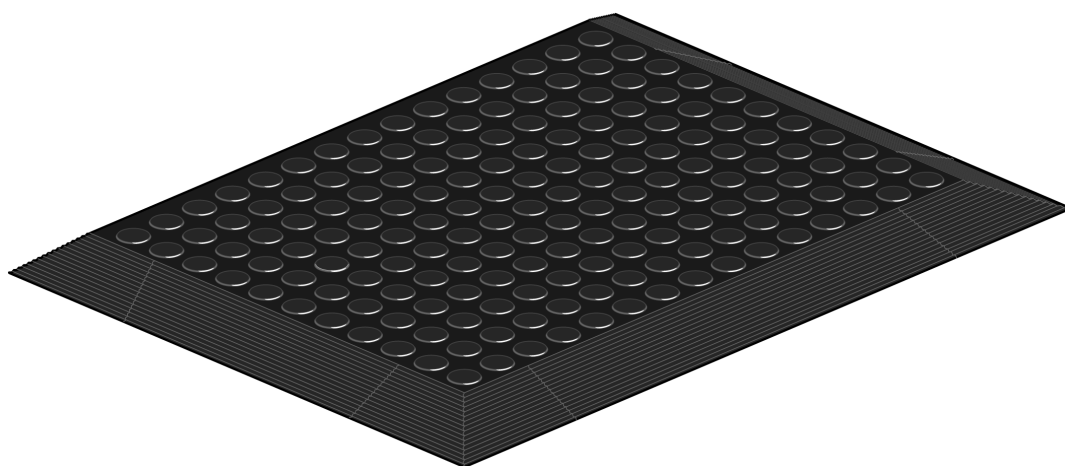


—  
SAFETY PRODUCTS

# **ASK-Series**

## **Product manual Safety Mat**

### **Product Manual**





## **Read and understand this document**

Please read and understand this document before using the products. Please consult your ABB JOKAB SAFETY representative if you have any questions or comments.

### **Suitability for use**

ABB JOKAB SAFETY shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customers application or use of the product. At the customer's request, ABB JOKAB SAFETY will provide applicable third-party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

**NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE ABB JOKAB SAFETY PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.**

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# 1 Introduction

## 1.1 Scope

The purpose of the product manual is to describe the safety mat and to provide the necessary information required for installation and use.

## 1.2 Audience

This document is intended for authorized users.




## 1.3 Prerequisites

It is assumed that the reader of this document has knowledge of the following:

- Basic knowledge of ABB Jokab Safety products.
- Knowledge of machine safety.

## 1.4 Special notes

Pay attention to the following special notes in the document:








- |   |   |
|---|---|
|  <b>Warning!</b> | Danger of severe personal injury!<br>An instruction or procedure which, if not carried out correctly, may result in injury to the technician or other user. |
|  <b>Caution!</b> | Danger of damage to the equipment!<br>An instruction or procedure which, if not carried out correctly, may damage the equipment.                            |
|  <b>Note!</b>    | Important or explanatory information.   |

## 2 Overview

### 2.1 General description

The safety mat is used as personal protection within the hazardous areas around presses, robots, production lines, machines etc. When connected to a suitable safety control unit, stepping on the safety mat will immediately be detected causing hazardous machine movements to be stopped. This is made possible by the detection of electrical contacts closing within the sandwich construction. The safety mat is provided with a slip-free surface. The safety mat and its connection cabling are to be monitored by a suitable ABB AB Jokab Safety safety control unit, Sentry or Pluto.

### 2.2 Safety regulations

-  **Warning!** Carefully read through the entire manual before using the device.
-  **Warning!** The devices shall be installed by a trained electrician following the Safety regulations, standards and the Machinery directive.
-  **Warning!** Failure to comply with instructions, operation that is not in accordance with the use prescribed in these instructions, improper installation or handling of the device can affect the safety of people and the plant.
-  **Warning!** For installation and prescribed use of the product, the special notes in the instructions must be carefully observed and the technical standards relevant to the application must be considered.
-  **Warning!** In case of failure to comply with the instructions or standards, especially when tampering with and/or modifying the product, any liability is excluded.
-  **Warning!** The safety mat is NOT intended for wheeled vehicles.
-  **Warning!** The safety mat is NOT intended for children, or persons weighing < 20 kg.

## 3 Installation and maintenance

### 3.1 Safety mat – general

The safety 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 is then covered with a top layer of slip-free rubber mat. Attachment to the floor is by means of a ramped rail. Two cable exits are provided. These cables consist of one M8 male plug and one M8 female plug in standard construction.

