


Control devices

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Safeball™
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JSHD4

Introduction and overview

Selection guide

ABB offers ergonomic control devices that allow operators to safely control dangerous machinery.

	Safeball	JSHD4
Image		
Type	One or two-hand control device	Tree-position device
Description	Ergonomic and unique machine control	Ergonomic hold-to-run device with extra control buttons
Application	Mainly used in pairs as a two-hand control in applications where it must be ensured that the operator has his hands outside the hazardous area, e.g. for starting a press cycle.	Used during e.g. troubleshooting, test running and programming, in order to allow the operator to be inside the hazardous area without stopping the machine, while ensuring limited movement and stop in case of danger.
Advantages	<ul style="list-style-type: none"> - Ergonomic design - Several grip possibilities - Flexible mounting - Two opposing buttons minimize the possibility to defeat 	<ul style="list-style-type: none"> - Ergonomic shape and operation - Hand recognition prevents defeat - Easy connection with M12 connectors - Several models to suit multiple applications - Extra buttons for e.g. machine control

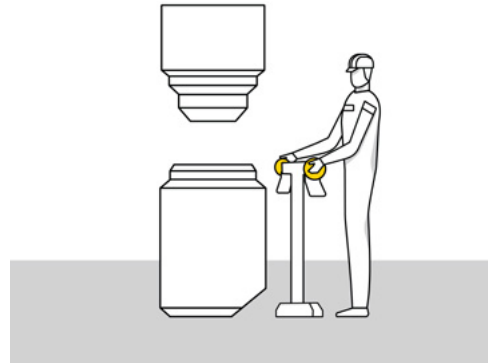
Introduction and overview

Selection orientation

Different types of control devices

When to use a two-hand or one-hand control device

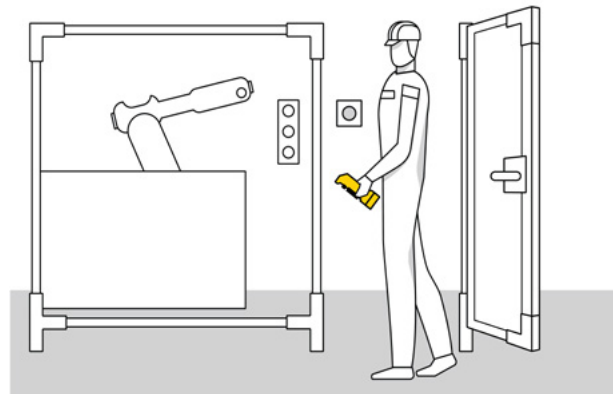
A two-hand control device is often used for machines with manual loading or unloading. The operator uses the two-hand control device to safely start a machine cycle. A two-hand control must be used with a safety control device that supervises that both buttons are pressed simultaneously, i.e. both hands are on the control and therefore outside the dangerous zone, in order to start the dangerous movement. An one-hand control device can be used in applications when the operator cannot reach the hazardous area with his/her free hand, or on less dangerous machines.



When to use a three-position device

A three-position device (or hold-to-run device) is used to allow a limited movement of the machine when the operator needs to be in the dangerous area without stopping the dangerous machine, for example during troubleshooting, test running or programming.

The operator pushes the larger black button to a middle position in order to allow a movement. In case of danger, the operator will either release the button or squeeze it to its bottom position and the machine will stop.



Standards

The safety distance of two-hand control devices should be calculated using EN ISO 13855.

When constructing a two-hand station for a machine, the standard EN 574 about functional aspects and principles for design needs to be followed.

One- and two-hand devices

Safeball™

Safeball™ is an ergonomic control device used for safe start and stop of machine cycles. Usually two Safeball™ are used together to form a two-hand control.

Safeball™ consists of a spherical ball containing two embedded push button switches, one on each side of the ball. Both buttons must be pressed in order to start and operate the machine. The risk of unintentional activation is thereby minimized and the device is simple and ergonomic to use.

When two Safeball™ are used in a two-hand device application, the operator must press all four push buttons simultaneously in order to operate the machine. If one or more of the buttons are released, a stop signal is given to the machine.



Optimum interface



Safety and protection

Ergonomic design

The design of Safeball™ allows for comfort of use for all hand sizes and a great variety in gripping positions. And there is no need for shrouding top covers to prevent defeat, as there is for two-hand devices with standard push buttons.

Flexible mounting

With the JSM C5 mounting bracket, Safeball™ can be orientated in the most ergonomic position for the operator.

Unique design

The unique design of Safeball™ combines the highest level of safety with the best ergonomics.

Highest safety level

Safeball™ provides the operator with a dual switching function and short-circuit supervision in each hand.

