JOKAB SAFETY
A MEMBER OF THE ABB GROUP

Original instructions

Stop-Line

Safety rope pull switch

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www.jokabsafety.com

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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Table of Contents

1 Introduction

Scope

The purpose of these instructions is to describe the safety rope pull switch Stop-line and to provide the necessary information required for assembly, installation, checks and adjustments after installation, and maintenance.

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.
- Basic knowledge of safety devices.
- Knowledge of machine safety.

Special notes

Pay attention to the following special notes in the document:

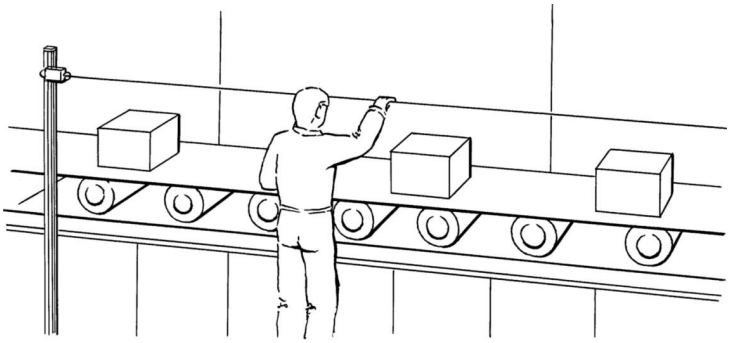
⚠ **Warning!**	Danger of severe personal injury! An instruction or procedure which, if not carried out correctly, may result in injury to the technician or other personnel.
Caution!	Danger of damage to the equipment! An instruction or procedure which, if not carried out correctly, may damage the equipment.
NB:	Notes are used to provide important or explanatory information.

2 Overview

General description

Rope pull switches are applied at the operator end of conveyor systems and machines. With Emergency-Stop switching devices installed in intervals at the machine (e.g. mushroom button) the Emergency-Stop signal can only be generated at the device itself. Using a rope pull switching device it is possible to generate the signal at any point of the line.

The metallic enclosed rope pull switching devices of the Stop-Line type may be applied under indoor conditions as well as for outdoor use.



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

The system consists of the switching device, a red pull rope, the rope supports and the opposite spring.
The pulling gadget of the rope pull switching device gets connected with a steel rope. The Emergency-Stop function can be generated by pulling the rope. The pull rope system is pre-tensioned by an integrated spring. Thus the rupture of the rope will immediately initiate the latching of the switching device and generates the Emergency-Stop function. The safety contacts remain latched after the actuation. After elimination of the dangerous situation and inspection of the whole line the switching device may be reset manually to normal operation.

Construction

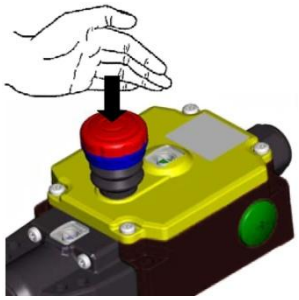
The safety rope pull switching devices of the Stop-Line type have an aluminium pressure die cast housing. They achieve protection class IP67 when the cover is closed properly and an at least evenly matching cable gland is installed. The Stop-Line is equipped with three cable entries M20x1.5.

The switching devices comply with the international requirements according IEC60947-5-5, EN ISO 13850; upon actuation or rupture of the pull rope the Emergency-Stop switching device shall lock automatically and can only be reset to normal operational mode through its onboard reset device.

By installing a pull rope to the pulling gadget a bracing length up to 75m can be realized. The length depends on the particular type. Keep in mind that the sheath of the rope has to be removed at those points were the rope gets clamped!

Integrated emergency stop button

The Stop-Line safety rope pull switches are equipped with an integrated emergency stop impact button that can be pressed in hazardous situations. In the same way as when the pull rope is actuated the safety contacts open and the switch latches. After elimination of the dangerous situation and inspection of the whole line the switching device may be reset manually to normal operation by pulling the emergency stop impact button. The emergency stop impact button has to be suitably protected (by a roof covering) from direct rain/snow etc.



Concerning this please note item 3 in the section *Installation sequence*!

Indication of rope tension

During installation/adjustment of the rope assembly, the correct tension of the rope can be checked through the integrated inspection window. To ensure optimum rope tension as part of the adjustment procedure, the tips of the indicator arrows should be aligned with the marking. The rope tensioning springs at the opposite side are to be optimally selected according to the various switch types (maximum rope length). For this purpose, please refer to sections *Selection of System Components* and *Installation Sequence*.

