

Original instructions

# Eden AS-i

## Proximity safety sensor



## Read and understand this document

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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

### Scope

The purpose of these instructions is to describe the non-contact safety sensor Eden AS-i and to provide the necessary information required for installation and operation.

### Audience

This document is intended for authorized installation personnel.


### Prerequisites

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

- Basic knowledge of ABB Jokab Safety products.
- Knowledge of the AS-i system.
- Knowledge of machine safety.

### Special notes

Pay attention to the following special notes in the document:

 **Warning!** Danger of severe personal injury!  
An instruction or procedure which, if not carried out correctly, may result in injury to the technician or other personnel.

**Caution!** Danger of damage to the equipment!  
An instruction or procedure which, if not carried out correctly, may damage the equipment.

NB: Notes are used to provide important or explanatory information.

## 2 Overview

### General description

Eden AS-i is a non-contact safety sensor consisting of two separate devices – Adam and Eva – for use on interlocked gates, hatches etc. The sensing distance between Adam and Eva is 0-15 mm +/- 2 mm.

### Safety regulations

#### **Warning!**

Carefully read through this entire manual before using the device.

The devices shall be installed by a trained electrician following the Safety regulations, standards and the Machine directive.

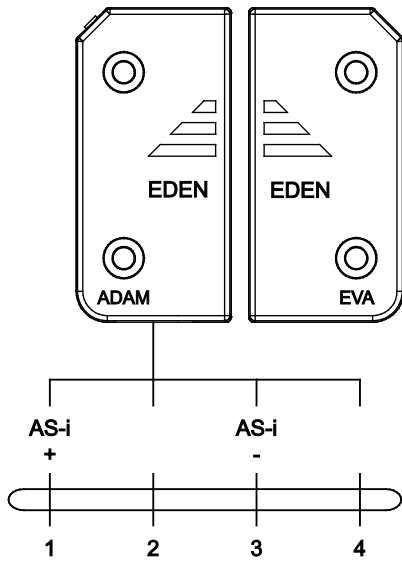
Failure to comply with instructions, operation that is not in accordance with the use prescribed in these instructions, improper installation or handling of the device can affect the safety of people and the plant.

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.

In case of failure to comply with the instructions or standards, especially when tampering with and/or modifying the product, any liability is excluded.

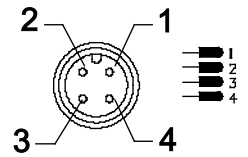
### 3 Connections

#### Eden AS-i electrical connections



**M12-connector:**  
(4-pole male)

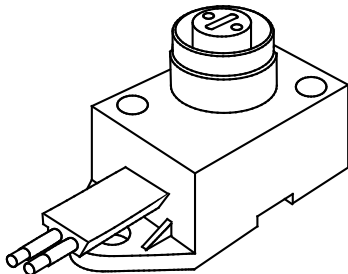
- 1 ) Brown: AS-i +
- 2 ) White: Not connected
- 3 ) Blue: AS-i -
- 4 ) Black: Not connected



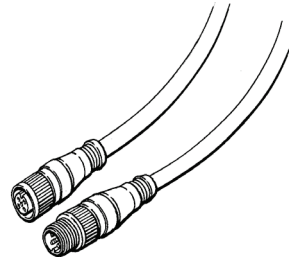
Eden M12-connector,  
from cable side

#### Accessories for connection to the AS-i bus

Type	Article number	Description
AS-i T-connector with M12	2TLA020073R0000	Flat cable connector to M12
M12-C112	2TLA020056R2000	1 m cable, 5-pole, 0.34 mm <sup>2</sup> , M12 female + male
M12-C312	2TLA020056R2100	3 m cable, 5-pole, 0.34 mm <sup>2</sup> , M12 female + male