Applications and features

Safeball™

Applications

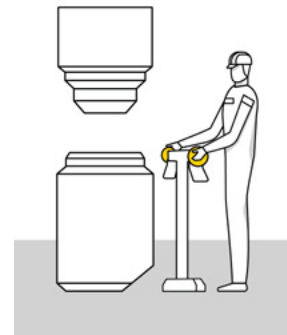
One-hand control device

One Safeball™ can be used as an ergonomic “hold to run” button, i.e. the movement is allowed as long as both push buttons on Safeball™ are pressed, usually when the operator cannot reach the hazardous area with his/her free hand, or on less dangerous machines. Safeball™ is a very practical one-hand control device since it is very easy to locate and activate.



Two-hand control device

A two-hand control device is often used for machines with manual loading or unloading. The operator uses the two-hand control device to safely start a machine cycle. A two-hand control must be used with a safety control device that makes sure that both buttons are pressed simultaneously, i.e. both hands are on the control and therefore outside the dangerous zone, in order to start the dangerous movement. Using two Safeball™, it is easy to realize a custom two-hand device.



Features

Mounting methods

Safeball™ can be mounted in many different ways. It can be mounted on a table, on the machine, on a support or wherever suitable for ergonomic reasons. Safeball™ can be mounted in a fixed position or on a tilting and/or rotating support when used with a JSM C5. This flexibility in mounting enhances ergonomics and minimizes work-related musculoskeletal disorders.

When two Safeball™ are used as a two-hand device, no shrouding top cover is necessary to prevent defeat, as it is for two-hand devices with push buttons, since it is very difficult to push all 4 push buttons of the two Safeball™ with e.g. a hand and an elbow.

Highest level of safety

When used as a two-hand control device, a safety controller for two-hand devices must be used, like an appropriate Sentry safety relay or a Pluto programmable safety controller. The safety controller monitors that all four push buttons (i.e. on each side of both Safeball™) are pressed within 0.5 second, in order to detect e.g. a short circuit or fraud, like a rubber band around one device. Safeball™ is certified to comply with type III C according to EN 574+A1:2008.

JSTD25

The JSTD25 control stations are pre-built two-hand devices utilizing the good ergonomics of Safeball™. They can be used as fixed devices that are easy to install, or as mobile devices. All models are equipped with shields to protect the buttons from accidental operation, and also protect from damage if the device is dropped on the floor when used as mobile device. All versions meet EN 574 and EN ISO 13849-1.



Ordering information

Safeball™



2TLC00041F0201

Safeball™



2TLC172096F0201

JSTD25F



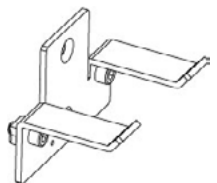
2TLC172618F0201

JSTD25K



2TLC172949F0201

JSMC5



2TLC172959F0201

JSMC7

Safeball™ JSTD1

Types of switches	Cable length	Type	Order code
1 NO + 1 NC	2 m	JSTD1-A	2TLA020007R3000
	0.2 m	JSTD1-B	2TLA020007R3100
	10 m	JSTD1-C	2TLA020007R3200
2 NO	0.2 m	JSTD1-E	2TLA020007R3400

Two-hand control devices JSTD25

Extra feature	Connector male	Type	Order code
None	M12-5	JSTD25F	2TLA020007R6000
	M12-8	JSTD25H	2TLA020007R6300
Pre-mounted Smile 10 EK emergency stop button	M12-8	JSTD25K	2TLA020007R6900

Accessories

Description	Type	Order code
Mounting bracket for JSTD1 with orientation possibility (ball joint)	JSM C5	2TLA020007R0900
Suspension shelf for JSTD25F/H/K	JSM C7	2TLA020007R1200
Protection coat for Safeball	Safeball coat	2TLA020007R1900

Cables and connectors

Safeball™



M12-C61

2TLC172851F0201



M12-C61HE

2TLC000091F0201



M12-C334

2TLC172831F0201

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
		6 m		M12-C61	2TLA020056R0000
		10 m	Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		20 m	Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
	Female + male	0.3 m		M12-C201	2TLA020056R1400
		0.06 m		M12-C0312	2TLA020056R5800
		1 m		M12-C00612	2TLA020056R6300
		3 m		M12-C112	2TLA020056R2000
		6 m		M12-C312	2TLA020056R2100
		10 m		M12-C612	2TLA020056R2200
		16 m	Angled female connector	M12-C1012V2	2TLA020056R6700
		20 m		M12-C1612	2TLA020056R5400
		6 m		M12-C2012	2TLA020056R2400
		10 m		M12-C62	2TLA020056R0200
M12-8	Female	6 m		M12-C102	2TLA020056R1200
		10 m		M12-C63	2TLA020056R3000
		20 m		M12-C103	2TLA020056R4000
	Female + male	0.06 m		M12-C203	2TLA020056R4100
		1 m		M12-C00634	2TLA020056R6400
		3 m		M12-C134	2TLA020056R5000
		3 m		M12-C334	2TLA020056R5100



