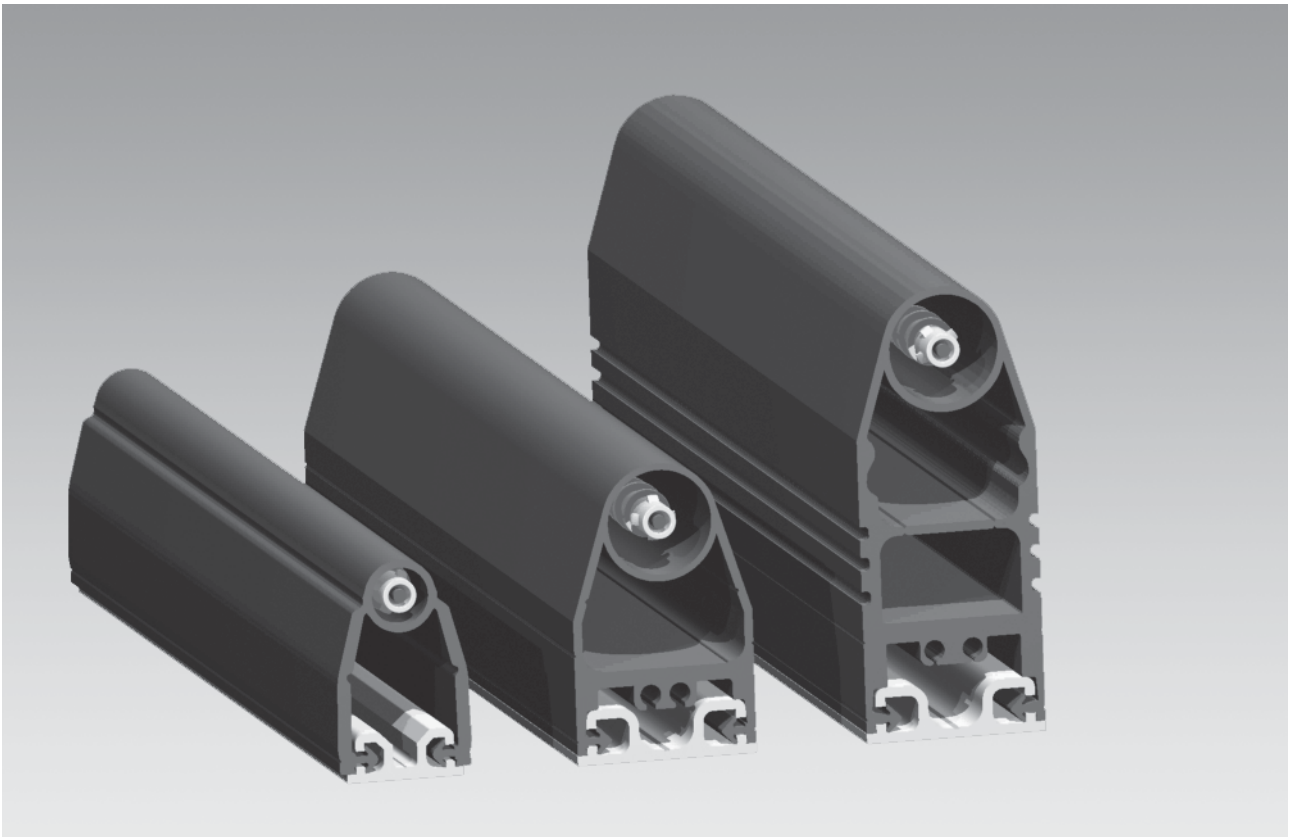




Product information



Normally Closed Safety Edges SL/NC II

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Important information

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

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

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Definitions

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

Intended use

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

Safe operation of a Safety Edge depends entirely on

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

Tip

See ISO 13856-2 Appendix E.

Limits

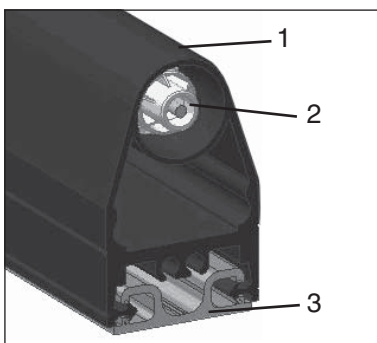
A maximum of 10 SL/NC (Normally Closed) Safety Edges may be connected to one signal processing.

Exclusion

The normally closed Safety Edge is not suitable:

- for detecting fingers
- for areas of application with high levels of vibration
- for doors/gates per EN 12978 (applies only to GP 48)