Flat cable connector to M12  
Article number:  
2TLA020073R0000



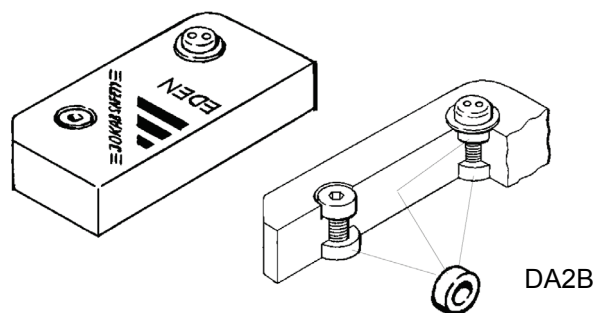
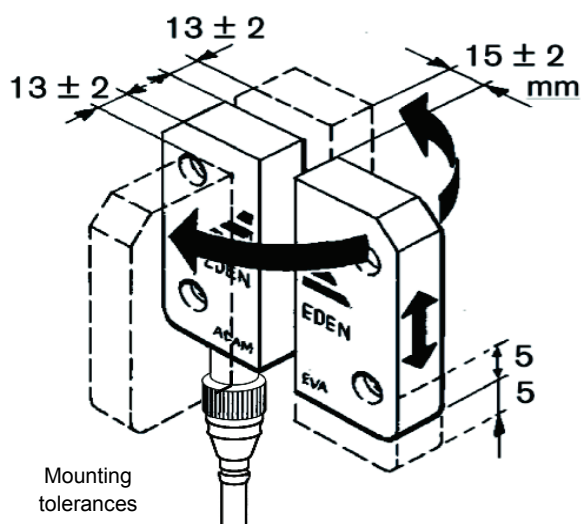
5 x 0.34 mm<sup>2</sup> cable, screen with straight female + male M12 connectors.  
Screen connected to pin 3 on male connector.  
Article number: 2TLA020056R2000 (1 m), 2TLA020056R2100 (3 m)

## 4 Installation and maintenance

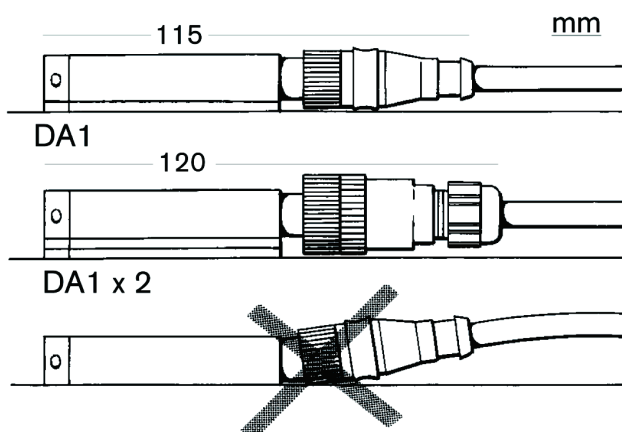
Eva can be turned in a number of different ways relative Adam, see details in the figure below. Depending on the cable connector used to connect to Eden, different distance plates can be necessary in order to avoid damage to Adam. The protection plates (DA1) supplied with Adam M12-models connector are recommended for this, see figure below. Also, the mounting spacers supplied must be used in order to physically protect Eden from damage.

Use two M4-screws to fasten each sensor. Safety screw SM4x20 are recommended. Use max tightening torque 2 Nm. Lock screw with Loctite or similar if necessary to prevent easy dismounting (refer to risk assessment).

### Eden installation



The DA2B mounting spacer **must be** used in order to physically protect Eden from damage.



Mounting with one protection plate (DA1) for Adam M12 using prewired moulded M12 connector

Mounting with two protection plates (DA1) for Adam M12 using M12 connector with glanded cable.

Wrong mounting without protection plate may cause permanent damage to sensor.

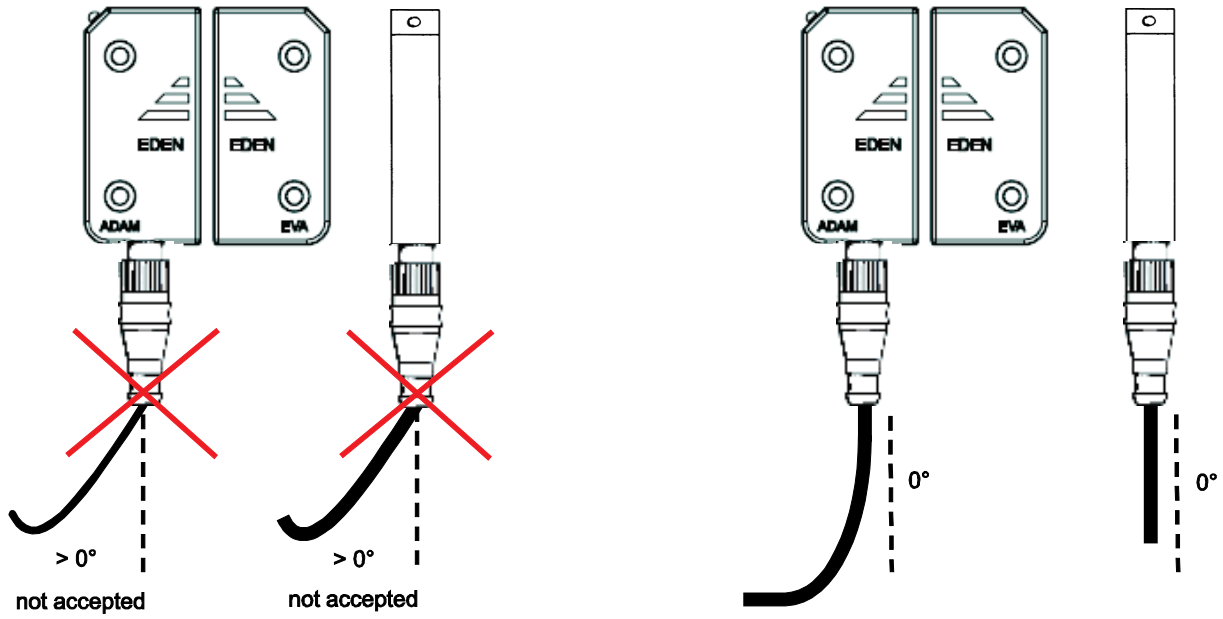
Sensing distance between Adam and Eva:

0-15 mm +/- 2 mm

Minimum distance between two Eden pairs:

100 mm

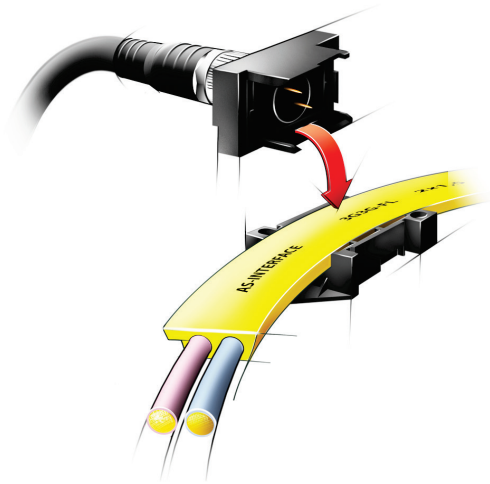
## Cable mounting



The cable should be mounted so there is no force on Adam sensor in any directions. The cable should be fixed if it's connected to a moving object, for example a cable chain or a door. This can be done with for example two cable clamps.

An improperly installed cable can damage the sensor.

## Connection to the AS-i bus



Eden AS-i is supplied with 30 VDC from the AS-i bus.

Recommended connection to the AS-i bus is through a flat cable connector to M12 (see figure to the left), making it possible to quickly and easily connect Eden AS-i to the yellow AS-i cable.

The unit can also be connected directly to the AS-i bus using only two cables (pin-1 and 3 of the M12-connector on the unit, refer to "Connections" above).



## Minimum safety distance

When using interlocking guards without guard locking to safeguard a hazard zone, the minimum allowed safety distance between the guarded opening and the hazardous machine must be calculated. In order to ensure that the hazardous machine motion will be stopped before it can be reached, the minimum safety distance is calculated according to EN ISO 13855 ("Positioning of safeguards with respect to the approach speeds of parts of the human body").

The minimum safety distance is calculated according to the formula:

$$S = (K \times T) + C$$

Where

**S** = minimum safety distance (mm)

**K** = approach speed of a human body; 1600 mm/s


**T** = the total time from opening of the guard until the hazardous machine movement has stopped, i.e. including control system reaction times and other delays (s)

**C** = a safety distance taken from Table 4 or Table 5 of EN ISO 13857:2008, if it is possible to push fingers or a hand through the opening towards the hazard before a stop signal is generated


NB: In some cases, T might be reduced by the opening time of the guard until the opening size permits access of the relevant parts of the body. Refer to EN ISO 13855 for further details and EN ISO 13857 for specified values.


## Installation precautions

- Note that the sensing distance can change with different metals.
- The Eden AS-i can be mounted on metal, but should not be surrounded.
- The  $S_{ar}$  distance should be used in calculations.
- Control that Adam and Eva are aligned in parallel to each other.
- The cable to Adam should be U-shaped if the units are mounted in wet areas.

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

## Maintenance

 **Warning!** The safety functions and the mechanics shall be tested regularly, at least once every year to confirm that all the safety functions are working properly (EN 62061:2005).

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

### Installation of a new Eva AS-i

If necessary, it is possible to install a new Eva AS-i. Such an installation requires that all remaining slaves of the bus are in function and connected.

1. Disconnect the Adam AS-i from the bus.
2. Set the node address for actual Adam AS-i to 0, using an external tool.
3. Place Adam and the new Eva AS-i together.
4. Follow the AS-i master and the monitor procedure for changing security slave.  
See below for an extract from Pluto AS-i manual.

