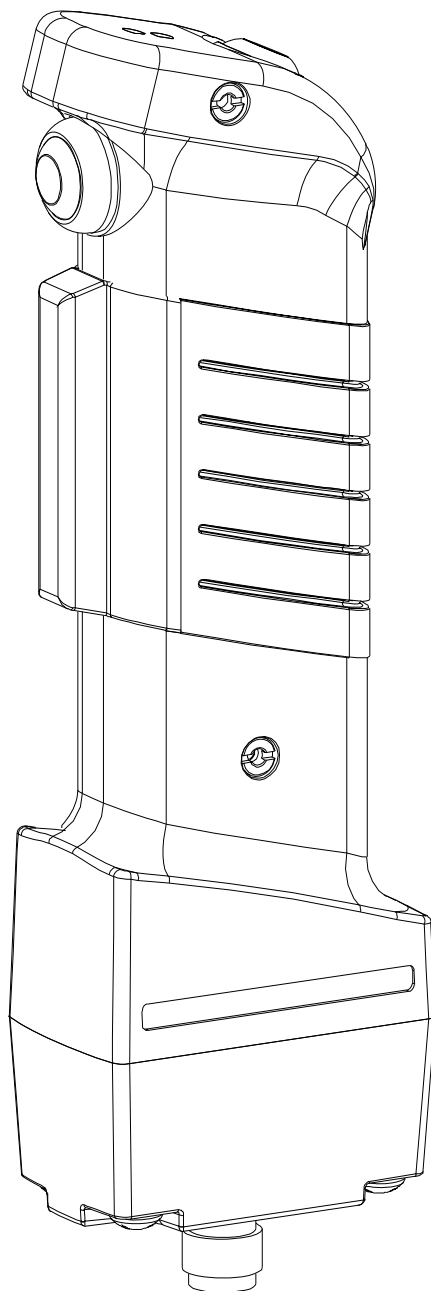


Original instructions

JSHD4

Three-position enabling device



Read and understand this document

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1 Introduction

Scope

The purpose of these instructions is to describe the three-position enabling device JSHD4 and to provide the necessary information required for assembly, installation and maintenance. The instructions also include information necessary to connect JSHD4 to a safety circuit. Note that JSHD4 can be connected to both safety relays in the RT-series and safety-PLC Pluto.

Specific AS-i data and other instructions for enabling devices with AS-i nodes are left out and can be found in the instructions manual for JSHD4 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 safety devices and safety circuits.
- 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


JSHD4 is a dual channel three-position enabling device, intended for use in hazardous areas where no other protection is possible or practical. The device as a stand-alone unit is not sufficient for this task and must be connected to a suitable control unit (safety relay or safety-PLC) with two channel inputs and short-circuit detection. Also, the machinery or equipment causing the potential danger may need to be set in jog-mode or by other means limited in movement, speed, temperature etc.

Two three-position push buttons operated by one common surface ensures a high level of safety, both when released and when pressed into the third and final position. The safety contacts are closed only in the middle position, but are opened if pressed further and remain open during the return to the top (resting) position.

The anti-tampering device consists of a capacitive sensor and an accelerometer. By combining these sensors the device can be used to determine if an operator is holding the enabling device. This can be used if there is any risk for tampering of the enabling device.

JSHD4 is based on a modular system that allows for a number of different versions of a complete enabling device to be created, using different top parts (handles) and bottom parts (with different cables and connectors, AS-i nodes, emergency stop, etc). There are also a number of accessories available, such as fittings for safety switches/sensors, anti-tampering electronics, cables and resting stations. For more information, see chapter *Model overview*.

For more details on JSHD4 operation, see chapter *Operation*.

 **Warning!** The anti-tampering device is not a safety function; the safety relies on the three-position button being operated as intended.

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.

Function description

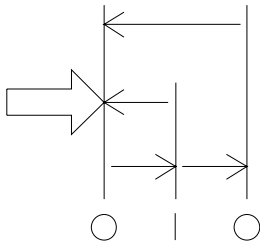
Three-position principle

A three-position enabling switch provides signals that:

- when activated, allows a machine or other equipment to be initiated by a separate start control, and
- when de-activated, initiate a stop function and prevent an initiation of machine/equipment operation.

A three-position switch can also be used as a hold-to-run device. Used as such a device, the machine may already be running and by putting the device in position 2 (ON) and removing it from a holder with position sensor, another guarding system (light curtain, door interlock switch etc) is muted and the restricted area can be entered without stopping the machine. Certain limitations in time, speed etc may be needed to ensure an acceptable safety level.

Two three-position switches are used and operated simultaneously, to provide a dual channel safety system.



The symbol for three-position switches illustrates the three positions (OFF, ON and OFF) with O and I, the pushing force from left to right, and the possible switching travels (IEC 60947-5-8:2006).

An important characteristic for a three-position switch is that when returning from position 3, the ON state is not reached – the contacts remain open.

The three positions are designated as follows:

- Position 1: OFF state of the contact (actuator is not pressed)
- Position 2: ON state of the contact (actuator is pressed to the normal enabling position)
- Position 3: OFF state of the contact (actuator is fully depressed).

When released, the actuator always returns to position 1, regardless of whether it was in position 2 or 3. During this return movement, the contact(s) remain open.

In addition to the three-position safety function, JS4D can be equipped other features such as push buttons for selectable functions (start, stop, gripping tool, etc), an emergency stop or an anti-tampering sensor.