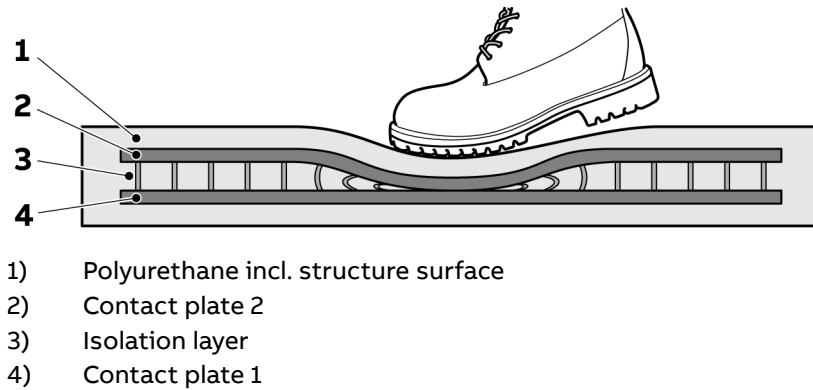


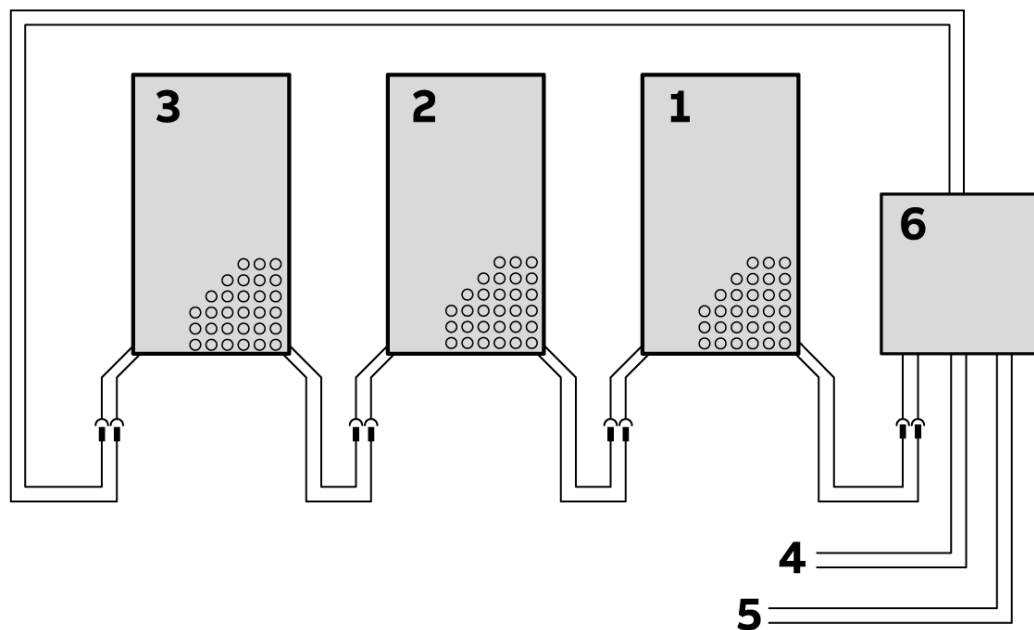
Figure 1: Safety mat cross section

## 3.2 Operation principle

The safety mat is fitted with two two-core connecting cables where both ends are connected to the safety control unit. Different dynamic signals are used in each of the two cores. This connection makes a safety circuit where the safety control unit provides the monitoring of the entire circuit including the cabling route and the safety mat.

The two surfaces of the safety mat make contact when stepped on, causing a short circuit which is detected by the safety control unit. This immediately causes the safe outputs to be turned off. The entire switching circuit is at the same time monitored for damage to cables or manipulation.

If several safety mats are to be connected to one safety control unit, they need to be connected in series.



- 1-3) Safety mats
- 4) Safe output
- 5) Voltage supply
- 6) Safety control unit

Figure 2: Setup of connected safety mats

### 3.3 Installation of safety mats

**⚠ Caution!** The safety mats shall not be broken or bent. Safety mats must not be rolled/twisted or modified in any way. It is also essential that safety mats are not cut into any shape or shortened following delivery. The mounting surface must be absolutely even, clean and dry. Safety mats should not be glued on the bottom.

**⚠ Warning!** The safety mat shall be installed with a minimum safety distance according to EN ISO 13855.

Place the safety mat in required position with the ground plate downwards. If more than one safety mat is to be installed, make sure to place the safety mats tight together without space.

