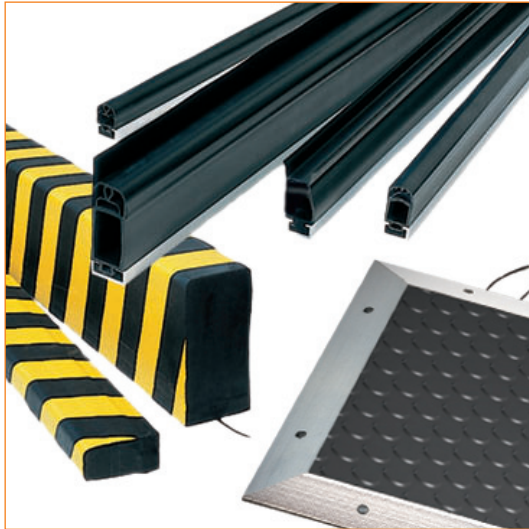


# Contact Edges, Bumpers and Safety Mats

Protection against crushing accidents!  
Protection around hazardous machinery!  
Personal protection within dangerous areas!



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# When should I use Contact Edges, Bumpers and Safety Mats?

...to be able to stop a machine during crushing accidents or around hazardous machinery!

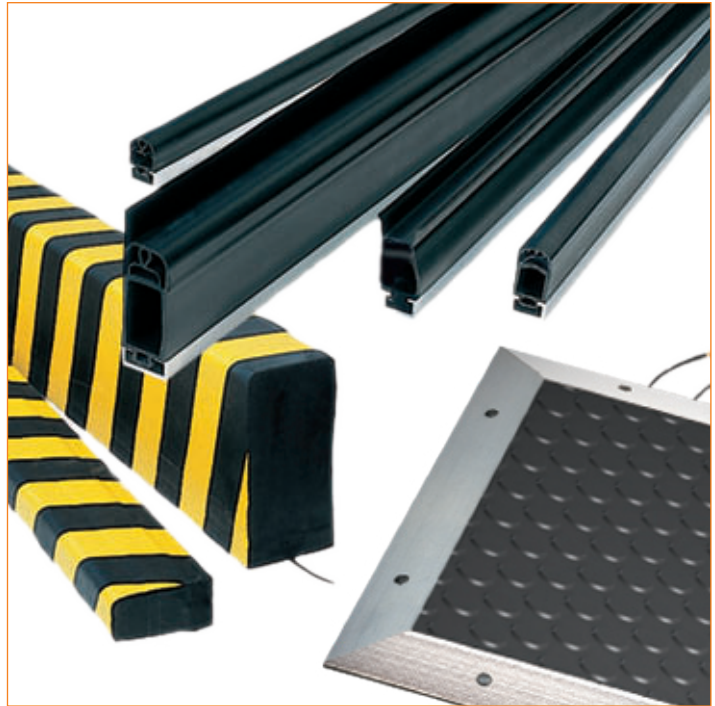
## Contact Edges and Bumpers

Contact edges are used as protection against crushing accidents, i.e. on moving machine parts and automatic doors and hatches. The strips come in customized lengths and various cross sections.

Bumpers are used as safety buffers to protect against remote control transport vehicles and other dangerous moving objects that require long stopping distances.

## Safety Mats

Safety mats are used for protection around hazardous machinery. They are well suited for monitoring an area used for loading and unloading of material to a machine.



## Requirements for Contact Edges, Bumpers and Safety Mats are stated in these standards and regulations

### EN 1760-1 Safety of Machinery

*Pressure Sensitive Protective Devices – Part 2: General requirements.*

General principles for the design and testing of pressure sensitive edges and pressure sensitive bars.

### EN 1760-1 Safety of Machinery

*Pressure Sensitive Protective Devices – Part 1: General requirements.*

General principles for the design and testing of pressure sensitive mats and pressure sensitive floors.

# Safety Contact Edges and Bumpers

## Safety Contact Edges

Contact edges are used as protection against crushing injuries, for example, moving machine parts, automatic doors.

### Contact Edges with Cast-in Contact Strips

Our new contact edges consist of a rubber profile with a cast-in contact strip. They are made up simply using connection plugs that are glued to the ends together with a terminal cap. The rubber profile is fitted on an aluminium profile and is available in EPDM design, supplied in lengths up to 25 m.

### Contact Edges with Contact Strips SKS18

The contact edge consists of a rubber profile with a safety contact strip inside. The contact edge is fitted on an aluminium profile.

The special design of rubber profiles of EPDM or NBR rubber protect the inner contact strip in the best way possible against damage and also allow for a contact angle exceeding  $\pm 45^\circ$ . Normally supplied in lengths up to 25 m.

## Bumpers

Bumpers are employed on automatic production lines to minimize danger to both people and machines. The large foam rubber cushions enable long practical braking and run-through distances, thus enabling designers to optimize protection for both personnel and machines.

The safety contact strips are mounted inside aluminium profiles which are, in turn, protected by the large foam cushions that are glued to the carrier profile and then sprayed with a thin film of polyurethane which makes the bumper waterproof and helps to minimize wear and tear.

The bumpers are delivered mounted to the carrier profile in ordered lengths (0,2 m – 3 m).



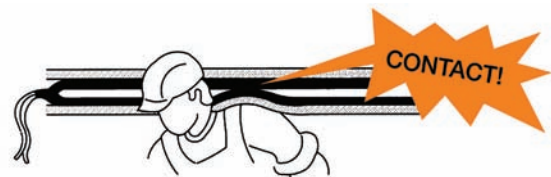
## Applications

- Protection against crushing accidents on moving machine parts and automatic doors

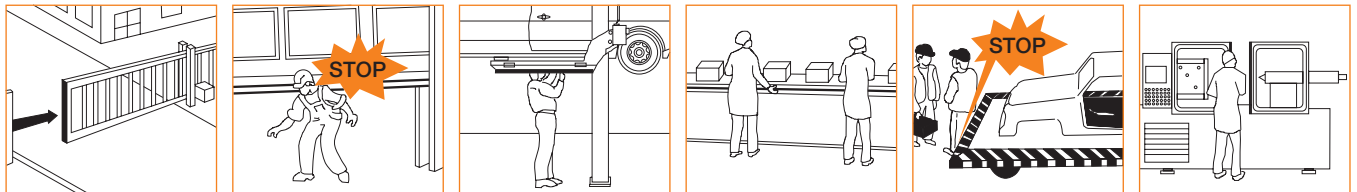
## Features

- Can be connected to a safety relay, Vital or Pluto Safety PLC
- IP 65
- Simple assembly on site
- Lengths up to 25 m