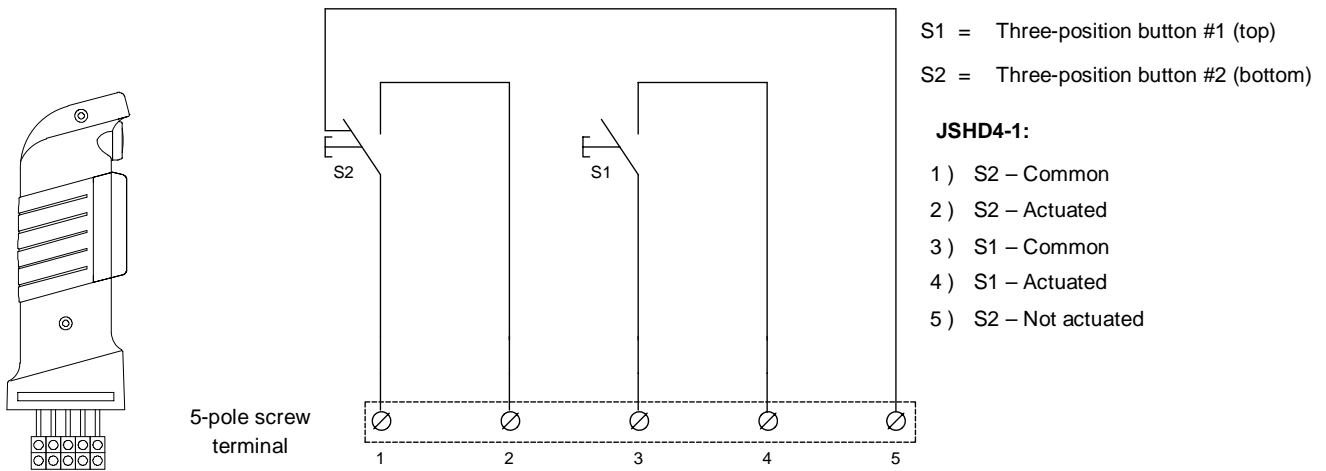
Anti-tampering device

Many versions of JS4D can be equipped with a sensor that prevents tampering (for instance by keeping the three-position switches in ON-position using a rubber band or similar). The sensor detects a human hand and also the small movements/vibrations that are normal when holding the handle. If both these requirements are fulfilled (detected), a contact is closed. When properly connected, the contact can be used to open the safety circuit, and thus prohibit tampering.

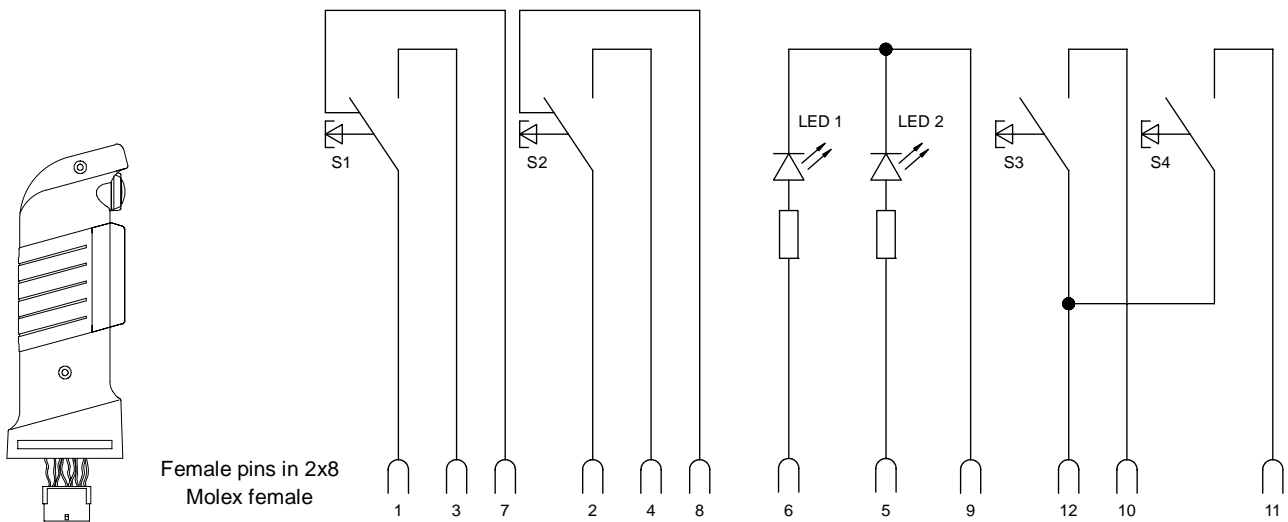
3 Connections

Top parts

Electrical connections – JSHD4-1



Electrical connections – JSHD4-2, -3, -4, -5



NB: The 2x8 Molex female on top parts JSHD4-2...5 mates with corresponding connector on bottom parts.

- S1 = Three-position button #1 (top)
- S2 = Three-position button #2 (bottom)
- S3 = Top push button
- S4 = Front push button
- LED 1 = Red LED
- LED 2 = Green LED

#	Description	JSHD4-2	JSHD4-3	JSHD4-4	JSHD4-5
1)	S1 – Common	x	x	x	x
2)	S2 – Common	x	x	x	x
3)	S1 – Actuated	x	x	x	x
4)	S2 – Actuated	x	x	x	x
5)	+24 VDC (LED 2)	x	x	x	x
6)	+24 VDC (LED 1)	x	x	x	x
7)	S1 – Not actuated	x	x	x	x
8)	S2 – Not actuated	x	x	x	x
9)	0 VDC (LED 1, LED 2)	x	x	x	x
10)	S3 – Actuated	x	-	-	x
11)	S4 – Actuated	x	-	x	-
12)	S3, S4 – Common	x	-	x	x

Anti-tamper PCB

The optional anti-tamper PCB may be connected separately or in series with one of the three-position push buttons (S1 or S2).

Warning!