M12-C01

2TLC172857F0201



C5 cable

2TLC000098F0201


Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
Cable with 5 conductors		
10 m cable with 5 x 0.34 shielded conductors	C5 cable 10 m	2TLA020057R0001
50 m cable with 5 x 0.34 shielded conductors	C5 cable 50 m	2TLA020057R0005
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
50 m cable with 8 x 0.34 shielded conductors	C8 cable 50 m	2TLA020057R1005
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Technical data

Safeball™

Technical data

Approvals	Inspecta 
Conformity	CE 2006/42/EC - Machinery EN ISO 12100:2010, EN 574+A1:2008
Functional safety data	
EN/IEC 61508:2010	Up to SIL3, depending on system architecture
EN/IEC 62061:2005+A1:2013	Up to SILCL3, depending on system architecture
EN ISO 13849-1:2008	Up to Cat. 4, PL e, depending on system
Mechanical data	
Operating force	Approx. 2N
Life, mechanical	> 1 x 10 ⁶ operations at max 1 Hz
Connection cable	
JSTD1-A	PVC-cable, 4 x 0.75 mm ² , L = 2 m
JSTD1-B, JSTD1-E	Wires, 4 x 0.75 mm ² , L = approx. 0.2 m
JSTD1-C	PVC-cable, 4 x 0.75 mm ² , L = 10 m
Protection class	IP67. Not intended for use under water
Ambient temperature	-25 °C to +50 °C (operating)
Material JSTD1	Polypropylene
Weight JSTD1	
With 2 m cable	0.2 kg
With 10 m cable	0.7 kg
With 4 x 0.2 m wires	0.1 kg

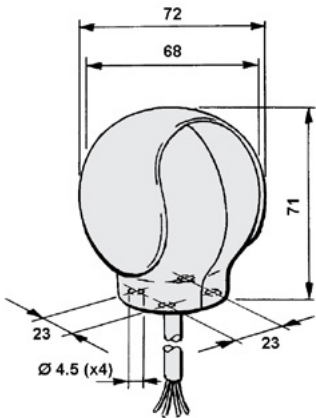
More information

For more information, e.g. the complete technical information, see product manual for:
Safeball [2TLC172182M0201](#)

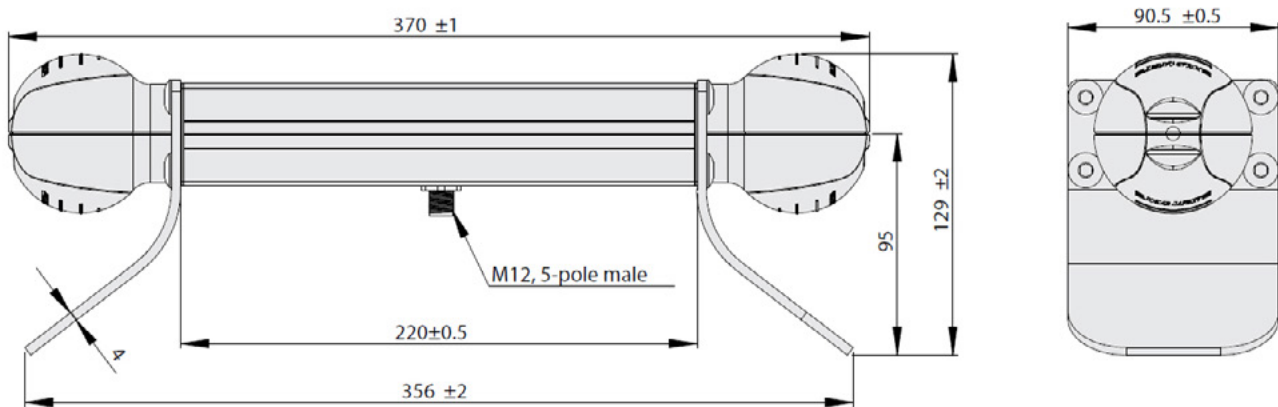
Dimension drawings

Safeball™

Safeball™



JSTD25F



All dimensions in mm

Three-position device

JSHD4

JSHD4 is a three-position device used to allow a limited movement of the machine when the operator is in the dangerous area, for example during troubleshooting, test running and programming.

The operator pushes the larger black button to a middle position in order to allow a movement. In case of danger, the operator will either release the button or squeeze it to its bottom position and the machine will stop.

JSHD4 is available with different types of connectors for an optimal adaptation to the application. Some models offer additional top and front button to control a non-safe signal, for ex. move forward and/or backward.



Safety and protection

Cheat-safe hand recognition

All JSHD4 models comply with PL e/ Cat 4. Some models offer an “anti-tamper” function: an extra signal indicate if the JSHD4 is held in the middle position by a human hand. A machine movement will be authorized only in presence of this signal and not if the device is held in run position by any other (fraudulent) mean.



