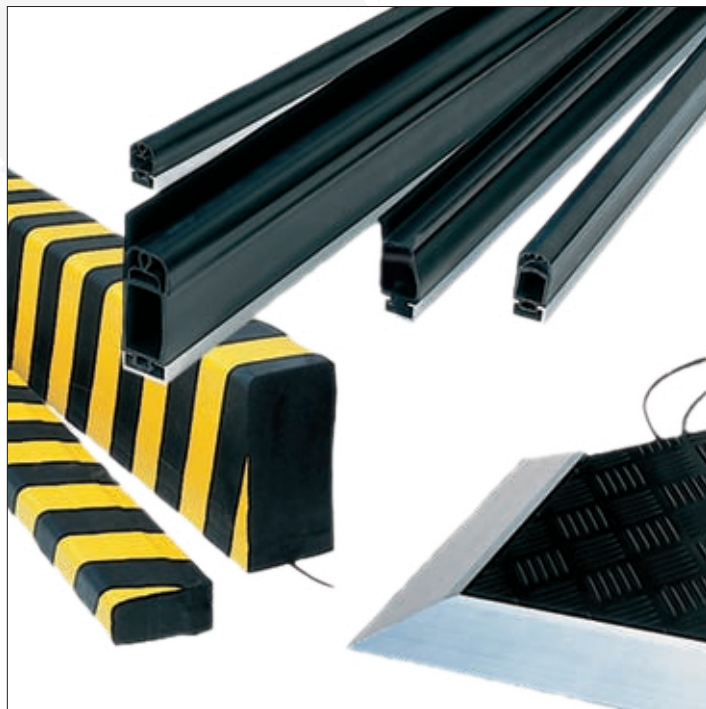


Contact rails, Bumpers and Safety Mats



<i>When shall I use contact rails, bumpers and safety mats?</i> _____	12:1
<i>Contacts rails and bumpers</i> _____	12:2
<i>Safety mats</i> _____	12:8

Descriptions and examples in this book show how the products work and can be used. This does not mean that they can meet the requirements for all types of machines and processes. The purchaser/user is responsible for ensuring that the product is installed and used in accordance with the applicable regulations and standards. We reserve the right to make changes in products and product sheets without previous notice. For the latest updates, refer to www.jokabsafety.com. 2011.

When shall I use contact rails, bumpers and safety mats?

■ Contact rails and bumpers

Contact rails are used as protection against squeezing accidents, i.e. on moving machine parts and automatic doors and hatches. The strips come in customised 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.

§

Standard: EN 1760-2 Safety of machinery - Pressure sensitive protective devices - Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars

§

Standard: EN 1760-1 Safety of machinery - Pressure sensitive protective devices - Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors

Safety contact rails & bumpers

Approvals:

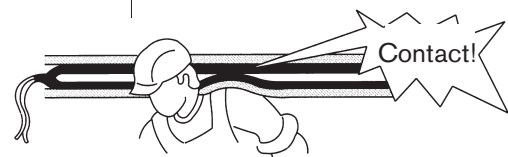


Utilization:

Protection against squeezing accidents on moving machine parts and automatic doors.

Features:

- Can be connected to a safety relay, Vital or Pluto
- Supplied in customized lengths
- IP 65
- Simple assembly on site
- Lengths up to 25 m.



Safety contact rails and bumpers as safety devices for potentially dangerous machines

Safety contact rails

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.

Available in EPDM design. Supplied in lengths up to 25 m.

Contact edges with contact strips SKS 18

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.

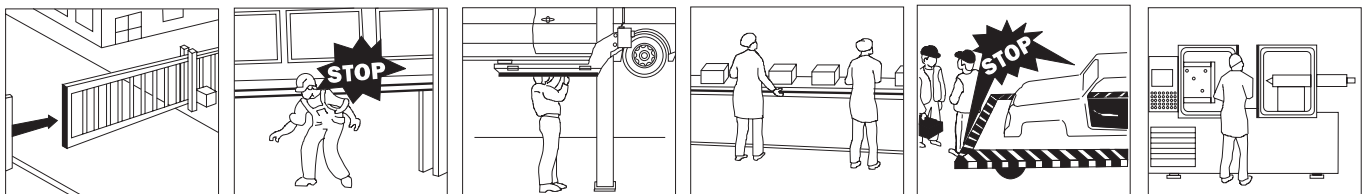
Bumpers

Bumpers are employed on automatic production lines to minimise danger to both people and machines. The large foam rubber cushions enable long practical braking and run-through distances, thus enabling designers to optimise 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 minimise wear and tear.

