

Original instructions

Safeball JSTD1-G AS-i

One/two-hand enabling device with safe AS-i input node



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.

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1 Introduction

Scope

The purpose of these instructions is to describe the one hand device, how to set up a two hand device, 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

JSTD1-G AS-i is a one hand device with a built-in dual channel safe AS-i input slave. The device can also be used in pair to create a two hand device. 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 the publication “AS-Interface The Automatic Solution”.

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.

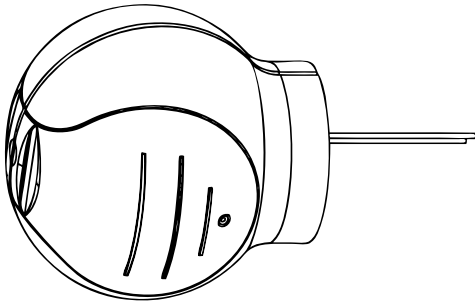
Failure to comply with instructions, operation that is not in accordance with the use prescribed in these instructions, improper installation or handling of the device can affect the safety of people and the plant.

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

Electrical connections – JSTD1-G AS-i

**Connector cables:**

Brown: AS-i +

Blue: AS-i -

4 Installation and maintenance

Electrical installation

JSTD1-G AS-i is connected to the AS-i bus using the two connection cables.

Mechanical installation

The Safeball is mounted using four M5 screws or ST4.8 self-tapping screws. If necessary, the connection cables can be taken out at the sides at the lower part of the Safeball. The two prepared outlets are provided for this purpose.

The distance between two Safeballs (for a two-hand device) or to the edge of a table or a wall depends on how the units are mounted. The minimum distances are given in the below sections.

NB: The Safeball can be mounted in many different ways; on a table or a machine, on a stand or wherever ergonomically suitable. It is also possible to mount the Safeball either in a fixed position or on a flexible mount such as a ball joint, allowing tilt and rotation for increased ergonomic support. Refer to the "Accessories" section below or the product list at www.abb.com/lowvoltage for details.

Installation precautions

Warning! Safeball must be installed with a minimum distance S to the dangerous machine movement. This distance is calculated using the following formula for Safeball according to approving agencies and EN 13855:

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

Where:

S = safe distance in mm

K = hand speed, 1600 mm/s

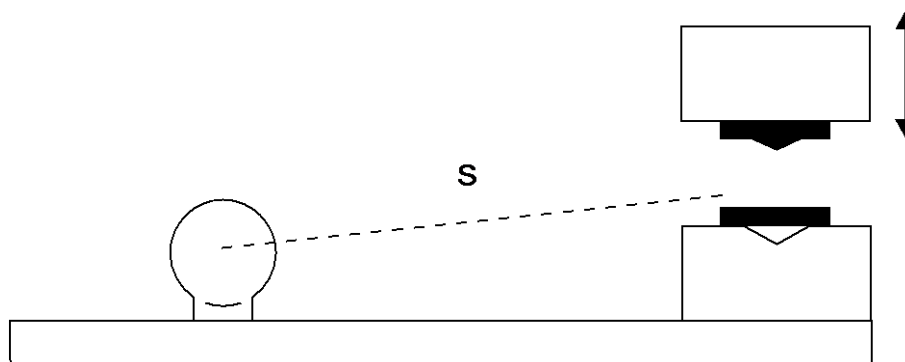
T = total stopping time for the dangerous movement, including the relay response time in seconds.

C = constant for possible encroachment while the actuators are operated.

Two-hand configuration: 0 mm

One-hand configuration: Must be calculated by installer, based on possible encroachment reach of operator to ensure sufficient minimum safety distance.

Warning! The minimum mounting distance must never be less than 100 mm. When mounting the Safeballs on aluminium profiles or similar, the fixing screws must be locked in order to prevent the safety distance between two Safeballs being easily changed.



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

Minimum mounting distances and requirements for two hand device

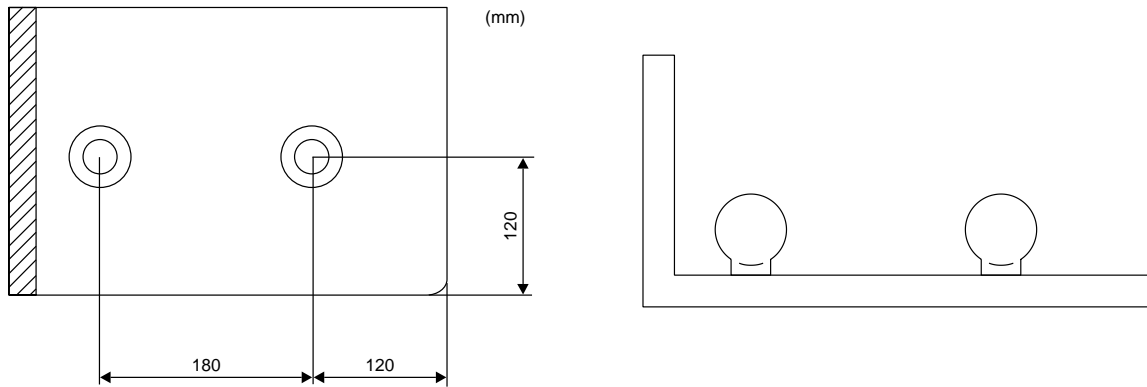
Warning! Follow the below instructions to avoid severe personal injury.