## Approvals



## Fields of Application



## Safety Contact Edges GP - General

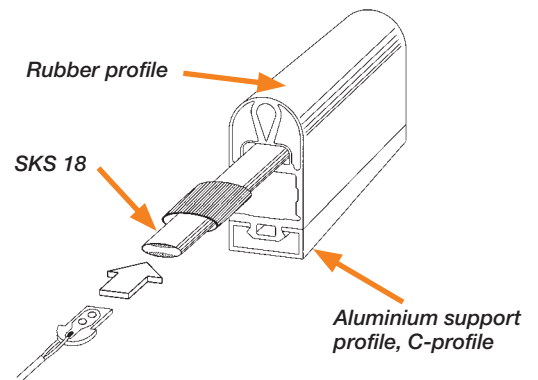
The safety contact strip, SKS 18, the actual contactor, is located inside the safety contact edge. The safety contact strip consist of a homogeneous highly insulating outer EPDM material and has two internal conducting contact surfaces. The conducting elastomer contains two copper wires that provide low-resistance detection even in lengths exceeding 100 metres.

Because of the contact points, the safety contact edge has approximate 20 mm of inactive length at each end.

To provide protection against damage and to enable its proper use, the safety contact strip is inserted into the switching chamber of the rubber contactor profile. The rubber profiles (EDPM or NBR) are then permanently sealed with a special elastic adhesive and end caps to make them watertight.

The safety contact edge is then pressed into the aluminium profile.

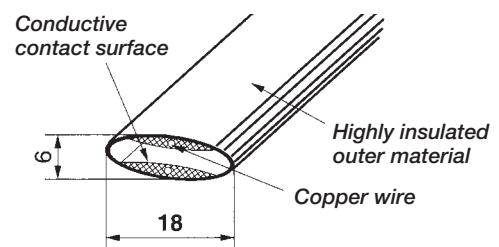
## Safety Contact Edge, Construction



## Safety Contact Strip SKS 18 for Contact Edge GP Technical Data

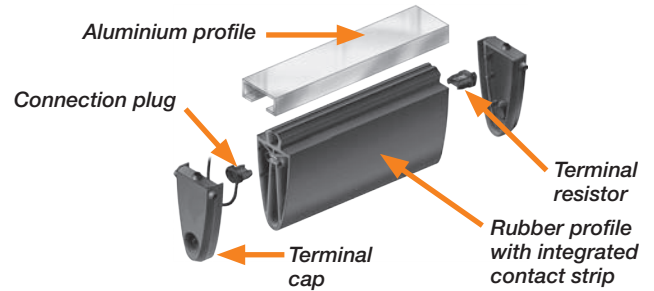
Outer material	EPDM, electrical insulation >30 Mohm
Inner material	EPDM, electrical elastomer with reinforce copper wire
Conductivity	60 ohm / 100 meters
Contact resistance	approx. 50 ohm
Max. electrical load	24 V / 100 mA
Max. applied pressure	6.5 N/cm <sup>2</sup>
Dimensions	18 x 6 mm

## Safety Contact Strip SKS 18



## Construction - Contact Edge GE

Inside the contact edge there is a cast-in contact strip that consists of two conductive alternating surfaces on the inside and a highly-effective insulating shell. There are two conductive wires in the contact surfaces that allow for low ohm measurements even when the contact edge has an extended length. The cast-in contact strip is protected against damage by the surrounding chamber. The cast end plugs ensure a permanent contact from the conductive surfaces in the contact strip. A special flexible adhesive is used to make the connector ring watertight.



## Rubber Profiles Technical Data

Type		GP 25-25	GP 25-40	GE 25-25	GE 25-45
Fixing Profile		AL 25-14	AL 25-14	AI 25-14	AI 25-14
Material		EPDM/NBR	EPDM/NBR	EPDM	EPDM
Length max (m)	(1)	6(10)	6(10)	25	25
Weight (g/m)		370	480	510	770
Weight incl. C-Profile (g/m)		690	800	820	1080
Activation force (N)	(2)	34/37	39/52	64,1	69,1
Actuating distance (mm)	(3)	8.0/7.5	9.4/9.7	4,7	6,73
Braking distance (mm)	(3)	7.2/5.9	10.2/9.5	6.48	20.73
Max. Actuating (°)	(4)	2x 45°	2x 60°	2x20°	2x20°

- (1) 10-metre lengths of GP edges on request
- (2) Measured with (Ø 80 mm test specimen), 10 mm/s
- (3) Measuring speed 10 mm/s
- (4) Not including DIN 31006-2 (GS - BE - 17)

**Note: Contact us for other profile sizes.**

## Contact Edge Technical Data

Manufacturer	ABB AB/Jokab Safety, Sweden
Ordering information	see pages 11:15-11:16
Mechanical load max <sup>1</sup>	500 N
Actuating angle (DIN) <sup>1</sup>	2x 20°
Mechanical life <sup>1</sup>	10 <sup>5</sup>
Max. operate temp. range <sup>2</sup>	-20C° to +55°C
Max. temperature range	-25°C to +70°C
Protection classification	IP 65
Max. Electrical load	24V 100mA
Resistance	0.6 Ohm/m
Conductors	GP: 2x 0.38 mm <sup>2</sup> GE: 2x 0.34 mm <sup>2</sup>
Conductors insulation material	GP: PVC GE: PUR matt blackt

(1) According to DIN 31006-2 (GS - BE - 17)

(2) Not including DIN 31006-2 (GS - BE - 17)

## Physical and Chemical Material Properties

Properties	EPDM	NBR
Tensile strength	3	2
Tensile elongation	3	2
Durability	3	2
Tear resistance	3	3
Cold flexibility	2	3
Heat resistance	2	2
Oxidation resistance	1	3
UV-resistance	1	3
Weather/ ozone resistance	1	3
Flame resistance	6	6
Gas permeability	4	2