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

Fields of Application



Safety contact rails GP - General

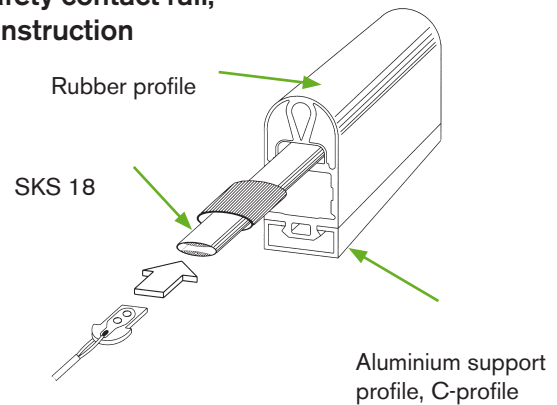
The safety contact strip, SKS 18, the actual contactor, is located inside the safety contact rail. The safety contact strip consists of a homogeneous highly insulating outer EPDM material and has two internal conducting contact surfaces. The conducting elastomer contains two copper wires that provide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

Because of the contact points, the safety contact rail 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 (EPDM or NBR) are then permanently sealed with a special elastic adhesive and end caps to make them watertight.

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

Safety contact rail, construction

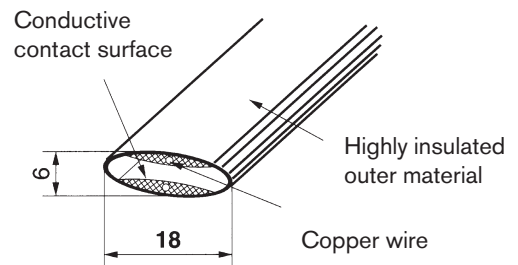


Safety contact strip SKS 18 for contact edge GP

Technical data - SKS 18

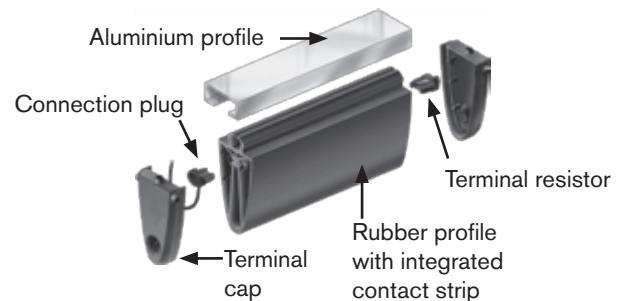
Outer material	EPDM, electrical insulation >30 Mohm
Inner material	EPDM, electrical elastomer with reinforce copper wire
Conductivity	60 ohm / 100 meters
Contact resistance	approx. 50 ohm
Max. electrical load	24 V / 100 mA
Max. applied pressure	6.5 N/cm ²
Dimensions	18 x 6 mm

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.



Technical data - Rubber profiles

Type		GP 25-25	GP 25-40	GE 25-25	GE 25-45
Fixing Profile		AL 25-14	AL 25-14	Al 25-14	Al 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)	10.2/9.5	7.2/5.9	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.

Common properties

Technical specifications – Contact rails		
Manufacturer	ABB AB/Jokab Safety, Sweden	
Article number/ ordering data:	<p><i>GP</i></p> <p>2TLJ076025R2500 Contact rail GP25/25 EPDM. Ordered by length</p> <p>2TLJ076125R2500 Contact rail GP25/25 NBR. Ordered by length</p> <p>2TLJ076025R4000 Contact rail GP25/40 EPDM. Ordered by length</p> <p>2TLJ076125R4000 Contact rail GP25/40 NBR. Ordered by length</p> <p>2TLJ076009R0100 Ready-made, 2+2 m cable</p> <p>2TLJ076009R0500 Ready-made, 5+5 m cable</p> <p>2TLJ076009R0800 Ready-made, 7+7 m cable</p> <p>2TLJ076009R1000 Ready-made, 10+10 m cable</p> <p>Please contact us for more alternatives.</p>	<p><i>GE</i></p> <p>2TLJ076005R0200 Contact edge GE25-25 EPDM per metre.</p> <p>2TLJ076005R0400 Contact edge GE25-45 EPDM per metre.</p> <p>2TLJ076005R4400 Connection plug with 2.5 m cable.</p> <p>2TLJ076005R4500 Connection plug with 5m cable</p> <p>2TLJ076005R4600 Connection plug with 10m cable</p> <p>2TLJ076005R4700 Connection plug with resistor 8.2kΩ</p> <p>2TLJ076005R6100 Terminal cap for GE25-45</p> <p>2TLJ076005R6200 Terminal cap for GE25-25</p>
Mechanical load max ¹	500 N	
Actuating angle (DIN)¹	2x 20°	
Mechanical life¹	10 ⁵	
Max. operate temp. range²	-20°C 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 ² GE: 2x 0.34 mm ²	
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)

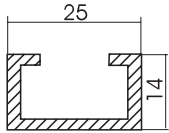
Physical and chemical material properties

