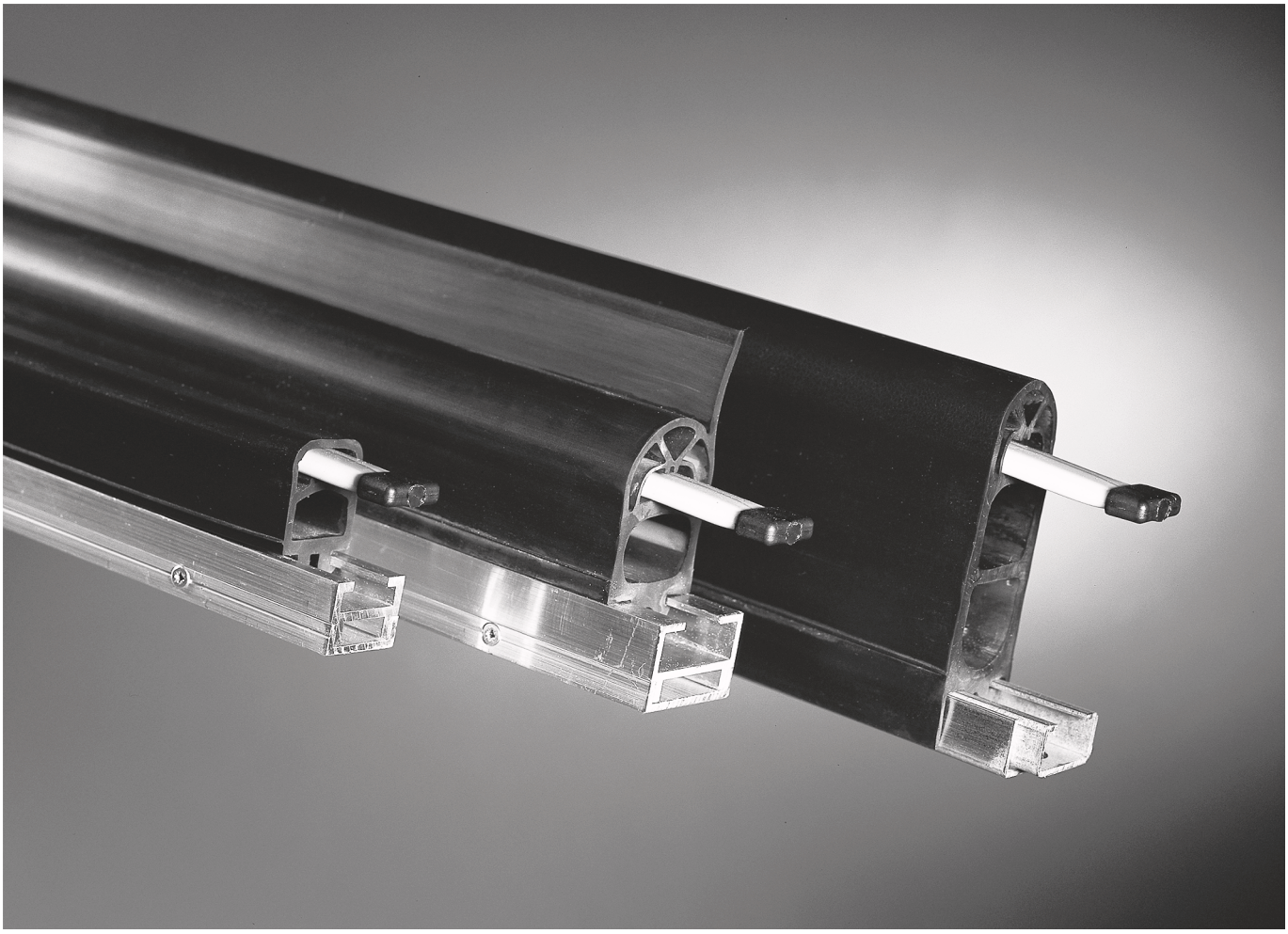
MAYSER®

Innovative by tradition.



Safety edges SL

EN | Product information

Mayser GmbH & Co. KG
Örlinger Straße 1–3
89073 Ulm
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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Contents

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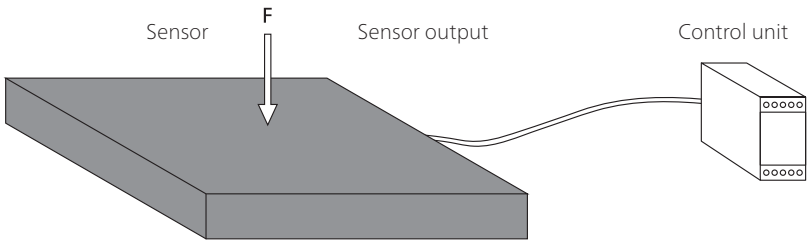
Subject to technical modifications.

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.

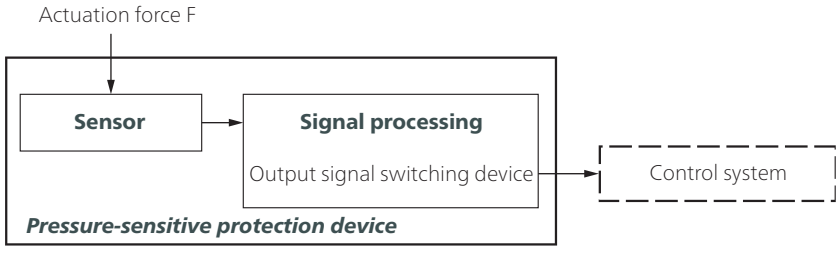


Sensor

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.



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

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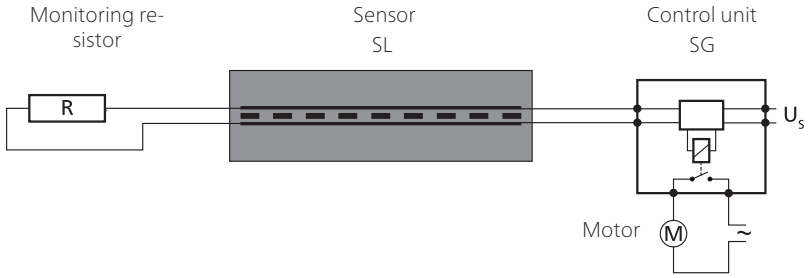
Criteria for selecting the sensor type

- Category 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:
  IP67 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?

Tip: For additional sensor selection criteria, please refer to ISO 13856-2 Appendix C and Appendix E.

Operating 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).

