Emergency stops
and safety stops
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Why do you need an Emergency stop?

So that anyone shall be able to stop a machine during a machine break-down or if someone is in danger.

How do I recognise an E-stop?

E-stop buttons shall according to relevant standards be red with a yellow background. An emergency stop grab wire shall be red for high visibility. A sign that indicates the location of the E-stop shall be green with a white picture and possibly with text in the local country’s language.

How shall an E-stop stop the machine?

An E-stop shall stop the machine as quickly as possible. To obtain a quick stop one either removes the power directly or one lets a frequency converter ‘run down’ and afterwards after a little delay, remove the power. An E-stop shall not create other hazards. Therefore a risk analysis must be made for the E-stop to be correctly connected.

Requirements for E-stops are stated in the following standards and regulations

2006/42/EC The Machinery Directive
Clause 1.2.4.3 in Annex 1 gives requirements for the emergency stop function for new machines). See also clause 1.2.2 Control devices. (see chapter “Standard and Regulations”)

Council Directive 89/655/EEC (with amendments) concerning the minimum safety and health requirements for the use of work equipment by workers at work
Clause 2.4 gives the requirements for the emergency stop function for older machines. See also clause 2.1. (see chapter “Standard and Regulations”)

EN ISO 13850 Safety of machinery – Emergency stop — Principles for design
A harmonized standard that gives technical specifications for the requirements in the Machinery Directive. Could also be used for older machinery.

EN 60204-1 Safety of Machinery - Electrical equipment of machines – Part 1: General requirements.
Harmonized standard that gives requirements for the electrical equipment of machinery including the emergency stop actuator/function. Se clauses 9.2.2 and 9.2.5.4.2.

From 2006/42/EC, clause 1.2.4.3

... This device must:
- have clearly identifiable, clearly visible and quickly accessible control devices,
- stop the hazardous process as quickly as possible, without creating additional risks,
- where necessary, trigger or permit the triggering of certain safeguard movements.

...
Emergency stop for enclosure installation

INCA 1

INCA 1 is an emergency stop designed for installation in 22.5 mm holes on cabinets. "INCA 1" has potential free contacts for connection to safety relays. The connection is made in cabinets via a removable terminal which also have excellent measuring points. Inca 1 is also available with a black pushbutton and used as a safety stop. See section on safety stops.

In the emergency stop button there is a LED that displays current status on:
- Green = everything ok
- Red = this emergency push button has been pressed
- Off = a unit earlier in the circuit is affected

Yellow front ring and emergency stop signs for emergency stop.
INCA 1 Tina is an emergency stop designed for installation in 22.5 mm holes in equipment cabinets. In addition to the INCA 1 version, "INCA 1 Tina" is also available with electronic adjustment of the dynamic safety loop for connection to the Vital and Pluto units. The connection is made in equipment cabinets via a removable terminal block which also has marked measuring points. Inca 1 Tina is also available with black push button and is used in this case as a safety stop. See section on safety stops.

The emergency stop button has a LED that displays the current status:
- Green = everything is OK
- Red = this emergency stop has been pressed.
- Flashing red/green = a protection device earlier in the loop has been actuated.

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**INCA 1 Tina**

Yellow front ring and emergency stop signs for emergency stop.
Technical data - INCA 1/INCA 1 Tina

Manufacturer: ABB AB/Jokab Safety, Sweden

Article no./Ordering data:
INCA 1 2TLJ030054R0100
INCA 1 Tina 2TLJ030054R0000

Impact resistance (half sinusoidal) Max. 150 m/s², pulse width 11 ms, 3-axis, acc. to EN IEC 60068-2-27

Vibration resistance (sinusoidal) Max. 50 m/s² at 10 Hz... 500 Hz, 10 cycles, 3-axis, acc. to EN IEC 60068-2-6

Climate resistance
Damp heat, cyclical 96 hours, +25 °C / 97%, +55 °C / 93% relative humidity, as per EN IEC 60068-2-30
Damp heat, sustained 56 days, +40 °C / 93% relative humidity, as per EN IEC 60068-2-27
Dry heat 96 hours, +70 °C, as per EN IEC 60068-2-2
Cooling 96 hours, +40 °C, as per EN IEC 60068-2-1
Salt mist 96 hours, +35 °C in a chemical solution with NaCl as per EN IEC 60068-2-11

Level of safety:
Cat. 4/PL e EN ISO 13849-1
Category 4 EN 954-1
SIL 3 EN 62061
SIL 3 IEC/EN 61508-1...7