Optimum interface

Ergonomic shape and operation

JSHD4 is ergonomic, both in respect of its shape, fitting to the hand, and the way the buttons are operated. JSHD4 is easy to operate using just the fingers (even with gloves), and the middle position provides a safe resting position.



Continuous operation

Safely inspect a running machine

JSHD4 allows the operators to safely inspect the manufacturing process without completely stopping the machine.

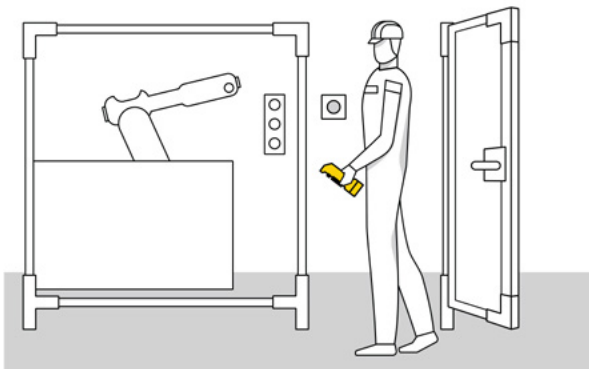
Applications and features

JSHD4

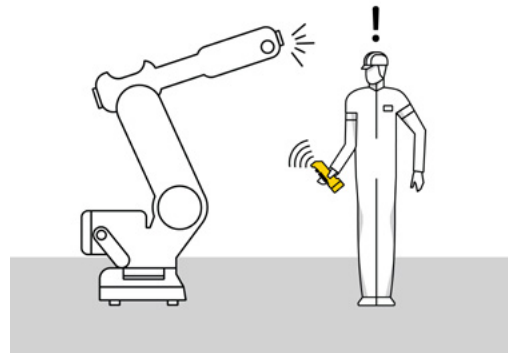
Applications

Safe troubleshooting, programming and testing

If the operator has to enter a risk area for troubleshooting or test running, it is extremely important that he/she is able to stop the machinery without having to rely on someone else pushing a stop button. In addition, no-one else should be able to start the machinery after it has been stopped by the operator. An operator who is under pressure must also be able to give a stop signal, whether in panic he/she pushes harder on the button or just releases it.



JSJD4 three-position control device can be used for troubleshooting, programming and test running in situations where no other protection is available or feasible. JSJD4 allows the operator to safely inspect the process without completely stopping the machine. The big black button has 3 distinct positions: released, pressed gently and pressed hard. The middle position allows the machine to run with limited speed or range, but when released or pressed hard the machine stops.



Features

Hand recognition for protection against tampering

An optional “anti-tamper” function sends an extra signal to indicate if the JSJD4 is held by a human hand or not. By using this, the safety level is increased, and the risk of manipulation or bypass of the safety function is reduced. It is no longer possible to expose the operator to danger by trying to lock the three-position control device in run mode.

Ergonomic design

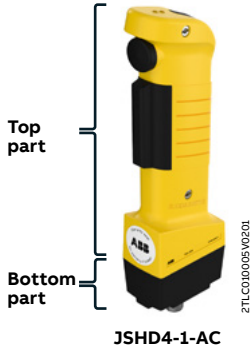
JSJD4 is ergonomic, both in respect of its shape, fitting to the hand and the way the buttons are operated. It is easy to operate the device by using just the fingers (even with gloves), and the middle position provides a secure resting position.

Additional top and front buttons for non-safe signals

The two additional buttons can be used for e.g. start/stop, up/down or forward/ back. Internally the device is duplicated. The three-position function itself is built up of two completely independent three-position buttons which feels as one button for the user.