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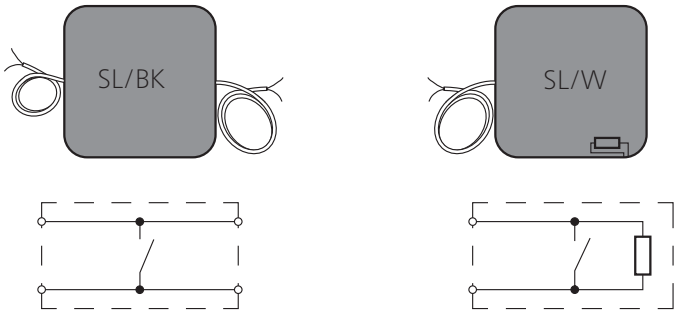
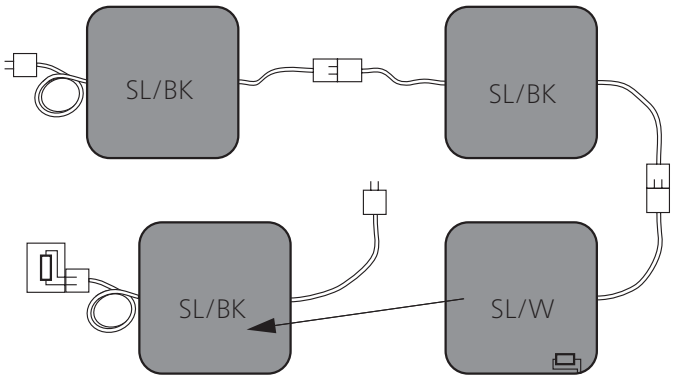
Design

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

SL/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

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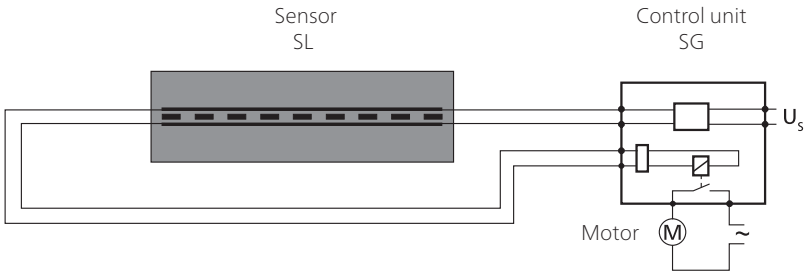
Subject to technical modifications.

Operating principle 4-wire-technology



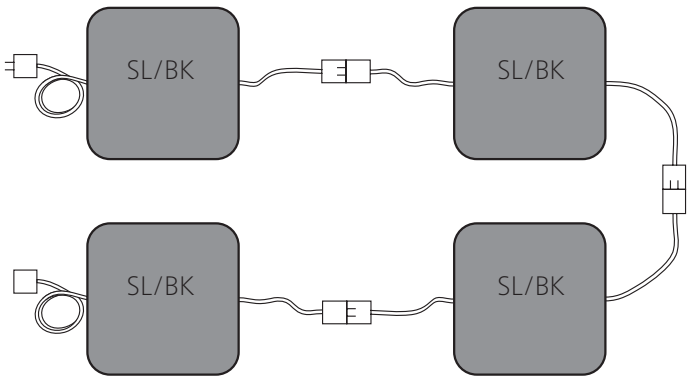
The 4-wire technology can be used only together with control unit SG-EFS 104/4L.

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

Design

SL/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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Safety

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.

For additional application guidelines refer to ISO 13856-2 Annex E.

Due to the design, the visible actuation area is reduced by the non-sensitive edges. What remains is the actual effective actuation area (see chapter *Effective actuation area*).

Limits

- max. 10 sensors type /BK on one control unit
- max. 9 sensors type /BK and 1 sensor type /W on 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 edge seal.
  The edge seal can be in full contact with the closing edge, which allows it to repel wind and water.

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Other safety aspects

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

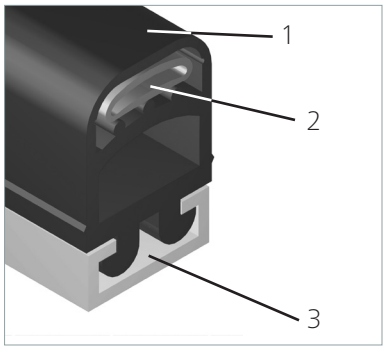
Performance Level (PL)
The PL was determined during a procedure according to ISO 13849-1. Fault exclusion according to ISO 13849-2 Table D.8: Non-closing of contact by pressure-sensitive equipment according to ISO 13856. In this case the sensor will no longer be taken into account in determining the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

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

Design



The safety edge SL consists of one sensor (1 to 3)
(1) Rubber profile GP,
(2) Safety element,
(3) Aluminium profile or steel profile and an evaluating control unit SG.

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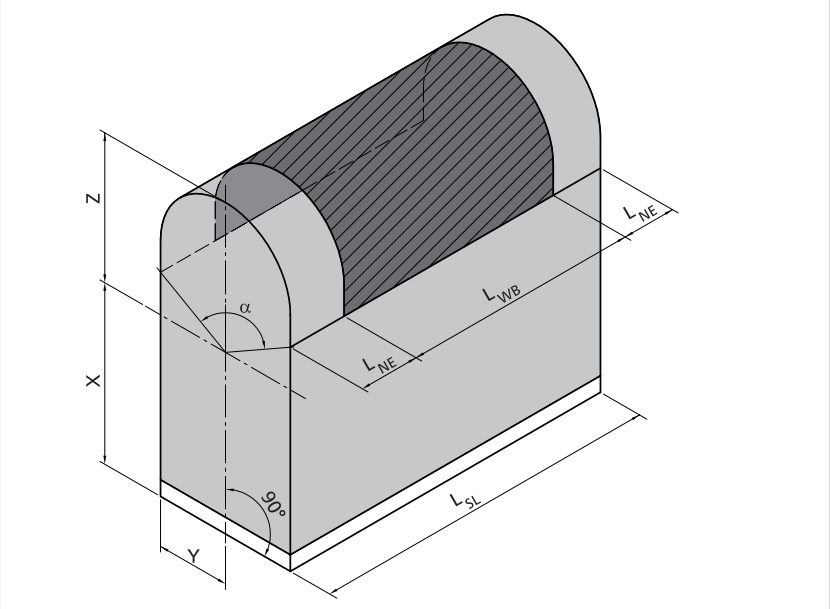
Effective actuation area

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 the 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	C15	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

The effective actuation angle α (70°) for 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 A to D as per ISO 13856-2 are possible.

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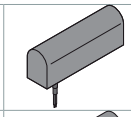
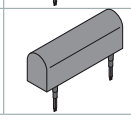
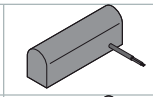
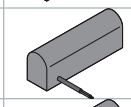
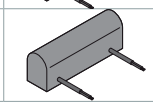
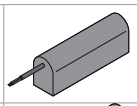
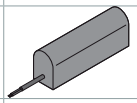
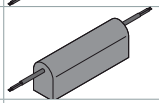
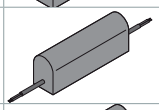
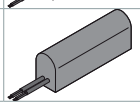
Connection

Cable exits

- Some with cable sleeves
- For rubber profiles, type L (L), please note: the rubber lip is always on the left side looking at the frontal view
- Other variations (e.g. smaller non-sensitive areas on ends) on enquiry

Cable exit KA		SL GP					
		15-1	22-1	39 (L)-1	50 (L)-1	60-1	120 -1
90° exit Distance KA to front end each 25 mm; Versions with cable sleeves							
Version 11: SL/W				●	●	●	●
Version 5: SL/BK				●	●	●	●
lateral exit Distance KA to front end each 25 mm; Versions without cable sleeves							
Version 15: SL/W				●	●	●	
Version 16: SL/W				●	●	●	
Version 17: SL/BK				●	●	●	
axial exit 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

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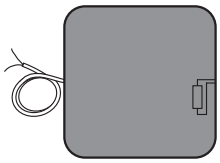
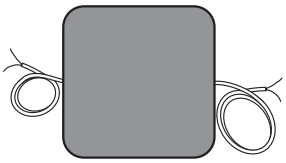
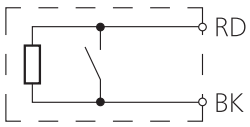
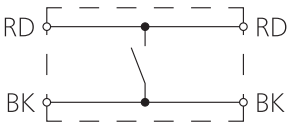
Cable connection