Properties	EPDM	NBR	Resistance	EPDM	NBR	1 = no effect	for lasting contact
Tensile strength	3	2	Water (distilled)	1-2	1	2 = slight effect	non-lasting contact
Tensile elongation	3	2	Acids (diluted)	1	3	3 = moderate effect	moderate contact
Durability	3	2	Bases (diluted)	2	2	4 = appreciable effect	limited contact
Tear resistance	3	3	Non-oxidised acids	2	3	5 = strong effect	short-term contact
Cold flexibility	2	3	Oxidised acids	4	5	6 = extreme effect	avoid contact
Heat resistance	2	2	ASTM oil No. 3	6	1		
Oxidation resistance	1	3	Vegetable oil	5	1		
UV-resistance	1	3	Ester solvent	2	5		
Weather/ ozone resistance	1	3	Ketone solvent	3	5		
Flame resistance	6	6	Aliphatic hydrocarb.	5	1		
Gas permeability	4	2	Aromatic hydrocarb.	6	2-3		
			Halogenic hydrocarb.	6	5		
			Alcohols	1	5		

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

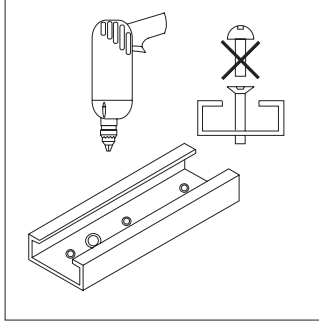
Note! The information given is based on data obtained from the respective material suppliers. Although all efforts have been made, unforeseen factors can have a considerable effect on the generally applied indications during practical use therefore this information must be used as a general guide only.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



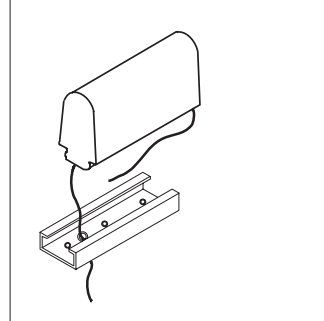
The selected contact profile should be mounted using a suitable aluminium C profile (as shown opposite).

Mounting



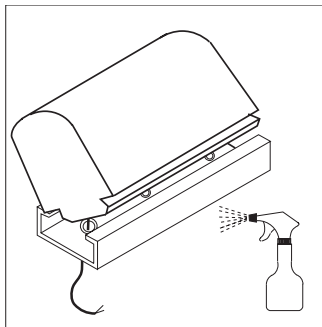
Stage 1 – GP and GE

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.



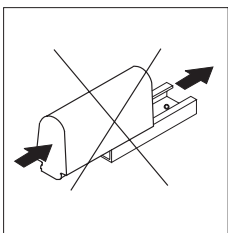
Stage 2 – GP and GE

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.



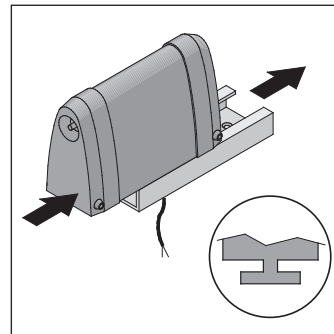
Stage 3 – GP

In order to make fitting of the safety contact rail easier, the aluminium profile and the safety contact rail 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 rail, talcum powder, oils or similarly permanent lubricating agents must not be used.



Note! Pulling or pushing the safety contact rail into the aluminium profile can cause damage to the contact rail 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.



Stage 3 – GE

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

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.

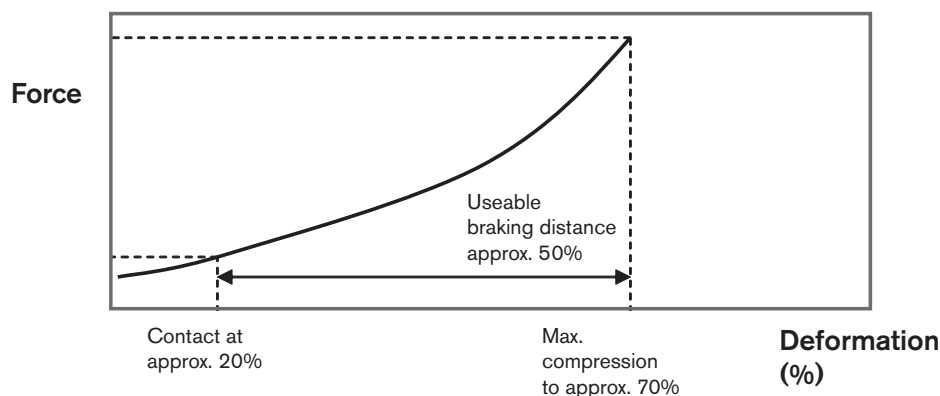
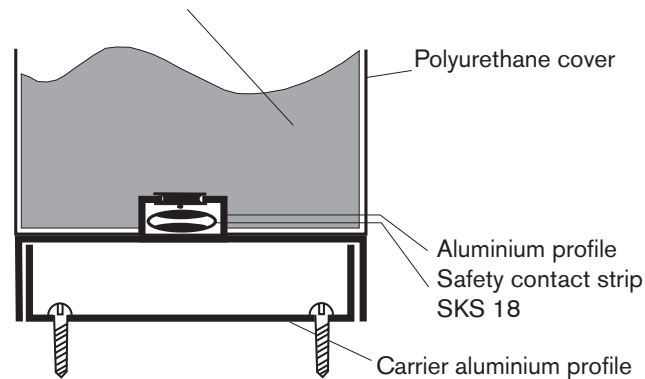
The Safety Bumper must be connected to a suitable two input channel Safety Relay. e.g. ABB Jokab Safety type RT6 or RT7 which provides all necessary monitoring of the bumpers activation and detection of cable faults.