Ordering information

JSHD4



Choose top part, bottom part and anti-tamper

Top part	Bottom part	ID	Connection	Anti-tamper	Type	Order code
Buttons and LEDs	Use your own cable	AA	Cable gland and 5 screw connections		JSHD4-1-AA	2TLA019995R0000
	Cost effective and quick connection	AC	M12-5 male		JSHD4-1-AC	2TLA019995R0100
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections		JSHD4-1-AL	2TLA019995R4700
JSHD4-2	Cost effective and robust	AB	Cannon 12 male pins		JSHD4-2-AB	2TLA019995R0200
	LEDs			•	JSHD4-2-AB-A	2TLA019995R0300
		Front button			•	JSHD4-2-AD
	Top button				•	JSHD4-2-AD-A
		Use your own cable, simplified connection	AH	Cable gland and 10 screw connections	•	JSHD4-2-AH
	Use your own cable, full pin connection	AJ	Cable gland and 16 screw connections	•	JSHD4-2-AJ	2TLA019995R1000
	Replacement of old units*	AK	Cannon 12 male pins	•	JSHD4-2-AJ-A	2TLA019995R1100
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections	•	JSHD4-2-AK	2TLA019995R4800
				•	JSHD4-2-AL	2TLA019995R4900
				•	JSHD4-2-AL-A	2TLA019995R5000
JSHD4-3	Cost effective and robust	AB	Cannon 12 male pins		JSHD4-3-AB	2TLA019995R1200
	LEDs			•	JSHD4-3-AB-A	2TLA019995R1300
		No buttons			•	JSHD4-3-AD
					•	JSHD4-3-AD-A
	E-stop	AE	M12-8 male		JSHD4-3-AE	2TLA019995R1600
	Use your own cable, simplified connection	AH	Cable gland and 10 screw connections	•	JSHD4-3-AH	2TLA019995R2000
	Use your own cable, full pin connection	AJ	Cable gland and 16 screw connections	•	JSHD4-3-AH-A	2TLA019995R2100
				•	JSHD4-3-AJ	2TLA019995R2200
				•	JSHD4-3-AJ-A	2TLA019995R2300
	Replacement of old units*	AK	Cannon 12 male pins	•	JSHD4-3-AK	2TLA019995R5100
Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections	•	JSHD4-3-AL	2TLA019995R5200	
			•	JSHD4-3-AL-A	2TLA019995R5300	
JSHD4-4	Cost effective and robust	AB	Cannon 12 male pins		JSHD4-4-AB	2TLA019995R2400
	LEDs			•	JSHD4-4-AB-A	2TLA019995R2500
		Front button			•	JSHD4-4-AD
					•	JSHD4-4-AD-A
	Use your own cable, simplified connection	AH	Cable gland and 10 screw connections	•	JSHD4-4-AH	2TLA019995R3000
	Use your own cable, full pin connection	AJ	Cable gland and 16 screw connections	•	JSHD4-4-AH-A	2TLA019995R3100
				•	JSHD4-4-AJ	2TLA019995R3200
				•	JSHD4-4-AJ-A	2TLA019995R3300
	Replacement of old units*	AK	Cannon 12 male pins	•	JSHD4-4-AK	2TLA019995R5400
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections	•	JSHD4-4-AL	2TLA019995R5500
			•	JSHD4-4-AL-A	2TLA019995R5600	
JSHD4-5	Cost effective and robust	AB	Cannon 12 male pins		JSHD4-5-AB	2TLA019995R3400
	LEDs			•	JSHD4-5-AB-A	2TLA019995R3500
		Top button			•	JSHD4-5-AD
					•	JSHD4-5-AD-A
	Use your own cable, simplified connection	AH	Cable gland and 10 screw connections	•	JSHD4-5-AH	2TLA019995R4000
	Use your own cable, full pin connection	AJ	Cable gland and 16 screw connections	•	JSHD4-5-AH-A	2TLA019995R4100
				•	JSHD4-5-AJ	2TLA019995R4200
				•	JSHD4-5-AJ-A	2TLA019995R4300
	Replacement of old units*	AK	Cannon 12 male pins	•	JSHD4-5-AK	2TLA019995R5700
	Holder for Eva (used with JSM54)	AL	Cable gland and 10 screw connections	•	JSHD4-5-AL	2TLA019995R5800
			•	JSHD4-5-AL-A	2TLA019995R5900	

* See document [2TLC010007L0201](#) for information about replacement

Cables and connectors

JSHD4



M12-C61

2TLC1729151F0201



M12-C61HE



M12-C334

2TLC1729151F0301



HK20S4

Cable with connectors

Connector	Female/male	Length	Special feature	Type	Order code
M12-5	Female	3 m		M12-C31	2TLA020056R0500
		6 m		M12-C61	2TLA020056R0000
			Harsh environment, halogen free	M12-C61HE	2TLA020056R8000
		10 m		M12-C101	2TLA020056R1000
			Harsh environment, halogen free	M12-C101HE	2TLA020056R8100
		20 m		M12-C201	2TLA020056R1400
	Female + male	0.3 m		M12-C0312	2TLA020056R5800
		0.06 m		M12-C00612	2TLA020056R6300
		1 m		M12-C112	2TLA020056R2000
		3 m		M12-C312	2TLA020056R2100
		6 m		M12-C612	2TLA020056R2200
		10 m		M12-C1012	2TLA020056R2300
		16 m		M12-C1612	2TLA020056R5400
		20 m		M12-C2012	2TLA020056R2400
Male		6 m		M12-C62	2TLA020056R0200
		10 m		M12-C102	2TLA020056R1200
M12-8	Female	6 m		M12-C63	2TLA020056R3000
		10 m		M12-C103	2TLA020056R4000
		20 m		M12-C203	2TLA020056R4100
	Female + male	0.06 m		M12-C00634	2TLA020056R6400
		1 m		M12-C134	2TLA020056R5000
		3 m		M12-C334	2TLA020056R5100
Cannon	Female	5 m		HK5	2TLA020003R4700
		10 m		HK10	2TLA020003R4800
		20 m		HK20	2TLA020003R4900
		2 m	Spiral cable	HK20S4	2TLA020003R5100
		3.2 m	Spiral cable	HK32S4	2TLA020003R5200
		4 m	Spiral cable	HK40S4	2TLA020003R3500
		6 m	Spiral cable	HK60S4	2TLA020003R3600
		8 m	Spiral cable	HK80S4	2TLA020003R5300

