Original instructions

Eden AS-i
Proximity safety sensor
Read and understand this document

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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.

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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

<table>
<thead>
<tr>
<th>Type</th>
<th>Article number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS-i T-connector with M12</td>
<td>2TLA020073R0000</td>
<td>Flat cable connector to M12</td>
</tr>
<tr>
<td>M12-C112</td>
<td>2TLA020056R2000</td>
<td>1 m cable, 5-pole, 0.34 mm², M12 female + male</td>
</tr>
<tr>
<td>M12-C312</td>
<td>2TLA020056R2100</td>
<td>3 m cable, 5-pole, 0.34 mm², M12 female + male</td>
</tr>
</tbody>
</table>

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
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

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 \( S_{\text{min}} \) 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 \((p_3, p_2, p_1, p_0)\)

<table>
<thead>
<tr>
<th>LED on Adam</th>
<th>Setting (hex)</th>
<th>Setting (binary)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED on Adam</td>
<td>F</td>
<td>1,1,1,1</td>
<td>Automatic LED indication</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>1,1,1,0</td>
<td>Manually programmed LED indication</td>
</tr>
<tr>
<td></td>
<td>All other</td>
<td>All other</td>
<td>Not to be used</td>
</tr>
</tbody>
</table>

Manual LED indication – data bit settings \((b_3, b_2, b_1, b_0)\)

<table>
<thead>
<tr>
<th>LED on Adam</th>
<th>Setting (hex)</th>
<th>Setting (binary)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED on Adam</td>
<td>1</td>
<td>0,0,0,1</td>
<td>LED lights red</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0,0,1,0</td>
<td>LED lights green</td>
</tr>
<tr>
<td></td>
<td>All other</td>
<td>All other</td>
<td>LED OFF</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>LED on Adam</th>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED on Adam</td>
<td>Green</td>
<td>Eva within sensing distance</td>
</tr>
<tr>
<td></td>
<td>Green and/or Red (fast flash)</td>
<td>Eva within ~2 mm of maximum sensing distance</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Eva not within sensing distance</td>
</tr>
</tbody>
</table>

LED indication (independent of manual or automatic control)

<table>
<thead>
<tr>
<th>LED on Adam</th>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED on Adam</td>
<td>Green-Red (flash)</td>
<td>No contact with AS-i master or not in project</td>
</tr>
<tr>
<td></td>
<td>Red (flash)</td>
<td>Internal fault. Power cycle, replace if still present</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>AS-i (green)</th>
<th>Fault (red)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>AS-i power missing</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Normal operation</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>No data exchange with master</td>
</tr>
<tr>
<td>Flash</td>
<td>ON</td>
<td>No data exchange because address = 0</td>
</tr>
</tbody>
</table>
## Model overview

<table>
<thead>
<tr>
<th>Type</th>
<th>Article number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adam AS-i</td>
<td>2TLA020051R6000</td>
<td>Adam AS-i M12-connector, 4 DA1</td>
</tr>
<tr>
<td>Eva AS-i</td>
<td>2TLA020051R8000</td>
<td>Eva AS-i</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Article number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA 1</td>
<td>2TLA020053R0000</td>
<td>Protection plate</td>
</tr>
<tr>
<td>DA 2B</td>
<td>2TLA020053R0300</td>
<td>Mounting spacer</td>
</tr>
<tr>
<td>-</td>
<td>2TLA020053R4200</td>
<td>Safety screw SM4 x 20, for mounting Adam and Eva</td>
</tr>
<tr>
<td>-</td>
<td>2TLA020053R5000</td>
<td>Safety screwdriver bit SBITS</td>
</tr>
</tbody>
</table>

![Protection plate (DA1)](image1.png)

![Safety screws and screwdriver bit](image2.png)
# Technical data

## Manufacturer

<table>
<thead>
<tr>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB JOKAB SAFETY</td>
</tr>
<tr>
<td>Varlabergsvägen 11</td>
</tr>
<tr>
<td>S-434 91 Kungsbacka</td>
</tr>
<tr>
<td>Sweden</td>
</tr>
</tbody>
</table>

## AS-i data

<table>
<thead>
<tr>
<th>AS-i profile</th>
<th>S-7.B.E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slave address at delivery</td>
<td>0</td>
</tr>
<tr>
<td>Addressing</td>
<td>M12-connector</td>
</tr>
<tr>
<td>Response time over AS-i bus</td>
<td>10ms</td>
</tr>
</tbody>
</table>

## Power supply

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

## General

<table>
<thead>
<tr>
<th>Protection class</th>
<th>IP69K</th>
</tr>
</thead>
</table>
| 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            |

<table>
<thead>
<tr>
<th>Detection distance (Hysteresis 1-2 mm)</th>
<th>15 +/- 2 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assured release distance (Sar)</td>
<td>45 mm</td>
</tr>
<tr>
<td>Assured operating distance (Sao)</td>
<td>7.5 mm</td>
</tr>
</tbody>
</table>

## Safety / Harmonized Standards

<table>
<thead>
<tr>
<th>Approved standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Machinery Directive 2006/42/EG</td>
</tr>
<tr>
<td>IEC/EN 61508-1…7 SIL3, PFH$_d$: 6.0 * 10^-10</td>
</tr>
<tr>
<td>EN 62061 SIL3</td>
</tr>
<tr>
<td>EN ISO 13849-1 Performance level: Pl e, category 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Certificates</th>
</tr>
</thead>
<tbody>
<tr>
<td>TUV Nord</td>
</tr>
</tbody>
</table>
Dimensions

Eden AS-i dimensions

NB: All measurements in millimetres.

**CAD model**


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

Product
Non-contact safety sensor
Eden AS-i

Certificate
44 12 799 393737-000

Certification Body
TÜV NORD CERT GmbH
Langemarckstrasse 20
45141 Essen
Germany

Used harmonized standards

Other used standards
EN 61508:2010

Jesper Kristensson
PRU Manager
Kungsbacka 2012-07-02

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www.jokabsafety.com

Original