JSTD1 Safeball™: A Unique New Category 4 Two-Hand Control Device



Safeball is a completely new approach to the design of one and two-hand safety devices. Instead of the conventional approach using ordinary push buttons and non-ergonomic protection for unintentional activation, a 'hands on' approach has been developed. Safeball consists of a spherical ball containing two embedded push button switches, one on each side of the ball. By using this push button configuration, the risk of unintentional activation is minimized and the device is simple and ergonomic to use.

Safeball can be utilized for either one-hand (one Safeball) or two-hand (two Safeballs) applications. In either application, and in order to meet the required level of safety, the Safeball(s) switches are monitored by specified/certified Jokab Safety safety relays.

In the case where two-hand control is used, both Safeballs i.e. all four push buttons have to be activated within 0.5 seconds. If one or more push buttons are released a Stop signal is given to the machine. In order to provide the highest level of safety the Safeball design provides the operator with a dual switching function and short circuit supervision in each hand.

Each Safeball is ergonomically designed and has both its cover and actuator made of environmental friendly polypropylene. The design allows for comfort of use for all hand sizes and operation from numerous gripping positions. Mounting of the Safeball is also very flexible allowing the device to be mounted in the most ergonomic position for the operator.

When can a two-hand or one-hand control be used?

A two-hand control can be used when it is necessary to ensure that the operator is outside and must be prevented from reaching into the hazardous area. If the operator decides, after the start signal has been given to the machine, to make an 'after grasp' i.e. try to adjust the part that has been placed into the machine, then a dual stop signal is given to the machine.

A one-hand control device can be used when the operator cannot reach the hazardous area with his/her free hand or on less dangerous machines.

Highest Safety Level

The Safeball is certified by DNV (Inspecta) in Sweden for use as a two-hand control device, when used with a JSBR4 Jokab Safety safety relay or Pluto Safety PLC, in accordance with the highest safety level in standard EN 574 (type IIIc) and EN 954-1/ISO 13849-1 (safety category 4).



JSTD25A
Mounting Station

Applications

- Two-Hand Device
- One-Hand Device

Features

- Ergonomic
- Low activation force
- Flexible mounting
- Several grip possibilities
- Highest safety level (category 4)
- Two-channel switching in each hand

Regulations and Standards

The JSTD1 Safeball is certified by DNV. Approval numbers are 01-MAL-CM-0101 (two-hand device) and 01-NAL-CM-0100 (one-hand device).

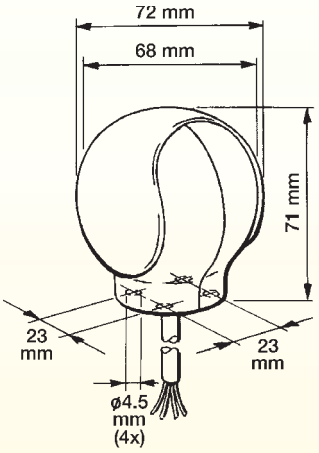
Approvals

CERTIFIED BY inspecta

JSTD1 Safeball Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 8:26-8:28
Color.....black and yellow
Weight.....0.2 kg with 2 m cable
0.7 kg with 10 m cable
0.1 kg with 4x0.25 m wires

Size
Height.....approximately 71 mm
Diameter.....minimum 68 mm, maximum 72 mm
Base.....42 mm
Temperature.....0°C to +55°C (operating)
-20°C to +70°C (storing)
Protection Class.....IP67
(not intended for use below water surface)
Operating Force.....approx. 2 N
Actuator Travel.....1.3 +/- 0.6 mm
Max. Switching Load.....30 V/2A DC, resistive load
Recommended Load.....24 V/10mA DC, resistive load
Min. Switching Load.....6 V/10mA DC, resistive load
Contact Resistance.....100 mOhm
Mechanical Life.....>1x10^6 operations at max 1 Hz
Material..... polypropylene