PFH\textsuperscript{d}:
INCA 1 PFH\textsuperscript{d}: 1,60×10\textsuperscript{-10}
INCA 1 Tina: PFH\textsuperscript{d}: 4,66×10\textsuperscript{-9}

Colour: Yellow, red and black

Weight: Approx. 45 grams

Size: See drawing

Material: Polyamide PA66, Macromelt, Polybutyleneterephthalate PBT UL 94 V0

Temperature: -10°C to +55°C (operation), -30°C to +70°C (storage)

Enclosure classification
Print: IP 65, Connector: IP20

Installation: 22,5 mm

Emergency stop LEDs:
INCA 1: Green: Safety device OK. Not lit: A unit earlier in the circuit is affected. Red: This emergency stop has been pressed.
INCA 1 Tina: Green: Safety device OK, safety circuit OK. Flashing: Safety device OK, safety circuit previously broken. Red: This button is pressed in, and the safety circuit is broken.

Operating voltage (LED):
INCA 1: 24 VDC
INCA 1 Tina: 24VDC +15% -25%

Current consumption (LED):
INCA 1: 15 mA
INCA 1 Tina: 47 mA

Emergency stop button operating force:
Approx. 4 mm to locked position

Contact material: Gold-plated silver alloy

Minimum current:
INCA 1: 10 mA, 10 VDC/10 VAC
INCA 1 Tina: —

Maximum current:
INCA 1: 2 A 24 VDC, 1A 125 VAC
INCA 1 Tina: —

Mechanical life: > 50 000 operations

Standards:
EN 60204, EN 60947-5-1 & -5
EN ISO 13850

Accessories:
Front ring yellow for INCA Emergency stop sign S D F, 22,5mm
Emergency stop sign E FT, 22,5mm

Conformity:
2006/42/EG EN 954-1, EN ISO 13849-1, EN 62061, EN 60204-1, EN 61496-1, IEC 60664-1, EN 61000-6-2, EN 61000-6-4, EN 60947-5-1, EN 1088
Emergency stop with indication

Smile

Smile - small and cost effective E-stop

In order to fulfil the need for a small and easy to install E-stop, Smile has been developed. The size of the device makes it possible to be installed wherever you want. With M12 connection/s or cable and centralised mounting holes Smile is very easy to install, especially on aluminium extrusions. Smile is available for E-stops in both dynamic and static safety circuits i.e. for interfacing to Vital/Pluto and Safety relays. Each version is available with either one or two M12 connections or cable. At the top of Smile, a LED shows the current status as: green = protection OK, red = this emergency stop has been pressed and if the LED is off, an emergency stop earlier in the loop has been actuated. Smile is also available with black push button and is used as a safety stop. See section on safety stops.

Smile emergency stop has six different variants:
1. Smile 10EA has a 1 m cable connected through the base of the unit.
2. Smile 10EK has four 1 m short connecting leads through the base of the unit. No LED.
3. Smile 11EA has a five-pole M12 connector on one end of the unit.
4. Smile 12EA has two five-pole M12 connectors, one on each end of the unit.
5. Smile 11EAR has one 5-pole M12 connector at one end.
6. Smile 12EAR has two 5-pole M12 connectors at each end.

Approvals:
- CE
- Indepacta

Application:
To stop a machine or a process

Features:
- Emergency push button up to cat. 4/PL e acc. to EN ISO 13849-1
- With LED info in push button
- Robust
- Push button IP 65, housing IP67
- Available as safety stop (black push button)
Connection examples – Smile

**Smile 10EA** can be connected to either Pluto or a safety relay. *Single channel* example with LED indication. Safety category 1. The connection cable exits from underneath the unit.

![Diagram of Smile 10EA Connection](image1)

**Smile 11EA** can be connected to either Pluto or a safety relay. *Single channel* example with LED indication. Safety category 1. Connection via M12 connector.

![Diagram of Smile 11EA Connection](image2)

**Smile 12EA** can be connected to either Pluto or a safety relay. *Single channel* example with LED indication. Safety category 1. Connection via M12 connector + termination connector.

![Diagram of Smile 12EA Connection](image3)

**Smile 12EA** can be connected to either Pluto or a safety relay. *Two channel* serial connection example with LED indication. Safety circuit category 3. Connection via M12 connectors. Connection is made here without a termination device for Smile 12EA (C), this unit is reconnected to the Pluto/safety relay via a separate cable. You can also use JST2 as a termination device after Smile 12EA (C).

