Original instructions

Smile 41AS-i

Push-button box with / without safe AS-i input slaves
Read and understand this document

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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.

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1 Introduction

Scope
The purpose of these instructions is to describe the push-button box Smile 41 AS-i (with variants Smile 41 WWWWN AS-i, Smile 41 EWWW A AS-i and Smile 41 EKWWA AS-i), and to provide the necessary information required for installation, operation, checks and adjustment after installation and maintenance. Unless other stated, the information given applies to all variants of Smile 41 AS-i.

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:

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

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

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

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.

After installation or after changes in existing equipment all safety functions must be tested and verified before the equipment is used.
2 Overview

General description
Smile 41 AS-i is a push-button box with various possibilities to control the protection surrounding a machine, for instance to allow start, stop and reset when a protective device has been activated.

Function Description
Smile 41 AS-i is available in different variants:

- **Smile 41 WWWWN AS-i:** Pushbutton box with one non-safe AS-i node (N = Standard addressing).
- **Smile 41 EWWWA AS-i:** Emergency stop pushbutton box with one non-safe and one safe AS-i node. (A = Extended addressing).
- **Smile 41 EKWWA AS-i:** Emergency stop pushbutton box with safe key selector
  One non-safe and two safe AS-i nodes. (A = Extended addressing)

⚠️ **Warning!** The emergency stop push-button must only be used in emergency situations, not as a normal stop signal.
Description of the different nodes

Non-safe node

All push-button boxes have a non-safe node to control illuminated push-buttons. If a illuminated push-button is replaced by another component. The corresponding bit below should not be used.

<table>
<thead>
<tr>
<th>Node</th>
<th>Bit</th>
<th>Bit value</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bit 1</td>
<td>0</td>
<td>Contact 1 open&lt;br&gt;</td>
</tr>
<tr>
<td>1</td>
<td>Bit 2</td>
<td>0</td>
<td>Contact 2 open&lt;br&gt;</td>
</tr>
<tr>
<td>1</td>
<td>Bit 3</td>
<td>0</td>
<td>Contact 3 open&lt;br&gt;</td>
</tr>
<tr>
<td>1</td>
<td>Bit 4</td>
<td>0</td>
<td>Contact 4 open&lt;br&gt;</td>
</tr>
</tbody>
</table>

Safe nodes

The push-button boxes can also be equipped with one or two safe nodes, for safety related functions (emergency stop, safe key selector etc).

<table>
<thead>
<tr>
<th>Node</th>
<th>Bit</th>
<th>Bit value</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>open</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>closed</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>open</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>closed</td>
</tr>
</tbody>
</table>

The AS-i bus and the safety around it is specified by the two organizations “AS-International Association” and “AS-Interface Safety at Work”, and is described in the publication “AS-Interface The Automatic Solution”.

⚠️ Warning! All variants of Smile 41 AS-i normally needs to be complemented with other safety functions such as interlocking guards etc. Refer to risk analysis.

NB: The emergency stop (Smile 41EWWWA AS-i and 41EKWWA AS-i) should not be used as normal stop of the machine, only in case of emergency.
3 Connections

Electrical connections

4-pole M12 connector:
1) AS-i +
2) Not used
3) AS-i –
4) Not used

Accessories for connection to the AS-i bus

<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 + M12 male connectors</td>
</tr>
<tr>
<td>M12-C312</td>
<td>2TLA020056R2100</td>
<td>3 m cable, 5-pole, 0.34 mm², M12 female + M12 male connectors</td>
</tr>
</tbody>
</table>

5 x 0.34 mm² cable, screen with straight female and male M12 connectors. Screen connected to pin 3 (0 VDC) on male connector.
4 Installation and maintenance

Smile 41 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 the unit to the yellow AS-i cable.

Smile 41 AS-i 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).

Installation precautions

Mount Smile 41 AS-i using two M5 bolts before attaching the M12-connector. Tightening torque: 2 Nm.