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

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

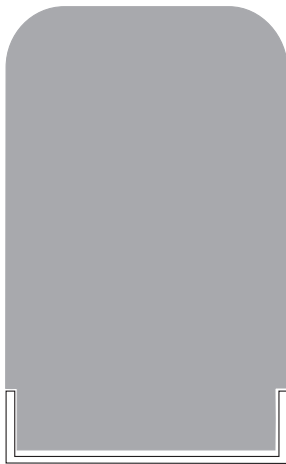
Technical data - Bumpers	
Article number/ ordering data: 2TLJ076200R0100 2TLJ076200R0200 2TLJ076200R0300 2TLJ076200R0400 2TLJ076200R0500 2TLJ076200R0600 2TLJ076200R0700 2TLJ076200R0800 2TLJ076200R0900 2TLJ076200R1000 2TLJ076200R1100 2TLJ076200R1200 2TLJ076200R1300 2TLJ076200R1400 2TLJ076200R1500 2TLJ076200R1600 2TLJ076200R0000	Bumper ASB 53/100 black 100/200 black 150/300 black 200/400 black 53/100 black/yellow 100/200 black/yellow 150/300 black/yellow 200/400 black/yellow 60/100 NBR black (63/100) 100/200 NBR black 150/300 NBR black 200/400 NBR black 200/200 black 150/150 NBR black 100/200 NBR black/yellow 150/250 NBR black/yellow Bumper base price
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 ⁵
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 ² PU covered