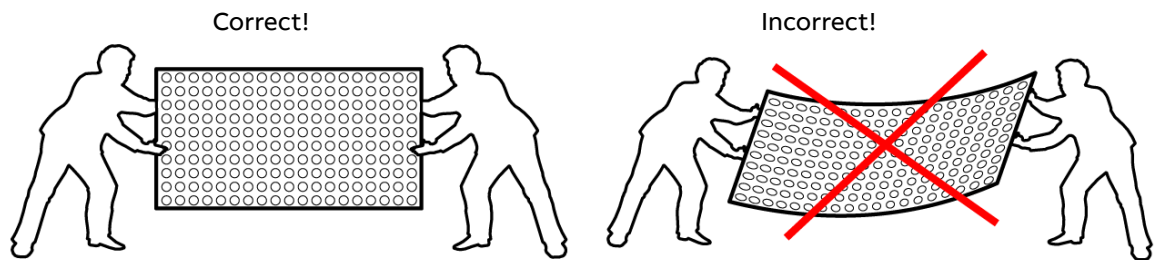


Figure 3: Handling of safety mat

Safety mats with cast-in rubber edge trim can be secured to the floor by screws straight through the ramp rail.

For safety mats with an aluminum edge trim refer to section 3.3.1.3 'Assembly of ASK mats with aluminum rail' for installation instructions.

The safeguarded area (same as ordered size) on a safety mat with a ramp rail is the dimensions of the safety mat without the ramp rails. Therefore, the width of the edge trim (for example 35 mm for mats with cast-in rubber edge trim) must be added for each ramp rail side to get the over-all dimension for the floor space. The ramp rail serves for fixation to the ground.

Maximum producible size of a safety mat is 2350 mm x 1350 mm. All dimensions larger than this must be realized by using several safety mats.



### 3.3.1 Aluminum ramp

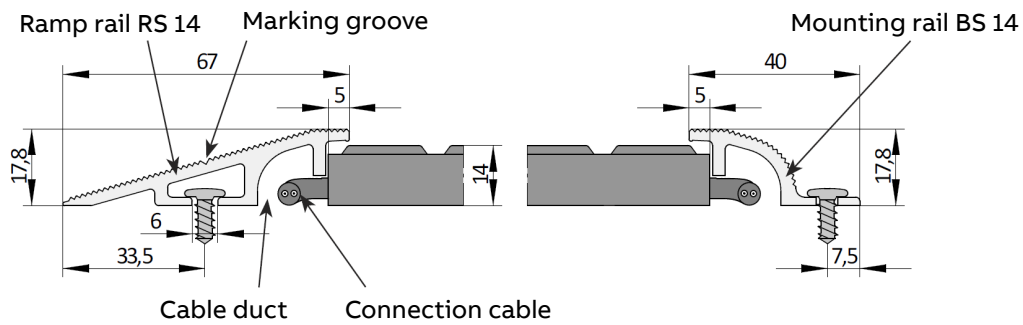


Figure 4: Safety mat ASK-1U4.4-NP

#### 3.3.1.1 Ramp rail RS 14

The ramp rail RS 14 provides secure mounting capability for the safety contact mat. The angled design reduces tripping and slipping when mounted to the mat. The integrated channel can be used for clean and safe installation of the connecting cable.

##### Technical specifications ramp rail RS 14

**Material:** Aluminum AlMgSi 0,5

**Weight:** Approx. 788 g/m

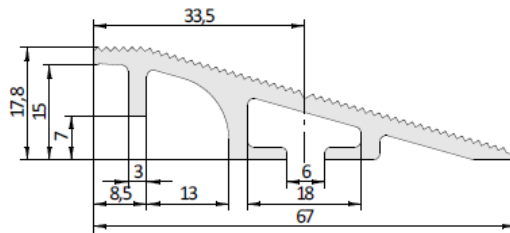


Figure 5: Ramp rail RS 14

#### 3.3.1.2 Mounting rail BS 14

The mounting rail BS 14 can be used to attach the safety contact mat in less accessible areas (for example at machines, shut-off positions, walls, etc.). The integrated channel can also be used for clean and safe installation of the connecting cable.

##### Technical specifications mounting rail BS 14

**Material:** Aluminum AlMgSi 0,5

**Weight:** Approx. 411 g/m

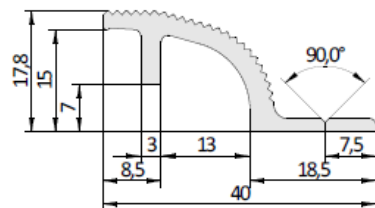


Figure 6: Mounting rail BS 14

### 3.3.1.3 Assembly of ASK mats with aluminum rail

When using corner connectors, the ramp rail must be shortened around 20 mm for each corner connector.

The corner connector nearest the cable is to be mounted from above over the cable in such a way that the cable is guided safely in the cable duct (figure 7). Afterwards drill and fasten it to the bottom with 6 mm dowel and suitable screw.

Push the ramp rails laterally to the mat and then on the fixation-pin of the corner connector (figure 8). Mark the fastening points along the marking groove on the rail and pre-drill 10 mm for the intended plugs. Fasten the rails on the bottom with 6 mm dowels and suitable screws (approx. 60 cm between the screws) and close the openings with the plugs (figure 9).