A Safeball must be mounted at a minimum distance to the edge of the mounting surface in order to prevent the system being defeated and the device being activated either intentionally or unintentionally with a part of the body other than the hands.

If the Safeball is mounted on e.g. a ball joint or any other solution where the Safeball can be moved, the distance to the closest wall must also be considered. This distance is determined by the mount, but the Safeball must never be able to reach the wall in any position.

To accomplish a two hand device type III C according to EN 574, the following additional requirements must be met:

- Two one-hand devices must be used and connected to the same safety monitor.
- The two devices must be mounted at a minimum distance between each other in order to prevent both of them being operated with one hand (see measurements in the figure below).

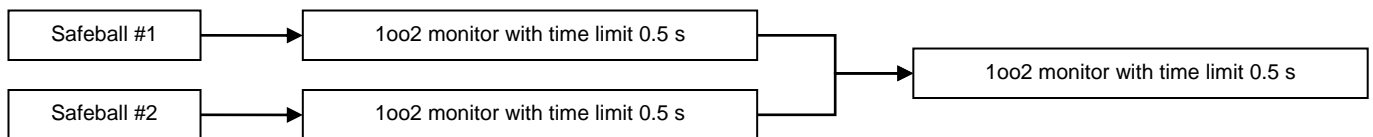


Minimum mounting distances

Warning! The minimum safety distance varies greatly as there are many ways to mount JSTD1 units. It is essential that mounting prevents the system being defeated either intentionally or unintentionally.

Two hand device function description

The safety monitor must be programmed / parameterized to monitor the simultaneous action of both the two channels in the devices and also the simultaneous action of the two devices. The maximum time between activation of the two channels in each device must be 0.5 seconds and the maximum time between activation of the two devices must also be 0.5 seconds.



Two hand device function description

Maintenance

Daily checks:

The function of the two-hand control system should be checked daily. Check that the safety relay is de-energized and the machine is stopped when one or more of the JSTD1 push buttons are released. Check that the covers over the JSTD1 switches are OK and that the push buttons have a distinct operating function.

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).

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.

Testing of the safety functions

This section describes testing when the Safeballs are used in a two-hand configuration. When used as one-hand hand device, testing is similar but simplified.

Make sure the safety unit is working properly by following these steps:

- 1) Push all four push buttons – the safety relay should activate, starting the machine.
- 2) Release all push buttons – the safety relay should de-energize stopping the machine.
- 3) Push all four push buttons again – the safety relay should activate, starting the machine.
- 4) Release one of the push buttons – the safety relay should de-energize, stopping the machine.
- 5) Push the released push button again – the safety relay should **not** re-energize and the machine should not start.
- 6) Release all push buttons.

Repeat sequence 3-6 for the three remaining push buttons.

- 7) Activate each push button in turn (in all possible combinations, see table to the right), the safety relay should **not** energize and the machine should not start.

Button	1	2	3	4
	x			
		x		
			x	
				x
	x	x		
	x		x	
	x			x
		x	x	
		x		x
			x	x
	x	x	x	
	x	x		x
	x		x	x
		x	x	x

Possible push button combinations

Check of simultaneousness:

Check the simultaneousness of the system by operating one of the push buttons for more than 0.5 seconds before activating the remaining push buttons. The machine should not be started. These checks should be repeated at least every year and after changes or maintenance on the machine. The stopping time should also be measured at least once each year.

5 Operation

One hand device

To activate a one hand device, both buttons on the Safeball must be pressed. Unlike a two-hand device, there is no minimum time requirement for activation of the two buttons. Instead, the safety distance is longer. Refer to section *Installation precautions* for further details. The safety monitor must send a “stop” signal as soon as one or more push buttons have been released, and check that all push buttons have been released before a new start is possible.