*1 = excellent - 6 = poor*

Resistance	EPDM	NBR
Water (distilled)	1-2	1
Acids (diluted)	1	3
Bases (diluted)	2	2
Non-oxidised acids	2	3
Oxidised acids	4	5
ASTM oil No. 3	6	1
Vegetable oil	5	1
Ester solvent	2	5
Ketone solvent	3	5
Aliphatic hydrocarb.	5	1
Aromatic hydrocarb.	6	2-3
Halogenic hydrocarb.	6	5
Alcohols	1	5

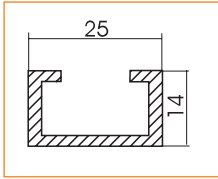
<b>1 = no effect</b>	for lasting contact
<b>2 = slight effect</b>	non-lasting contact
<b>3 = moderate effect</b>	moderate contact
<b>4 = appreciable effect</b>	limited contact
<b>5 = strong effect</b>	short-term contact
<b>6 = extreme effect</b>	avoid contact

<b>EPDM</b>	Good resistance to ozone and weather, especially against chemicals
<b>NBR</b>	Good resistance to oil and petrol
<b>ASTM</b>	American Society for Testing Material
<b>Kw</b>	Aromatic hydrocarbon
<b>Ester</b>	Organic solvent
<b>Ketone</b>	Oxidized solvent
<b>Aliphatic</b>	i.e. petrol
<b>Aromatic</b>	i.e. benzol

*Note: The information given is based on data obtained from the respective material suppliers. Although all efforts have been made, unforeseen factors can have a considerable effect on the generally applied indications during practical use therefore this information must be used as a general guide only. If there is any doubt as*

*to the suitability of the materials used for any specific application/ environment, we will, upon request, supply rubber samples for your own evaluation or, if given written specifications of your proposed environmental conditions, test the suitability of materials for your specific application.*

## Mounting and Electrical Connection – Safety Contact Edges

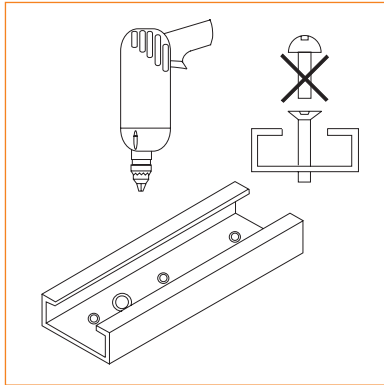


The selected contact profile should be mounted using a suitable aluminium C profile (as shown opposite).

### Mounting - Safety Contact Edges

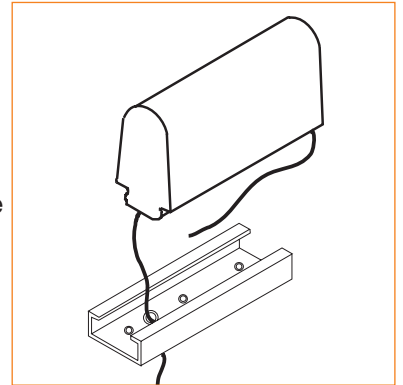
#### Stage 1 GP and GE

Pan or round-head screws should not be used to mount the aluminium C profile. If such screws are used this can result in the connecting wire in the aluminium profile being damaged.



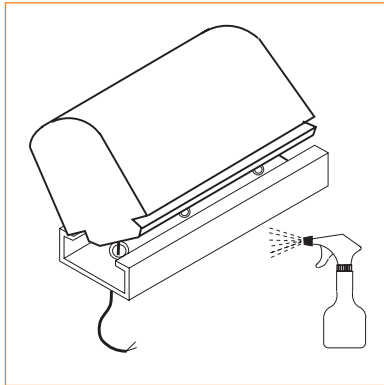
#### Stage 2 GP and GE

In order to feed the connecting wire through the profile, an 8 mm hole must be drilled in a suitable position. Carefully remove the burr from the hole edges and insert the supplied rubber collar. The connecting wires can also be placed in the aluminium profile.



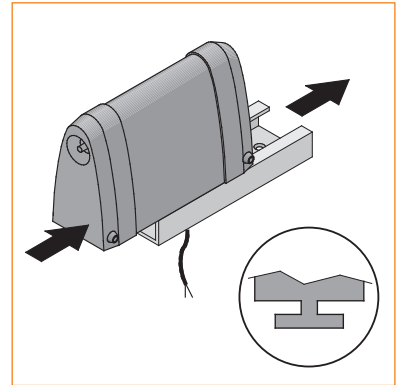
#### Stage 3 GP

In order to make fitting of the safety contact edge easier, the aluminium profile and the safety contact edge should be sprayed with a water based soap solution. One side of the rubber profile must then first be inserted into the profile and then the whole profile pressed in. Once the soap solution has evaporated, the contact strip will be firmly fitted into the profile. In order to prevent subsequent slipping of the safety contact edge, talcum powder, oils or similarly permanent lubricating agents must not be used.

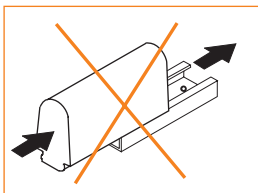


#### Stage 3 GE

Safety contact edges with a t-base have to be pushed into the aluminium profile.



**Note:** Pulling or pushing the safety contact edge into the aluminium profile can cause damage to the contact edge and should be avoided at all costs. Any other proposed methods of fixing should only be attempted after consultation with ABB Jokab Safety. Other methods of fixing, unless approved by ABB Jokab Safety may invalidate the warranty and may lead to incorrect device operation.



## The Safety Bumper Principle

The contact function of the ABB Jokab Safety bumper consists of the safety contact strip SKS 18 being actuated by a special mechanical construction. This construction, which is protected by a large foam cushion, is inserted and glued to the carrier profile. The foam rubber is covered with a polyurethane skin. The safety bumper is also covered with cross-bound polyurethane, which can be provided in a range of colours. By utilising this construction the bumper gives a stop signal when impacted from all directions with soft sides.

The Safety Bumper must be connected to a suitable two input channel Safety Relay. e.g. ABB Jokab Safety type RT6 or RT7 which provides all necessary monitoring of the bumpers activation and detection of cable faults.

The twin cable connection makes it possible to connect several bumpers in series.