Push the corner connectors laterally to the mat and then the fixation-pin into the rail (figure 10). Afterwards drill and fasten it to the bottom with 6 mm dowel and suitable screw.

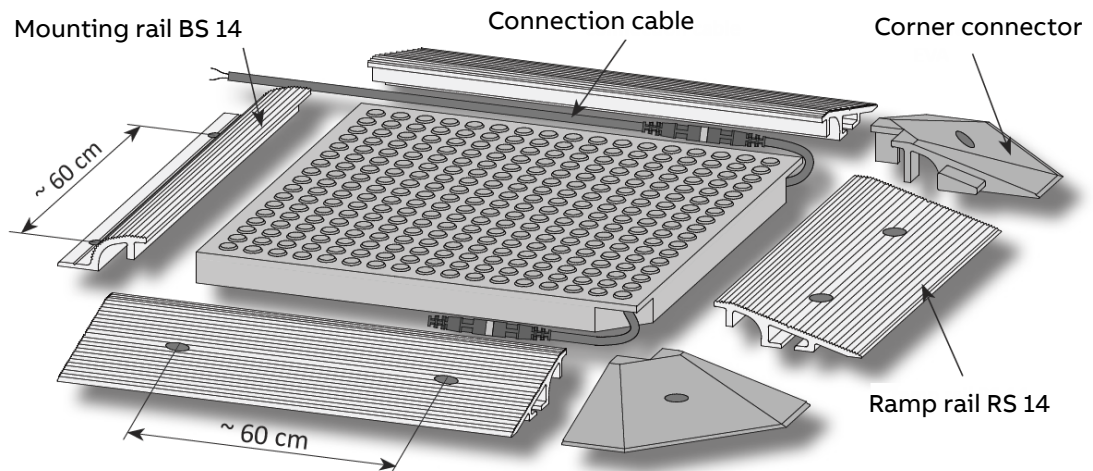


Figure 7: Rail assembly

At the machine side the conclusion takes place via the adjustment with the mounting rail BS 14. Fasten the rail to the bottom with 6 mm dowels and suitable screws (approx. 60 cm between the screws). If possible bring out the cable laterally and attach it to the safety control unit (figure 10).

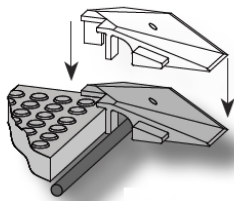


Figure 8: Cable duct

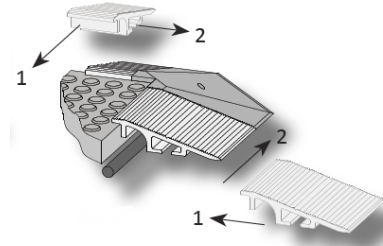


Figure 9: Corner connector

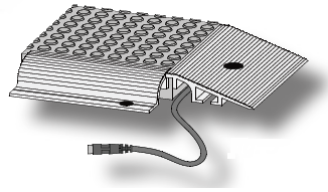


Figure 10: Cabling

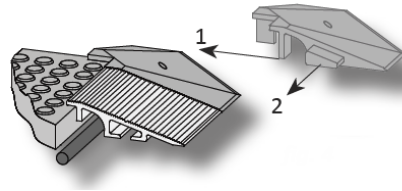
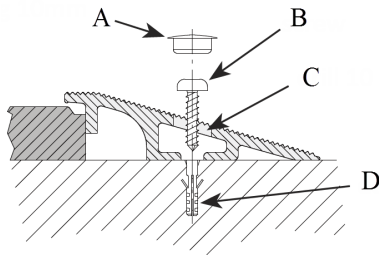
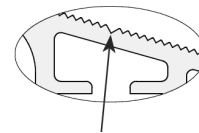


Figure 11: Corner connector mounting



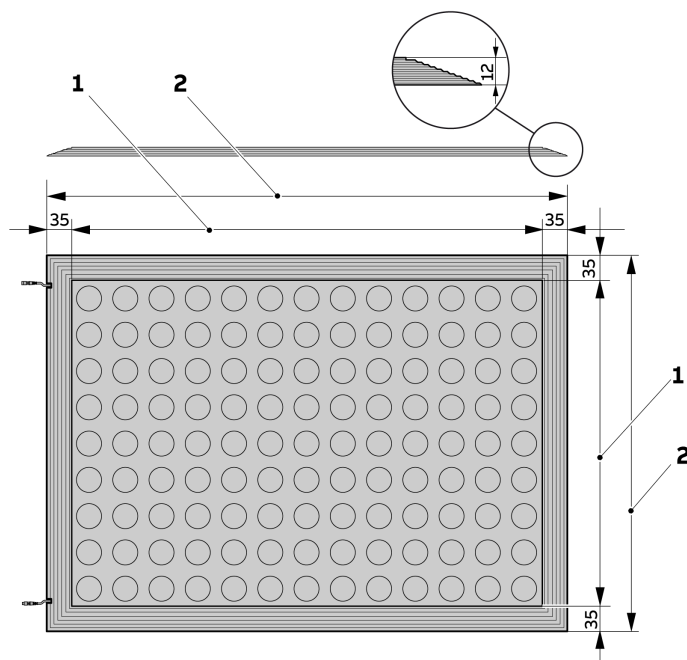
- A) Plug 10 mm
- B) Screw
- C) Drill 10 mm
- D) Dowel 6 mm