Chemical Resistance at 20°C

Chemical	Resistance
Alcohols	Good
Paraffin Oil	Good
Milk	Good
Silicon Oil	Good
Acetone	Good

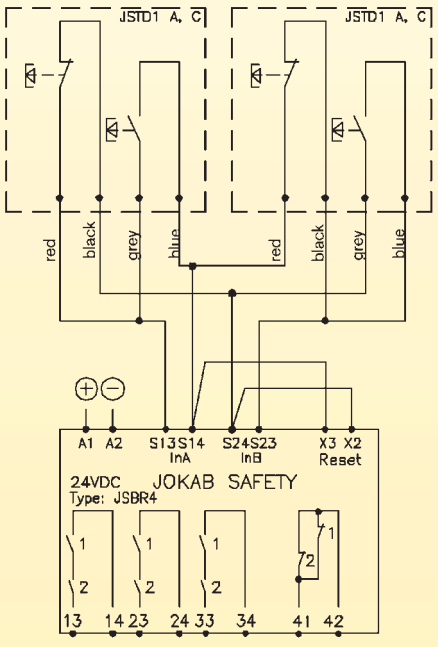
Electrical Life.....dependent upon electrical load characteristics

Connection Cable
JSTD1-A.....2m PVC-cable, 4 x 0.75mm^2
JSTD1-B, JSTD1-E.....4 x 0.75mm^2 wires, approx. 0.20m
JSTD1-C.....10m PVC-cable, 4 x 0.75mm^2

JSTD1 Safeball Electrical Connections

Two-Hand Control Device

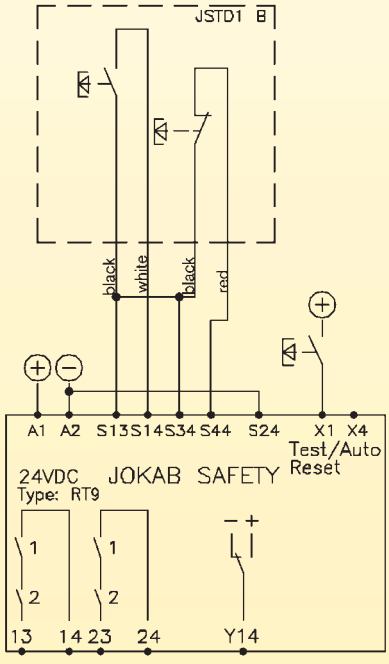
The Safeballs are designed to be connected to a Jokab Safety JSBR4 safety relay or safety PLC to achieve the requirements for a two-hand device. By connecting the Safeballs in this electrical configuration Type IIIc, the highest safety level according to European standard EN 574 is achieved.



Example of two Safeballs connected to Jokab Safety relay JSBR4. The reaction time at 'stop' is < 15 ms.

One-Hand Control Device

When used as a one-hand device the Safeball is designed to be connected to a Jokab Safety RT6, RT7 or RT9 safety relay in order to achieve the highest possible safety level for this type of control.