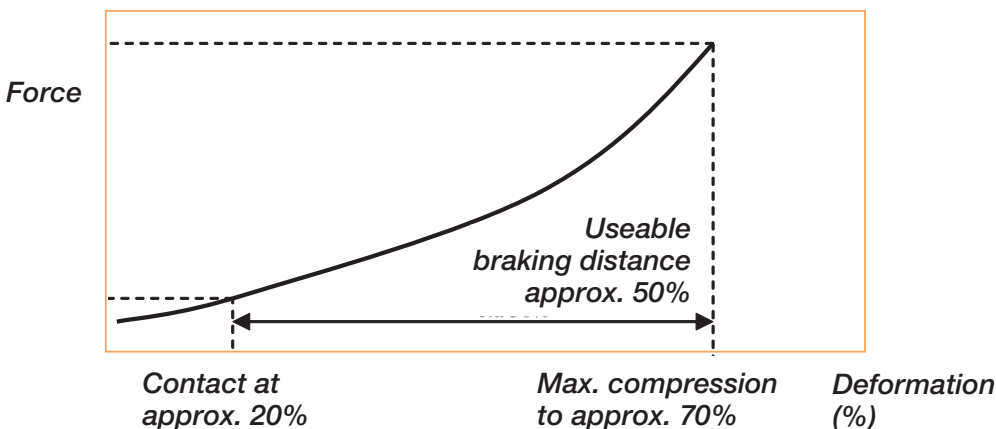
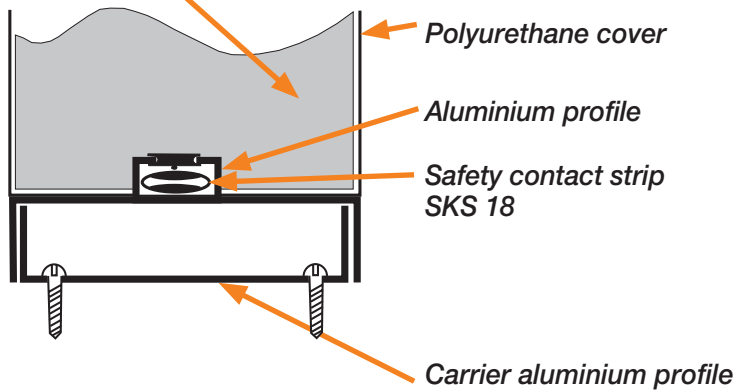
For further information and examples of electrical connection see Connection examples.

## Bumps Technical Data

Ordering information	see page 11:16
Dimensions	in accordance with the illustration, or special dimensions
Actuating distance	approx. 20% of height
Braking distance	at least 50% of height
Actuating force [N]	150 N at 80 mm around the test specimen
Life	greater than 10 <sup>5</sup>

Protection class	IP 65
Ambient temperature	-20° to +60°
Chemical resistance Oil, grease 10% acid 10% alkaline (caustic) solutions	good resistant resistant
Connection cable	2 x 2 m; 2 x 0,34 mm <sup>2</sup> PU covered

*Foam rubber core*





## Standard shapes

Shape A



Shape B



Customer-Specified Special Shape

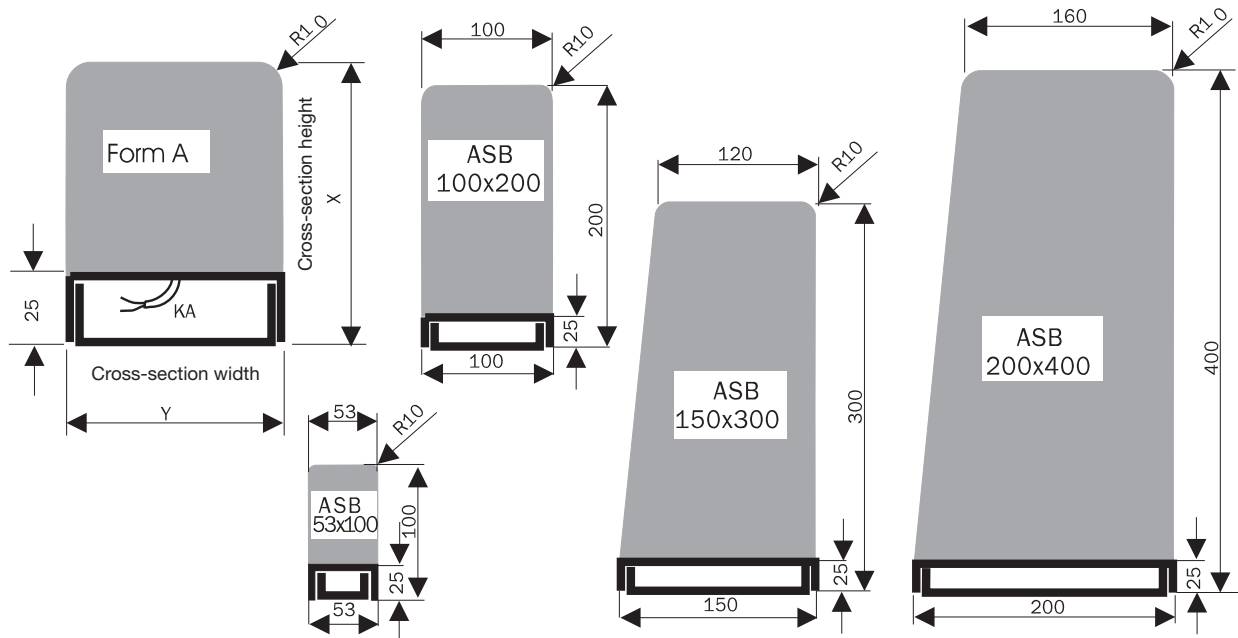


Cable exits at the ends of the bumper or according to customer requirements.

## Dimensions

Bumpers are available in four different standard dimensions. Other dimensions can be supplied on request. Note that in the case of customized orders,

the ratio of 2:1 for X:Y must not be exceeded. Bumpers can be supplied in lengths of up to 3000 mm. The minimum cross-section is 53 x 100 mm.



# Safety Mats

## A Safety Mat used as Personal Protection Within Dangerous Areas

The ASK Safety Mat is used as personal protection within the dangerous areas around presses, robots, production lines, machines etc.