Design



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

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

ATTENTION

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

Tip

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

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

Effective actuation area

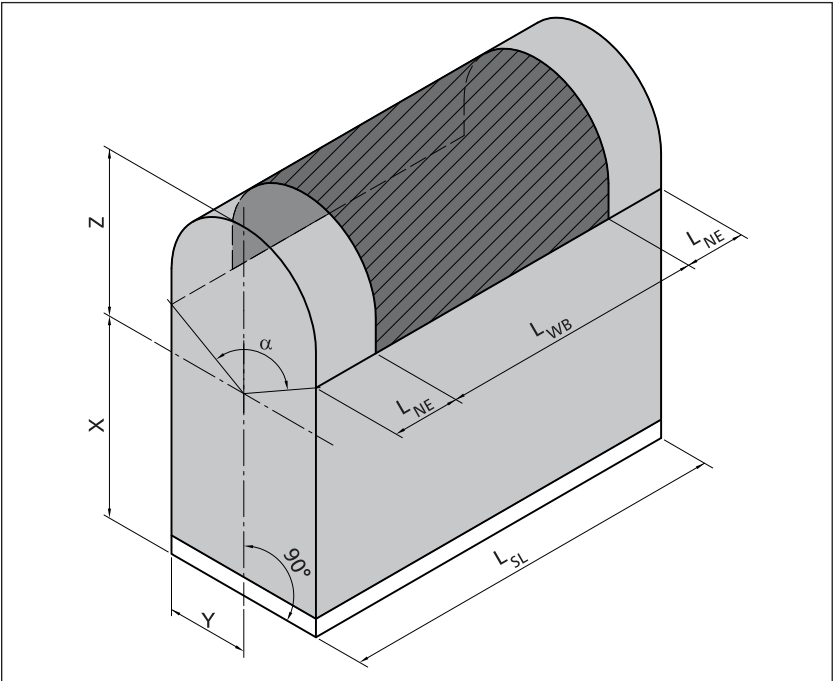
The parameters X, Y, Z, L_{NE} and the angle α describe the effective actuation area.

For the effective actuation area, the following applies:

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

Parameters:

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



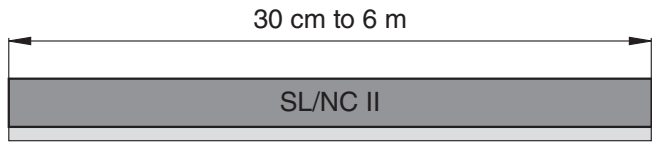
ATTENTION

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

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

Subject to technical modifications

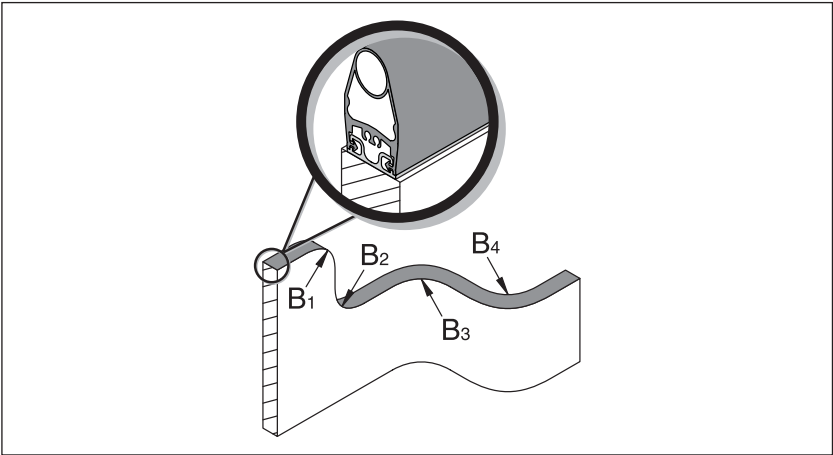
Available lengths



Bend angles and bend radii

Bend angles

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



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

Bend radii

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

Biegeradius min.	GP 48	GP 65	GP 100
B ₁	750 mm	750 mm	750 mm
B ₂	750 mm	750 mm	750 mm
B ₃	—	—	—
B ₄	—	—	—

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

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.

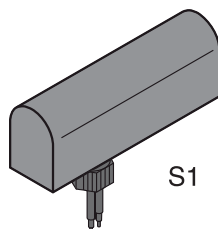
Subject to technical modifications

Connection

Cable exits

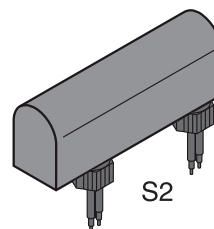
90° exit

Distance to front end each 60 mm



S1

Standard (S1)