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

Sensor type /W with 1 line	Sensor type /BK with 2 lines
• As an individual sensor type /W or an end sensor type /W • Integrated resistor • 2-wire cable	• As a feed-through sensor type /BK • Without resistor • 2 two-wire cables
	

Wire colours

Sensor type /W with 1 line	Sensor type /BK with 2 lines
	

Colour coding

BK	Black
RD	Red

Connection examples

Legend:

SG 2W	evaluation 2-wire technology
SG 4L	evaluation 4-wire technology

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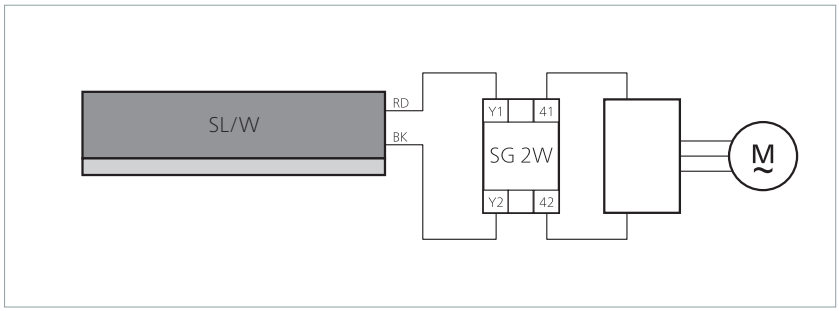

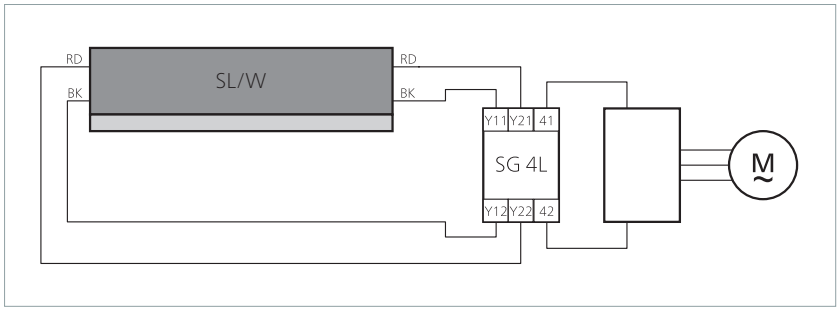

Sensor surface

Resistances

The resistance ratings listed below (at a room temperature of 23 °C) require a signal transmitter with an undamaged surface.

Physical resistance

Rubber profile GP	EPDM	NBR	CR
UV-resistance	yes	yes	yes

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 specifications in the table are the result of tests conducted in our lab. The suitability of our products for your special area of application must always be verified with your own practical tests.

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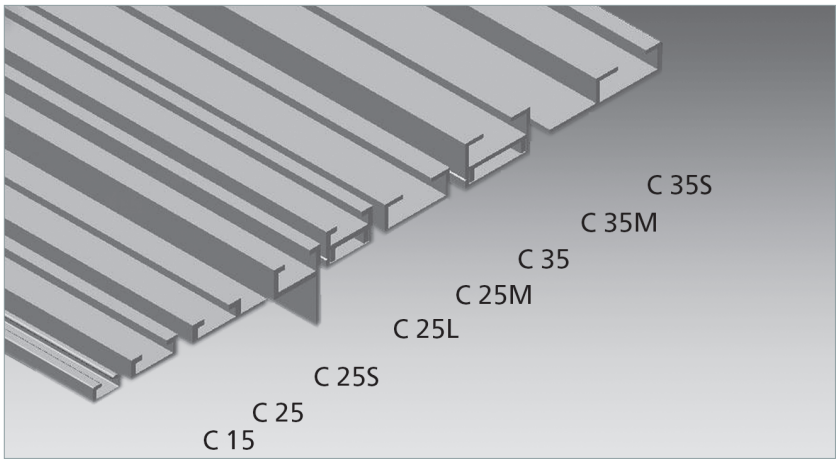
Explanation of symbols:
+ = resistant
± = resistant to a certain extent
- = not resistant

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

Attachment

The sensors are mounted directly on the hazardous main and secondary closing edges. Special aluminium profiles are used for mounting. 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

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Subject to technical modifications.

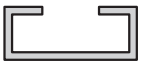
Aluminium profiles: Overview of combinations

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 35Sw	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

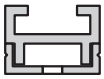
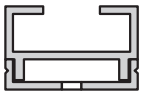
Standard profile

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
	

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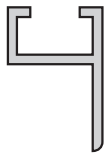
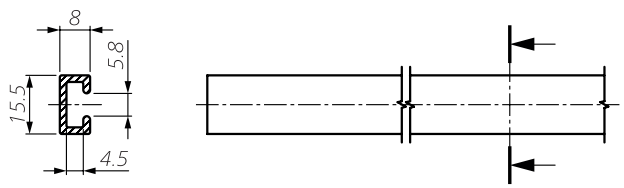
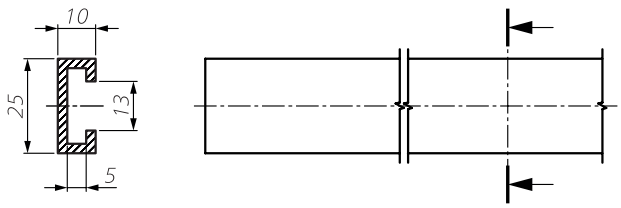
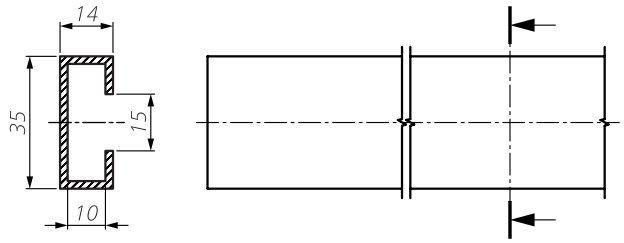
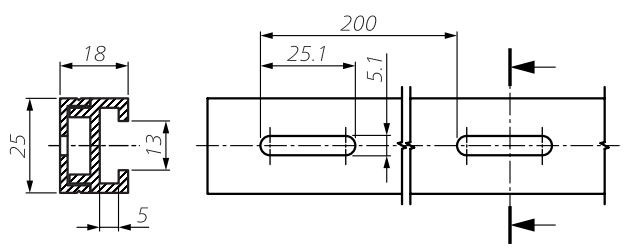
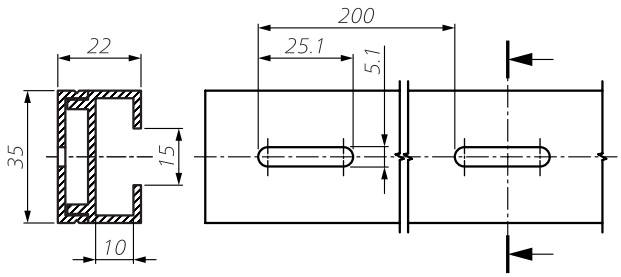
Angle profile type L