When connected to a suitable monitoring system stepping on the Safety Mat will immediately be detected causing dangerous machine movements to be stopped. This is made possible by the detection of electrical contacts closing within the sandwich construction of the Mat. As a load-bearing component the Mat is made with a bottom plate of either synthetic material or metal. The Safety Mat is provided with a slip-free surface, which is fixed by adhesive to the surface of the Safety Mat.

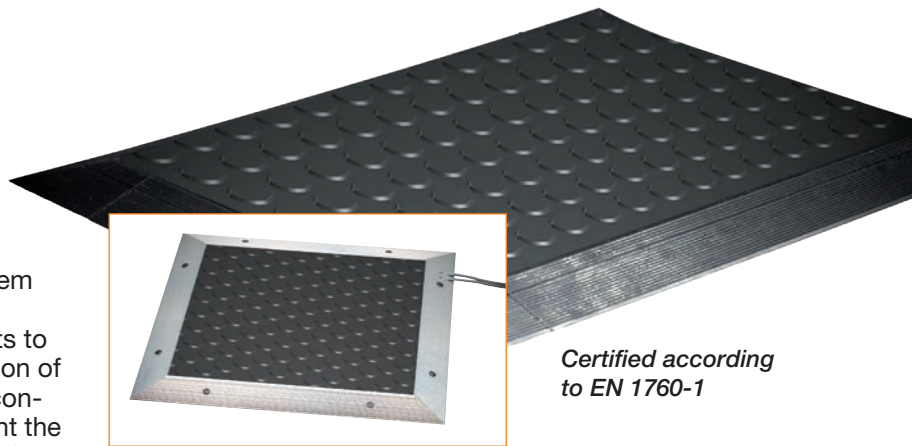
The safety mat and its connection cabling can be supervised by a suitable ABB Jokab Safety safety relay, Vital Controller or Pluto Safety PLC which provides PL d.

### Mat Construction

The basic Mat construction consists of a ground plate of either PVC, Aluminium or Stainless Steel which provides protection against uneven ground etc. The Mat is made up of a sandwich construction, the pressure contact switch consisting of two conducting sheets separated from each other by a webbed isolating layer. The internal switching surface is cast into a durable polyurethane to protect against moisture, and this is then covered with a top layer of slip-free rubber mat or a thin aluminium plate.

Attachment to the floor is by means of a ramped edge trim or special profiles made of aluminium. The ramp profile has a channel for connection cables.

Custom Mats can be made, i.e. special shape, resistant against harsh industrial environments (mineral oil, acid, bleach etc.) or with a non-slip surface or M12-contacts.



Certified according to EN 1760-1

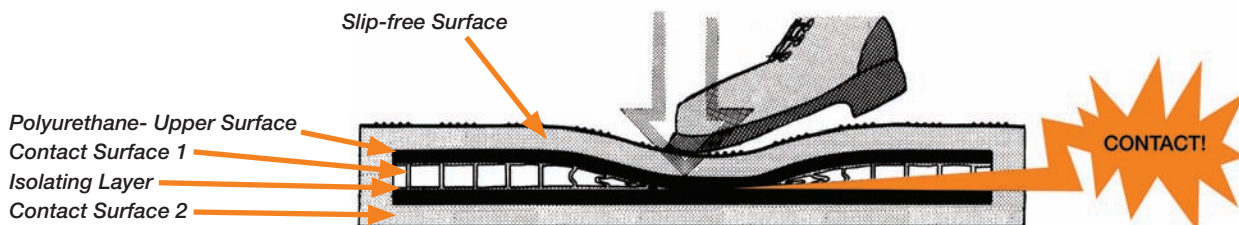
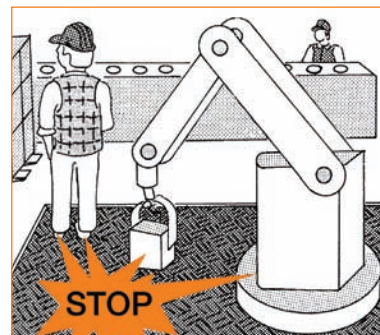
### Applications

- Personal protection within the dangerous areas around presses, robots, production lines, machines etc.

### Features

- Can be connected to a safety relay, Vital or Pluto
- Very durable
- IP 67

### Approvals

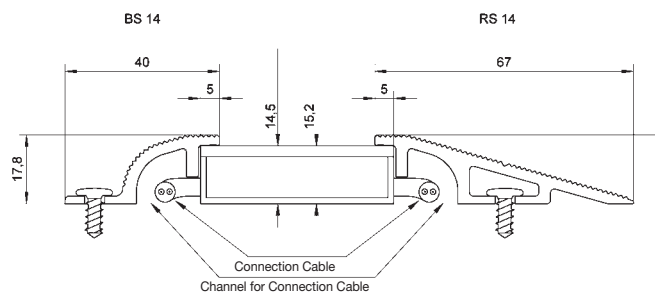


## Safety Mats Technical Data

Manufacturer	ABB AB/Jokab Safety, Sweden
Ordering information	see page 11:17
Max. area	Entire mat = 2350 x 1350 mm 10 m <sup>2</sup> (divided mat) Rec. relation max 3:1 Min 100x100 mm
Height	10mm without slip-free surface max 14.5 mm with slip-free surface
Inactive Area	Nominally 10 mm from Mat edge
Switching Force	150N (Round body 80mm)
Max. Pressure	2000 N over ø 80 mm
Material	Black polyurethane, other colours on request
Protection Class	IP 67
Ambient Air Temperature	0°C to +60°C

Chemical Resistance	
Oil, grease	good
10% acid	resistant
10% alkaline (caustic) solutions	resistant
Cable	2 x 5 m, 2 x 0,34 mm <sup>2</sup> , PU sheathed
Mechanical Life	> 1,5x10 <sup>6</sup> load shifting

### ASK-1U4.4-NP



## Edge Trim - Safety Mats

### Edge trim RS 14

Eliminates vertical edges and attaches the Safety Mat to the floor. Also provides protection and channel for connection cables.

### Profile BS14

Best for use on the side nearest the machine. Permits a shorter distance from, for example, a wall.

### Corner trim

Can be used between two RS 14 profiles as an alternative to miter cutting of profiles.

### ASK-1 T4.4-NP

Completely molded mat with molded edge profiles in PU.