Marking groove

Figure 12: Fixation

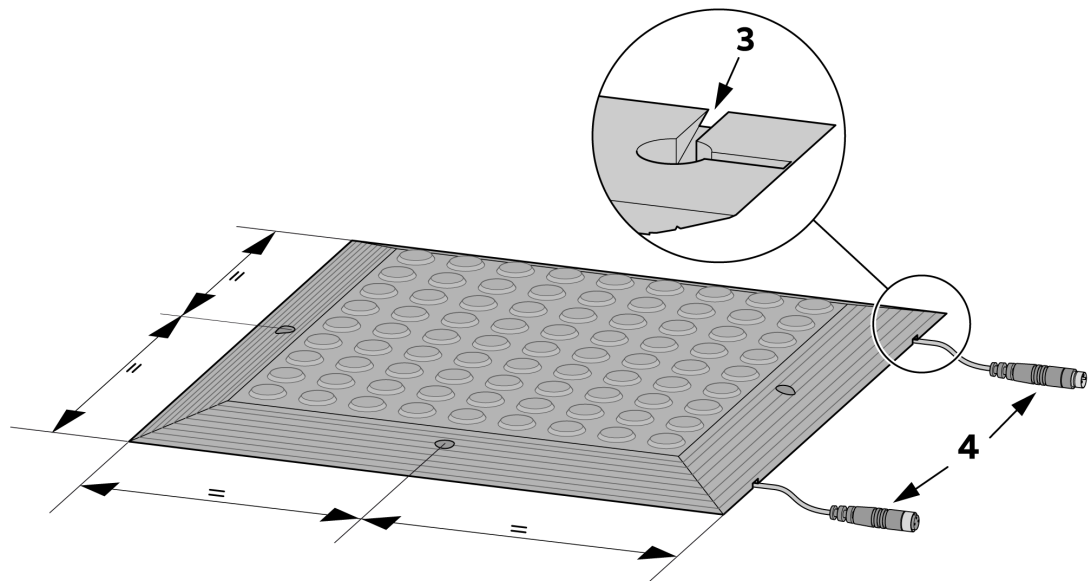
### 3.3.2 Molded ramp



- 1) Area for safeguard
- 2) Area for safeguard + 35 mm at each side

Figure 13: Dimensions of safety mat

Cut out the cable output at appropriate side in a way that the cables coming out are not squeezed or sheared while placing the safety mat afterwards. Place and adjust the safety mat at the appropriate place. To provide against slipping use suitable screws and dowels on each side of the safety mat.



- 3) Cut out
- 4) Cables

Figure 14: Mounting of safety mat

To place several safety mats side by side, the relevant ramp rails have to be cut off. To do this, cut off the ramp rail with a knife in the given slit (B) (spray the knife and the cutting area with soapy water (A)).

