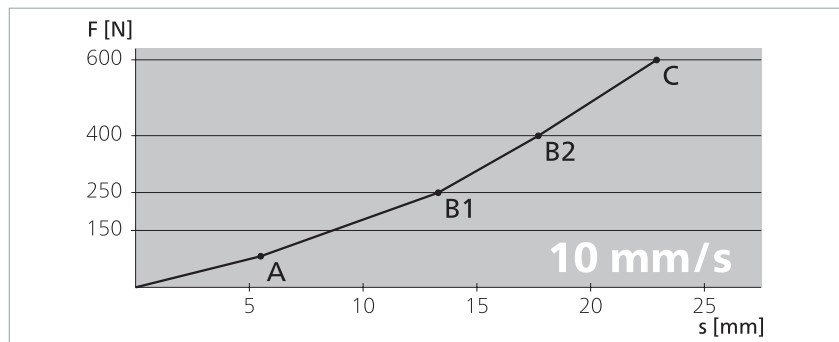
according to ISO 13856-2

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

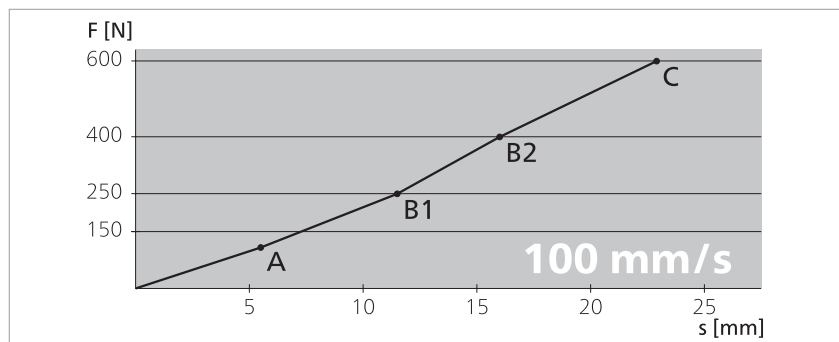
All the data given here has been
verified by Mayser GmbH & Co.
KG.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	82 N
Response time	550 ms
Actuation distance (A)	5.5 mm
Overtravel distance	
Up to 250 N (B1)	7.8 mm
Up to 400 N (B2)	12.2 mm
Up to 600 N (C)	17.4 mm
Total deformation	22.9 mm



Test velocity	100 mm/s
Actuation force	108 N
Response time	55 ms
Actuation distance (A)	5.5 mm
Overtravel distance	
Up to 250 N (B1)	6.0 mm
Up to 400 N (B2)	10.5 mm
Up to 600 N (C)	17.3 mm
Total deformation	22.8 mm