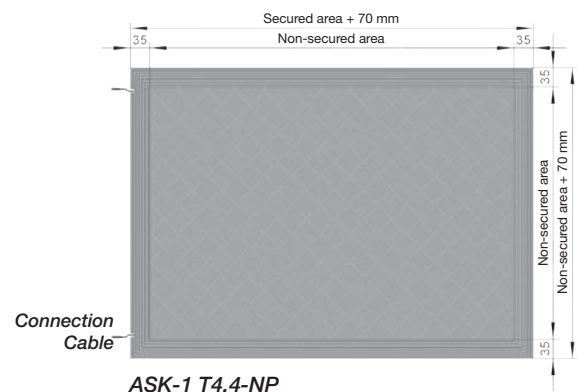
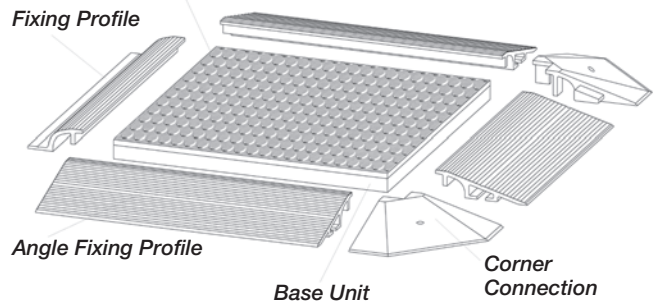
### Surface Protection

#### Fixing Profile

#### Angle Fixing Profile

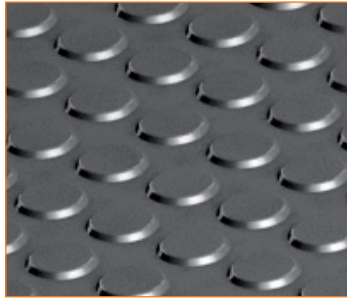
#### Base Unit

#### Corner Connection



## Surface Layer - Safety Mats

Safety mats are normally supplied with a dotted polyurethane non-slip surface layer that withstands tough conditions very well (oil, acid or caustic substances) and has anti-slip properties. If required, other patterns can be supplied, or for special requirements even other materials, such as NBR rubber. Please contact us for more information about these alternatives.



## Safety Distance - Safety Mat as Per EN ISO 13855

If a safety mat is used as entry protection, the smallest permitted safety distance between the hazardous area and the outer edge of the mat (seen from the hazard) is calculated using the formula from EN ISO 13855.

$$S = (K * T) + C$$

where

S = smallest permitted safety distance in mm

K = body speed (velocity of propagation 1600 mm/s)

C = additional distance in mm based on the intrusion of the body into the risk zone before the protection device is actuated (1200 mm)

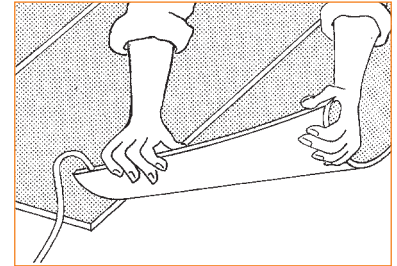
i.e.

$$S = (1600 * T) + 1200$$

## Mounting - Safety Mats

The ground on which the mats are to be laid must be level, clean and dry. The mats should not be glued to the ground.

Place mat in required position with groundplate downwards. If more than one mat is to be installed be sure to place the mats edge to edge (without space).



In the case of safety mats with cast-in rubber edge trim, the mat is secured to the floor by screws straight through the edge trim. In the case of safety mats with an aluminium edge trim, see below.

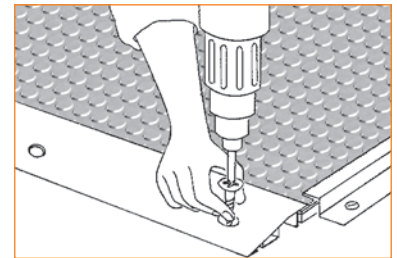
Place the selected edge trim to the mat. Edge trims are usually mitred (at 45 degrees) to provide complete protection around the corners of the mat.

Mark the cable routes on the edge trim and cut out slots to allow cable access into the cable channel as indicated. Connect the cables as shown under Electrical Connection.

Mark the locations of the securing screws along the scribed line on the edge trim. It is recommended that fixing screws should be located at 60 cm spacing.

Secure the edge trim to the ground with 6 mm plugs and suitable screws. Plug the holes above the screws in the edge trim with the cover plugs provided.

**NOTE: Safety mats must not be rolled/twisted or modified in any way. It is also essential that mats are not cut into any shape or shortened following delivery.**



## Electrical Connection - Safety Contact Edges, Bumpers and Safety Mats

Contact edge, bumper or safety mat must be connected to a suitable monitoring unit (e.g. ABB Jokab Safety safety relays RT6, RT7A/B, RT9, Vital with Tina 6A or Pluto safety-PLC).

The monitoring unit monitors the functionality of the contact protection and detects any breaks or short-circuits in the lines. Several crush protection units can be connected in series while still retaining the same level of safety.