### Change of Safety slaves after take in use

1. The system allows exchange of a safety slave without any tool for modification of the PLC program or other setup.
2. The requirement is that all slaves, except the one that shall be replaced, are working and connected to the AS-i bus. It is also necessary that the IDFIX is of type "IDFIX-DATA" or "IDFIX-PROG".
3. The procedure is following:
4. Press "K" button for 2 seconds.
5. If one safety slave is missing the display flashes "CC" -> "[slave number]".
6. Press the "K" button one more time to acknowledge and the display will show steady "CC".
7. The new safety slave can now be connected and the display will show "CF" (Code found).
8. By pressing "K" a last time, Pluto will automatically store the new code and reboot.

## 5 Operation

### LED indication

The LED indication can be set to either function automatically according to the table below, but it can also be manually controlled through data bit settings when programming Pluto.

#### Parameter bit settings (p<sub>3</sub>, p<sub>2</sub>, p<sub>1</sub>, p<sub>0</sub>)

LED	Setting (hex)	Setting (binary)	Description
LED on Adam	F	1,1,1,1	Automatic LED indication
	E	1,1,1,0	Manually programmed LED indication
	All other	All other	Not to be used

#### Manual LED indication – data bit settings (b<sub>3</sub>, b<sub>2</sub>, b<sub>1</sub>, b<sub>0</sub>)

LED	Setting (hex)	Setting (binary)	Description
LED on Adam	1	0,0,0,1	LED lights red
	2	0,0,1,0	LED lights green
	All other	All other	LED OFF

#### Automatic LED indication (parameter bit setting = 1,1,1,1)

LED	Indication	Description
LED on Adam	Green	Eva within sensing distance
	Green and/or Red (fast flash) or both lights at the same time	Eva within ~2 mm of maximum sensing distance
	Red	Eva not within sensing distance

#### LED indication (independent of manual or automatic control)

LED	Indication	Description
LED on Adam	Green-Red (flash)	No contact with AS-i master or not in project
	Red (flash)	Internal fault. Power cycle, replace if still present

NB: The signal used for automatic LED indication is not the same as the safe AS-i signal, i.e. there is a possibility that the LED on Adam will light green even though the Pluto master does not evaluate the signal as Eva being within sensing distance of Adam. This may e.g. occur when a different Eva (with a different AS-i safety code) is placed within sensing distance of Adam.

#### AS-i LED and Fault LED in combination

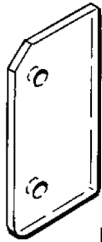
AS-i (green)	Fault (red)	Description
OFF	OFF	AS-i power missing
ON	OFF	Normal operation
OFF	ON	No data exchange with master
Flash	ON	No data exchange because address = 0

## 6 Model overview

Type	Article number	Description
Adam AS-i	2TLA020051R6000	Adam AS-i M12-connector, 4 DA1
Eva AS-i	2TLA020051R8000	Eva AS-i

### Accessories

Type	Article number	Description
DA 1	2TLA020053R0000	Protection plate
DA 2B	2TLA020053R0300	Mounting spacer
-	2TLA020053R4200	Safety screw SM4 x 20, for mounting Adam and Eva
-	2TLA020053R5000	Safety screwdriver bit SBITS



Protection plate (DA1)



Safety screws and  
screwdriver bit

## 7 Technical data

### Manufacturer

Address	ABB JOKAB SAFETY Varlabergsvägen 11 S-434 91 Kungsbacka Sweden
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### AS-i data

AS-i profile	S-7.B.E
Slave address at delivery	0
Addressing	M12-connector
Response time over AS-i bus	10ms

### Power supply

Operating voltage	30 VDC, AS-i bus. Tolerance 26.5 – 31.6 VDC
Total current consumption	70 mA