![Diagram of Smile 12EA Serial Connection](image4)
Connection examples – Smile

Smile 12EA and 11EA can be connected to either Pluto or safety relay. Two channel example with LED indication. Safety circuit category 3. Connection via M12 connectors. Note that there is no termination connector as the Smile 11EA (C) completes the circuit without the need for a termination connector (JST2) or return cable.

<table>
<thead>
<tr>
<th>E-Stop Button status</th>
<th>LED Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>A R R C</td>
<td>A G G G</td>
</tr>
<tr>
<td>R R D D</td>
<td>R G G Rd B</td>
</tr>
<tr>
<td>R D R D</td>
<td>Rd G Rd B</td>
</tr>
<tr>
<td>D R R D</td>
<td>Rd B B</td>
</tr>
<tr>
<td>D D D D</td>
<td>Rd B B</td>
</tr>
</tbody>
</table>

The table shows the LED indication status of the E-Stop buttons from the example shown in above example.

A = Smile 12EA  
B = Smile 12EA  
C = Smile 11EA  
D = Released  
R = Released  
G = Green light from the top of the button  
Rd = Red light from the top of the button  
B = Blank, no light

Smile 10EA/11EA/12EA are like any other emergency stops when 0V to the LED indication is not connected. This means that any suitable Safety PLC or safety relay can be used. If the LED indication is used, the voltage between Pin 1(+) and Pin 3 (-) should be between 19.2 – 28.8 VDC. The following examples show connections to Safety PLC and Safety relay.

Single channel PLC connection

Two channel Safety relay connection

The cable is connected to Smile 10EA via the lid at the back.
1. Input 1  
2. Input 2  
3. 0 VDC (to be connected only if LED indication is required)  
4. Output 2  
5. Output 1

The leads are connected to Smile 10EK via the lid at the back. No LED connection.
1. Input 1  
2. Input 2  
3. 0 VDC (to be connected only if LED indication is required)  
4. Output 2, feedback  
5. Output 1, feedback
### Technical data – Smile

**Manufacturer:** ABB AB/Jokab Safety, Sweden

<table>
<thead>
<tr>
<th>Article number/ordering data:</th>
<th>2TLJ030051R0400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smile 10EA with 1 m cable</td>
<td>2TLJ030051R0600</td>
</tr>
<tr>
<td>Smile 10EK with short</td>
<td>2TLJ030051R0000</td>
</tr>
<tr>
<td>connecting leads</td>
<td>2TLJ030051R0200</td>
</tr>
<tr>
<td>(No LED connection)</td>
<td>2TLJ030051R0100</td>
</tr>
<tr>
<td>Smile 11EA with M12 male</td>
<td>2TLJ030051R0300</td>
</tr>
<tr>
<td>connector</td>
<td>2TLJ030051R1300</td>
</tr>
<tr>
<td>Smile 12EA with male and</td>
<td></td>
</tr>
<tr>
<td>female M12 connectors</td>
<td></td>
</tr>
<tr>
<td>Smile 11EAR</td>
<td></td>
</tr>
<tr>
<td>Smile 12EAR</td>
<td></td>
</tr>
<tr>
<td>JST2 termination for Smile 12.</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** There are versions for dynamic technology (with Tina).

**Impact resistance** (half sinusoidal) max. 150 m/s², pulse width 11 ms, 3-axis, as per EN IEC 60068-2-27

**Vibration resistance** (sinusoidal) max. 50 m/s² at 10 Hz, 10 cycles, 3-axis, as per EN IEC 60068-2-6

**Climate resistance**

<table>
<thead>
<tr>
<th>Damp heat, cyclical</th>
<th>96 hours, +25 °C / 97%, +55 °C / 93 % relative humidity, as per EN IEC 60068-2-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damp heat, sustained</td>
<td>56 days, +40 °C / 93 % relative humidity, as per EN IEC 60068-2-78</td>
</tr>
<tr>
<td>Dry heat</td>
<td>96 hours, +70 °C, as per EN IEC 60068-2-2</td>
</tr>
<tr>
<td>Cooling</td>
<td>96 hours, -40 °C, as per EN IEC 60068-2-1</td>
</tr>
<tr>
<td>Salt mist</td>
<td>96 hours, +35 °C in a chemical solution with NaCl as per EN IEC 60068-2-11</td>
</tr>
</tbody>
</table>

**Level of safety:**

| IEC/EN 61508-1...7 | SIL 3 |

**PFH₄:** 1,60E-10

**Colour:** Yellow, red and black

**Weight:** Approx. 65 grams

**Size:**

| Length: 84 mm | Width: 40 mm |
| M12 contact(s) (12.5 mm each) | Height: 52 mm |

**Material:**

- Polyamide PA66, Macromelt, Polybutyleneterephthalate PBT, Polypropylene PP, UL 94 V0

**Ambient temperature:**

-10°C to +55°C (operation), -30°C to +70°C (stock)

**Protection class:** IP 65

**Mounting:** Two M5 recessed hexagon head screws, L ≥25 mm. Hole cc: 44 mm

**LED on E-Stop:**

- **Green:** Safety device ok, Safety circuit closed
- **Off:** Safety circuit broken (When an E-Stop is depressed all following units in the circuit lose the LED function).
- **Red:** Safety device actuator depressed and Safety circuit broken.