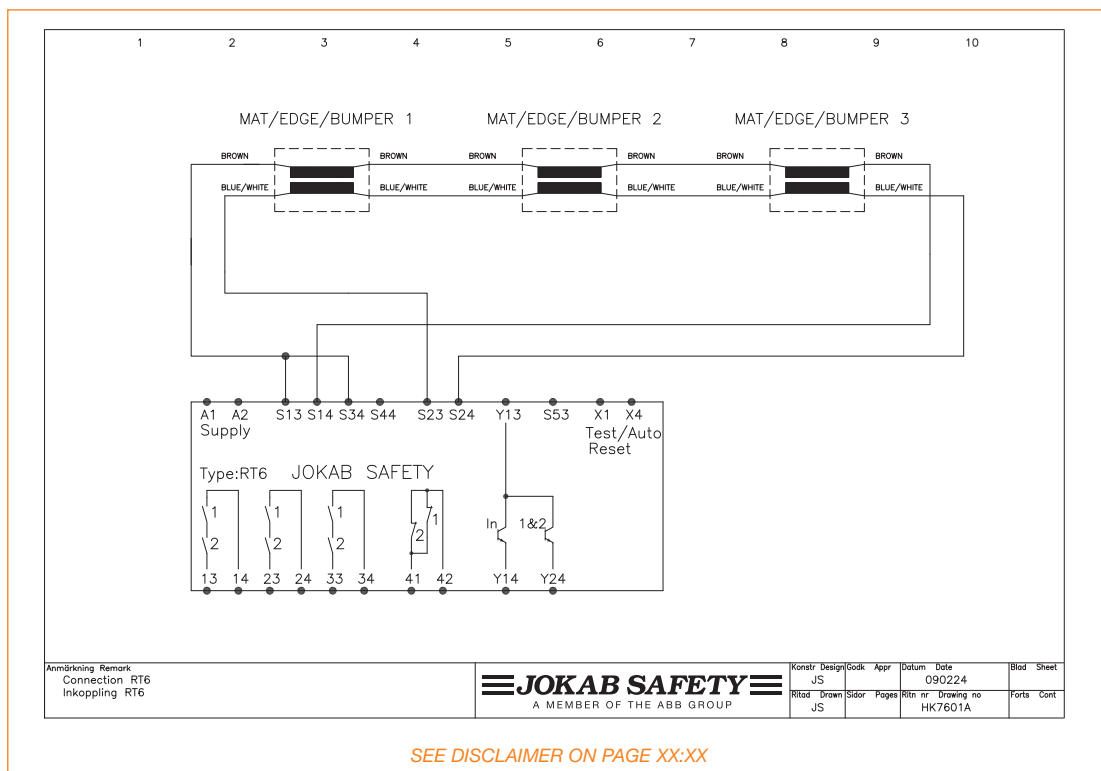
When pressure is applied, the active surface of the contact area in the contact protection is closed and

the safety output on the monitoring unit trips. A stop signal will be sent to the machine's safety circuits preventing any dangerous movements.

**Note: If alternative units are used rather than the recommended ABB Jokab Safety relays, it is essential that the user checks their suitability with ABB Jokab Safety before use. Failure to do so may result in incorrect operation and/or damage to the safety bumpers and invalidate warranty.**