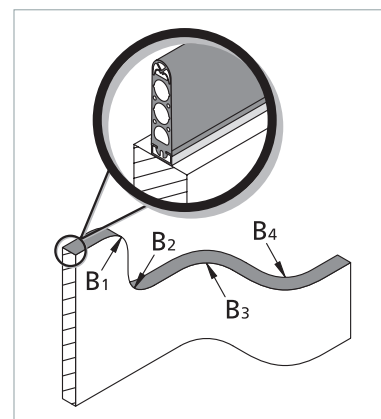


Technical data

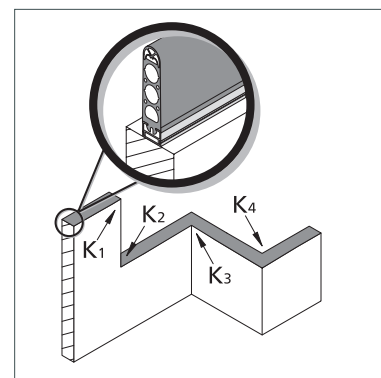
GP 120-1 EPDM

Safety edge	SL/W GP 120-1 EPDM with SG-EFS 104/2W
Testing basis	EN 12978, ISO 13849-1, ISO 13856-2
Switching characteristics at $v_{\text{test}} = 100 \text{ mm/s}$	
Switching operations	10,000
Actuation force	
Test piece (cylinder) Ø 80 mm	< 150 N
Actuation distance	
Test piece (cylinder) Ø 80 mm	8.0 mm
Actuation angle	
Test piece (cylinder) Ø 80 mm	±60°
Response time	95 ms
Finger detection	No
Safety classifications	
ISO 13856: reset function	With/without
ISO 13849-1:2015	Category 3 PL d
MTTF _D (PSPD)	192 a
MTTF _D (sensor)	761 a
B _{10D} (sensor)	4 × 10 ⁶
n _{op} (assumption)	52,560/a
Mechanical operating conditions	
Sensor length (min./max.)	20 cm / 6 m
Cable length (min./max.)	2.0 m / 100 m
Bend radii, minimum	With C 35 only
B ₁ / B ₂ / B ₃ / B ₄	– / – / 550 / 550 mm
Bend angles, maximum	
K ₁ / K ₂ / K ₃ / K ₄	15° / 10° / 90° / 90°
Operating velocity	
(min. / max.)	10 mm/s / 100 mm/s
Load capacity (max.)	600 N
Tensile load, cable (max.)	20 N
IEC 60529: degree of protection	IP67
Humidity (max. at 23 °C)	95% (non-condensing)
Operating temperature	–10 to +50 °C
Storage temperature	–10 to +50 °C
Weight (without / with aluminium profile C 35)	2.24 / 2.64 kg/m
Electrical operating conditions	
Connection cable	Ø 3.7 mm TPE, 2 × 0.22 mm ²
Sensor	24 V DC / max. 10 mA
Number of /BK-type sensors	Max. 10 in series

Bend radii:

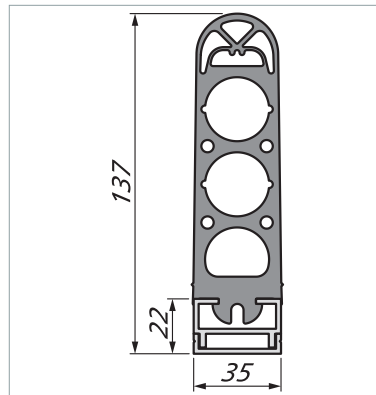


Bend angles:



Dimensions and distances

GP 120-1 EPDM (1:3)



Dimensional tolerances
according to ISO 3302 E2/L2

Test conditions

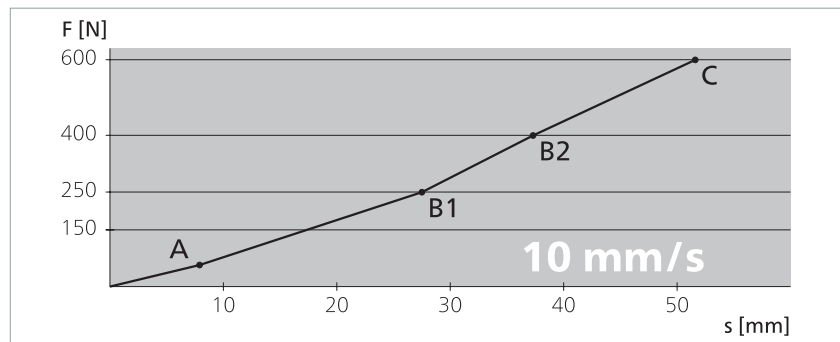
according to ISO 13856-2

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

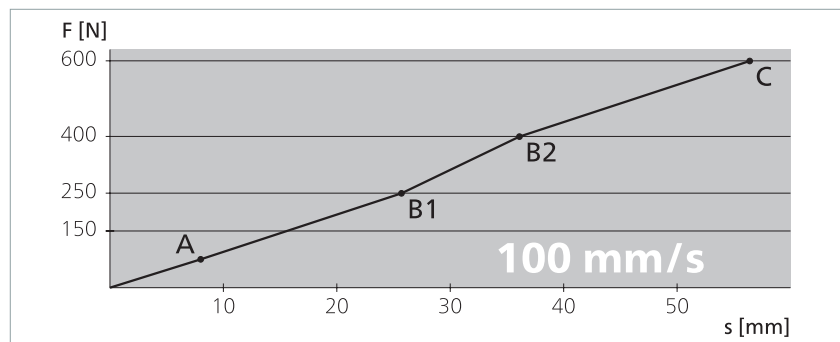
All the data given here has been
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KG.

Force-distance ratios

Test velocity	10 mm/s
Actuation force	57 N
Response time	790 ms
Actuation distance (A)	7.9 mm
Overtravel distance	
Up to 250 N (B1)	19.6 mm
Up to 400 N (B2)	29.4 mm
Up to 600 N (C)	43.7 mm
Total deformation	51.6 mm



Test velocity	100 mm/s
Actuation force	75 N
Response time	80 ms
Actuation distance (A)	8.0 mm
Overtravel distance	
Up to 250 N (B1)	17.7 mm
Up to 400 N (B2)	28.1 mm
Up to 600 N (C)	48.4 mm
Total deformation	56.4 mm



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 the product complies with the basic requirements of the following directives:

- 2006/42/EC (Safety of Machinery)
- 2011/65/EU (RoHS)
- 2014/30/EU (EMC)

The Declaration of Conformity is available in the Downloads section of our website:

www.mayser.com/de/download.