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

C 25L


Aluminium profile: Dimensions

Standard profile	1:2
C 15	C 25
	
C 35	–
	

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

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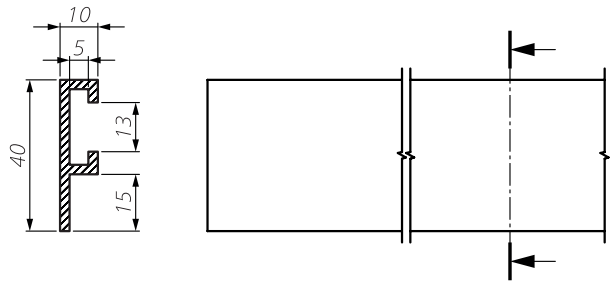
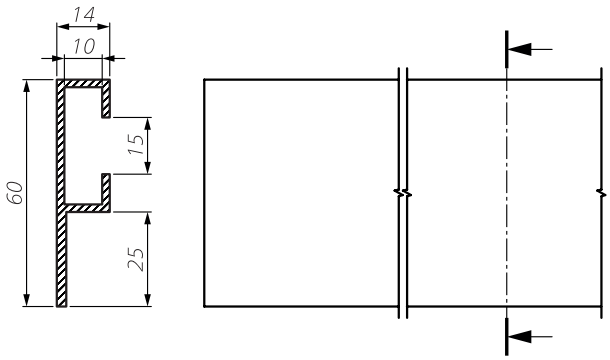
Flange profile type S 1:2

C 25S

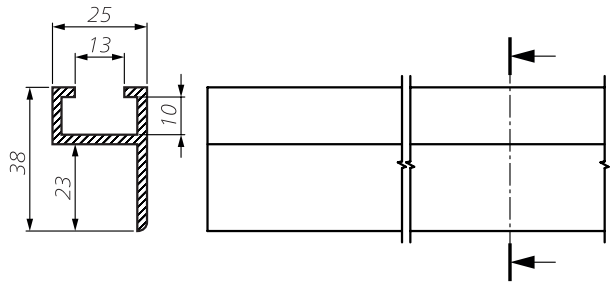


C 35S



Angle profile type L 1:2

C 25L



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Subject to technical modifications.

SL: 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 profiles: see chapter *Technical data*.

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 = 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 could be sufficient. The response time of the safety edge t_1 = 435 ms.

$s_1 = 1/2 \times v \times T$ where: $T = t_1 + t_2$
$s_1 = 1/2 \times 10$ mm/s $\times$ (435 ms + 190 ms)
$\mathbf{s_1} = 1/2 \times 10$ mm/s $\times$ 0.625 s = **3.1 mm**

$s = s_1 \times C$ where: $C = 1.2$
s = 3.1 mm $\times$ 1.2 = **3.8 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.

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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. This reduces the response time of the safety edge to t_1 = 59 ms.

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

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

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

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

s = 12.5 mm × 1.2 = **15.0 mm**

The safety edge must have a minimum overtravel distance of s = 15.0 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.

Example 3

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

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

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

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

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

s = 14.3 mm × 1.2 = **17.2 mm**

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

Result: The SL GP 120-1 EPDM is **suitable** for this case.

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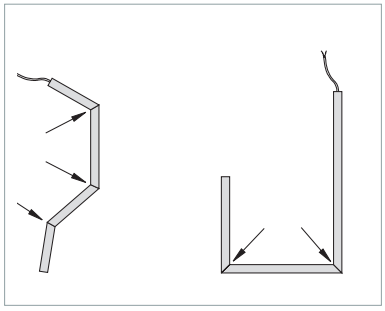
Customised designs

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

- safety edges with sensitive ends
- durability at high temperatures:
  short-term (< 15 min) up to +80 °C
  long-term up to +55 °C
  in the case of degree of protection: IP50
- durability at low temperatures:
  long-term up to max. -20 °C
- angled safety edges with sensitive zones in edge areas
- the safety edges GP 39-1, GP 50-1, GP 60-1, and GP 120-1 are possible with sensitive ends



Maintenance and cleaning

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

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

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

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

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Technical data

GP 15-1 NBR

Safety edge	SL/W GP 15-1 NBR with SG-EFS 104/2W
Testing basis	based on ISO 13856-2
Switching characteristics at v_{test} = 10 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} (Acceptance)	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 speed	10 mm/s
max. load capacity	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 mm²
Sensor	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

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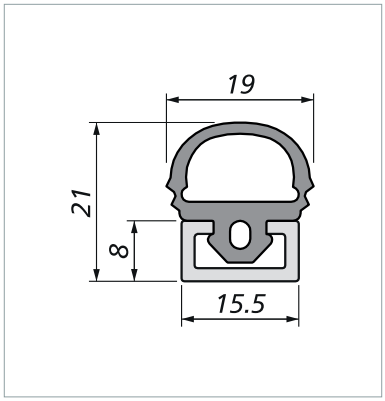
Dimensions and distances

GP 15-1 NBR (1:1)



Dimensional tolerances according to ISO 3302 E2/L2.

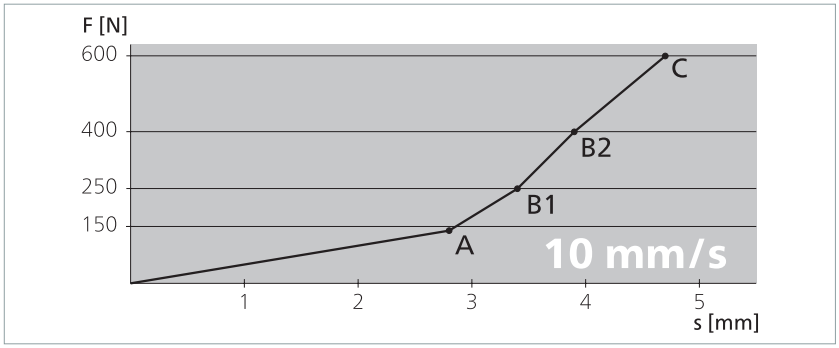
Test conditions
according to ISO 13856-2

- 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 speed	**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



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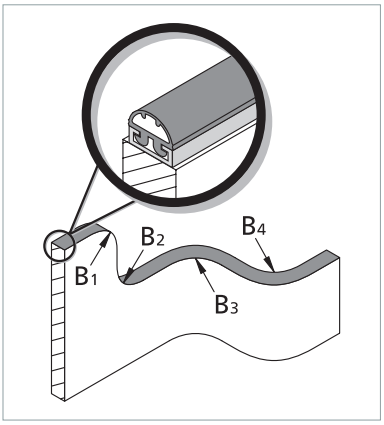
Technical data

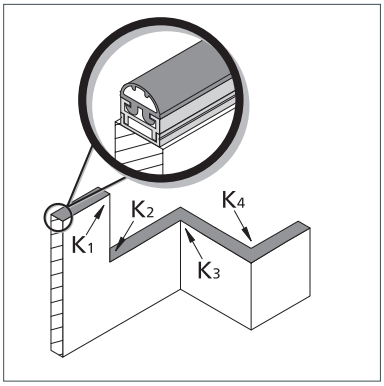
GP 22-1 NBR

Safety edge	SL/W GP 22-1 NBR with SG-EFS 104/2W
Testing basis	based on ISO 13856-2
Switching characteristics at v_{test} = 10 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} (Acceptance)	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	only with C 25
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 speed	10 mm/s
max. load capacity	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	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

Bend radii:



Bend angles:



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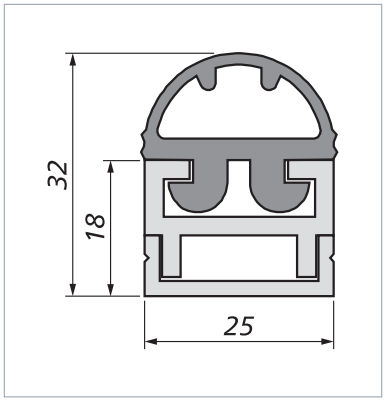
Dimensions and distances

GP 22-1 NBR (1:1)



Dimensional tolerances according to ISO 3302 E2/L2.