When the anti-tamper PCB is connected **in series** with a three-position button, one out of the two alternatives below must be implemented to ensure proper functionality of the three-position switch:

1. Simultaneous check of the two channels at actuation of the switches.
2. Supervised reset of the three-position button connected in series with the anti-tamper PCB.

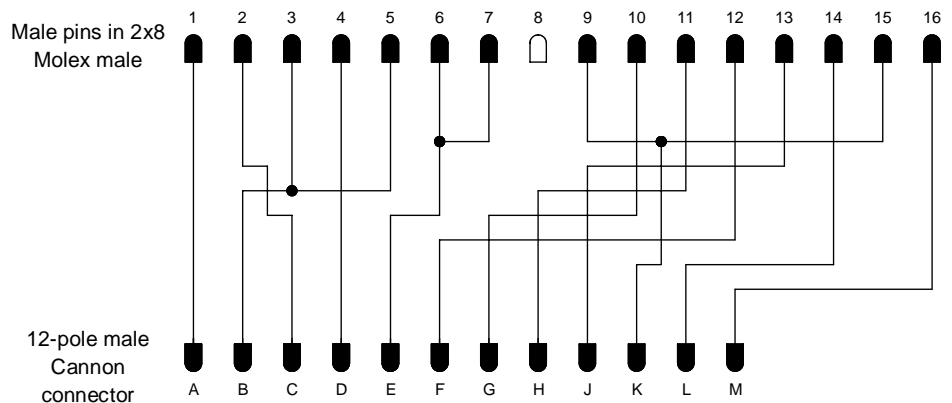
Bottom parts

Electrical connections – AB

Bottom part - AB:

12-pole male Cannon connector

- A) S1 – Common*
- B) S1 – Actuated
- C) S2 – Common
- D) S2 – Actuated
- E) S1 – Not actuated
- F) S3, S4 – Common
- G) S3 – Actuated
- H) S4 – Actuated
- J) +24 VDC (anti-tamper)
- K) 0 VDC (anti-tamper, LED 1, LED 2)
- L) Anti-tamper – Common
- M) Anti-tamper – Operator detected



* NB: COM signal must be +24 VDC for proper LED and anti-tamper PCB function.

NB: 12-pole Cannon connector, wiring suited for any monitor. Anti-tamper PCB is possible.

Electrical connections – AC

Bottom part – AC:

5-pole M12 connector

- 1) Brown: S2 – Common
- 2) White: S1 – Common
- 3) Blue: S2 – Actuated
- 4) Black: S1 – Actuated
- 5) Grey: S1 – Not actuated

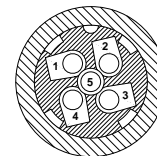
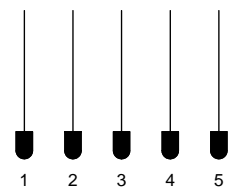
NB:

Connections according to factory assembled units.

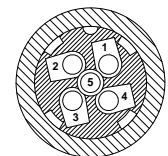
Suggested use for manual assembly. Cable colours for each pin according to the list.

5x individual wires

5-pole male M12-connector



M12 5-pole male seen from cable side



M12 5-pole female seen from cable side

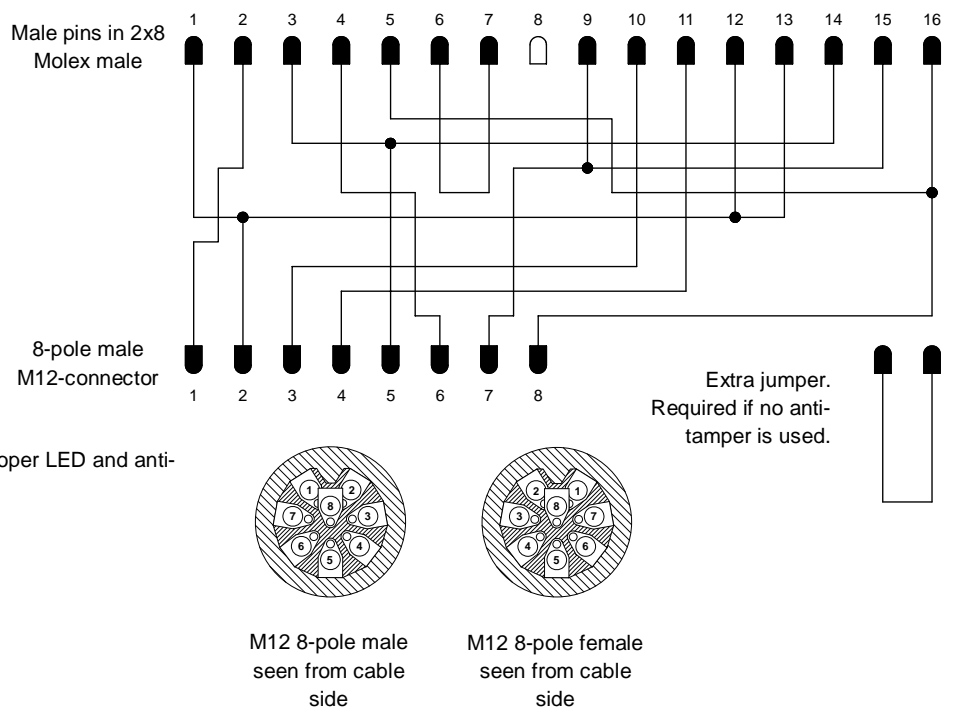
NB: 5-pole male M12 connector. Suited for top part JSHD4-1 only. Wiring suited for safety relays in the RT-series and Pluto safety-PLC. Anti-tamper PCB is not possible.

Electrical connections – AD

Bottom part – AD:

8-pole male M12-connector

- 1) S2 – Common
- 2) S1, S3, S4 – Common*
- 3) S3 – Actuated
- 4) S4 – Actuated
- 5) S1 – Actuated
- Anti-tamper – Common
- 6) S2 – Actuated
- 7) 0 VDC (anti-tamper, LED 1, LED 2)
- 8) Anti-tamper – Operator detected



* NB: COM signal must be +24 VDC for proper LED and anti-tamper PCB function.