Two hand device

To activate a two-hand device, the two individual one-hand devices must be activated within 0.5 seconds of each other. To activate an individual one-hand device, both push buttons must be pressed within 0.5 seconds of each other. This must be set up in the safety monitor by the safety application programmer. The safety monitor must also send a “stop” signal as soon as one or more push buttons have been released, and check that all push buttons have been released before a new start is possible.

Limitations

A two-hand control system does not give any protection against parts or liquids which can be thrown out of a machine. If it is required to protect other persons in the same risk area, either each person at risk should be equipped with a further two-hand control system (suitably interlocked), or complementary protection should be provided, e.g. a light curtain.

LED indication

AS-i LED and Fault LED in combination

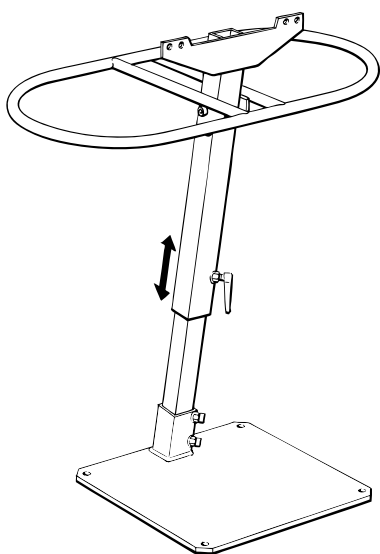
AS-i (Green)	Fault (Red)	Description
OFF	OFF	AS-i power missing
ON	OFF	Normal operation
ON	ON	No data exchange with master
Flash	ON	No data exchange because address = 0

6 Model overview

Type	Article number	Description
JSTD1-G AS-i	2TLA020007R3900	Safeball with built-in AS-i safe input slave. 2 x 0.25 m connection cables.

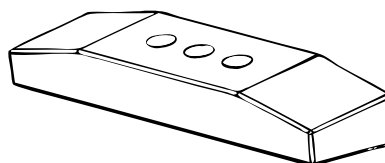
Accessories

Type	Article number	Description
JSM C5	2TLA020007R0900	Ball & socket table mount for Safeball
JSTD25C	2TLA020007R5200	Two-hand station without Safeballs or emergency stop push button
JSTS31	2TLA020007R4100	Floor stand including spacer ring



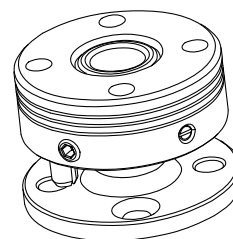
JSTS31
Floor stand including spacer ring.

Article number:
2TLA020007R4100



JSTD25C
Two-hand station without Safeballs or emergency stop push button.

Article number:
2TLA020007R5200



JSM C5
Ball & socket table mount for Safeball.

Article number:
2TLA020007R0900

A wide variety of mounts and other accessories are available; please refer to the product list at www.abb.com/lowvoltage.

7 Technical data

Manufacturer

Address	ABB AB / JOKAB SAFETY Varlabergsvägen 11 SE-434 39 Kungsbacka Sweden
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AS-i data

AS-i profile	S-0.B.0
Addressing	Through connection cables or after installation
Slave address at delivery	0
Response time over AS-i bus	5 ms (+ response time of safety monitor)

Power supply

Voltage	30 VDC, AS-i bus. Tolerance 26.5 – 31.6)
Total current consumption	< 50 mA

General

Degree of protection	IP65
Ambient temperature	-25...+50°C
Connector	2 x 0.25 m connection cables, 0.5 mm ² (brown + blue)
Size	Height: approx. 71mm Diameter, min. 68 mm Diameter, max. 72 mm Diameter, base 42 mm
Actuating force	Approx. 2 N
Actuator travel	1.3 ± 0.6 mm
Mechanical life	> 1*10 ⁶ operations at max 1Hz