Foam rubber core



Standard shapes

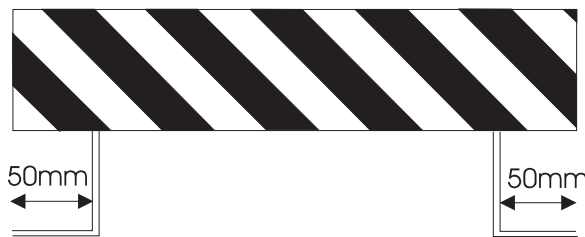
Shape A



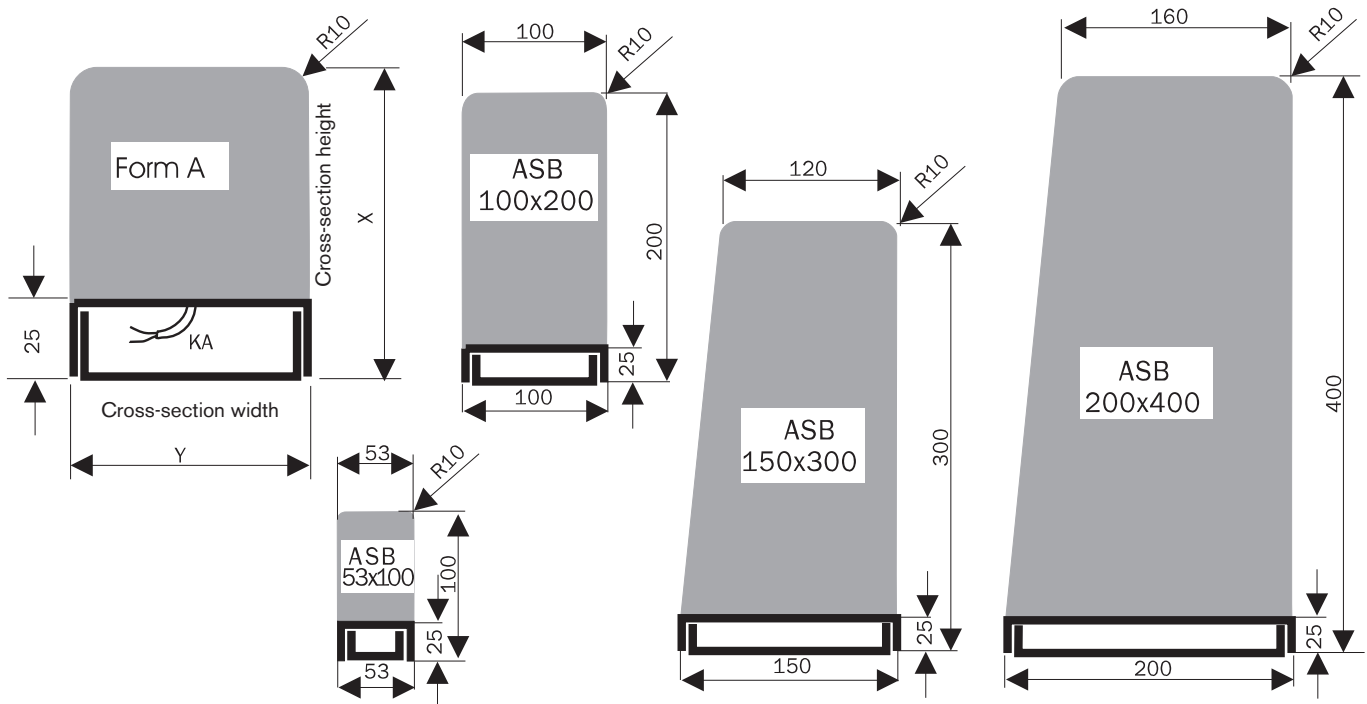
Shape B



Customer-specified special shape



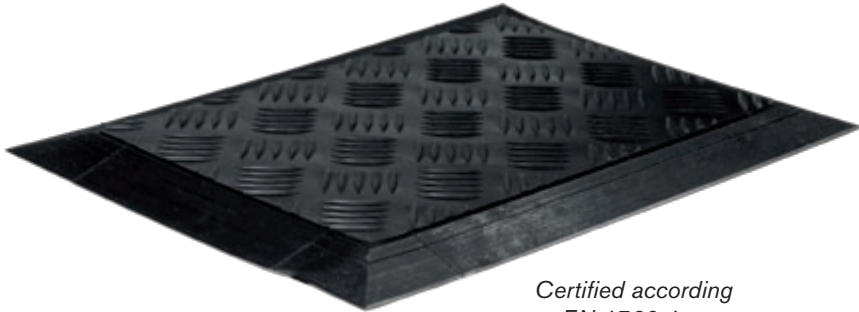
Cable exits at the ends of the bumper or according to customer requirements.



Dimensions

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



Certified according to EN 1760-1.

Approvals:



Safety Mats for:

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

Features:

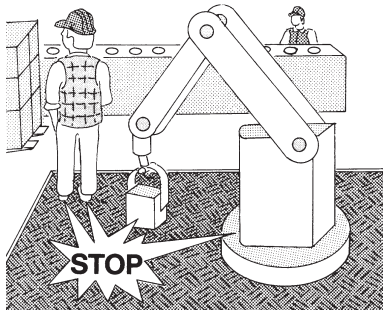
Can be connected to a safety relay, Vital or Pluto

Very durable

IP 67

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 ribbed surface, which is fixed by adhesive to the surface of the Safety Mat.

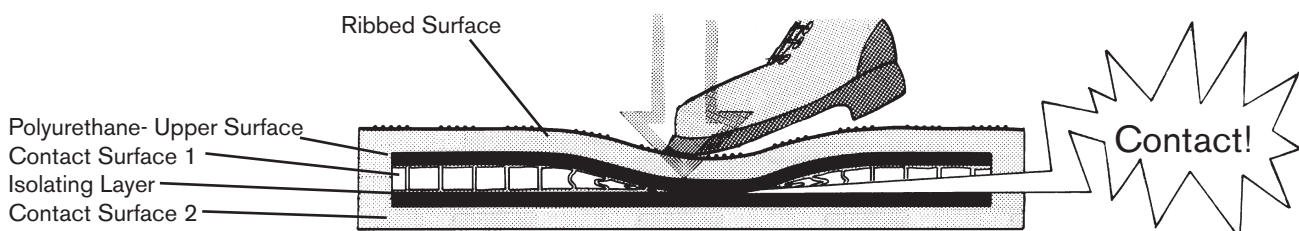
The safety mat and its connection cabling can be supervised by a suitable ABB Jokab Safety safety relay, which provides PL d.

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 ribbed or chequered rubber mat or a thin aluminium plate.

Attachment to the floor is by means of a ramped edge trim or a z-profile 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.



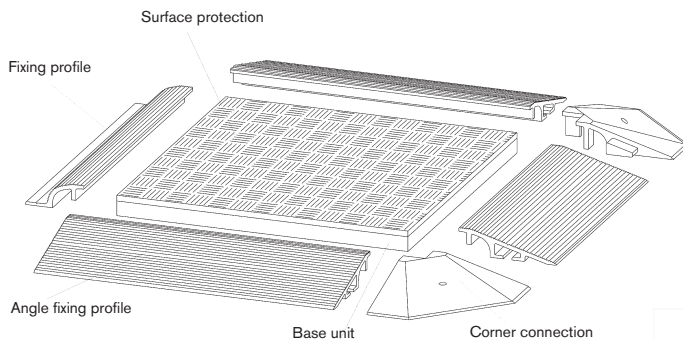
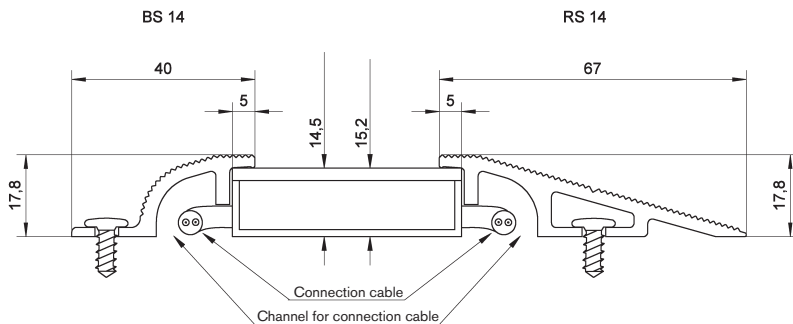
Technical Data - Safety Mats