Test conditions

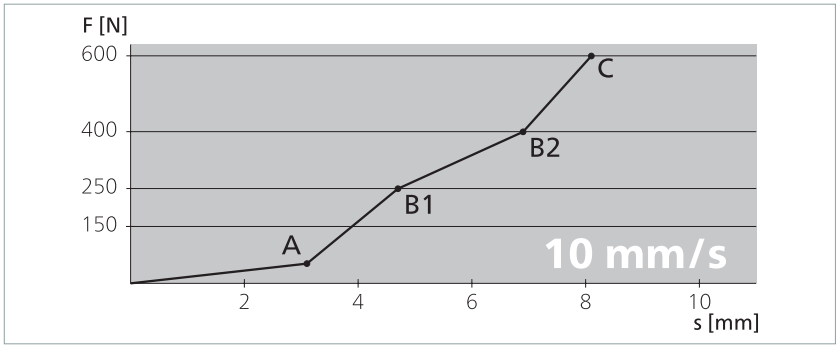
according to ISO 13856-2

- 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.

Test speed	**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

Force-distance ratios



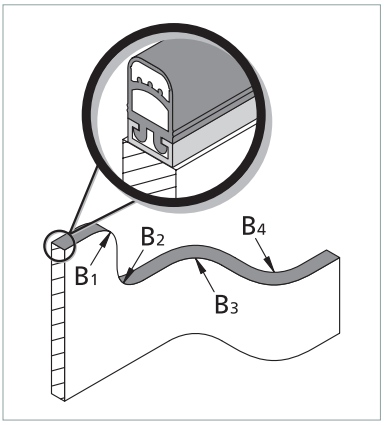
180321 v2.00-RiA

Technical data

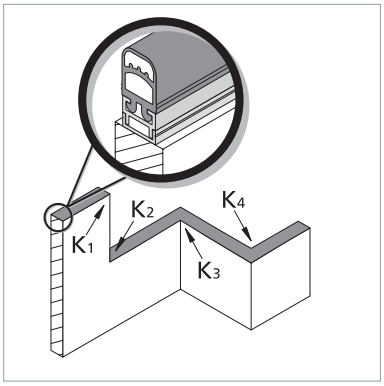
GP 39-1 NBR

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_{test} = 100 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} (Acceptance)	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	only with C 25
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 speed	
(min. / max.)	10 mm/s / 100 mm/s
max. load capacity	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	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

Bend radii:



Bend angles:



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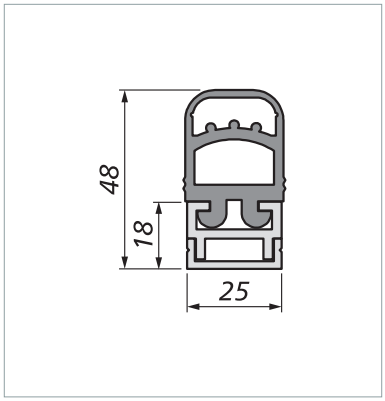
Dimensions and distances

GP 39-1 NBR (1:2)



Dimensional tolerances according to ISO 3302 E2/L2.

Test conditions

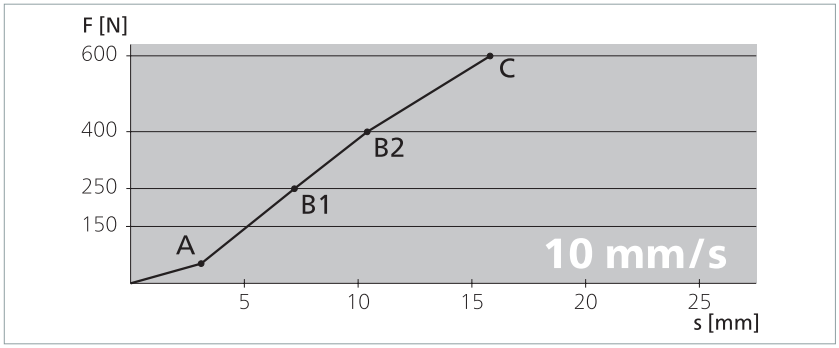
according to ISO 13856-2

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

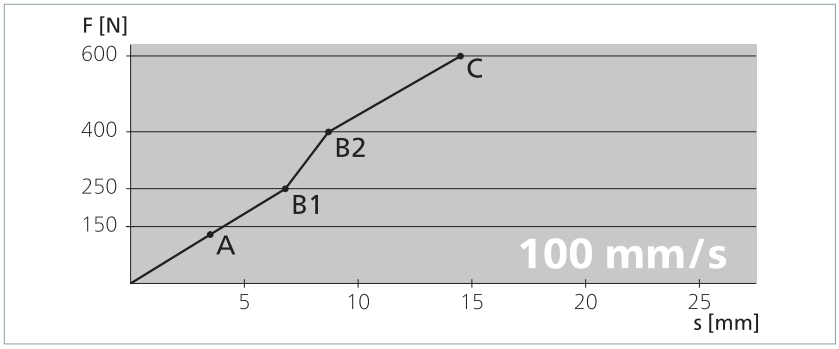
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test speed	**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 speed	**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



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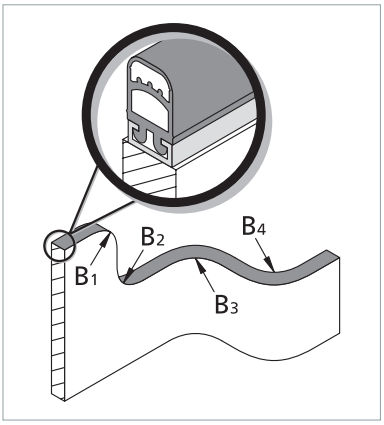
Technical data

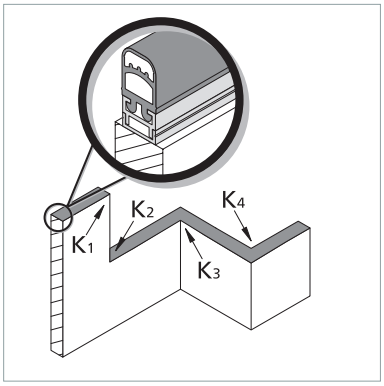
GP 39-1 EPDM

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_{test} = 100 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	±40°
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} (Acceptance)	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	only with C 25
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 speed	
(min. / max.)	10 mm/s / 100 mm/s
max. load capacity	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	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

Bend radii:



Bend angles:



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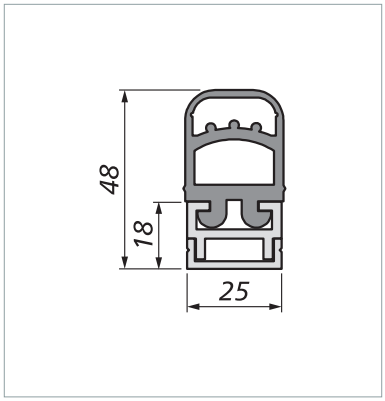
Dimensions and distances

GP 39-1 EPDM (1:2)



Dimensional tolerances according to ISO 3302 E2/L2.