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

Assembly of colored filters

To illustrate the different functions of the push-buttons, colored filters can be pressed over the original push-buttons as shown below. A kit with five filters in different colors are delivered with the unit.

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.

⚠️ 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 sheet are not implemented. These requirements form part of the product warranty.
5 Operation

Emergency stop

Push the emergency stop button. An actuating force of 22 ± 4 N is required, and the actuator travel is approximately 4 mm to latch. Pull the button until the button is unlatched.

Key switch

The selector switch is safely activated when it is in the right position. The key can be taken out in both left and right position.

NOTE: The keys for the selector switch is not individual coded.

LED indication

LED-indication is programmed individually in the PLC-programed according to the table below, depending on variant.

LED indication on non-safe node:

<table>
<thead>
<tr>
<th>Node</th>
<th>Bit</th>
<th>Bit value</th>
<th>LED status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>LED 1 off</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>LED 1 on</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>0</td>
<td>LED 2 off</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>LED 2 on</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>0</td>
<td>LED 3 off</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>LED 3 on</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>0</td>
<td>LED 4 off</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>LED 4 on</td>
</tr>
</tbody>
</table>

LED indication on safe nodes:

Led Indication is programmed individually per function and per safe node in the PLC-program according to the table below. The status of a push-button can be indicated by a central LED. If bit 1 and bit 2 both are set to 1 the LED will be “off”. A key selector can be indicated by one LED to the right and one to the left. The picture illustrates the position of the LEDs on a unit with both emergency stop and key selector. In this case they have on safe node each.

<table>
<thead>
<tr>
<th>bit</th>
<th>Bit value</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>Central LED off</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Central LED on, red</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>Central LED off</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Central LED on, green</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>Left LED off</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Left LED on</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>Right LED off</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Right LED on</td>
</tr>
</tbody>
</table>
AS-i LED and Fault LED in combination / LED pairs:

<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>

Position of AS-i LEDs:
1. Safe node 1
2. Safe node 2
3. Non-safe node

Re-addressing
If two nodes in the same Smile 41 have been given the same address they can be re-addressed.

The push-button box is opened as shown below. A node is shut off when the jumper is removed. The arrow shows the jumpers. Only one node may be active during re-addressing (only one jumper connected). When done, put back all jumpers and assemble the box again. Test and verify the functions.
## 6 Model overview

<table>
<thead>
<tr>
<th>Type</th>
<th>Article number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smile 41 WWWWN AS-i</td>
<td>2TLA030056R0000</td>
<td>Push-button box</td>
</tr>
<tr>
<td>Smile 41 EWWWA AS-i</td>
<td>2TLA030056R0100</td>
<td>Push-button box with emergency stop</td>
</tr>
<tr>
<td>Smile 41 EKWWA AS-i</td>
<td>2TLA030056R0200</td>
<td>Push-button box with emergency stop and key selector</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Article number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key for key selector (spare part)</td>
<td>2TLA030059R1500</td>
<td>Key for key selector (spare part)</td>
</tr>
<tr>
<td>Kit of colour filters</td>
<td>2TLA030059R2600</td>
<td>Blue, green, red, white, yellow</td>
</tr>
</tbody>
</table>

### Dimensions

- **Key Dimensions**
  - Width: 260 mm
  - Height: 71 mm
  - Depth: 60 mm

- **Keyhole Dimensions**
  - Diameter: 33.5 mm

- **Thread Dimensions**
  - Diameter: M5 (2X)
  - Length: 11 mm

**NB:** All measurements in millimeter.
# Technical data

## Manufacturer

| Address: | ABB JOKAB SAFETY  
Varlabergsvägen 11  
454 39 Kungsbacka  
Sweden |