Cables and connectors

JSHD4



M12-C01

2TLCT2659F0201



C5 cable

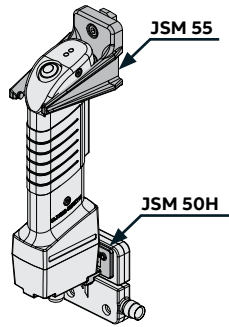
2TLCO0038F0201

Separate cables and connectors

Description	Type	Order code
Connectors		
M12-5 pole female, straight	M12-C01	2TLA020055R1000
M12-5 pole male, straight	M12-C02	2TLA020055R1100
M12-8 pole female, straight	M12-C03	2TLA020055R1600
M12-8 pole male, straight	M12-C04	2TLA020055R1700
12-pole female cannon connector for JSHD4	JSHK0	2TLA020003R0300
Cable with 5 conductors		
10 m cable with 5 x 0.34 shielded conductors	C5 cable 10 m	2TLA020057R0001
50 m cable with 5 x 0.34 shielded conductors	C5 cable 50 m	2TLA020057R0005
100 m cable with 5 x 0.34 shielded conductors	C5 cable 100 m	2TLA020057R0010
200 m cable with 5 x 0.34 shielded conductors	C5 cable 200 m	2TLA020057R0020
500 m cable with 5 x 0.34 shielded conductors	C5 cable 500 m	2TLA020057R0050
Cable with 8 conductors		
50 m cable with 8 x 0.34 shielded conductors	C8 cable 50 m	2TLA020057R1005
100 m cable with 8 x 0.34 shielded conductors	C8 cable 100 m	2TLA020057R1010
200 m cable with 8 x 0.34 shielded conductors	C8 cable 200 m	2TLA020057R1020
500 m cable with 8 x 0.34 shielded conductors	C8 cable 500 m	2TLA020057R1050

Accessories

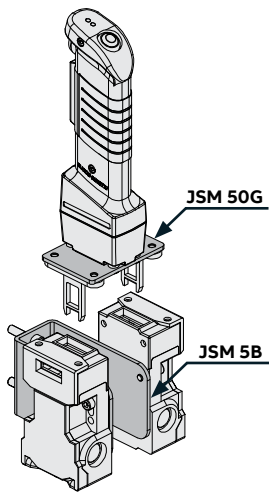
JSHD4



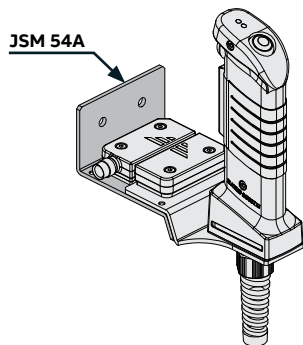
JSM 55 wall bracket and JSM 50H bracket for Eden

Accessories

Description	Type	Order code
Brackets and bottom plates		
JSM 55 Wall bracket for three position device	JSM 55	2TLA040005R0500
JSM 5B Wall bracket for 2 pcs MKey5 interlock switches	JSM 5B	2TLA040005R0700
JSM 54A Wall bracket for Adam. Used with AL bottom part that has a holder for Eva	JSM 54A	2TLA020205R2800
JSM 50G Bracket for key switches	JSM 50G	2TLA020205R6300
JSM 50H Bracket for Eden sensor	JSM 50H	2TLA020205R6400
Others		
JSHD4 protection coat	JSHD4 Coat	2TLA020200R4600



JSM 50G bracket for key switches and JSM 5B wall bracket for 2 pcs MKey5



JSM 54A wall bracket for Adam (and AL bottom part that has a holder for Eva)