**Input voltage (LED):** 17-27 VDC ripple ±10% (LED supply voltage)

**Current consumption (LED):** 15 mA

**E-Stop button**

- **Actuating force:** 22 ± 4 N
- **Actuator travel:** Approx. 4 mm to latch

**Material, contacts:** Silver alloy gold plated

- **Min current:** 10 mA 10 VDC/ 10 VAC
- **Max current:** 2 A 24 VDC, 1 A 125 VAC
- **Life, mechanical:** > 50 000 operationer

**Accessories:**

| Emergency stop button S D F, 32,5mm | 2TLJ030054R0700 |
| Emergency stop button E F T, 32,5mm | 2TLJ030054R0800 |

**Conformity:**

- EN ISO 13850, EN 60204, EN 60947-5-1 & -5

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Sign for emergency stop

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Emergency stop with indication

Smile Tina

Smile Tina - small and cost effective E-stop

In order to fulfil the need for a small and easy to install E-stop, Smile has been developed. The size of the device makes it possible to be installed wherever you want. With M12 connections or cable and centralised mounting holes Smile is very easy to install, especially on aluminium extrusions. Smile is available for E-stops in both dynamic and static safety circuits i.e. for interfacing to Vital system/Pluto safety PLC and Safety relays. Each version is available with either one or two M12 connections or cable. Two M12 connectors are used to enable the connection of E-stops in series, which is often used with dynamic safety circuits fulfilling safety category 4. In the top of the Smile Tina E-stop unit, LEDs show the actual status according to the dynamic system:
- Green = everything is OK, Red = E-stop activated.
- Flashing Red/Green = Stop activated from another preceding device. Smile is also available with black push button and used as a safety stop. See section on safety stops.

The Smile Tina emergency stop is available in four versions:
1. Smile 10EA Tina has a 1 m cable connected via the base of the unit.
2. Smile 11EA Tina has a five-pole M12 connector on the end of the unit for connecting the ABB Jokab Safety cable.
3. Smile 12EA Tina has two five-pole M12 connectors, one on each end of the unit for connecting the ABB Jokab Safety cable.
4. Smile 11EAR Tina has one 5-pole M12 connector at one end for connection of cable from ABB Jokab Safety.

Approvals:

Application:

To stop a machine or a process

Features:

- Emergency push button up to cat. 4/PL e acc. to EN ISO 13849-1
- Light grids, emergency stop and Eden in the same safety loop together with Vital or Pluto gives cat. 4/PL e acc. to EN ISO 13849-1
- With LED indication on push button
- Robust
- Info-signal from each emergency stop
- Push button IP 65, housing IP67
- Available as safety stop (black push button)
Connection examples – Smile Tina

Smile 10EA Tina can be connected to either a Pluto or Vital system. Safety circuit category 4 with LED indication/information. The connection cable exits from underneath the unit.

Smile 11EA Tina can be connected to either a Pluto or Vital system. Safety circuit category 4 with LED indication/information. Connection via M12 connectors. The circuit below shows three Smile 11EA Tina units connected in series via connection terminals in the electrical cabinet.

Smile 11EA Tina can be connected to either a Pluto or Vital system. Safety circuit category 4 with LED indication/information. Connection via M12 connectors. The circuit below shows three Smile 11EA Tina units and one Eden connected in series via a Tina 4A connection block.

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Connection examples – Smile Tina

**E-Stop Button status** | **Information output signal**
---|---
| A | B | C | A | B | C |
| R | R | R | ← | H | H | H |
| R | R | D | ← | H | H | L |
| R | R | R | ← | H | L | H |
| R | D | R | ← | L | H | L |
| D | R | R | ← | L | H | H |
| D | D | R | ← | L | L | H |
| D | D | D | ← | L | L | L |

The table shows the information output signal status from each of the Smile 11EA Tina units in the previous connection examples.