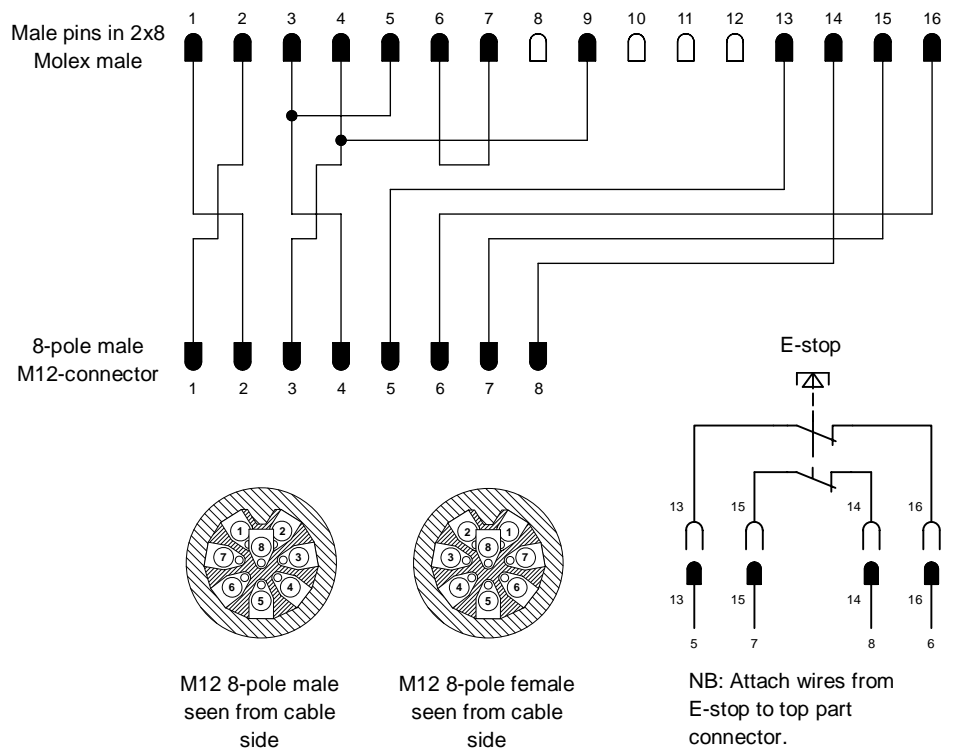
NB: 8-pole male M12 connector with wiring suitable for safety relays in the RT-series and Pluto safety-PLC. A jumper must be placed over pins 14-16 on the 2x8 Molex connector if an anti-tamper PCB is not used.

Electrical connections – AE

Bottom part – AE:

8-pole male M12-connector

- 1) S2 – Common
- 2) S1 – Common*
- 3) S2 – Actuated
- 0 VDC (LED 1, LED 2)
- 4) S1 – Actuated
- 5) E1 (E-stop channel 1)
- 6) E1 (E-stop channel 1)
- 7) E2 (E-stop channel 2)
- 8) E2 (E-stop channel 2)



* NB: COM signal must be +24 VDC for proper LED function.

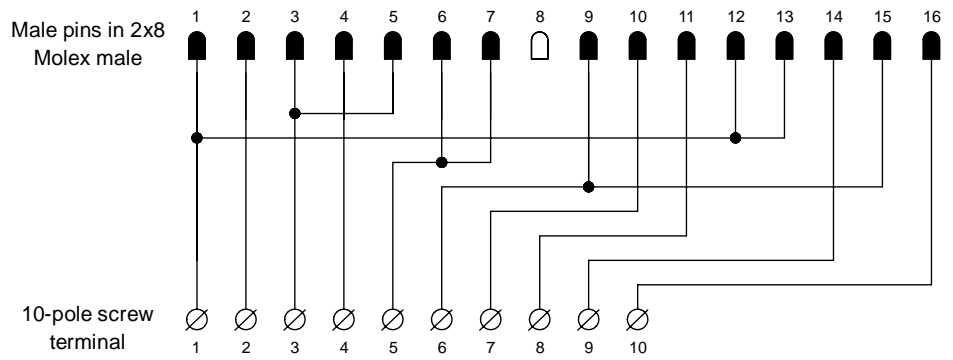
NB: 8-pole male M12 connector with wiring suitable for safety relays in the RT-series. An emergency stop push button is attached on the bottom part and is connected to pins 13-16 on the 2x8 Molex connector. Anti-tamper PCB or extra push buttons are not possible for this unit.

Electrical connections – AH

Bottom part – AH:

10-pole screw terminal

- 1) S1, S3, S4 – Common*
- 2) S2 – Common
- 3) S1 – Actuated
- 4) S2 – Actuated
- 5) S1 – Not actuated
- 6) 0 VDC (anti-tamper, LED 1, LED 2)
- 7) S3 – Actuated
- 8) S4 – Actuated
- 9) Anti-tamper – Common
- 10) Anti-tamper – Operator detected



* NB: COM signal must be +24 VDC for proper LED and anti-tamper PCB function.