Chemical resistance at 20°C

Alcohols	Good
Paraffin oil	Good
Milk	Good
Silicon oil	Good
Acetone	Good

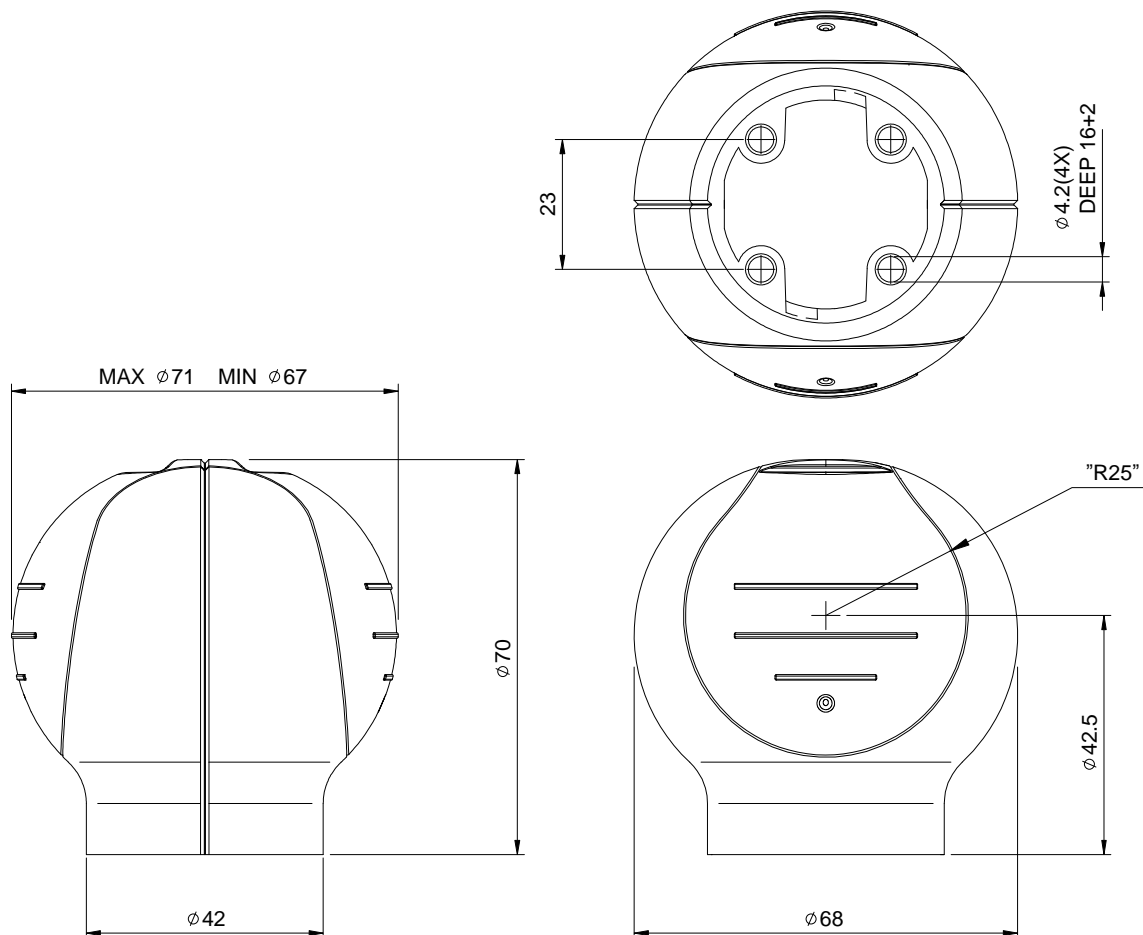
Please contact ABB/Jokab Safety for more information regarding other substances.

Safety / Harmonized Standards

Conformity	European Machinery Directive 2006/42/EC EN ISO 12100-1:2003, EN ISO 12100-2:2003, EN 574+A1:2008, EN 62061:2005, EN ISO 13849-1:2008, EN ISO 13849-2:2008
IEC/EN 61508-1..7	SIL3, $PFD_{avr}: 3,25 \cdot 10^{-5}$, $PFH_d: 7,55 \cdot 10^{-9}$
EN62061	SIL3
EN ISO 13849-1	Performance level PL e, Category 4, MTTF _d : high (if $n_{op} < 6.5 \cdot 10^5$)
EN 954-1	Category 4
EN 547	Appropriate for the design of two hand device type III C
Certifications	TÜV Nord

Dimensions

Safeball dimensions



8 EC Declaration of conformity



EC Declaration of conformity

(according to 2006/42/EC, Annex2A)

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

declare that the safety components of JOKAB SAFETY make with type designations and safety functions as listed below, is in conformity with the Directives
2006/42/EG
2004/108/EG

Authorised to compile the technical file

ABB AB
JOKAB Safety
Varlabergsvägen 11
SE-434 39 Kungsbacka
Sweden

Product

Two hand control device JSTD1-G AS-i,
Safeball

Certificate/Notified Body

10-SKM-CM-0112/0409

44 799 10 555631 000/0044

Notified Body

Inspecta Sweden AB
Box 30100
SE-104 25 Stockholm
Sweden
Notified body No. 0409

TÜV NORD CERT GmbH
Langemarkstrasse 20
45141 ESSEN
Germany
Notified body No. 0044

Used harmonized standards

EN ISO 12100-1:2010, EN 574+A1:2008, EN 62061:2005,
EN ISO 13849-1:2008, EN ISO 13849-2:2008

Jesper Kristensson
PRU Manager
Kungsbacka 2011-12-16

www.abb.com
www.jokabsafety.com

Original

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