In the example showing connection with an Eden sensor, the Eden status information signal acts in the same way as the Smile Tina 11EA units. The status information signal can be connected to e.g. PLC input.

**Note.** The information signal must not be used as a safety signal. The signal should only be used to indicate the status of connected devices.

A = Smile 11 EA Tina  
B = Smile 11 EA Tina  
C = Smile 11 EA Tina  
D = Depressed  
H = High (i.e. supply voltage)  
L = Low (= 0 VDC)  
R = Released

**Smile 12EA** can be connected to either a Pluto or Vital system. Safety circuit category 4 with LED indication/information. Connection via M12 connectors. The last Smile 12 EA Tina unit feeds the dynamic signal back to the Pluto/Vital.

![Connection Diagram](image)

**E-Stop Button status** | **LED Indication**
---|---
| A | B | C | A | B | C |
| R | R | R | ← | G | G | G |
| R | R | D | ← | G | G | Rd |
| R | D | R | ← | G | Rd | F |
| R | D | D | ← | G | Rd | Rd |
| D | R | R | ← | Rd | F | F |
| D | R | D | ← | Rd | F | Rd |
| D | D | D | ← | Rd | Rd | Rd |

The table shows the LED indication status of the E-Stop buttons in the previous connection examples, where three Smile 10 EA, Smile 11 EA or 12 EA Tina units are connected in series.

A = Smile 10/11/12 EA Tina  
B = Smile 10/11/12 EA Tina  
C = Smile 10/11/12 EA Tina  
D = Depressed  
Rd = Red light from the top of the button  
F = Flashes between green and red light

**Smile 12EA** can be connected to either a Pluto or Vital system. Safety circuit category 4 with LED indication/information. Connection via M12 connectors. The circuit shows two Smile 12EA Tina’s, one Eden sensor and one Focus Light Curtain connected in series.

![Connection Diagram](image)

**Smile 10EA Tina**

Brown 1  
White 2  
Blue 3  
Black 4  
Grey 5

The connection cable is connected to the Smile 10EA Tina unit via the back panel.

1. Input voltage, 17-27 VDC ripple +/- 10%
2. Dynamic input signal
3. 0 VDC
4. Dynamic output signal
5. Information output

**Smile 11EA Tina**

Brown 1  
White 2  
Blue 3  
Black 4  
Grey 5

1. Input voltage, 17-27 VDC ripple +/- 10%
2. Dynamic input signal
3. 0 VDC
4. Dynamic output signal
5. Information output

**Smile 12EA Tina**

Brown 1  
White 2  
Blue 3  
Black 4  
Grey 5

1. Output voltage to next unit
2. Dynamic output signal (To next Smile or to Pluto or Vital system)
3. 0 VDC
4. Not used
5. Information output

Brown 1  
White 2  
Blue 3  
Black 4  
Grey 5
**Technical data – Smile Tina**

| Manufacturer: | ABB AB/Jokab Safety, Sweden |
| Article number/ordering data: | |
| Smile 10EA Tina with 1 m connection cable | 2TLJ030050R0400 |
| Smile 11EA Tina with M12 male connector | 2TLJ030050R0000 |
| Smile 12EA Tina with male and female M12 connectors | 2TLJ030050R0200 |
| Smile 11EAR Tina | 2TLJ030050R0100 |

- **Impact resistance (half sinusoidal):** max. 150 m/s², pulse width 11 ms, 3-axis, as per EN IEC 60068-2-27
- **Vibration resistance (sinusoidal):** max. 50 m/s² at 10 Hz, 10 cycles, 3-axis, as per EN IEC 60068-2-6

**Climate resistance**

- **Damp heat, cyclical:** 96 hours, +25 °C / 97%, +55 °C / 93% relative humidity, as per EN IEC 60068-2-30
- **Damp heat, sustained:** 56 days, +40 °C / 93% relative humidity, as per EN IEC 60068-2-78
- **Dry heat:** 96 hours, +70 °C, as per EN IEC 60068-2-2
- **Cooling:** 96 hours, -40 °C, as per EN IEC 60068-2-1
- **Salt mist:** 96 hours, +35 °C in a chemical solution with NaCl as per EN IEC 60068-2-11

**Level of safety:**

- IEC/EN 61508-1...7
- SIL 3
- PFH₅: 4.66E-09
- Colour: Yellow, red and black
- Weight: Approx. 65 grams
- Size:
  - Length: 84 mm + M12 contact(s) (12.5mm each)
  - Width: 40 mm
  - Height: 52 mm
- Material:
  - Polyamid PA66, Macromelt
  - Polybutylenterephthalate PBT
  - Polypropylen PP, UL 94 V0
- Ambient temperature:
  - -10°C to +55°C (operation)
  - -30°C to +70°C (storage)
- Protection class:
  - IP 65
- Mounting:
  - Two M5 hexagon socket screws, L ≥25 mm.
  - Hole centres: 44 mm