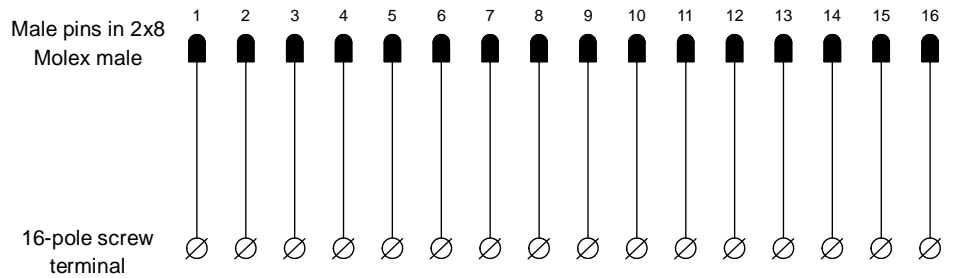
NB: 10-pole screw terminal with wiring suited for safety relays in the RT-series or Pluto safety-PLC. Intended for user assembled cable. Anti-tamper PCB is possible.

Electrical connections – AJ

Bottom part – AJ:

16-pole screw terminal

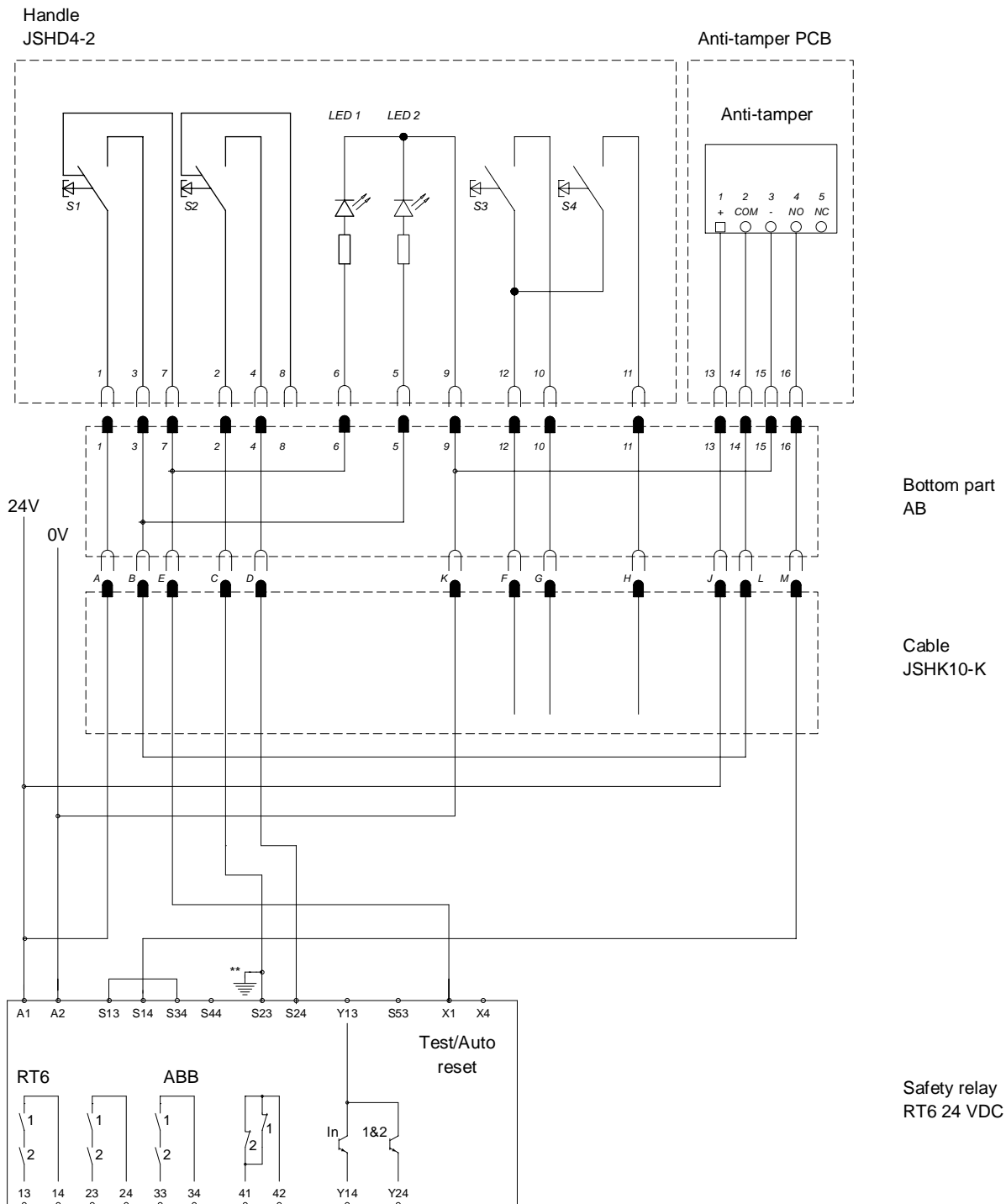
According to top part.



NB: 16-pole screw terminal, wiring suited for any monitor. Intended for user assembled cable. Anti-tamper PCB is possible.

Connection examples

Connection example – JSHD4-2-AB-A connected to an RT6 safety relay via the 12-wire cable JSHK10-K