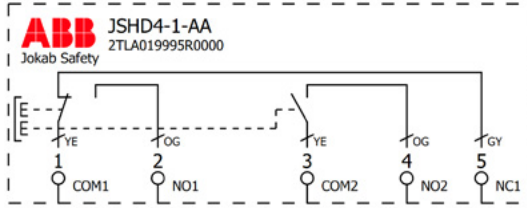


JSHD4 protection coat

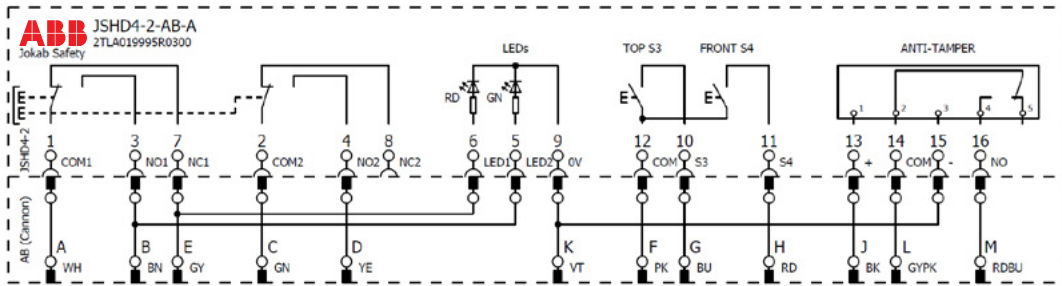
5

Electrical wiring diagrams

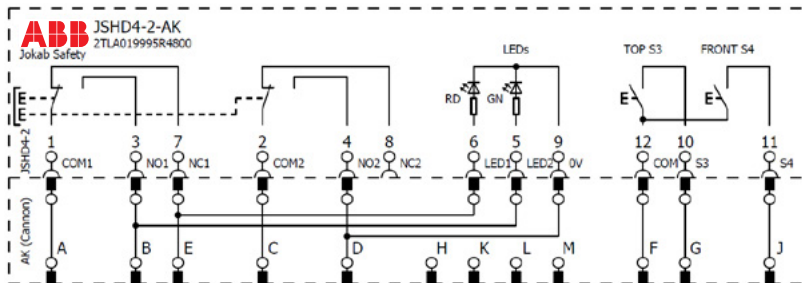
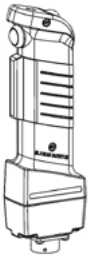
Examples with JSHD4-1 and JSHD4-2 models



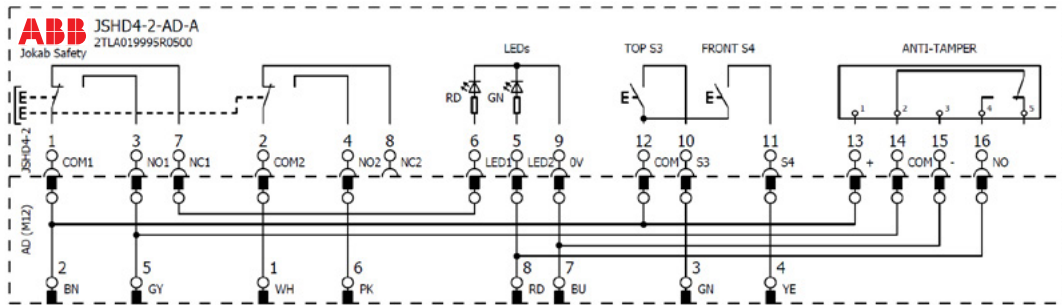
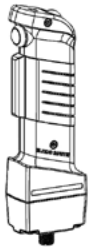
JSHD4-1-AA, cable gland and 5 screw connections on JSHD4-1



JSHD4-2-AB-A, Cannon 12 pins



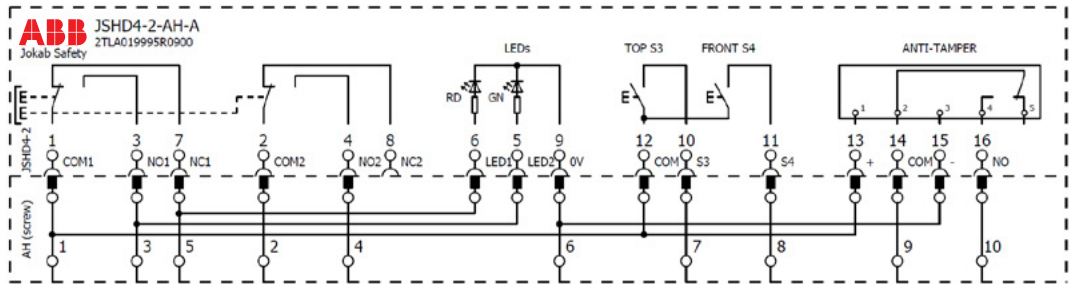
JSHD4-2-AK, Cannon 12 pins



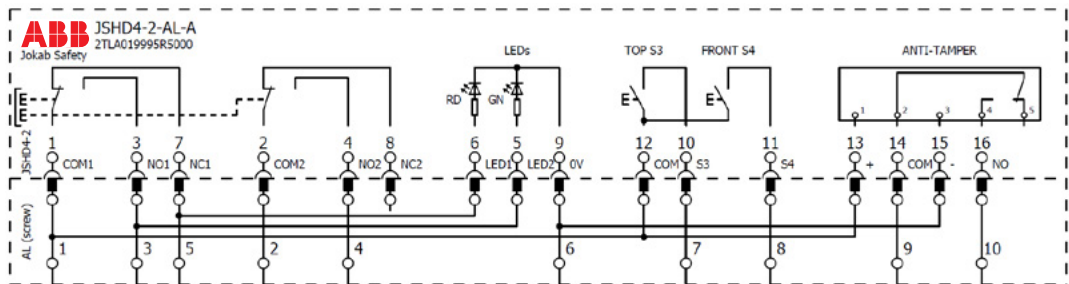
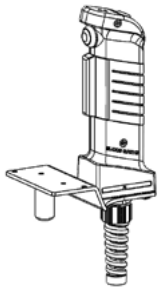
JSHD4-2-AD-A, M12-8