**LED on E-Stop:**

- **Output state:** Green: Safety device OK, Safety circuit OK
- **Output state:** Flashing: Safety device OK, safety circuit broken.
- **Output state:** Red: Breaks in safety device and safety circuit

**Time delay:**

- 1:1:5 (Two Smile units are equal to three Edens in time delay)

**Input voltage:**

- 17-27 VDC ripple ±10%

**Current consumption:**

- 47 mA (57mA with max. current from information output)
- 47 mA max

**Current from information output:**

- 10 mA max

**E-Stop button Actuating force:**

- 22±4 N

**Actuator travel:**

- Approx. 4 mm to latch

**Material, contacts:**

- Silver alloy gold plated

**Life, mechanical:**

- > 50 000 operations

**Conformity:**

- EN ISO 13850
- EN 60204
- EN 60947-5-1 & -5

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![Sign for emergency stop](image)
Smile 11EA is an emergency stop with a built-in dual channel safe AS-i input node. The AS-i bus and the safety around it is specified by the two organisations “AS-International Association” and “AS-Interface Safety at Work”, and is described in publications such as “AS-Interface The Automatic Solution”.

Smile 11EA is supplied with 30 V DC from the AS-i bus. The recommended connection to the AS-i bus is made via a flat cable terminal to M12 (see Figure), which makes it possible to quickly and easily connect the device to the yellow AS-i cable.

Smile AS-i can also be connected directly to the AS-i bus using only two conductors (pins 1 and 3 on the unit’s M12 contact). Smile is also available with black push button and is used in this case as a safety stop. See section on safety stops.
Technical data – Smile AS-i

Manufacturer: ABB AB/Jokab Safety, Sweden

Article number/ordering data:
Smile 11EA AS-i 2TLJ030052R0000

AS-i data
AS-i profile S-7.B.0
Addressing M12-contact
Node address on delivery 0
Response time across the AS-i bus 5 ms (+ response time for safety monitor)

Pin configuration
(1) AS-i +
(2) Not used
(3) AS-i –
(4) Not used
(5) Not used

Voltage supply
Output voltage 30 V DC from the AS-i bus.
Total current consumption Tolerance 26.5 – 31.6 V DC. < 60 mA

General
Enclosure protection class IP65
Ambient temperature -25…+50°C
Dimensions 52 x 40 x 84 (+12,5 mm M12 contact) (H x B x D)
Colour Base: Yellow
Emergency stop button (Smile 11EA AS-i): Red
Safe stop button (Smile 11SA AS-i): Black
Actuating force 22 ±4 N
Actuating movement Ca 4 mm till lås
Mechanical life > 50 000 operationer

PFHs 6,95x10^-9

Safety/Harmonised standards
IEC/EN 61508-1..7 SIL3, PFDavr: 2,95x10^-5
EN 62061 SIL3
EN ISO 13849-1 Performance level PL e, Category 4, MTTFd: high
EN 60947-5-1 & -5 For emergency stop buttons/safety stop buttons
EN ISO 13850:2008 For emergency stop buttons/safety stop buttons
Certification TÜV Nord

Push button control panel

Smile 41xxxx-x with one AS-i node for four pushbuttons.
Smile 41Exxxx-x with one AS-i safety node for e-stop and one AS-i node for three pushbuttons.
Smile 41EKxxxx-x with two safety nodes (e-stop and mode selector) and one AS-i node for two pushbuttons.
Emergency stop Grab Wire Safety Switch

Stop-Line

Duplicated safety in both directions
Stop-Line is used for easy reach of an emergency stop along machines, conveyors and processes. Stop-Line is easier to install than a system of several emergency stop buttons along a carriage path. Stop-Line indicates operation status, reset or triggered mode. There is also indication of how taut the wire is.

Stop-Line can be used as protection for conveyors with low risks. The wire can, for example, be installed at waist height in front of the conveyor, which provides an emergency stop if someone falls towards the conveyor.

Stop-Line has four contacts. If someone pulls the wire or if the wire is broken, all the contacts are affected. In both cases, the machine is emergency-stopped. Just before the safety contacts are broken an indication is given since the wire may accidentally trigger the stop signal as a result of temperature differences.