## AS-i data

| AS-i profile | For safe node: S-7.B.0  
For non-safe node XXXXA: S-7.A.0  
For non-safe node XXXXN: S-7.0 |
| Addressing | M12-connector |
| Node address at delivery | Non-safe node: 0  
Safe node 1: 31  
Safe node 2: 30 |
| Response time over AS-i bus | 5 ms (+ response time of safety monitor) |

## Power supply

| Operating voltage | 30 VDC, AS-i bus. Tolerance 26.5 – 31.6 VDC. |
| Total current consumption | Safe node 1: 80 mA  
Safe node 2: 80 mA  
Non-safe node: 150 mA |

## General

| Degree of protection | IP65 |
| Ambient temperature | -25…+50°C |
| Size (HxLxW) | 70.5 x 40 x 260 mm  
(+13.5 mm M12 connector) |
| Weight | 0.19 kg |
| Color | Box: Yellow  
Emergency stop: Red  
Illuminated push-button (without color filter): White  
Key selector: Grey |

## Emergency stop

| Actuating force | 22 ± 4 N |
| Actuator travel | Approx. 4 mm to latch |
| Mechanical life | > 50 000 operations |
| B10d | 65 000 operations |
| Emergency stop: | 7 ± 3 N |
| Illuminated push-button: | ± 45° |
| Key selector: | 1.3 Nm max |

## Illuminated push-button: 1000000

## Key selector: 30000
For the North American market (UL)

Enclosure

Type 1

Cable assemblies

Must comply with CYJV/7. Cord provided shall be 24 AWG (0.2mm²) minimum

Power source

The limited voltage source must comply with:

a) The maximum open circuit voltage potential available to the circuit shall not be more than 42.4 V peak;

b) All external circuit interconnecting cable cables shall be protected against burnout and damage to the insulation resulting from any overload or short circuit condition per the following table, based on the cable conductor size.

<table>
<thead>
<tr>
<th>Conductor size</th>
<th>Maximum ampere ratings of the overcurrent protection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWG (mm)</td>
<td>Ampere.</td>
</tr>
<tr>
<td>22 (0.32)</td>
<td>3</td>
</tr>
<tr>
<td>20 (0.52)</td>
<td>5</td>
</tr>
<tr>
<td>18 (0.82)</td>
<td>7</td>
</tr>
<tr>
<td>16 (1.3)</td>
<td>10</td>
</tr>
<tr>
<td>14 (2.1)</td>
<td>20</td>
</tr>
<tr>
<td>12 (3.3)</td>
<td>50</td>
</tr>
</tbody>
</table>

Safety / Harmonized Standards

Conformity

European Machinery Directive 2006/42/EC
EMC 2014/30/EU
RoHS 2011/65/EU
EN 61000-6-4:2011, EN ISO 13850:2015,
EN 60947-5-5:2005, EN 61508:2010

IEC/EN 61508-1…7 SIL3, PFD_{avg}: 2.95*10⁻⁸, PFH_{D}: 6.95*10⁻⁹
EN 62061 SIL3
EN ISO 13849-1 Performance level: PL e, category 4
MTTF_{D}: High
EN 60947-5-1 & -5 For E-stop button / safety stop button
EN ISO 13850:2008 For E-stop button / safety stop button
Certification cULus
8 EC Declaration of conformity

EC Declaration of conformity
(according to 2006/42/EC, Annex II A)

We, ABB AB
JOKAB SAFETY
Varlabergsvägen 11
SE-434 39 Kungsbacka
Sweden

declare that the safety components of ABB AB make 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

Authorised to compile the technical file
ABB AB
JOKAB SAFETY
Varlabergsvägen 11
SE-434 39 Kungsbacka
Sweden

Product
Control box with emergency stop device
Smile41 AS-i, versions
EXXY
EXXY

Used harmonized standards
EN 61000-6-4:2011, EN ISO 13850:2015

Other used standards
EN 60947-5-5:2005, EN 61508:2010

Tobias Gentzell
R&D Manager
Kungsbacka 2019-02-12

www.abb.com/jokabsafety

Original

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