Manufacturer	ABB AB/Jokab Safety, Sweden
Article number/ ordering data: Production cost cast mat in PU with RF finish ASK-1U4.4-RF Production cost cast mat in PU with RF finish and cast-in ramp edge trim ASK-1T4.4-RF ASK-1U4.4-RF. No ramp edge trim: 1000 x 750 mm 1000 x 1000 mm 1000 x 1500 mm kvm ASK-1T4.4-RF. Cast-in ramp edge trim: 1000 x 750 mm 1000 x 1000 mm 1000 x 1500 mm kvm The above have a PU surface layer. Mats are available in any size and in other materials. Connection cabling including 1 off M8 male and 1 off M8 female: 2,5 m 5 m	2TLJ076301R0000 2TLJ076301R0200 2TLJ076310R0500 2TLJ076310R0600 2TLJ076310R0700 2TLJ076301R0500 2TLJ076310R1000 2TLJ076310R1100 2TLJ076310R1200 2TLJ076301R0600 2TLJ076900R3200 2TLJ076900R3300

Max. area	Entire mat = 2350 x 1350 mm 10 m ² (divided mat) Rec. relation max 3:1 Min 100x100 mm
Height	10mm without ribbed surface max 14.5 mm with ribbed 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 10% acid 10% alkaline (caustic) solutions	good resistant resistant
Cable	2 x 5 m, 2 x 0,34 mm ² , PU sheathed
Mechanical Life	> 1,5x10 ⁶ load shifting

Edge Trim - Safety Mats

ASK-1U4.4-RF



Edge trim RS 14

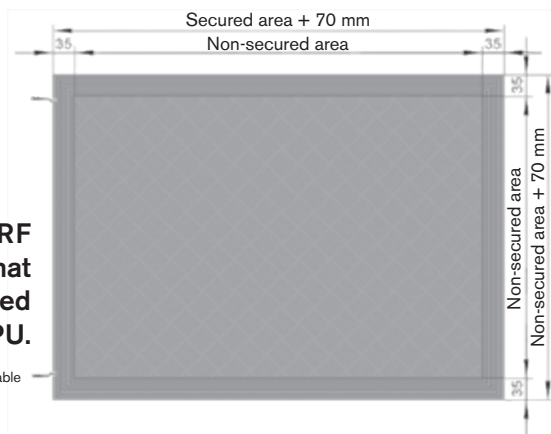
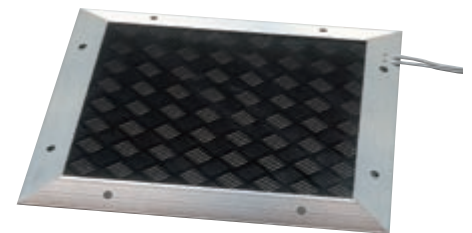
Art nr: 2TLJ076300R0500
Eliminates vertical edges and attaches the
Safety Mat to the floor. Also provides protec-
tion and channel for connection cables.

Profile BS14

Art nr: 2TLJ076300R0800
Best for use on the side nearest the machine.
Permits a shorter distance from, for example, a
wall.

Corner trim

Art nr: 2TLJ076300R0900
Can be used between two RS 14 profiles as an
alternative to mitre cutting of profiles.

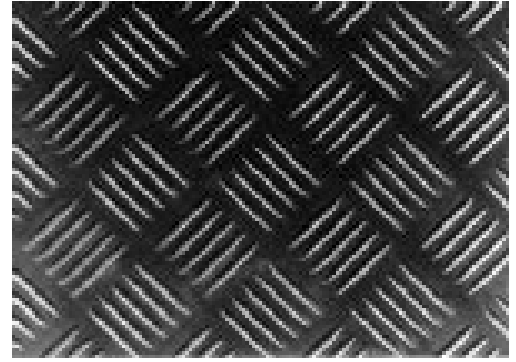


ASK-1T4.4-RF Completely moulded mat with moulded edge profiles in PU.