To reset the Stop-Line the combined emergency- and reset button must be pulled out.

Forced Disconnected Contacts
The contacts of the Stop-Line are forced-disconnected. Forced disconnection means that the contacts are mechanically pulled apart, thus ensuring protection against contact welding or sticking.

Safety level
The forced disconnected contacts provide a high level of safety. To achieve a high level of safety in respect to the connection with the machine control system, it is appropriate to use a safety relay manufactured by ABB Jokab Safety. Stop-Line can be combined with Tina devices for use in a safety circuit containing other safety devices and emergency stops according to PL e.

Regulations and Standards
The Stop-Line is designed and approved in accordance with relevant standards. See technical data.

Features:
- Duplicate extraction in two directions
- Up to 75 m length
- Robust
- IP 67
- Integrated emergency stop button
- Warned before the safety circuit is broken

Approvals:
- CE
- BG
- U.S. BG

Application:
- Emergency stop Grab Wire Safety Switch along machines or conveyors

Emergency-stop Grab Wire easily accessible during normal work operation along a machine
The wire should be mounted at least 20 mm from the underlying surface. If the wire is longer than 25 m it must be supported with low friction supports. The ambient temperature during installation should be the same as during operation. For the Stop-Line type A, after installation, pull the wire strongly several times and then adjust the tension to compensate for any extensions due to deformation of the thimbles.
Contact Adjustment Stop-Line

The tension is adjusted using the built-in set screw until the arrowhead is aligned with the label in the window (see picture below). When the combined emergency- and reset button is then pulled making the status window show green, all contact pairs are in operational mode and the machine can be started.

Pulling the wire, or if the wire is broken, all the contact pairs shift position and the machine is stopped. Before doing so, an electronic warning signal is provided which can be used to alert an operator to compensate for slow variations of the tension in the Stop-Line wire. This is useful to avoid unnecessary stops caused by e.g. ambient temperature variations.

Tolerance: distance ± 0.5 mm, power ± 15%

- on (closed)
- off (open)
- for contacts 11-12

Electrical Connection Stop-Line

Electrical connection of Stop-Line, highest level of safety.

Connection terminal 1 and 3:
Connection of supply voltage 10-30V DC

Connection terminal 2 and 3:
Connection to signal circuit or lamp for indication

Note! The connection shows the Stop-Line in a correctly tensioned condition.
## Ordering data – Stop-Line accessories

<table>
<thead>
<tr>
<th>Installation kit 1</th>
<th>2TLJ020043R1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contents:</td>
<td></td>
</tr>
<tr>
<td>2TLJ020034R0500 x 25 Wire</td>
<td></td>
</tr>
<tr>
<td>2TLJ020034R0400 x 6 Wire clamp</td>
<td></td>
</tr>
<tr>
<td>2TLJ020034R0300 x 6 Thimble</td>
<td></td>
</tr>
<tr>
<td>2TLJ020034R0600 x 1 Turnbuckle</td>
<td></td>
</tr>
<tr>
<td>2TLJ020034R0900 x 8 Eye bolt M8x50</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installation kit 2</th>
<th>2TLJ020043R1300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contents:</td>
<td></td>
</tr>
<tr>
<td>2TLJ020034R0500 x 40 Wire</td>
<td></td>
</tr>
<tr>
<td>2TLJ020043R0100 x 1 Pull wire spring</td>
<td></td>
</tr>
<tr>
<td>2TLJ020043R0300 x 9 Pullay block</td>
<td></td>
</tr>
<tr>
<td>2TLJ020043R0600 x 9 Fastener for pulley block</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wire 3mm (sheath 4mm)</th>
<th>2TLJ020034R0500</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Wire clamp for 3mm</th>
<th>2TLJ020034R0400</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Thimble</th>
<th>2TLJ020034R0300</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Turnbuckle</th>
<th>2TLJ020034R0600</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Swivel</th>
<th>2TLJ020034R1300</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Eye bolt M6x50</th>
<th>2TLJ020034R0300</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Eye bolt M8x50</th>
<th>2TLJ020034R0900</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pull wire spring QF 75</th>
<th>2TLJ020043R0000</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pull wire spring QF 37</th>
<th>2TLJ020043R0100</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pulley block, unhinged</th>
<th>2TLJ020043R0300</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Fastener for pulley block</th>
<th>2TLJ020043R0600</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pulley block, hinged</th>
<th>2TLJ020043R0400</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Deflection pulley Ø 75mm</th>
<th>2TLJ020043R0200</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Nut M6</th>
<th>2TLJ020034R0100</th>
</tr>
</thead>
</table>
Safety stop

Inca and Smile

When should I use the safety stop?