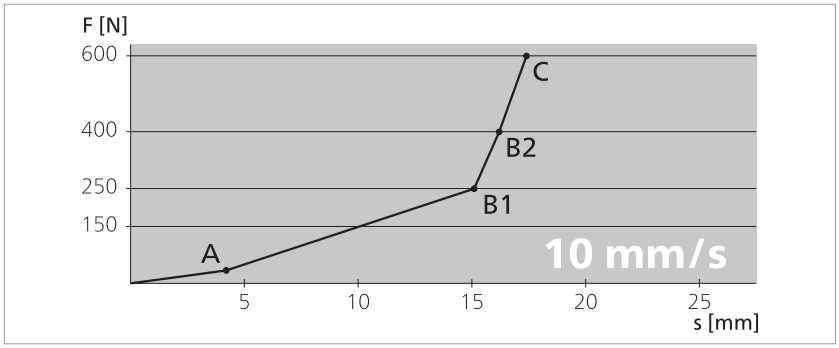
Test conditions
according to ISO 13856-2

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

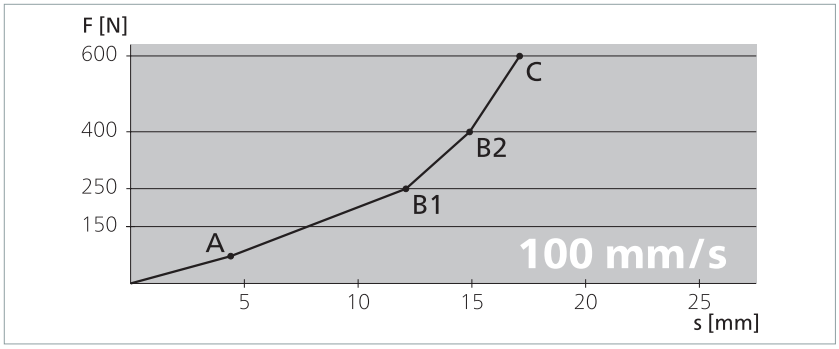
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test speed	**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 speed	**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



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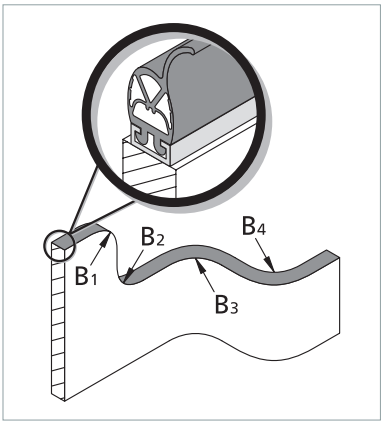
Technical data

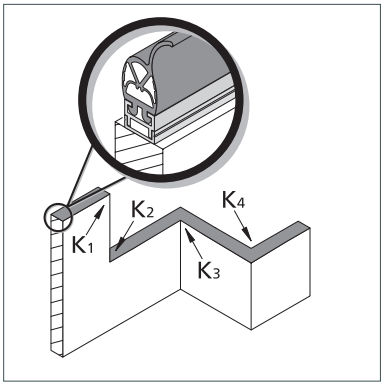
GP 39L-1 EPDM

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_{test} = 100 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} (Acceptance)	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	only with C 25
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 speed	
(min. / max.)	10 mm/s / 100 mm/s
max. load capacity	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	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

Bend radii:



Bend angles:



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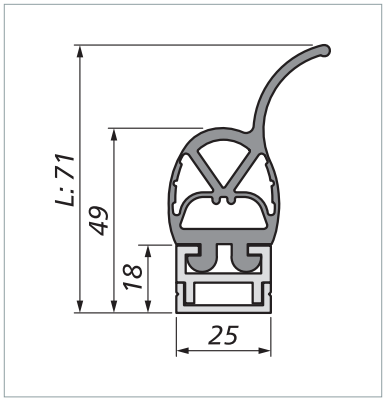
Dimensions and distances

GP 39L-1 EPDM (1:2)



Dimensional tolerances according to ISO 3302 E2/L2.

Test conditions

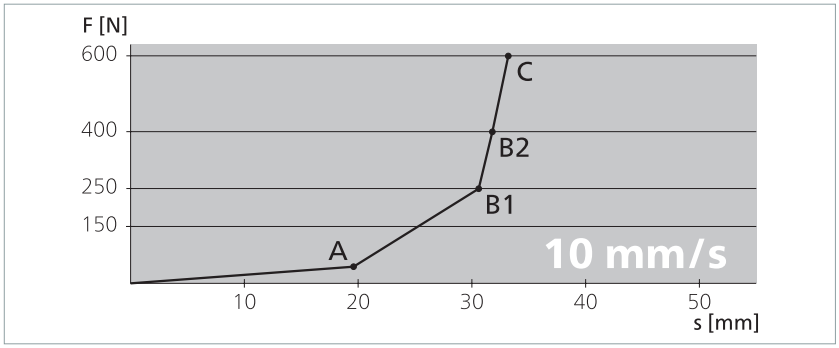
according to ISO 13856-2

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

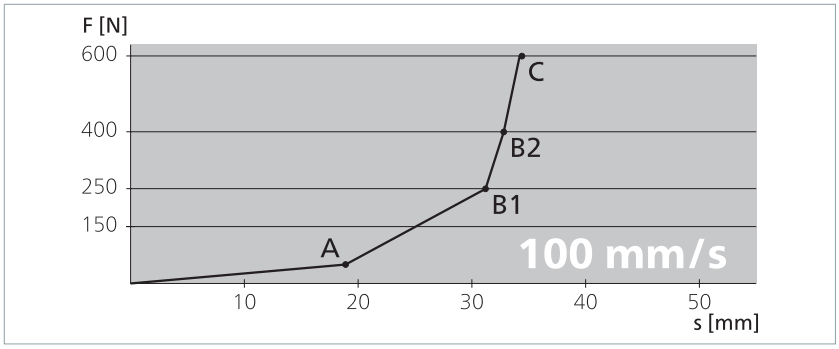
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test speed	**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 speed	**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



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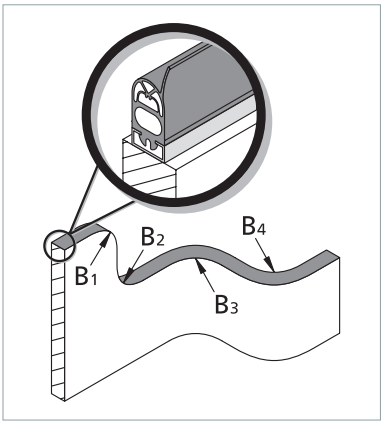
Technical data

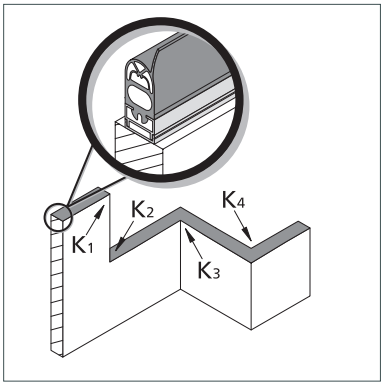
GP 50(L)-1 EPDM

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_{test} = 100 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} (Acceptance)	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	only with C 35
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 speed	
(min. / max.)	10 mm/s / 100 mm/s
max. load capacity	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	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

Bend radii:



Bend angles:



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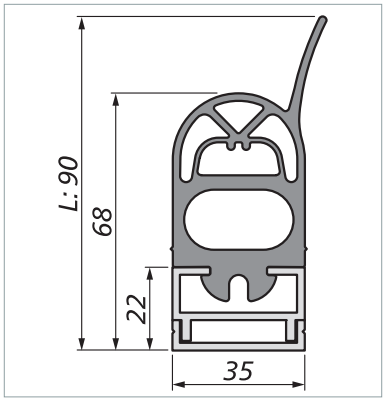
Dimensions and distances

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



Dimensional tolerances according to ISO 3302 E2/L2.