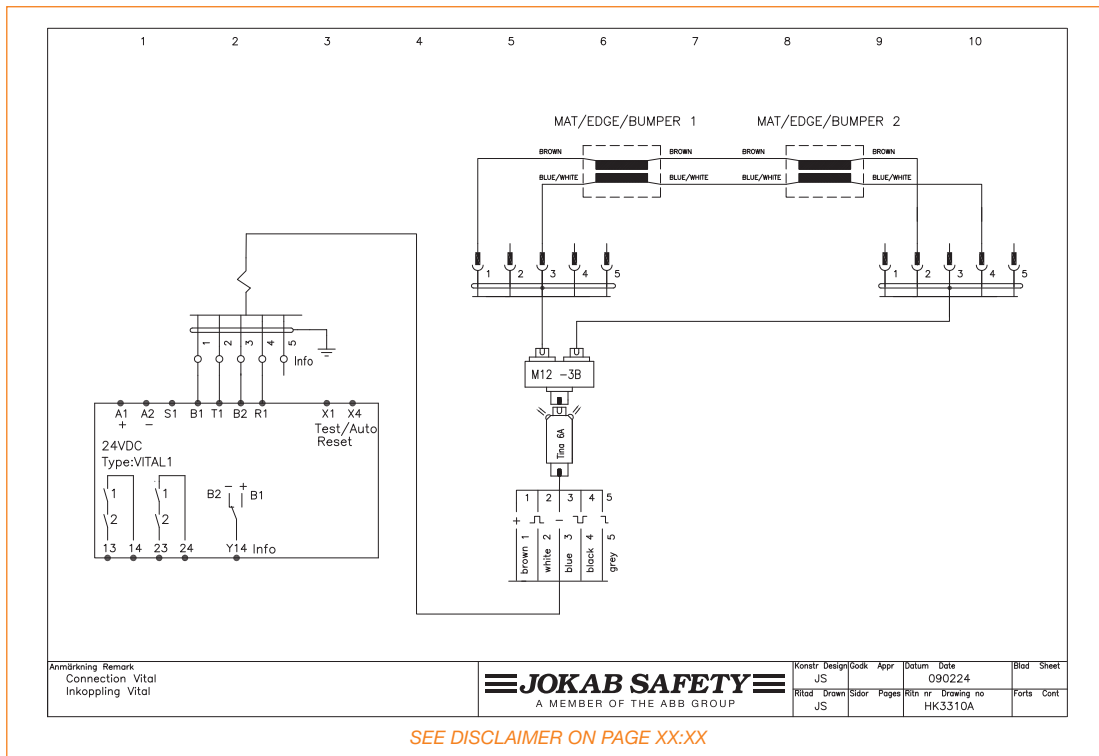
## Connection Example

### HK7601A – Connection Contact Protection for Safety Relay RT6



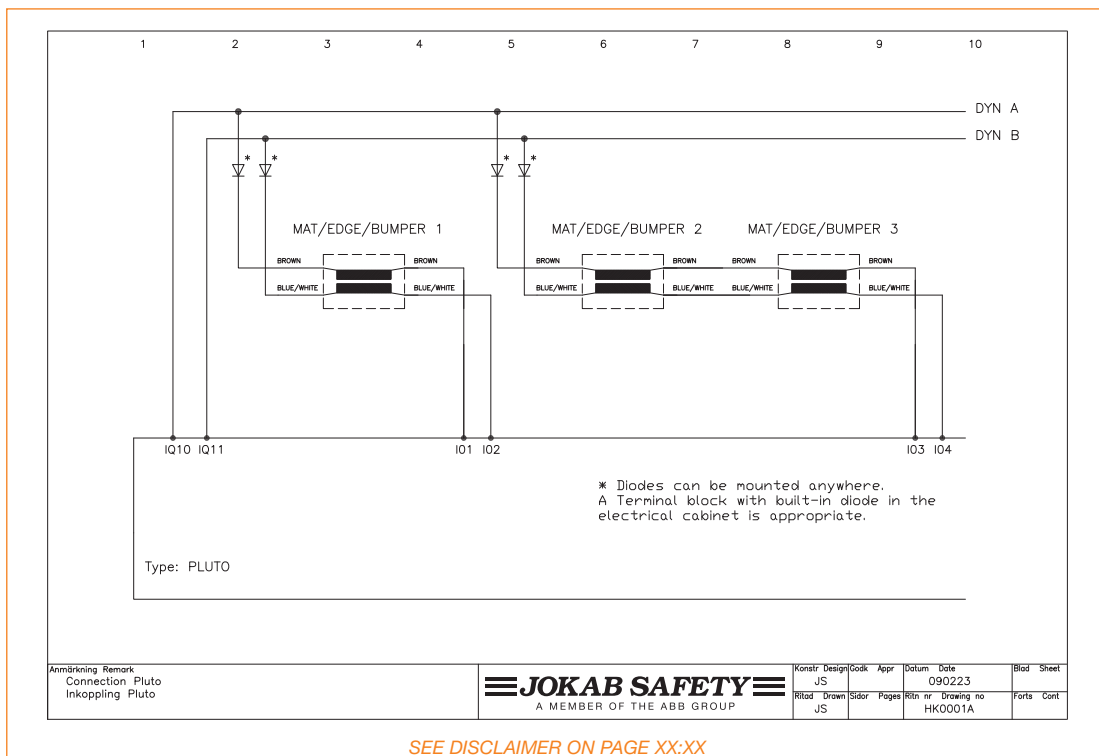
## Connection Example

### HK3310A – Connection Contact Protection for Safety Controller Vital 1



## Connection Example

### HK0001A – Connection Contact Protection for Safety PLC Pluto



## Component List - Contact Edges

Designation	Ordering Information	Description
GP25/25 EPDM	2TLA076025R2500	GP – Contact edge including aluminium profile. Ordered by length.
GP25/25 NBR	2TLA076125R2500	GP – Contact edge including aluminium profile. Ordered by length.
GP25/40 EPDM	2TLA076025R4000	GP – Contact edge including aluminium profile. Ordered by length.
GP25/40 NBR	2TLA076125R4000	GP – Contact edge including aluminium profile. Ordered by length.
Cable* 2+2	2TLA076009R0100	2+2 m Cable, production cost. Please contact us for more alternatives.
Cable* 5+5	2TLA076009R0500	5+5 m Cable, production cost. Please contact us for more alternatives.
Cable* 7+7	2TLA076009R0800	7+7 m Cable, production cost. Please contact us for more alternatives.
Cable* 10+10	2TLA076009R1000	10+10 m Cable, production cost. Please contact us for more alternatives.
GE25-25 EPDM	2TLA076005R0200	GE – Contact edge per meter. Ordered by length.
GE25-45 EPDM	2TLA076005R0400	GE – Contact edge per meter. Ordered by length.
Cable	2TLA076005R4400	Connection plug with 2.5 m cable. Two pieces per edge.
	2TLA076005R4500	Connection plug with 5m cable. Two pieces per edge.
	2TLA076005R4600	Connection plug with 10m cable. Two pieces per edge.
	2TLA076005R4700	Connection plug with resistor 8.2KΩ. Two pieces per edge.
End Cap	2TLA076005R6100	End cap for GE25-45. Two pieces per edge.
	2TLA076005R6200	End cap for GE25-25. Two pieces per edge.
	2TLA076005R0000	End cap, Production cost GE (when ready made). Two pieces per edge.
	2TLA076005R6100	End cap for GE25-45. Two pieces per edge.

\* Note: Please contact us for more alternatives.

## Component List - Accessories for Assembly

Designation	Ordering Information	Description
Gluing Set	2TLA076005R7600	Gluing set for assembly.
Scissors	2TLA076005R8500	Scissors.
	2TLA076005R8600	Plug insert tool.

## Component List - Bumps

Designation	Ordering Information	Description
ASB Bumper	2TLA076200R0100	53/100 black.
	2TLA076200R0200	100/200 black.
	2TLA076200R0300	150/300 black.
	2TLA076200R0400	200/400 black.
	2TLA076200R0500	53/100 black/yellow.
	2TLA076200R0600	100/200 black/yellow.
	2TLA076200R0700	150/300 black/yellow.
	2TLA076200R0800	200/400 black/yellow.
	2TLA076200R0900	60/100 NBR black (63/100).
	2TLA076200R1000	100/200 NBR black.
	2TLA076200R1100	150/300 NBR black.
	2TLA076200R1200	200/400 NBR black.
	2TLA076200R1300	200/200 black.
	2TLA076200R1400	150/150 NBR black.
	2TLA076200R1500	100/200 NBR black/yellow.
	2TLA076200R1600	150/250 NBR black/yellow.
	2TLA076200R0000	Bumper base price.



## Component List - Mats

Designation	Ordering Information	Description
Cast Mat	2TLA076301R0000	ASK-1U4.4-NP. Production cost cast mat in PU with NP finish
	2TLA076301R0200	ASK-1T4.4-NP. Production cost cast mat in PU with NP finish and cast-in ramp edge trim.
	2TLA076301R0500	ASK-1U4.4-NP. No ramp edge trim, sq.m.
	2TLA076310R0600	ASK-1U4.4-NP. No ramp edge trim, 1000 x 1000 mm.
	2TLA076310R0700	ASK-1U4.4-NP. No ramp edge trim, 1000 x 1500 mm.
Edge Trim	2TLA076310R1000	ASK-1T4.4-NP. Cast-in ramp edge trim, 1000 x 750 mm.
	2TLA076310R1100	ASK-1U4.4-NP. No ramp edge trim, 1000 x 1000 mm.
	2TLA076310R1200	ASK-1U4.4-NP. No ramp edge trim, 1000 x 1500 mm.
	2TLA076301R0600	ASK-1U4.4-NP. No ramp edge trim, sq.m.
Edge Trim RS14	2TLA076300R0500	Eliminates vertical edges and attaches the safety mat to the floor. Also provides protection and channel for connection cables.
Profile BS14	2TLA076300R0800	Best for use on the side nearest the machine. Permits a shorter distance from, for example, a wall.
Corner Trim	2TLA076300R0900	Can be used between two RS 14 profiles as an alternative to miter cutting of profiles.
Cabling	2TLA076900R3200	Connection cabling including 1 off M8 male and 1 off M8 female, 2.5 m.
	2TLA076900R3300	Connection cabling including 1 off M8 male and 1 off M8 female, 5 m.

*\* Note: The above have a PU surface layer. Mats are available in any size and in other materials.*

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