Safety stops are used to stop the operation of a machine in a safe manner. It must not be used as an emergency stop, but only as a stop for an individual hazardous motion. This is indicated by black push button. Likewise, an emergency stop push button with red push button must not be used as a safety stop.

Inca for panel mounting
The Inca series is available with black push button and is called Inca 1S/Inca 1S Tina. The safety stop is identical to the corresponding emergency stop apart from the black push button. For technical data see the Inca emergency stop.

<table>
<thead>
<tr>
<th>Article number</th>
<th>Ordering data</th>
</tr>
</thead>
<tbody>
<tr>
<td>2TLJ030054R0300</td>
<td>INCA 1S</td>
</tr>
<tr>
<td>2TLJ030054R0200</td>
<td>INCA 1S Tina</td>
</tr>
</tbody>
</table>

Smile with indication
The Smile series is available with black push button and has a similar designation apart from an S in the name instead of E. The safety stops are identical to the corresponding emergency stops apart from the black push button. For technical data see the Smile emergency stop.

<table>
<thead>
<tr>
<th>Article number</th>
<th>Ordering data</th>
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<tbody>
<tr>
<td>2TLJ030051R0900</td>
<td>Smile 11 SA</td>
</tr>
<tr>
<td>2TLJ030051R1000</td>
<td>Smile 12 SA</td>
</tr>
<tr>
<td>2TLJ030051R1100</td>
<td>Smile 11 SAR</td>
</tr>
<tr>
<td>2TLJ030050R0500</td>
<td>Smile 11 SA Tina</td>
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<tr>
<td>2TLJ030050R0600</td>
<td>Smile 12 SA Tina</td>
</tr>
<tr>
<td>2TLJ030050R0700</td>
<td>Smile 11 SAR Tina</td>
</tr>
<tr>
<td>2TLJ030050R0800</td>
<td>Smile 12 SAR Tina</td>
</tr>
<tr>
<td>2TLJ030052R0100</td>
<td>Smile 11SA AS-i</td>
</tr>
</tbody>
</table>
Smile 11R

When do I need reset push button?

Smile 11RA/B are reset Push buttons intended to reset safety circuits. Smile 11RA has a connection for the NO-contact and for the LED in the PB. The reset LED is to be turned off after reset of the safety circuit. Smile 11RB is used together with our Pluto Safety PLC in order to reduce the number of terminals, one terminal is used as both input for the reset as well as output for the LED.

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**Technical data – Smile 11R**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>ABB AB/Jokab Safety, Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article number/ordering data</td>
<td></td>
</tr>
<tr>
<td>Smile 11RA</td>
<td>2TLJ030053R0000</td>
</tr>
<tr>
<td>Smile 11RB</td>
<td>2TLJ030053R0100</td>
</tr>
<tr>
<td>Colour</td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td>yellow</td>
</tr>
<tr>
<td>Pushbutton</td>
<td>blue</td>
</tr>
<tr>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>Polypropylene PP</td>
</tr>
<tr>
<td>Pushbutton contact</td>
<td>Au</td>
</tr>
<tr>
<td>Power Supply</td>
<td></td>
</tr>
<tr>
<td>LED operating voltage</td>
<td>24 VDC (maximum 33 VDC)</td>
</tr>
<tr>
<td>LED current consumption</td>
<td>20 mA at 24 VDC</td>
</tr>
<tr>
<td></td>
<td>30 mA at 33 VDC</td>
</tr>
<tr>
<td>Pushbutton operating voltage</td>
<td>Min: 5 V, max: 35 V</td>
</tr>
<tr>
<td>Pushbutton current consumption</td>
<td>Min: 1 MA, max 100 mA</td>
</tr>
<tr>
<td>Pushbutton rated power</td>
<td>Max: 250 mW</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-25...+55°C</td>
</tr>
<tr>
<td>Humidity range</td>
<td>35 to 85% (no icing or condensation)</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP65</td>
</tr>
<tr>
<td>Connectors</td>
<td>5-pole male M12 connector</td>
</tr>
<tr>
<td>Size</td>
<td>84x40x36 (LxWxH) + 12 mm M12 connector (L)</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 60 g</td>
</tr>
<tr>
<td>Mechanical life</td>
<td>1,000,000 operations at 10 mA/24 VDC</td>
</tr>
<tr>
<td>Switching reliability</td>
<td>$10 \times 10^{-6}$ at 5 mA/24 VDC</td>
</tr>
</tbody>
</table>