### General

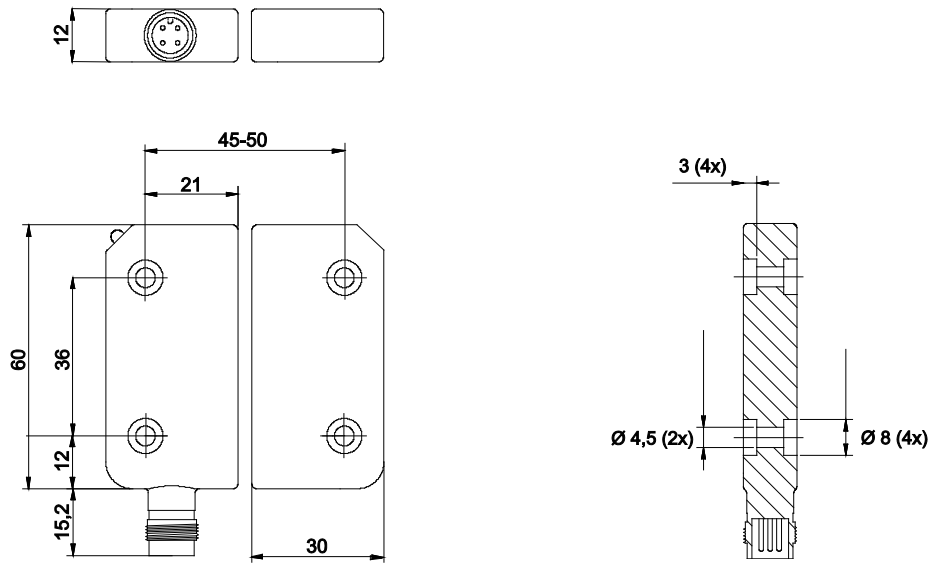
Protection class	IP69K
Ambient temperature	Storage: -40...+85°C Operation: -25...+55°C
Humidity range	35 to 85 % (with no icing or condensation)
Material	Housing: Polybutylene terephthalate (PBT) Moulding: Epoxy
Connector	M12 4-pole male (only pin-1 and pin-3 used)
Size	See drawings below
Weight	~150 g
Colour	Yellow, black text
Detection distance (Hysteresis 1-2 mm)	15 +/- 2 mm
Assured release distance (Sar)	45 mm
Assured operating distance (Sao)	7.5 mm

### Safety / Harmonized Standards

Approved standards	European Machinery Directive 2006/42/EG EN ISO 12100-1:2003+A1:2009, EN ISO 12100-2:2003+A1:2009, EN 954-1:1996/EN ISO 13849-1:2008, EN 62061:2005, EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007, EN 60947-5-1:2003+A1:2009, EN 1088+A2:2008
IEC/EN 61508-1...7	SIL3, PFH <sub>d</sub> : 6.0 * 10 <sup>-10</sup>
EN 62061	SIL3
EN ISO 13849-1	Performance level: Pl e, category 4
Certificates	TUV Nord

## Dimensions

### Eden AS-i dimensions



NB: All measurements in millimetres.

### CAD model

- 1) Visit [www.jokabsafety.com](http://www.jokabsafety.com).
- 2) Choose language **English** in the menu at the top of the page.
- 3) In the menu to the left, choose **Products**.
- 4) A list of products is now shown. Choose **3D CAD files**. This will open a new window called "Jokab Safety AB – SolidComponents".
- 5) In the new window there is a menu to the left, showing different product categories. Eden belongs to the category **Sensors/switches**, find it in the list and click it. If the language changed in the new window, click the corresponding flag at the top of the page to choose language again (Swedish, English or German available).
- 6) Choose **Eden** in the list of Sensors/switches.
- 7) Choose a preferred format in the scroll down list next to "CAD-format" (SolidWorks, ProE, Sat, Step, Parasolid, Iges, Dwg, Dxf).
- 8) Click the **save icon** in front of the desired product ("Adam", "Eva", etc).
- 9) The product will now be added to the list of downloads. Click the **save icon** again in the new list to start the download.

## 8 EC Declaration of conformity



### EC Declaration of conformity

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

We	ABB AB JOKAB Safety Varlabergsgatan 11 SE-434 39 Kungsbacka Sweden	declare that the safety components of ABB AB manufacture with type designations and safety functions as listed below, is in conformity with the Directives 2006/42/EC 2004/108/EC
Authorised to compile the technical file	ABB AB JOKAB Safety Varlabergsgatan 11 SE-434 39 Kungsbacka Sweden	
<b>Product</b>	<b>Certificate</b>	
Non-contact safety sensor Eden AS-i	44 12 799 393737-000	
Certification Body	TÜV NORD CERT GmbH Langemarckstrasse 20 45141 Essen Germany	
Used harmonized standards	EN ISO 12100:2010, EN ISO 13849-1:2008, EN 62061:2005, EN 60204-1:2006+A1:2009, EN 60664-1:2007, EN 61000-6-2:2005, EN 61000-6-4:2007, EN 60947-5-1:2003+A1:2009, EN 1088+A2:2008	
Other used standards	EN 61508:2010	
		
Jesper Kristensson PRU Manager Kungsbacka 2012-07-02		

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