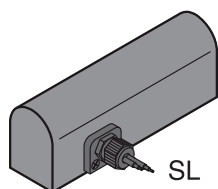


S2

S2: 2 cables

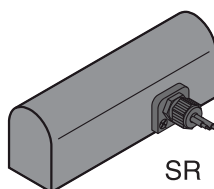
Lateral exit

Distance to front end each 60 mm



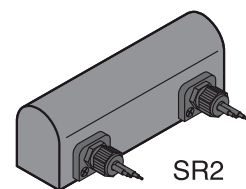
SL

SL: lateral exit left



SR

SR: lateral exit right



SR2

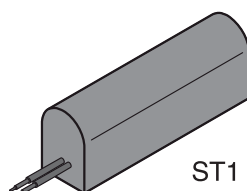
SR2: 2 cables

ATTENTION

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

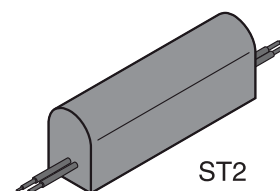
Axial exit

without PG-screw connection



ST1

ST1



ST2

ST2: 2 cables

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

Cable connection

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

ATTENTION

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

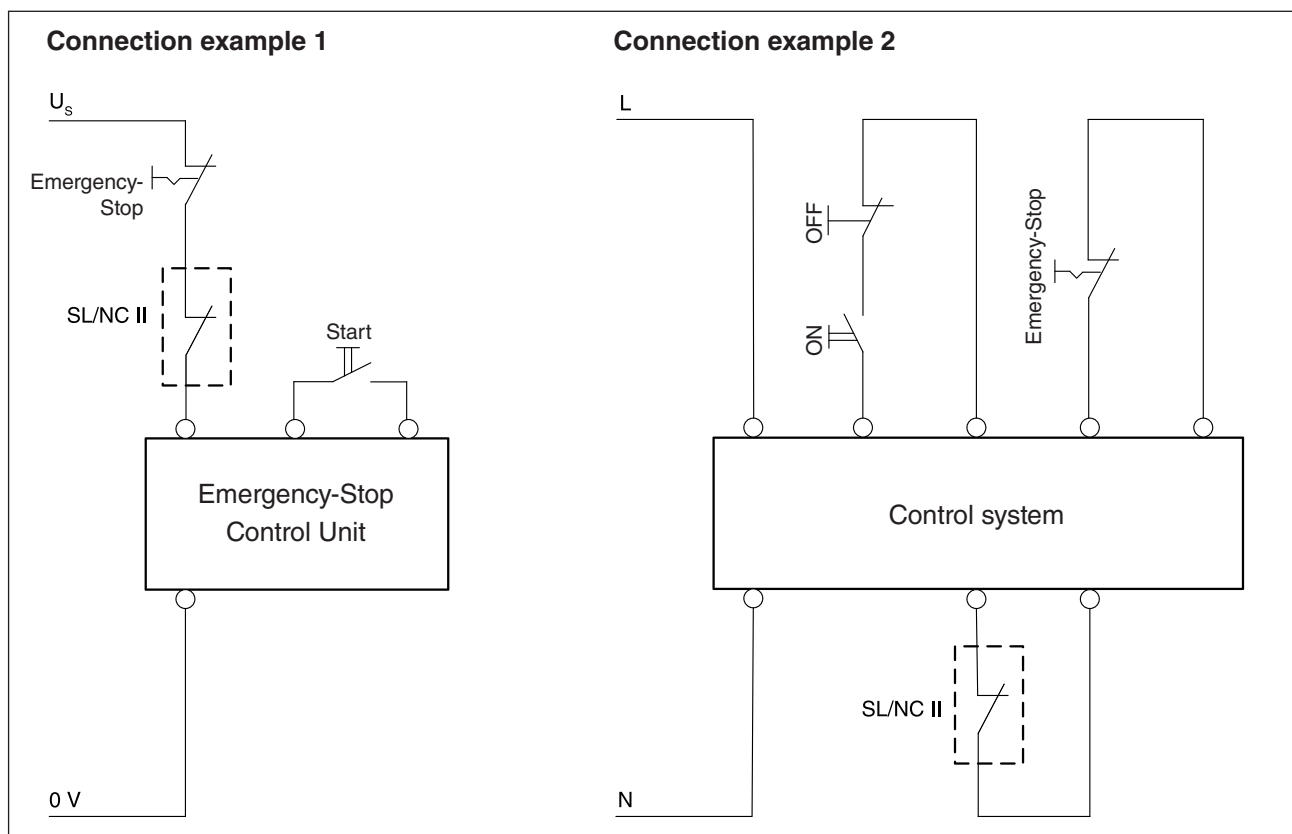
Connection examples

Connection example 1

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

Connection example 2

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

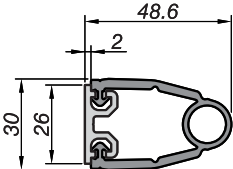
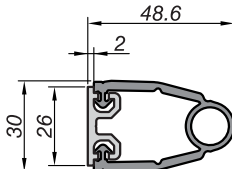