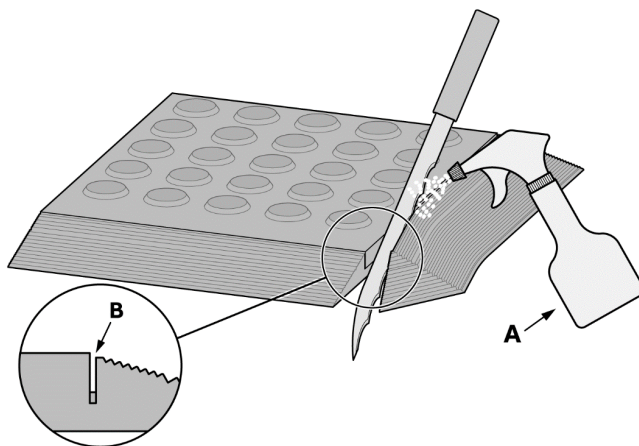
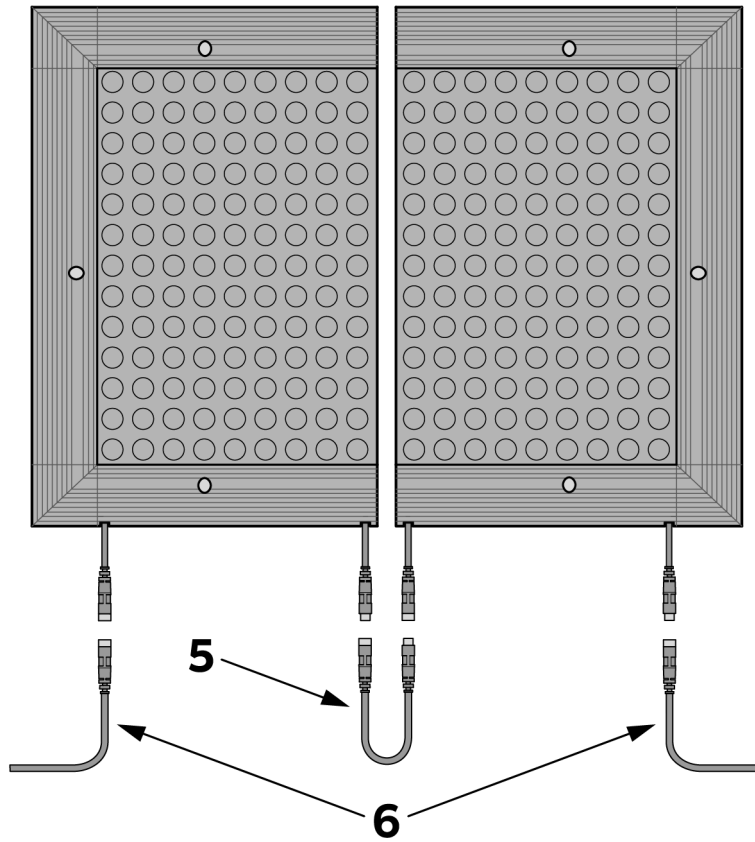


Figure 15: Adjustment of safety mat

If needed, the ramp rail can be cut off also when safety mats not are joined together.

### 3.3.3 Electrical installation

Connect the safety mat electrically and check connection on the different cores (channels).



- 5) Connection cable with M8 female and male plug
- 6) Supplied cables with M8 female and male plug

Figure 16: Several safety mats side by side

### 3.4 Electrical connections

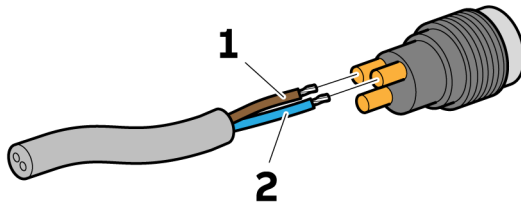


Figure 17: M8 Male pin configuration

#### M8-connector:

- 1) Brown connected to pin 1
- 2) Blue connected to pin 3

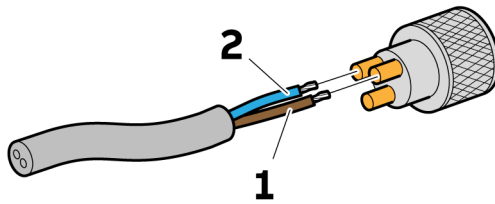


Figure 18: M8 Female pin configuration




Figure 19: Safety mat electrical view

The safety mat shall be connected to an ABB Jokab Safety Sentry safety relay (USR10 or USR22) or Pluto safety-PLC (A20, B20, S20, D20, B22, D45, B46, S46, AS-i, B42 AS-i or O2) which monitors the functionality of the safety mat and detects any disconnections or short-circuits in the lines. Several safety mats can be connected in series while still retaining the same level of safety.


**Note!** For maximum safety mat area and maximum number of safety mats, see section 'Technical Data', 'Mounting' table.


When pressure is applied, the active surface of the contact area in the safety mat is closed and the safety output on the safety control unit trips.


## 3.5 Installation precautions

 **Warning!** All safety functions shall be tested before starting up the system.

## 3.6 Maintenance

 **Warning!** The safety functions and the mechanics shall be tested regularly.

 **Warning!** In case of breakdown or damage to the product, contact the nearest ABB Jokab Safety Service Office or reseller. Do not try to repair the product yourself since it may accidentally cause permanent damage to the product, impairing the safety of the device which in turn could lead to serious injury to personnel.

 **Caution!** ABB Jokab Safety will not accept responsibility for failure of the switch functions if the installation and maintenance requirements shown in this document are not implemented. These requirements form part of the product warranty.