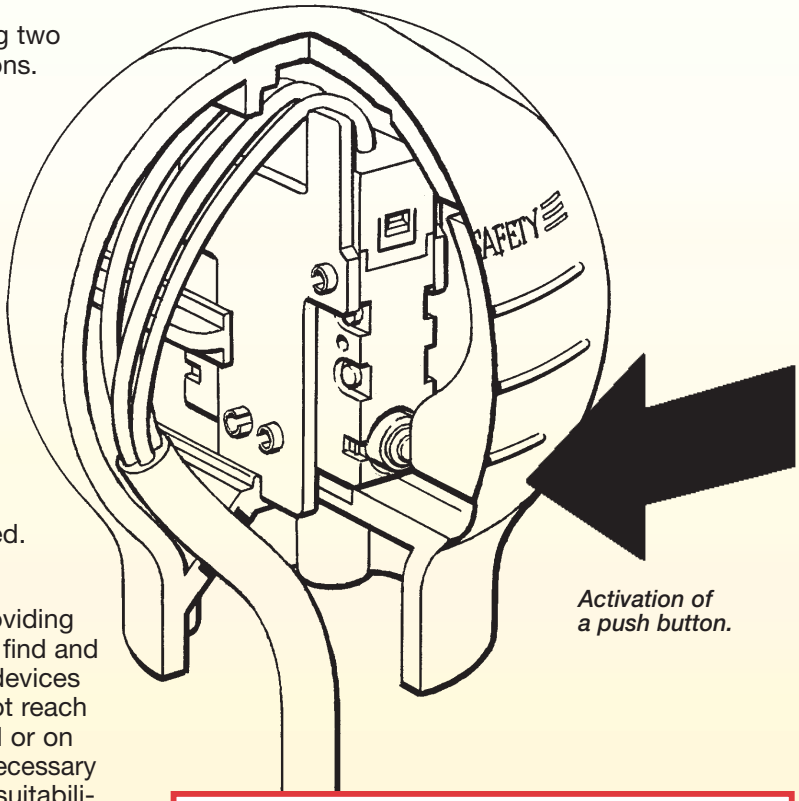
Example of a single Safeball connected to Jokab Safety relay RT6. The reaction time at 'stop' is < 20 ms.

JSTD1 Safeball Function

Two-Hand Control Device

The two-hand control device is made by using two Safeballs, each having two internal push buttons. The Safeballs must be mounted a minimum distance between each other (see Mounting specifications on page 5). By utilizing two push buttons in each device a double safety function is provided in each hand.

The highest safety level is achieved by connecting all four push buttons to the Jokab Safety JSBR4 safety relay. The safety relay gives a dual and supervised safety function and requires input activation within 0.5 seconds in order to start the machine. It also checks that all four push buttons have returned to their deactivated positions before a new start is allowed. The JSBR4 safety relay also provides a stop signal if one or more push buttons are released.



Activation of a push button.

One-Hand Control Device

Safeball is also a very practical method of providing a one-hand control device as it is very easy to find and activate by the machine operator. One-hand devices should only be used when the operator cannot reach into the hazardous area with his/her free hand or on less dangerous machines. Before installation necessary risk assessment must be made to determine suitability of this type of control. To achieve the highest safety level for one-hand control the Safeball must be connected to the Jokab Safety RT6 safety relay.

Versions

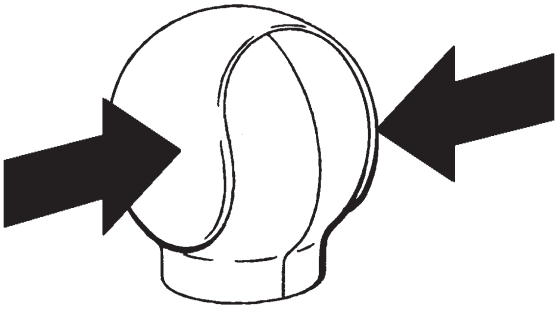
Safeball is available in several versions to meet different environmental conditions and mounting methods.

JSTD1-A The standard version with actuators made of plastic and 2 m cable.

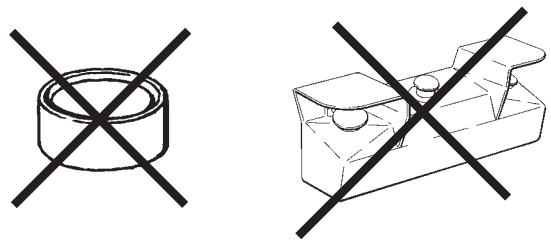
JSTD1-B Made as standard version but without cable. Instead it has four wires each 0.20m long.

JSTD1-C Same as JSTD1-A but with 10 m cable.

JSTD1-E Same as JSTD1-B but with 2 NO contacts.