Rubber profiles

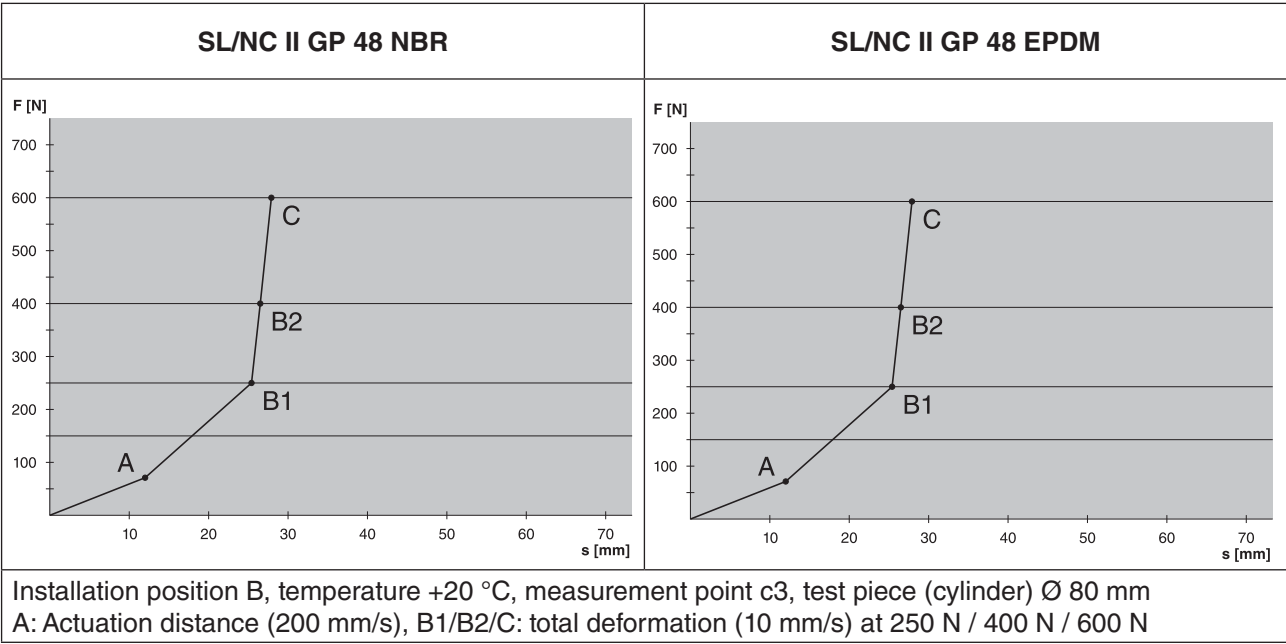
GP 48

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

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

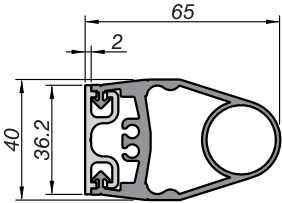
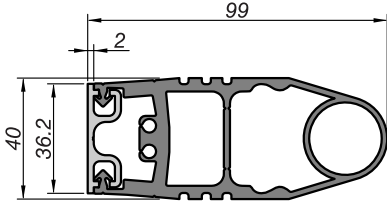
GP 48 NBR		GP 48 EPDM	
			
Actuation force:	< 150 N	Actuation force:	< 150 N
Response time		Response time	
at 10 mm/s	1100 ms	at 10 mm/s	1100 ms
at 200 mm/s	60 ms	at 200 mm/s	60 ms
Actuation distance (A)		Actuation distance (A)	
at 10 mm/s	11 mm	at 10 mm/s	11 mm
at 200 mm/s	12 mm	at 200 mm/s	12 mm
Overtravel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

Force-distance ratios



Subject to technical modifications

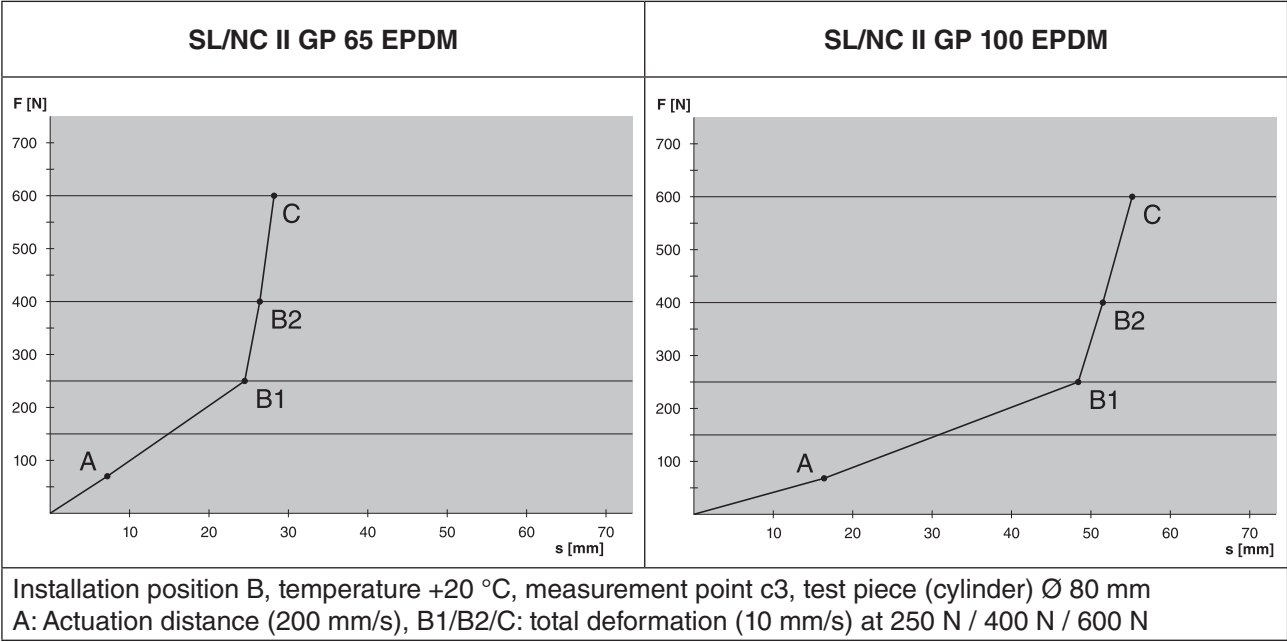
GP 65 and GP 100

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

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

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

Force-distance ratios



Subject to technical modifications

Physical resistance

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

Chemical resistance

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

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

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

Explanation of symbols:

+ = resistant

± = limited resistance

- = not resistant

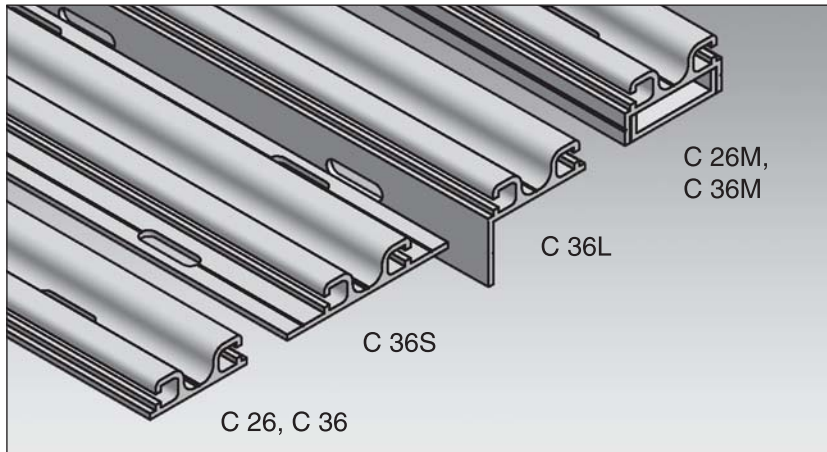
Note:

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

Subject to technical modifications

Fixing rails

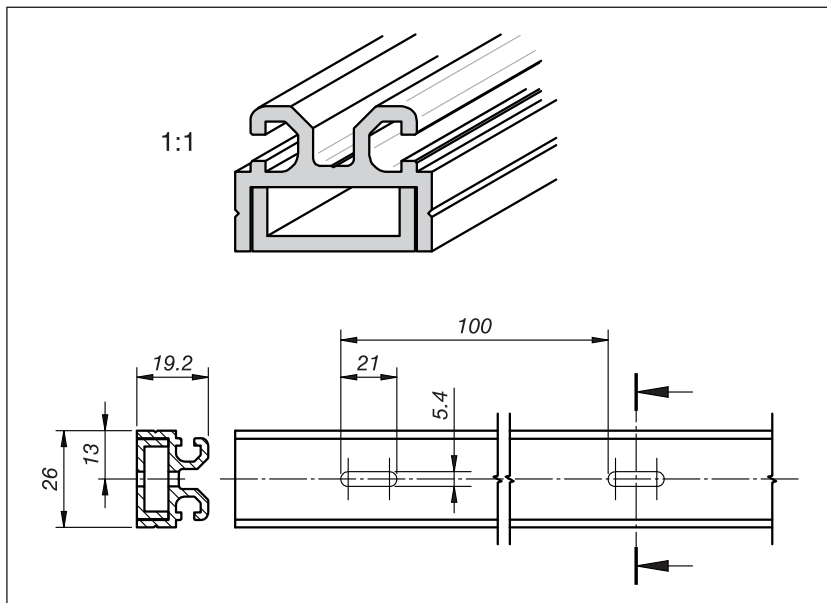
Normally closed Safety Edges SL/NC II are mounted directly to the dangerous main and secondary closing edges. The C26 and C 36 ranges of aluminium profiles are used for mounting. The aluminium profiles are mounted with M5 screws or rivets.



Material properties

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

Aluminium profile C 26M

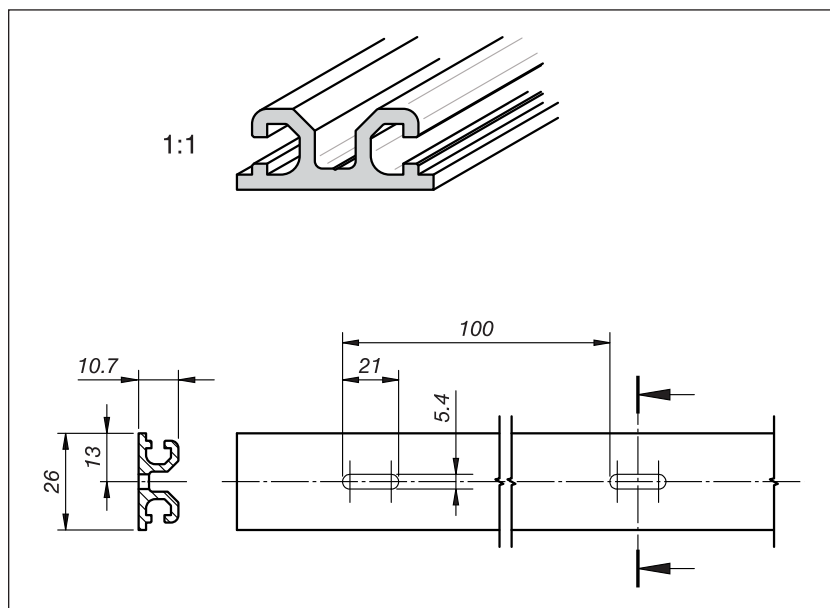


Two-part profile for GP 48:

For convenient assembly and disassembly. The rubber profile is clipped into the upper section and the upper section inserted in the installed lower section and fastened.