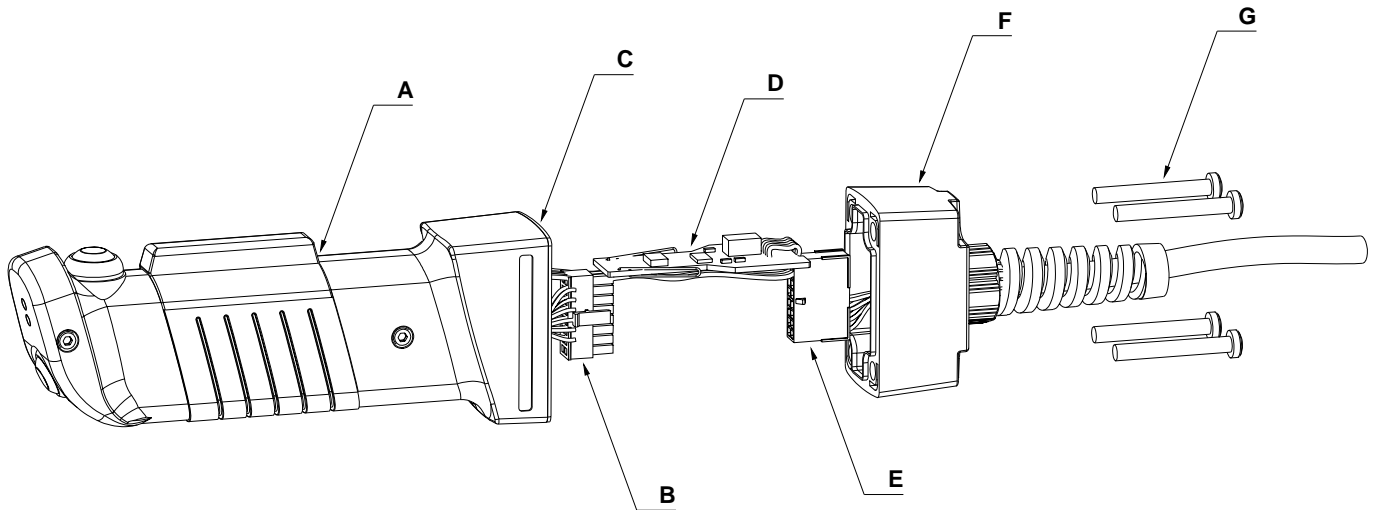


NB: The anti-tamper unit is connected in series with one three-position channel (S1). The supervised reset (input X1) is required to maintain highest level of safety. Top and front push buttons are not shown connected, but can be wired according to user demands.

4 Installation and maintenance

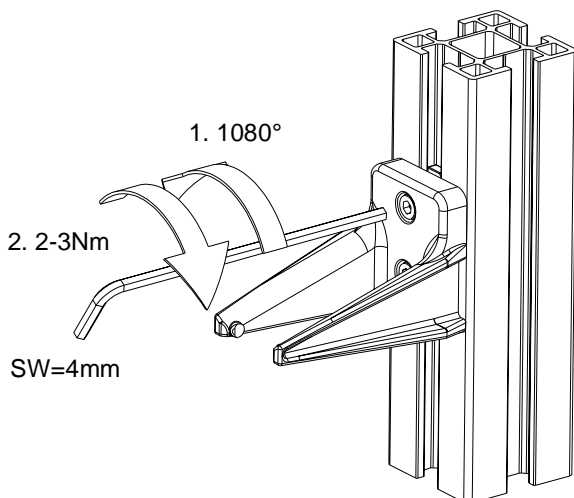
Assembly instructions

If a complete and ready to install unit is at hand, connect the cable to the control unit and connect enabling device to the cable. Otherwise, first assemble top and bottom part and, if needed, the anti-tampering unit (PCB) following the instructions below.



1. If used, insert pins from anti-tamper unit (D) into connector (B) from handle (A).
13: Red 14: Black 15: Blue 16: Pink
2. Insert PCB as shown, components facing forward. Push it all the way in.
3. If no anti-tamper is used, a jumper may need to be inserted between positions 14 and 16 in connector (B), depending on bottom part.
4. Remove protective liner from gasket (C) on handle.
5. Join connectors (B) and (E).
6. Press bottom part (F) against handle and tighten screws (G).


JSM55 installation



JSM 55 is designed to fit onto ABB/Jokab Safety Quick-Guard aluminium fencing extrusions, but can be used on any flat surface.

If the two pre-mounted nuts are used, place them in the groove in the extrusion, and then loosen each screw three turns before tightening them.

Installation precautions

 **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).

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.

5 Operation

Three-position button

The three possible positions of the main button represent three different states according to the figure below.

State 1 – "Resting state":

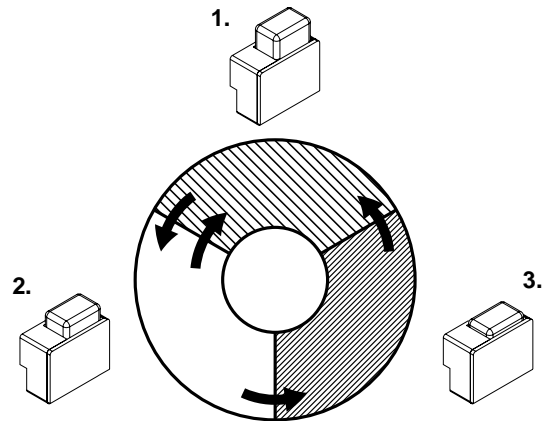
- Button rested, i.e. not pressed.
- Process not allowed to run.
- Waiting for the button to be pressed into its middle position ("operating state").

State 2 – "Operating state":

- Button actuated, pressed into its middle position.
- Process is allowed to run.
- Process is stopped if the button is released or pressed to its end position ("stopping state").

State 3 – "Stopping state":

- Button is pressed to its third and final position.
- Process is stopped by the control unit.
- Button must be released into "resting state" before "operating state" can be reached again.



Front and top button

The front and top button functionality are user defined and can be used for start/stop of individual movements etc. They have no intrinsic safety and are only to be used for subordinate functions.

Anti-tampering device

The anti-tampering device has two requirements to determine if JSHD4 is operated correctly:

- 1) A capacitive sensor determines if the device is held by a hand.
- 2) An accelerometer determines if the device is moving.

The internal contact is opened if the device is not held by a hand or if it has not moved for more than 20 seconds.

NB: Not all models are equipped with the additional (front and/or top) button or the anti-tampering device, see *Model overview* for further details.

Warning! The signals from the front and/or top button, as well as the anti-tampering device, are non-failsafe and must **never** be used for safety functions. They may enhance the safety level but can not be used alone, only in combination with other safety functions.