Electrical wiring diagrams

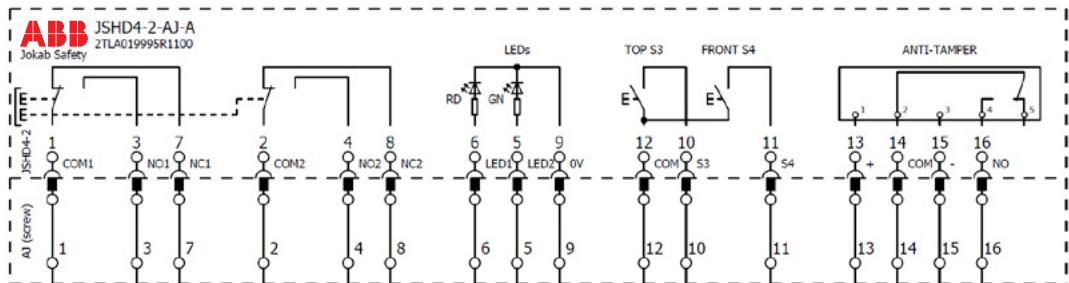
Examples with JSHD4-2 models



JSHD4-2-AH-A, cable gland and 10 screw connection



JSHD4-2-AL-A, cable gland and 10 screw connection





JSHD4-2-AJ-A, cable gland and 16 screw connection

Technical data and dimension drawings

JSHD4

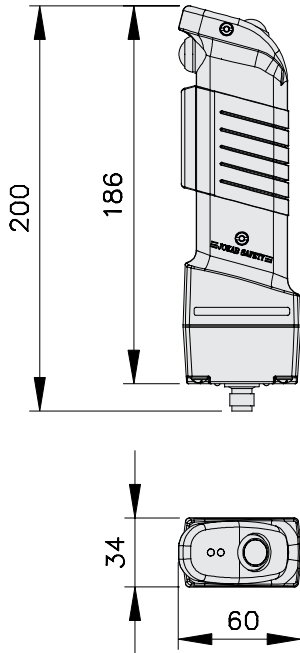
Technical data

Approvals	Inspecta  
Conformity	CE 2006/42/EC - Machines 2014/30/EU - EMC 2011/65/EU - RoHS EN ISO 12100-1:2010, EN ISO 13849-1:2015, EN ISO 13849-2:2012, EN 60204-1:2006+A1:2009, EN 61000-6-2:2005, EN 61000-6-3:2007
Functional safety data	
EN ISO 13849-1:2016	Up to PL e (depending on number of operations per year) B _{10d} : 2 000 000 to middle position, 968 000 to bottom position
Electrical data	
Current allowed, three-position button	Per channel: Maximum +30 VDC, 20 mA, (Minimum +10 VDC, 8 mA)
Current allowed, extra button	Maximum 500 mA
Operation force	Approx. 15 N for three-position buttons (ON) Approx. 45 N for three-position buttons (OFF) Approx. 2.5 N for top/front push button
Mechanical data	
Operating temperature	-10 ... +50 °C
Protection class	IP65
Mechanical life	1 000 000 cycles to middle position
Weight	Approx. 0.2 kg without cable

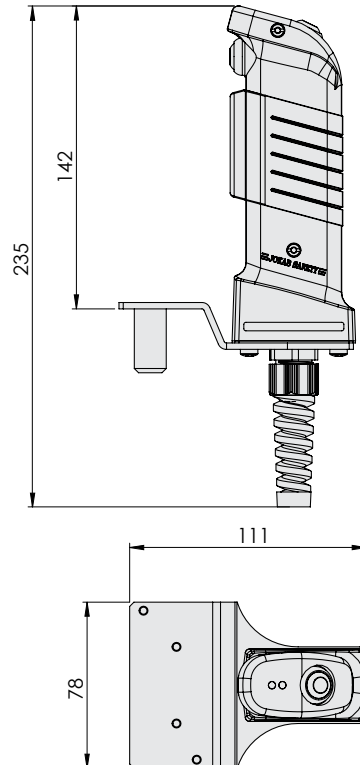
More information

For more information, e.g. the complete technical information, see product manual for: [JSHD4 2TLC172072M0201](#)

Dimension drawings



JSHD4-2-AD



JSHD4-2-AL

All dimensions in mm