## 4 Model overview

Order code	Description
<b>ASK-1T Cast-in ramp edge trim - Standard sizes</b>	
2TLA076310R1000	Safety mat ASK T4 with integrated ramp rail: 1000 x 750 mm, incl. 5+5 m cables
2TLA076310R1100	Safety mat ASK T4 with integrated ramp rail: 1000 x 1000 mm, incl. 5+5 m cables
2TLA076310R1200	Safety mat ASK T4 with integrated ramp rail: 1000 x 1500 mm, incl. 5+5 m cables
<b>ASK-1T Cast-in ramp edge trim - Custom sizes</b>	
2TLA076301R0200	Safety mat ASK CM T4 production cost
2TLA076301R0600	Safety mat ASK CM T4 Order code for size (m <sup>2</sup> ) and two 5 m cables. Specify dimensions (width x length in mm) in text.
<b>ASK-1U No ramp edge trim (to be used with Aluminum edge) -Standard sizes</b>	
2TLA076310R0500	Safety mat ASK-1U4.4-NP 750x1000mm
2TLA076310R0600	Safety mat ASK-1U4.4-NP 1000x1000mm
2TLA076310R0700	Safety mat ASK-1U4.4-NP 1000x1500mm
<b>ASK-1U No ramp edge trim (to be used with Aluminum edge) - Custom sizes</b>	
2TLA076301R0000	Safety mat ASK-1U4.4-NP production cost
2TLA076301R0500	Safety mat ASK-1U4.4-NP Order code for size (m <sup>2</sup> ). Specify dimensions (width x length in mm) in text.
<b>Aluminum ramp edge pieces and cutting costs</b>	
2TLA076300R0500	RS 14, Ramp rail
2TLA076300R0800	BS 14, Mounting rail
2TLA076300R0700	Cutting cost for BS 14 and RS 14
2TLA076300R0900	Corner piece
<b>Accessories, Cables</b>	
2TLA076900R3200	Safety mat extension cable 2.5 m with straight M8 female + male connector
2TLA076900R3300	Safety mat extension cable 5 m with straight M8 female + male connector

### Custom-made safety mats

When ordering a custom-made safety mat, two articles need to be ordered, one order code for the production cost and one for the square meter. When ordering, the size of the safety mat needs to be specified (X mm x Y mm).

Example:

One safety mat 0.5 x 0.5m:

Ordering example				
2TLA076301R0200	Safety mat ASK CM T4	Production cost	1 pcs	
2TLA076301R0600	Safety mat ASK CM T4	0.25 m <sup>2</sup>	1 pcs	á 500 mm x 500 mm



## 5 Technical data

Manufacturer	
Address	ABB AB, JOKAB SAFETY Varlabergsvägen 11 SE-434 39 Kungsbacka Sweden
Technical data	
Max. area	Entire safety mat = 2350 x 1350 mm, 10 m <sup>2</sup> , (divided safety mat) Rec. relation max 3:1, Min. 120 x 120 mm
Height	14 mm
Weight	U 24,9 Kg/m <sup>2</sup> ; T 26 Kg/m <sup>2</sup>
Inactive area	Nominally 10 mm from the safety mat ramp rail
Switching force	Nominally 150 N (Round body 80 mm)
Max. Pressure	2000 N over Ø 80 mm
Material	Black polyurethane
Protection class	IP65
Electrical capacity	24 V, 100 mA
Switching cycles	min. 1 Mio. (B <sub>10D</sub> : 2 000 000) Tested according to EN 13856-1
<b>Response time</b>	
Including Sentry	< 20 ms
Including Pluto (single Pluto)	< 30 ms
Including Pluto incl. Pluto bus	Normal condition: < 40 ms At fault condition: < 70 ms
Ambient air temperature	-10 °C to +55 °C
<b>Chemical resistance</b>	
Oil, grease	Good
Fuel	Resistant
Solvent	Sufficient
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	>1.0 x 10 <sup>6</sup> Load shifting

Standard compliance and approvals		
European Directives	2006/42/EC 2014/30/EU 2011/65/EU 2015/863	
Applied harmonized standards, Machinery Directive	EN ISO 13856-3:2013 EN ISO 13849-1:2015, PLd/Cat 4* EN 62061:2005+A1:2013, SIL CL 2	
* According to EN ISO 13849-2:2012, Table D.8, a fault exclusion for that the contacts in a pressure sensitive device will not close, can be made. This fault exclusion is limited up to PLd.		
Other applied standards		
Electrical safety	EN 60204-1:2006+A1:2009	
Electromagnetic compatibility	EN 61326-1:2008	
Approvals		
	TÜV Nord cULus	
Information for use in USA/Canada		
Intended use	Applications according to NFPA79	
Mounting		
Cabinet	The safety control unit shall be mounted in a cabinet with IP rating of at least IP54	
Maximum cable length	Sentry Pluto	25 m 100 m
Max no. of safety mats/evaluation unit	Sentry Pluto	10 N/A (see “Max safety mat area”)
Max safety mat area/evaluation unit	Sentry Pluto	2.5 m <sup>2</sup> 2 m <sup>2</sup>

## 6 Declarations of conformity

### 6.1 Sentry



#### EC Declaration of conformity

(according to 2006/42/EC, Annex 2A)