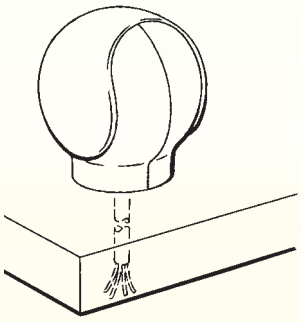
A top cover is not needed as activation switches are fitted on each side of the Safeball.



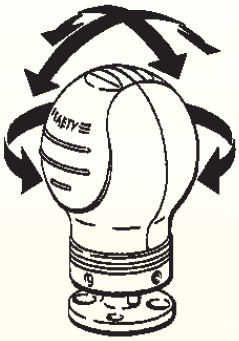
JSTD1 Safeball Mounting

The Safeballs can be mounted in many different ways. They can be mounted on a table, a machine, on a support or wherever suitable for ergonomic reasons. The Safeball can be mounted in a fixed position or on a tilt and rotational support. This flexibility of mounting permits the Safeball to be fitted in the best ergonomic position for the ease of operation by the operator.

The distance requirement between two Safeballs or between a Safeball and a wall or edge of a table depends on how the Safeball is mounted. Safeball can be mounted with four M5 screws or ST4.8 self-tapping screws. If required, the connection cable can be taken out at the side of the lower part of the Safeball. There are two prepared outlets provided for this purpose.



Mounting on a table.

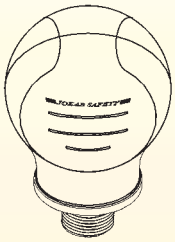


Mounting with ball joint, which can be rotated and angled.

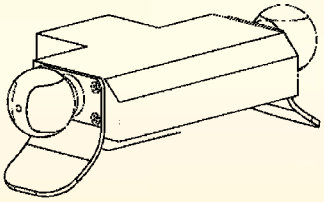
Mounting Methods

To be an approved two-hand device, both Safeballs must be mounted a minimum distance apart in order to prevent operation of both balls with one hand. Safeballs must be fitted a minimum distance from edges of tables or a wall.

It is essential that Safeballs are correctly installed in order to prevent unintended activation of the devices with part of the body in combination for example with a wall.



Mounting with 22 or 30 mm threaded adapter

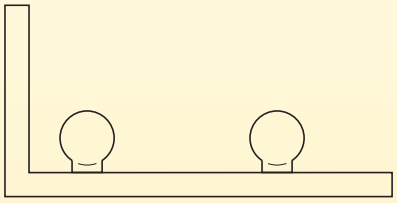


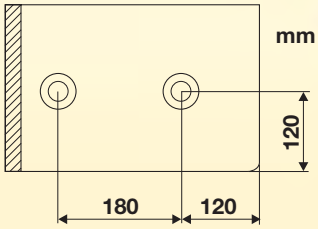
Example of alternative mounting method.

Note: When Safeballs are mounted in such a way that the distance between them can be adjusted to less than the specified minimum, the mounting screws must be locked to ensure any changes in the distance between the two balls cannot be made.

Mounting Distance

Table mounting two Safeballs. In order to prevent cheating, the distances shown are the minimum allowed.





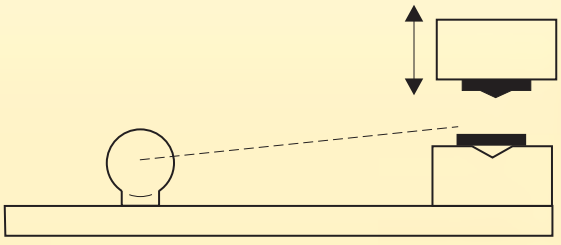
Safety Distance

The Safety distance is the distance between the Safeballs and the dangerous machine movement. The safety distance requirement can be calculated using the following formula for Safeball according to approving authority and EN 999:

S = KxT+C where—

S = safety distance in mm
K = hand speed, 1600 mm/s
T = total stopping time for the dangerous movement *(including the response time of the safety relays in seconds)*
C = Constant = 0 mm for Safeball

Note: S must never be less than 100 mm.



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JOKAB SAFETY