Test conditions

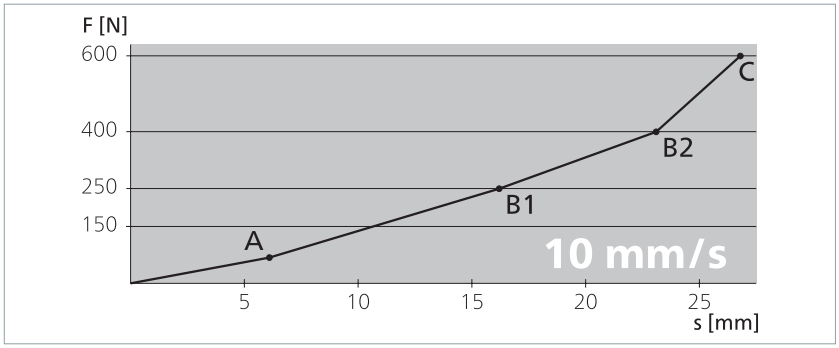
according to ISO 13856-2

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

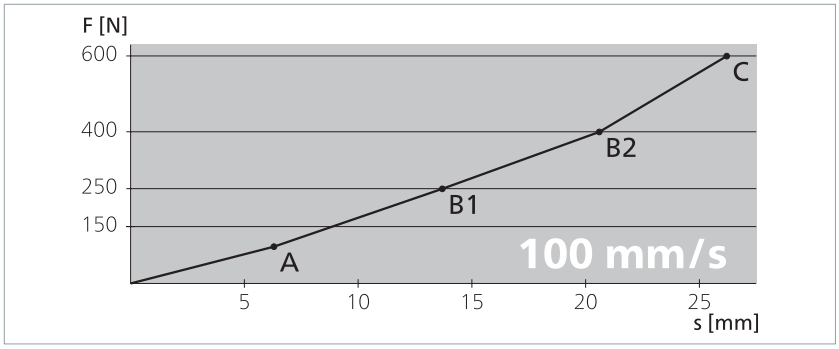
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test speed	**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 speed	**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



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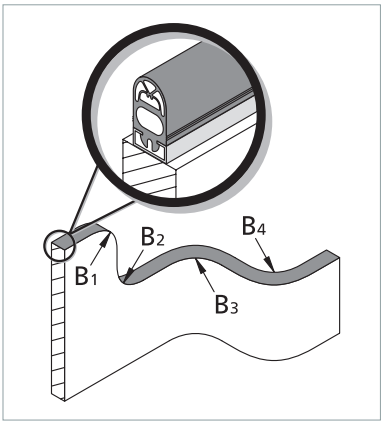
Technical data

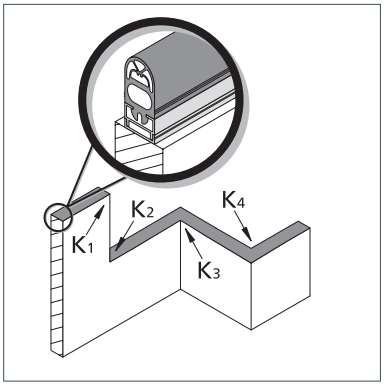
GP 50-1 CR

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_{test} = 100 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} (Acceptance)	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	only with C 35
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 speed	
(min. / max.)	10 mm/s / 100 mm/s
max. load capacity	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	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

Bend radii:



Bend angles:



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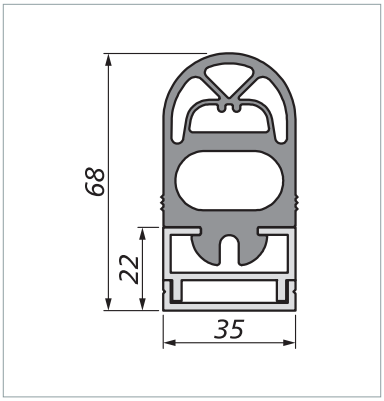
Dimensions and distances

GP 50-1 CR (1:2)



Dimensional tolerances according to ISO 3302 E2/L2.

Test conditions

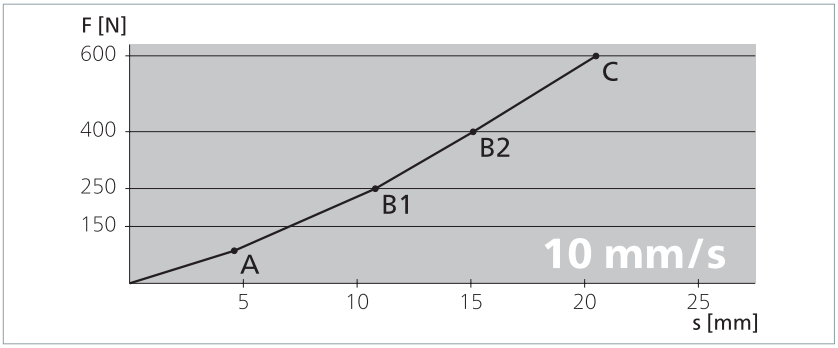
according to ISO 13856-2

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

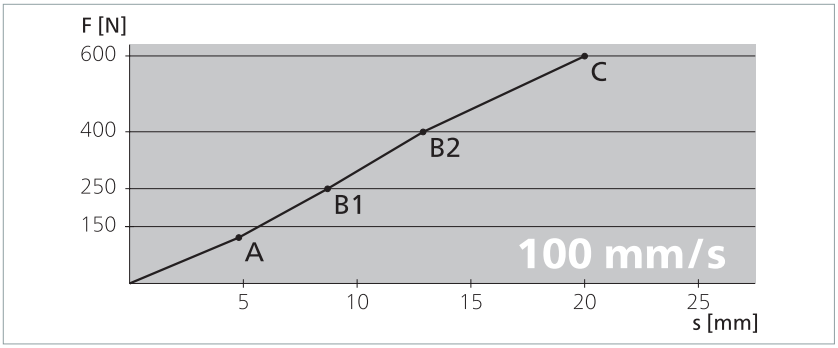
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test speed	**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 speed	**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



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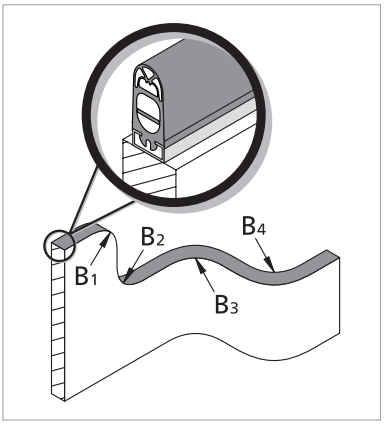
Technical data

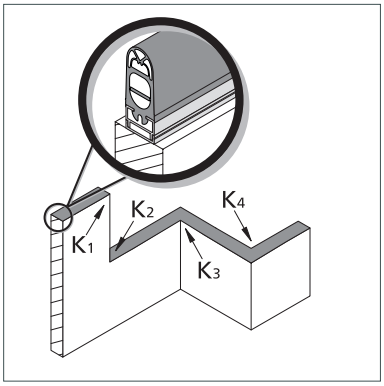
GP 60-1 EPDM

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_{test} = 100 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} (Acceptance)	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	only with C 35
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 speed	
(min. / max.)	10 mm/s / 100 mm/s
max. load capacity	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 steel profile C 37)	1.16 / 1.56 kg/m
Electrical operating conditions	
Connection cable	Ø 3.7 mm TPE, 2× 0.22 mm^2
Sensor	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

Bend radii:



Bend angles:



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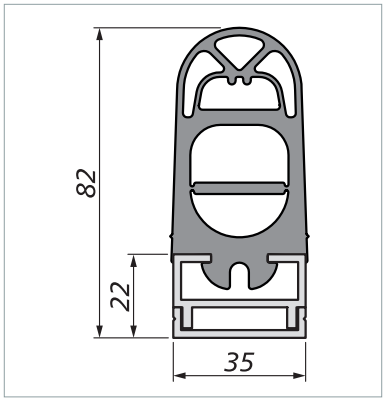
Dimensions and distances

GP 60-1 EPDM (1:2)



Dimensional tolerances according to ISO 3302 E2/L2.