We ABB Electrification Sweden AB  
SE-721 61 Västerås  
Sweden declare that the safety components of ABB Electrification  
Sweden AB manufacture with type designations and safety  
functions as listed below, is in conformity with the Directives  
2006/42/EC – Machinery  
2014/30/EU – EMC  
2011/65/EU – RoHS II + 2015/863

Authorised to compile the technical file ABB Electrification Sweden AB  
SE-721 61 Västerås  
Sweden

#### Product

Safety mat ASK  
together with  
Safety relay Sentry  
USR10, USR22

#### EC type-examination certificate

44 205 16135519

Notified Body TÜV Nord CERT GmbH  
Langemarckstrasse 20  
45141 Essen  
Germany  
Notified Body No. 0044

Used harmonized standards EN ISO 12100:2010, EN ISO 13856-1:2013, EN ISO 13849-1:2015,  
EN 62061:2005+A2:2015, EN 60204-1:2006+A1:2009,  
EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007

Other used standards EN 61508:2010


A handwritten signature in black ink, reading 'Alessandro Pelandi'.

Alessandro Pelandi  
R&D Manager  
Västerås 2023-10-18



## Declaration of conformity

(according to 2008 No 1597)

We	ABB Electrification Sweden AB SE-721 61 Västerås Sweden	declare that the safety components of ABB Electrification Sweden AB manufacture with type designations and safety functions as listed below, is in conformity with UK Statutory Instruments (and their amendments)
		2008 No 1597 – Supply of Machinery (Safety) Regulations (MD) 2016 No. 1091 – Electromagnetic Compatibility Regulations (EMC) 2012 No 3032 – Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations (RoHS)
Authorized representative		ABB Limited Tower Court Coventry CV6 5NX United Kingdom
Authorised to compile the technical file		ABB Limited Tower Court Coventry CV6 5NX United Kingdom
<b><u>Product</u></b>		
	Safety mat ASK together with Safety relay Sentry USR10, USR22	
Used designated standards		EN ISO 12100:2010, EN ISO 13856-1:2013, EN ISO 13849-1:2015, EN 62061:2005+A2:2015, EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007
Other used standards		EN 61508:2010
		
	Magnus Backman R&D Manager Västerås 2021-09-20	

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## 6.2 Pluto



### EC Declaration of conformity

(according to 2006/42/EC, Annex 2A)

We ABB Electrification Sweden AB  
SE-721 61 Västerås  
Sweden declare that the safety components of ABB Electrification  
Sweden AB manufacture with type designations and safety  
functions as listed below, is in conformity with the Directives  
2006/42/EC – Machinery  
2014/30/EU – EMC  
2011/65/EU – RoHS II + 2015/863

Authorised to compile the technical  
file ABB Electrification Sweden AB  
SE-721 61 Västerås  
Sweden

#### Product

Safety mat ASK  
together with  
Safety PLC Pluto  
A20, B20, S20, D20, B22, D45,  
B46, S46, AS-i, B42 AS-i, O2

#### EC type-examination certificate

44 205 16135521

Notified Body TÜV Nord CERT GmbH  
Langemarckstrasse 20  
45141 Essen  
Germany  
Notified Body No. 0044

Used harmonized standards EN ISO 12100:2010, EN ISO 13856-1:2013, EN ISO 13849-1:2015,  
EN 62061:2005+A2:2015, EN 60204-1:2006+A1:2009,  
EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007

Other used standards EN 61508:2010

Alessandro Pelandi  
R&D Manager  
Västerås 2023-10-18

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[new.abb.com/low-voltage/products/safety-products](http://new.abb.com/low-voltage/products/safety-products)

Original



## Declaration of conformity

(according to 2008 No 1597)

We ABB Electrification Sweden AB  
SE-721 61 Västerås  
Sweden

declare that the safety components of ABB Electrification Sweden AB manufacture with type designations and safety functions as listed below, is in conformity with UK Statutory Instruments (and their amendments)

2008 No 1597 – Supply of Machinery (Safety) Regulations (MD)  
2016 No. 1091 – Electromagnetic Compatibility Regulations (EMC)  
2012 No 3032 – Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations (RoHS)

Authorized representative

ABB Limited  
Tower Court  
Coventry  
CV6 5NX  
United Kingdom

Authorised to compile the technical file

ABB Ltd.  
Tower Court  
Coventry  
CV6 5NX  
United Kingdom

### Product

Safety mat ASK  
together with  
Safety PLC Pluto  
A20, B20, S20, D20, B22, D45, B46,  
S46, AS-i, B42 AS-i, O2

Used designated standards

EN ISO 12100:2010, EN ISO 13856-1:2013, EN ISO 13849-1:2015,  
EN 62061:2005+A2:2015, EN 60204-1:2006+A1:2009,  
EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007

Other used standards

EN 61508:2010

Magnus Backman  
R&D Manager  
Västerås 2021-09-17

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