Connection cable

Surface layer - Safety mats

Safety mats are normally supplied with a ribbed 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 or chequer plating in aluminium or stainless steel. Safety mats can also be supplied without a surface layer, to have a full coverage rubber sheet glued on during installation. 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

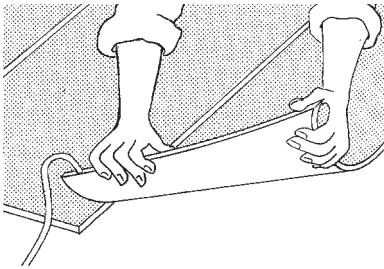
K = body speed (velocity of propagation 1600 mm/s)

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

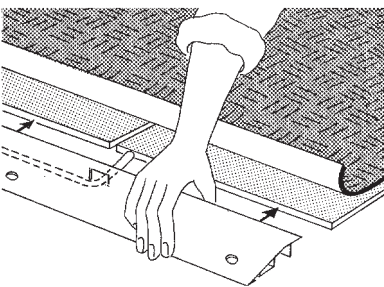


The ground on which the mats are to be laid must be level, clean and dry. The mats should not be glued to the ground.

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).

If the mats are delivered without the ribbed surface premounted, the selected surface should be placed in position over the mats and fixed by means of a suitable adhesive.

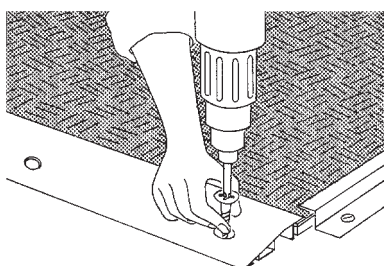


In the case of safety mats with cast-in rubber edge trim, the mat is secured to the floor by screws straight through the edge trim. In the case of safety mats with an aluminium edge trim, see below.

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 rails, bumpers and safety mats

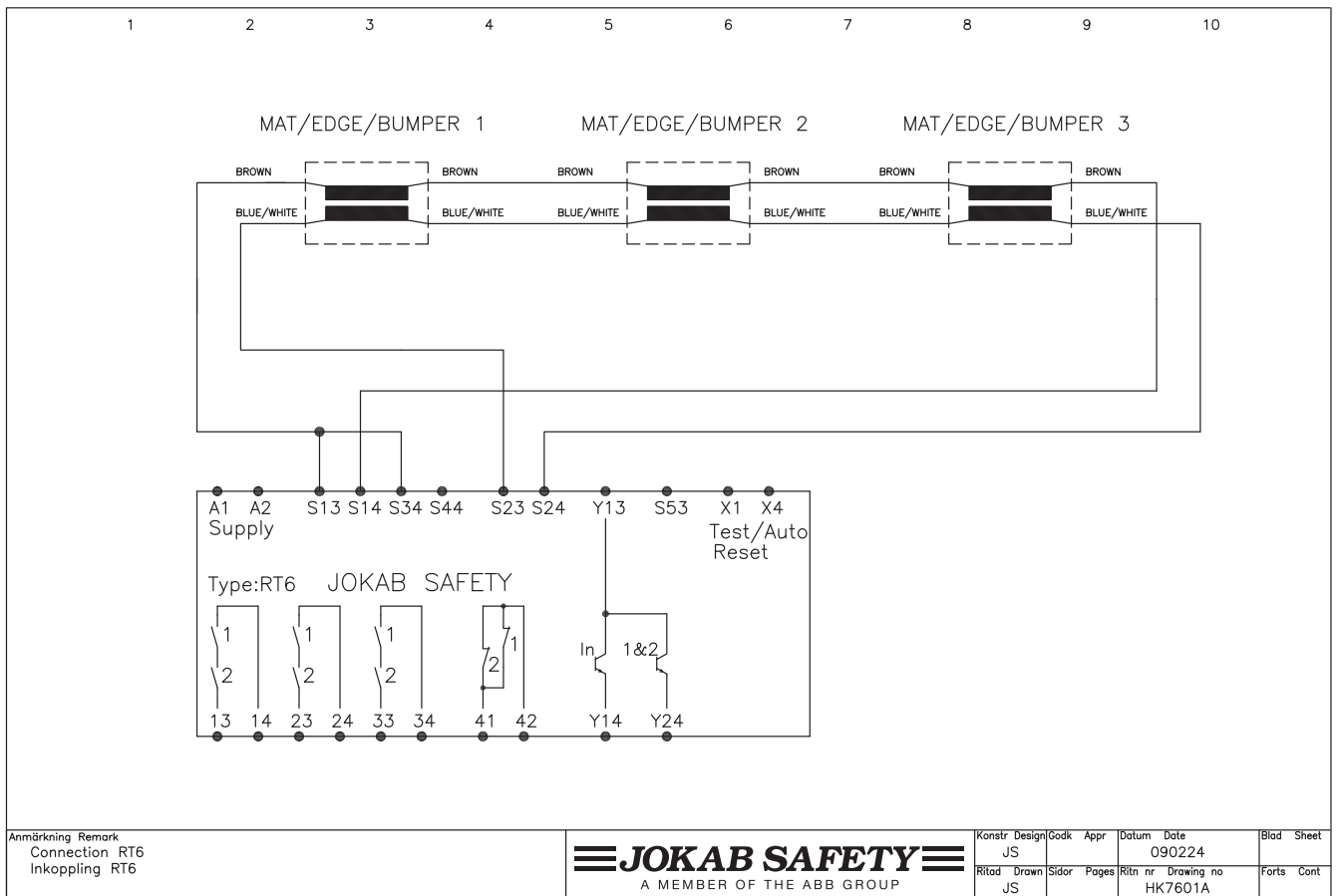
Contact edge, bumper or safety mat must be connected to a suitable monitoring unit (e.g. ABB Jokab Safety safety relays RT6, RT7A/B, RT9, RT10, Vital with Tina 6A or Pluto safety-PLC).