Subject to technical modifications

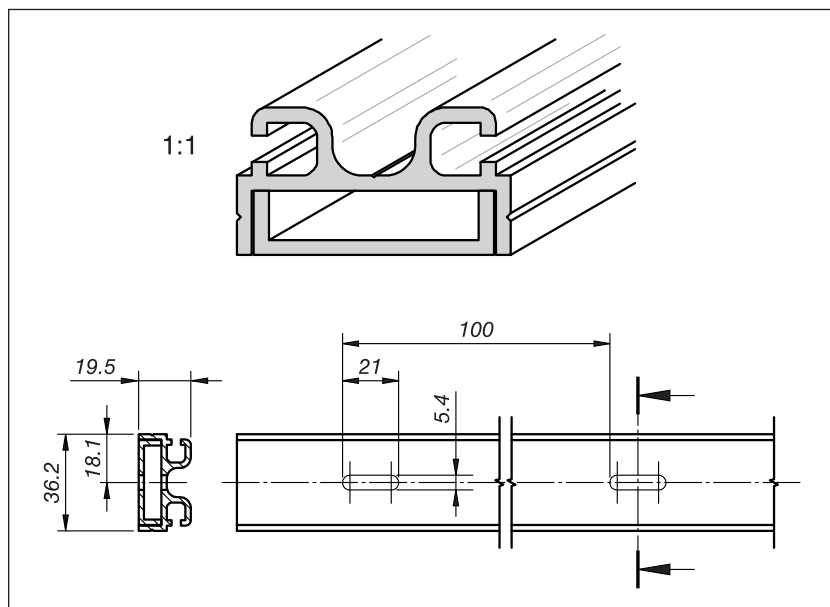
Aluminium profile C 26



Standard profile for GP 48:

The aluminium profile must first be installed on the closing edge and the rubber profile can then be clipped into the aluminium profile.

Aluminium profile C 36M

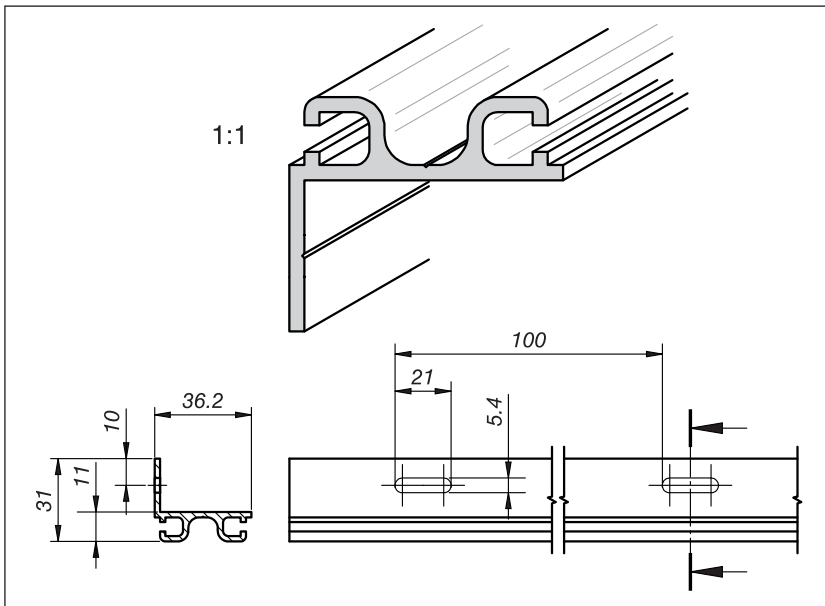


Two-part profile for GP 65 and GP 100:

For convenient assembly and disassembly. The rubber profile is clipped into the upper section and the upper section inserted in the installed lower section and fastened.

Subject to technical modifications

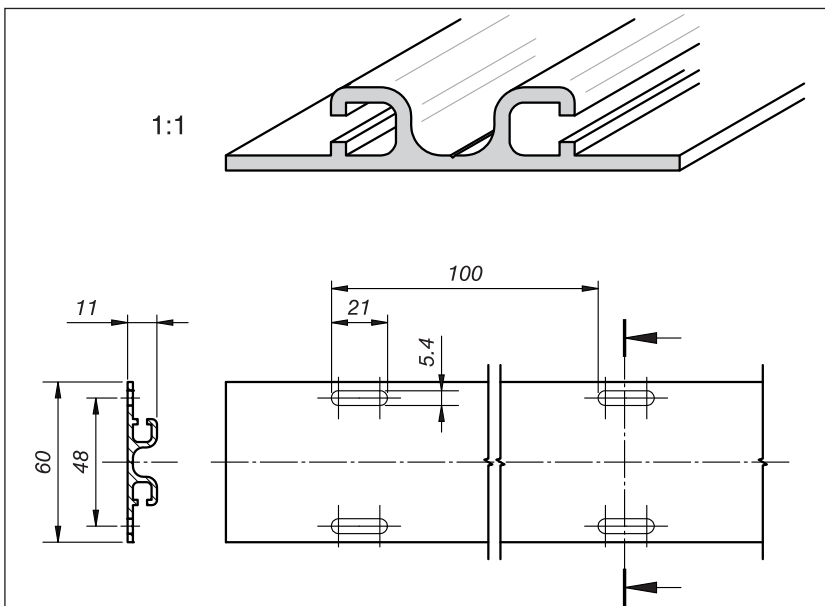
Aluminium profile C 36L



Angle profile for GP 65 and GP 100:

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

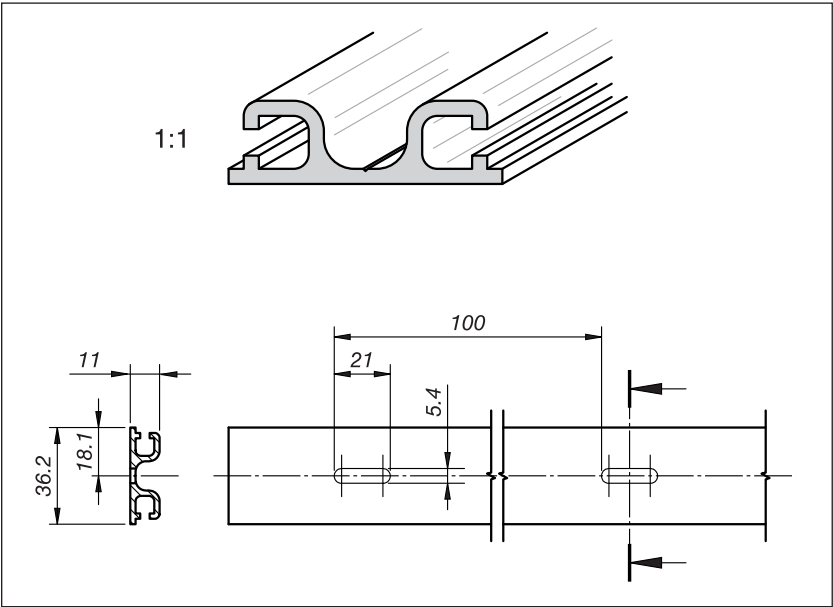
Aluminium profile C 36S



Flange profile for GP 65 and GP 100:

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

Aluminium profile C 36



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

Aluminium-profiles: Overview of combinations

Explanation of symbols:
● = Standard
○ = Option

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

SL/NC II: The right selection

Calculation for selection of the Safety Edge height

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

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

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

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

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

Calculation examples

Calculation example 1

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

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

$$\begin{aligned} s &= s_1 \times C & \text{where: } C &= 1.2 \\ s &= 6.75 \text{ mm} \times 1.2 = \mathbf{8.1 \text{ mm}} \end{aligned}$$

The Safety Edge must have a minimum overtravel distance of $s = 8.1 \text{ mm}$. The selected SL/NC II GP 48 NBR has an overtravel distance of at least 13 mm. This is more than the required 8.1 mm.

Result: The SL/NC II GP 65 EPDM is **suitable** for this case.

Calculation example 2

The same conditions as in calculation example 1 with the exception of the velocity of the dangerous movement. This is now $v = 100 \text{ mm/s}$.

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

$$\begin{aligned} s &= s_1 \times C & \text{where: } C &= 1.2 \\ s &= 18.5 \text{ mm} \times 1.2 = \mathbf{22.2 \text{ mm}} \end{aligned}$$

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

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

distance of at least 12 mm. This is less than the required 22.2 mm.

Result: The SL/NC II GP 48 NBR is **not suitable** for this case.

Calculation example 3

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

Tip:

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

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

$$\begin{aligned} s &= s_1 \times C & \text{where: } C &= 1.2 \\ s &= 21 \text{ mm} \times 1.2 = \mathbf{25.2 \text{ mm}} \end{aligned}$$

The Safety Edge must have a minimum overtravel distance of $s = 25.2 \text{ mm}$. The selected SL/NC II GP 100 EPDM has an overtravel distance of at least 27 mm at 100 mm/s. This is more than the required 25.2 mm

Result: The SL/NC II GP 100 EPDM is **suitable** for this case.

Customised designs

SL/NC II in ATEX version

The normally closed Safety Edge ATEX SL/NC II safety system consists of a sensor SL/NC II, aluminium profile, safety barrier and Control Unit. Safety Edges of the type ATEX SL/ NC II are only designed for the **equipment group II**, i.e. for all potentially explosive environments except for mining. The potentially explosive medium divides the area of application into substance groups G and D:

Substance group **G**
Gases, vapours, mist
Zones 1 and 2
Equipment categories 2 and 3
Ignition protection class “ib”
Explosion group IIC
Temperature class T4
Marking:



Corresponds to IEC 60079-11

Substance group **D**
Dusts
Zone 22
Equipment categories 3
Ignition protection class “ibD 22”
Temperature class T85°C
Marking:



Corresponds to IEC 61241-11

Accessories

Extension kit

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

Extension kit 5 m 1003870

Extension kit 10 m 1003871

Wiring aids

Diode 1003872

Special resistor 1k2 1003873

Special resistor 8k2 1003874

Conformity

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



Certificates

UL certification U8V 10 31146 006



Technical data

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

	GP 48 NBR	GP 48 EPDM
Testing basis	ISO 13856-2	ISO 13856-2
Switching characteristics at $v_{\text{test}} = 200 \text{ mm/s}$		
Switching operations at 0.1 A	$> 5 \times 10^4$	$> 5 \times 10^4$
Actuation force	$< 150 \text{ N}$	$< 150 \text{ N}$
Actuation distance	12 mm	12 mm
Response time	60 ms	60 ms
Effective actuation angle	60°	60°
Safety classifications		
EN 1760: Reset ISO 13849-1:2006 for systems design up to B_{10d}	without Category 1 Category 3 2×10^6	without Category 1 Category 3 2×10^6
Mechanical operating conditions		
Sensor length (min./max.)	30 cm / 6 m	30 cm / 6 m
Cable length (min./max.)	1.5 m / 200 m	1.5 m / 200 m
Operating velocity (min./max.)	10 mm/s to 200 mm/s	10 mm/s to 200 mm/s
Max. load capacity (Impuls)	600 N	600 N
IEC 60529: Degree of protection	IP67	IP67
Max. humidity (23 °C)	95% (non-condensing)	95% (non-condensing)
Operating temperature	+5 to +55 °C	+5 to +55 °C
Storage temperature	-20 to +80 °C	-20 to +80 °C
Weight (incl. C 26)	1.0 kg/m	1.0 kg/m
Electrical operating conditions		
Switching voltage (PELV)	max. 48 V DC max. 48 V AC 50/60 Hz	max. 48 V DC max. 48 V AC 50/60 Hz
Switching current	max. 0.2 A	max. 0.2 A
Contact fuse protection, external	250 mA inert	250 mA inert
Connection cable	Ø 3.3 mm PVC 1× 0.5 mm ²	Ø 3.3 mm PVC 1× 0.5 mm ²
Chemical resistance		
	The sensor is resistant to normal chemical influences over an exposure period of 24 hours (see page 10).	
Maintenance, service		
Maintenance Monitoring Inspection	The Safety Edge is maintenance-free. Possible via external control. <ul style="list-style-type: none">Depending on the amount of use, the Safety Edges are to be checked regularly for correct operation and visible signs of damage by manual operation or by applying the relevant test piece (cylinder).The correct position of the rubber profile in the aluminium profile is to be checked.	
Dimensional tolerances		
Rubber profile	ISO 3302 E2/L2	ISO 3302 E2/L2
Aluminium profile	EN 755-9	EN 755-9

Subject to technical modifications

Technical data

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

	GP 65 EPDM	GP 100 EPDM
Testing basis	ISO 13856-2	ISO 13856-2
Switching characteristics at $v_{\text{test}} = 200 \text{ mm/s}$		
Switching operations at 0.1 A	$> 5 \times 10^4$	$> 5 \times 10^4$
Actuation force	$< 150 \text{ N}$	$< 150 \text{ N}$
Actuation distance	8 mm	17 mm
Response time	40 ms	85 ms
Effective actuation angle	90°	90°
Safety classifications		
EN 1760: Reset ISO 13849-1:2006 for systems design up to B_{10d}	without Category 1 Category 3 2×10^6	without Category 1 Category 3 2×10^6
Mechanical operating conditions		
Sensor length (min./max.)	30 cm / 6 m	300 mm / 6000 mm
Cable length (min./max.)	1.5 m / 200 m	1.5 m / 200 m
Operating velocity (min./max.)	10 mm/s to 200 mm/s	10 mm/s to 200 mm/s
Max. load capacity(Impuls)	600 N	600 N
IEC 60529: Degree of protection		
Max. humidity (23 °C)	IP67	IP67
Operating temperature	95% (non-condensing)	95% (non-condensing)
Storage temperature	-10 °C to +55 °C	-10 °C to +55 °C
Weight (incl. C 36)	-20 °C to +80 °C 1.9 kg/m	-20 °C to +80 °C 2.1 kg/m
Electrical operating conditions		
Switching voltage (PELV)	max. 48 V DC max. 48 V AC 50/60 Hz	max. 48 V DC max. 48 V AC 50/60 Hz
Switching current	max. 0.2 A	max. 0.2 A
Contact fuse protection, external	250 mA inert	250 mA inert
Connection cable	Ø 3.3 mm PVC 1× 0.5 mm ²	Ø 3.3 mm PVC 1× 0.5 mm ²
Chemical resistance		
	The sensor is resistant to normal chemical influences over an exposure period of 24 hours (see page 10).	
Maintenance, service		
Maintenance Monitoring Inspection	The Safety Edge is maintenance-free. Possible via external control. <ul style="list-style-type: none">Depending on the amount of use, the Safety Edges are to be checked regularly for correct operation and visible signs of damage by manual operation or by applying the relevant test piece (cylinder).The correct position of the rubber profile in the aluminium profile is to be checked.	
Dimensional tolerances		
Rubber profile	ISO 3302 E2/L2	ISO 3302 E2/L2
Aluminium profile	EN 12020-2	EN 12020-2

Subject to technical modifications

Request for quotation

Fax:**+49 731 2061-222****From**

Company

Department

Name, first name

P. O. Box

Post code

City

Street

Post code

City

Phone

Fax

E-mail

Area of application

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

Environmental conditions

- ☐ dry ☐ water ☐ oil
- ☐ aggressive sub-
stances: ☐ Coolant, type: _____
- ☐ Solvent, type: _____
- ☐ other: _____
- ☐ room temperature ☐ other: from _____ °C to _____ °C

Mechanical conditions

- ☐ The stopping distance of the system is max. _____ mm
- ☐ cable exit version _____
- ☐ number of monitoring circuits: _____ ☐ SG- _____

Pinching and shearing edges to be protected:

(Sketch incl. mounting possibility and cable routing)

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