LED indication

This section does not apply to JSHD4-1.

LEDs on the top of the device

Red	Green	Description
OFF	OFF	A) No power or LED function not connected OR B) Power on, safety channel 1 in OK position but anti-tamper not OK
ON	OFF	Power on, safety channel 1 not in OK position
ON	ON	Power on, device faulty, muted, or improperly connected.
OFF	ON	Power on, safety channel 1 in OK position (and anti-tamper OK)

6 Model overview

A complete three-position device consists of one top part and one bottom part. It is also possible to add an optional anti-tampering electronic unit to most combinations of top and bottom parts. These three parts can be ordered as one factory assembled unit or as separate parts to be assembled by a user with the necessary training and knowledge in machine safety. A full list of all parts with descriptions and possible combinations can be found at www.abb.com/lowvoltage.

Separate parts, to be assembled by customer

Type	Article number	Description
JSHD4-1	2TLA020006R2100	Top part, no buttons, no LEDs, no possibility for anti-tamper.
JSHD4-2	2TLA020006R2200	Top part, top and front button, LEDs, possibility for anti-tamper.
JSHD4-3	2TLA020006R2300	Top part, no buttons, LEDs, possibility for anti-tamper.
JSHD4-4	2TLA020006R2400	Top part, front button, LEDs, possibility for anti-tamper.
JSHD4-5	2TLA020006R2500	Top part, top button, LEDs, possibility for anti-tamper.
Anti-tamper	2TLA020005R0900	Anti-tamper unit
AA	2TLA020005R1000	Bottom part, cable gland.
AB	2TLA020005R1100	Bottom part, 12-pole connector.
AC	2TLA020005R1200	Bottom part, 5-pole M12 connector.
AD	2TLA020005R1300	Bottom part, 8-pole M12 connector.
AE	2TLA020005R1400	Bottom part, 8-pole M12 connector with E-stop.
AF	2TLA020005R1500	Bottom part, 4-pole M12 connector, 2 AS-i nodes (safe + standard node).
AG	2TLA020005R1600	Bottom part, 4-pole M12 connector, 1 AS-i node (safe node).
AH	2TLA020005R1700	Bottom part, 10-pole screw terminal, cable gland.
AJ	2TLA020005R1800	Bottom part, 16-pole screw terminal, cable gland.

Complete handles, ready to use

	JSHD4-1	JSHD4-2	JSHD4-3	JSHD4-4	JSHD4-5
AA	2TLA019995R0000	-	-	-	-
AB	-	2TLA019995R0200	2TLA019995R1200	2TLA019995R2400	2TLA019995R3400
AB-A	-	2TLA019995R0300	2TLA019995R1300	2TLA019995R2500	2TLA019995R3500
AC	2TLA019995R0100	-	-	-	-
AD	-	2TLA019995R0400	2TLA019995R1400	2TLA019995R2600	2TLA019995R3600
AD-A	-	2TLA019995R0500	2TLA019995R1500	2TLA019995R2700	2TLA019995R3700
AE	-	-	2TLA019995R1600	-	-
AF	-	2TLA019995R0600	2TLA019995R1700	2TLA019995R2800	2TLA019995R3800
AF-A	-	2TLA019995R0700	2TLA019995R1800	2TLA019995R2900	2TLA019995R3900
AG	-	-	2TLA019995R1900	-	-
AH	-	2TLA019995R0800	2TLA019995R2000	2TLA019995R3000	2TLA019995R4000
AH-A	-	2TLA019995R0900	2TLA019995R2100	2TLA019995R3100	2TLA019995R4100
AJ	-	2TLA019995R1000	2TLA019995R2200	2TLA019995R3200	2TLA019995R4200
AJ-A	-	2TLA019995R1100	2TLA019995R2300	2TLA019995R3300	2TLA019995R4300

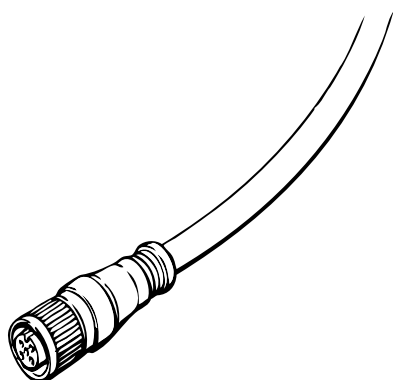
NB: A darker square in the table indicates that anti-tamper is not possible with this combination.

Not all combinations of top and bottom parts are possible or meaningful. The table above shows the part number for possible combinations. The designation is created as JSHD4-X-YY-Z, where X is the number for the top part, YY the two letters for the bottom part and Z means (if present) A: anti-tamper electronics included. A complete order information would look like *2TLA019995R0000 JSHD4-1-AA* or *2TLA019995R0700 JSHD4-2-AF-A*.

Accessories

Accessories and spare parts are ordered separately and assembled by the user. For a full list see www.abb.com/lowvoltage.

Type	Article number	Description
Anti-tamper PCB	2TLA020005R0900	Anti-tamper electronics, can be field fitted but will not work with all bottom parts and not with JSHD4-1. See table above.
JSHK10-K	2TLA020003R1100	10 m cable with 12-pole connector (for bottom part AB).
JSHK60S4	2TLA020103R3200	6 m spiral cable with 12-pole connector (for bottom part AB).
JSM 55	2TLA040005R0500	Wall fixing for three-position device
JSM 50H	2TLA020205R6300	Fitting for Eden sensor (Eva unit).
JSM 50G	2TLA020205R6400	Plate for JSNY5 actuators.
M12-C101	2TLA020056R1000	10 m cable with 5-pole M12-connector (for bottom part AC).
M12-C103	2TLA020056R4000	10 m cable with 8-pole M12-connector (for bottom part AD).
Gasket	2TLA020200R1200	Gasket between handle and bottom part (spare part).
Cable gland	2TLA020203R1700	Gland with cable protection, M16 (spare part).