Test conditions

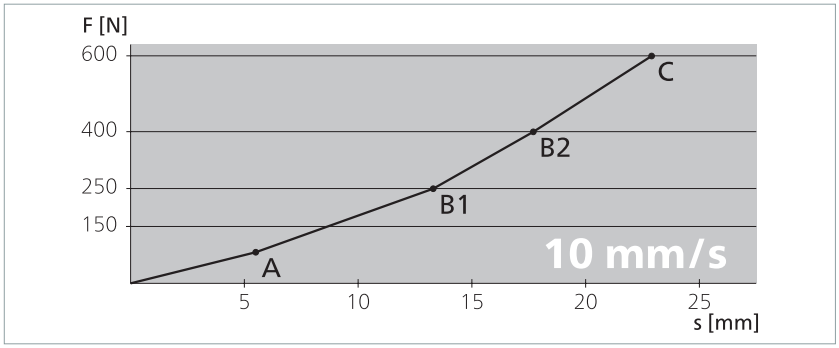
according to ISO 13856-2

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

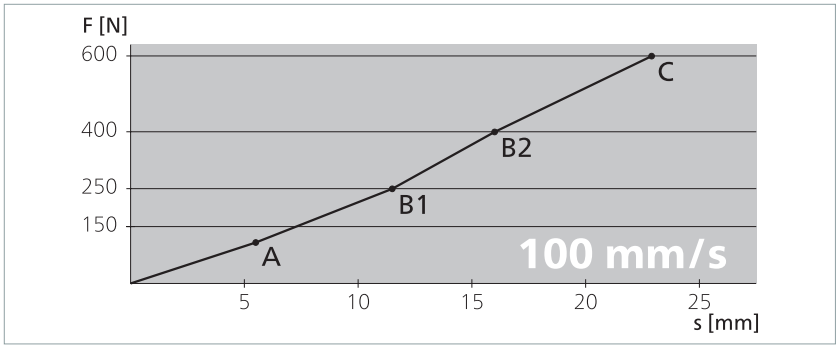
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test speed	**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 speed	**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



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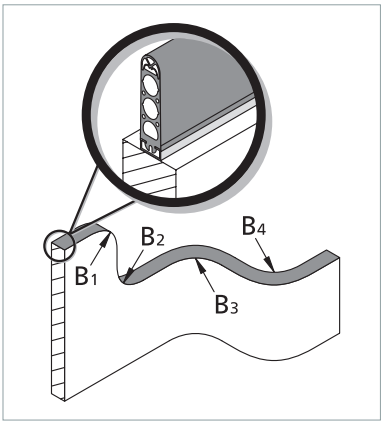
Technical data

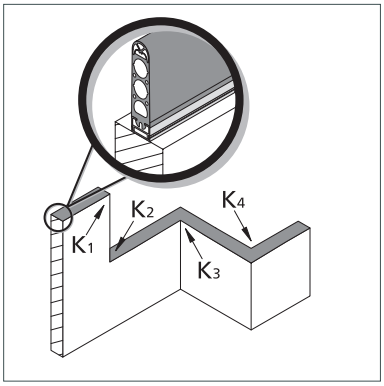
GP 120-1 EPDM

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_{test} = 100 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} (Acceptance)	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	only with C 35
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 speed	
(min. / max.)	10 mm/s / 100 mm/s
max. load capacity	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 steel profile C 37)	2.24 / 2.64 kg/m
Electrical operating conditions	
Connection cable	Ø 3.7 mm TPE, 2× 0.22 mm^2
Sensor	DC 24 V / max. 10 mA
Number of sensors type /BK	max. 10 in series

Bend radii:



Bend angles:



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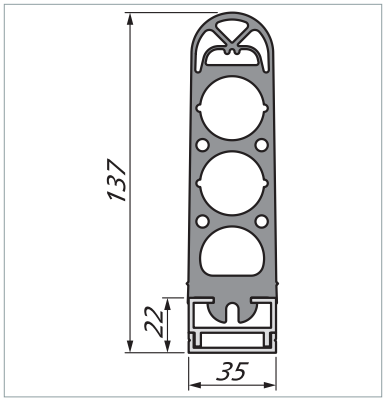
Dimensions and distances

GP 120-1 EPDM (1:3)



Dimensional tolerances according to ISO 3302 E2/L2.

Test conditions

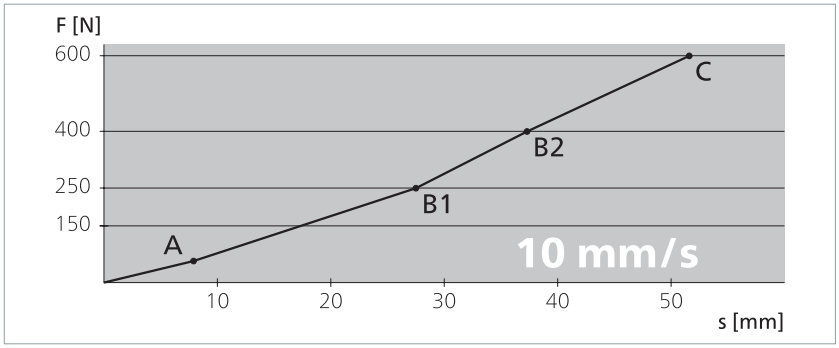
according to ISO 13856-2

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

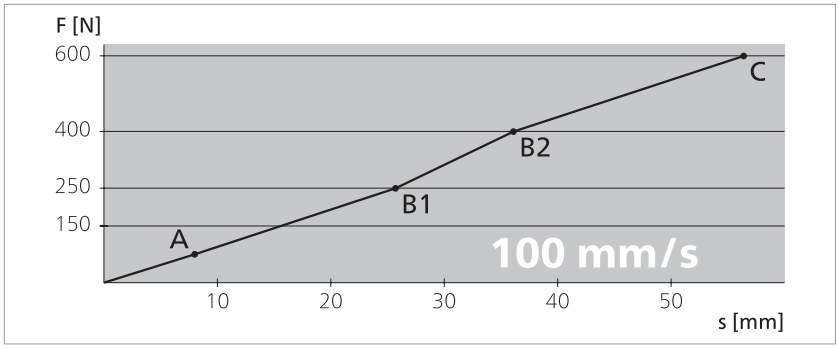
All the data given here has been verified by Mayser GmbH & Co. KG.

Force-distance ratios

Test speed	**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 speed	**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



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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/EC (RoHS)
- 2014/30/EC (EMC)

The Declaration of Conformity is available in the download section of the website: www.mayser.com.

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