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.

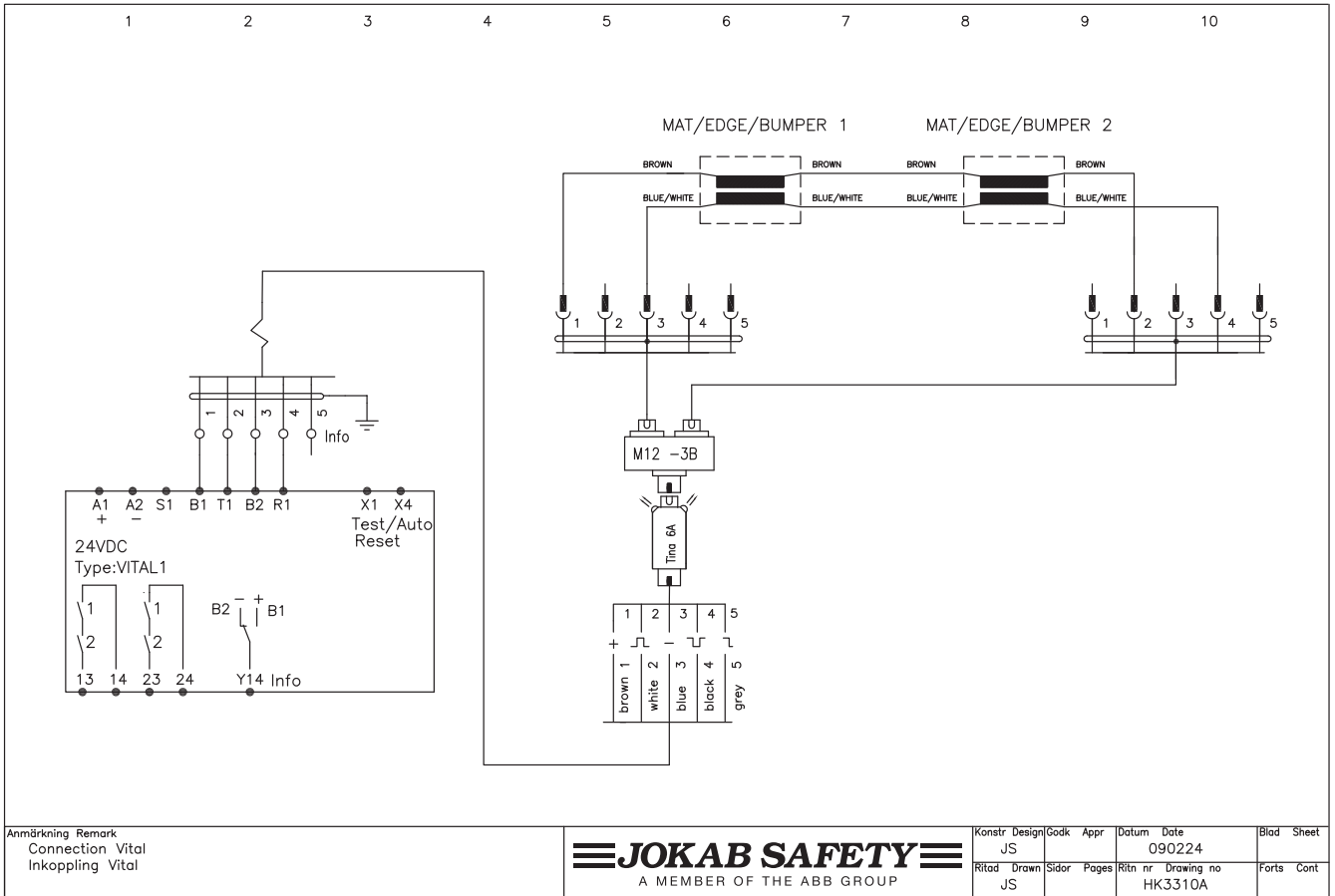
When pressure is applied, the active surface of the contact area in the contact protection is closed and the safety output on the monitoring unit trips. A stop signal will be sent to the machine's safety circuits preventing any dangerous movements.

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.

HK7601A - Connection contact protection for safety relay RT6



HK3310A – Connection contact protection for safety controller Vital 1



HK0001A – Connection contact protection for safety PLC Pluto