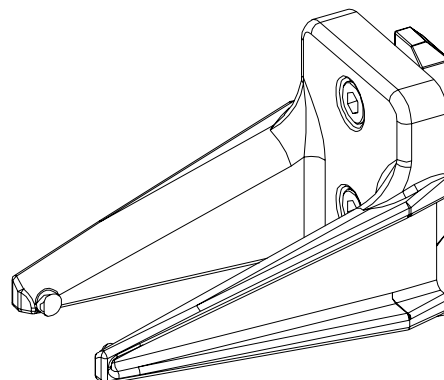


10 m cable with M12-connector

Article numbers:

2TLA020056R1000 (5-pole)

2TLA020056R4000 (8-pole)



JSM55

Wall fixing for three-position device

Article number:

2TLA040005R0500

7 Technical data

Manufacturer

Address	ABB AB / JOKAB SAFETY Varlabergsvägen 11 SE-434 39 Kungsbacka Sweden
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Power supply

Operating voltage	24 VDC \pm 10% at +20° C ambient temperature
Maximum current allowed	Three-position channel: 20 mA Push button: 500 mA



General

Protection class	IP65
Ambient temperature	-10...+50° C
Size	See drawing
Operating force	Approx. 15N for three-position buttons (ON) Approx. 45N for three-position buttons (OFF) Approx. 2.5N for top/front push button
Weight	Approx 0.2 kg without cable
Material	Handle: Polyamide and Noryl. Rubber: Neoprene
Colour	Yellow and black
Connector	Cable or contact depending on version.
Mechanical life	10 ⁶ cycles top to middle position 10 ⁵ cycles middle to bottom position, and top/front button.

Warning!

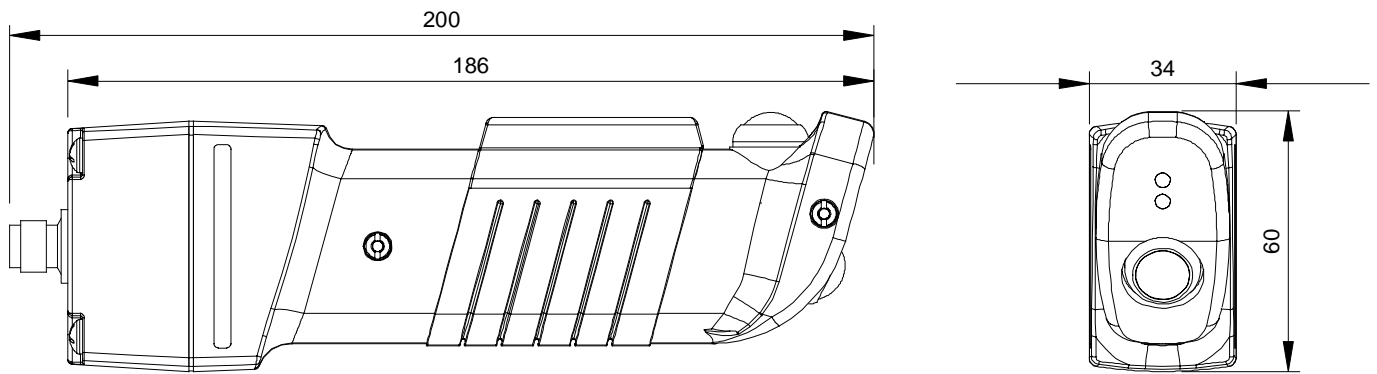
When connecting the enabling device to a control unit, make a function check immediately to detect any short circuits or two channel faults.

Safety / Harmonized Standards

Conformity	European Machinery Directive 2006/42/EC  EN ISO 12100-1:2010, EN 954-1:1996/EN ISO 13849-1:2008, EN 60204-1:2006+A1:2009 
EN ISO 13849-1	Performance level: PL e, category 4 B _{10d} : 2,000,000 (to middle position) B _{10d} : 968,000 (to bottom position)
EN 954-1	Category 4
Certificates	Inspecta

Dimensions

JSHD4 dimensions



NB: All measurements in millimetres.

8 EC Declaration of conformity

EC Declaration of conformity (according to 2006/42/EC, Annex 2A)	
We	ABB AB JOKAB SAFETY Varlabergsvägen 11 SE-434 39 Kungsbacka Sweden
	declare that the safety components of JOKAB SAFETY manufacture with type designations and safety functions as listed below, are in conformity with the Directive
	2006/42/EC
Authorised to compile the technical file	ABB AB JOKAB SAFETY Varlabergsvägen 11 SE-434 39 Kungsbacka Sweden
Product	Certificate
Three position device, JSHD4 versions	11-SKM-CM-0110
1AA, 1AC, 2AB, 2AB-A, 2AD, 2AD-A, 2AH, 2AH-A, 3AB, 3AB-A, 3AD, 3AD-A, 3AE, 3AH, 3AH-A, 4AB, 4AB-A, 4AD, 4AD-A, 4AH, 4AH-A, 5AB, 5AB-A, 5AD, 5AD-A, 5AH, 5AH-A	
Notified Body	Inspecta Sweden AB Box 30100 SE-104 25 Stockholm Sweden Notified Body No. 0409
Used harmonized standards	EN ISO 12100-1:2010, EN ISO 13849-1:2008, EN ISO 13849-2:2008, EN 60204-1:2006+A1:2009
 Jesper Kristensson PRU Manager Kungsbacka 2011-12-16	
<hr/>	
www.abb.com www.jokabsafety.com	
Original	

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www.abb.com/lowvoltage