Teleindication for monitoring the rope tension

The Stop-Line safety rope pull switches are equipped with a teleindication for monitoring the rope tension. This feature uses an integrated sensor unit that monitors situations in which the permissible rope tension is exceeded or triggering of the safety rope pull switch is imminent.

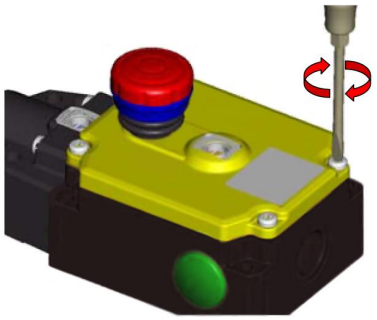
For this a supply voltage of 10-30 VDC has to be connected to terminal 1 and 3 of the electronic. When the rope tension leaves the optimal adjustment range due to changes in the lengths will this be indicated on terminal 2. This electronic output signals in good time that maintenance/adjustment is required before machine shut-down.

This output can be used as an indication signal or be connected directly to signal lights. This connection configuration conforms to "preventative maintenance" requirements.

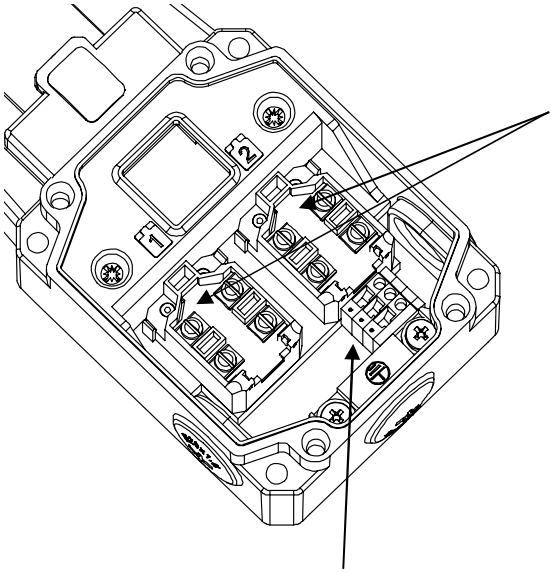
3 Connections

Cable installation

Only authorized and qualified personnel may carry out the electrical connection.



Tightening torque of cover retaining screws: 2 Nm



Built-in switches S1+S2

Tightening torque of contact screws 0.8 mm

Connection terminal of teleindication for monitoring rope tension.

1) **Remove cover**
For this purpose, undo cover screws with a screwdriver and detach cover.

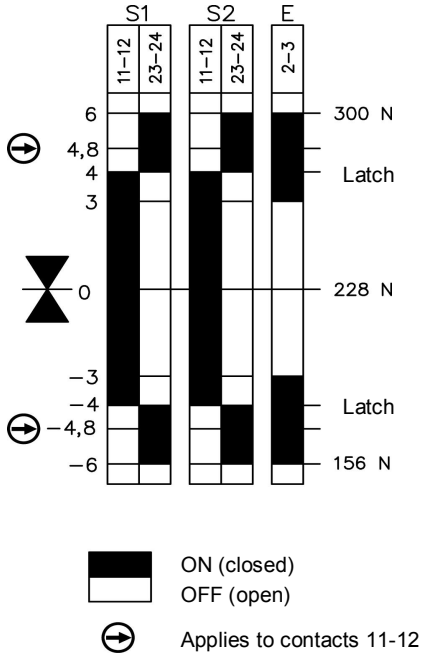
2) **Electrical connection**
The electrical contacts of the switching elements have M3.5 screw connections. See Section S*witching Diagram* for contact assignments. The connection requires a stranded wire with ferrule or a solid wire with a cross section of 0.5 – 1.5 mm².

3) **Close cover**
Place cover on housing as illustrated and tighten cover retaining screws to a torque of 2 Nm.

⚠ **Warning!**

- Make sure that no stranded wires or similar are trapped!
- Observe specified tightening torque requirements!
- Only operate the switching device with the cover closed!

Switching diagram



Contact description

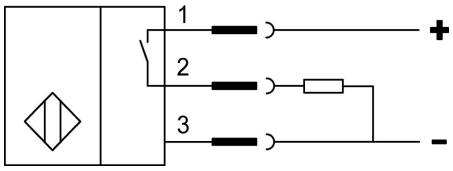
The contacts 11-12 on both S1 and S2 are forced disconnected and should be used for the safety function.

Tolerances

Distance: +/- 0.5 mm
Force: +/- 15 %

NB: The contacts are reached by detaching the yellow cover using a screwdriver to undo the screws. See section *Cable installation* above.

Connection of teleindication

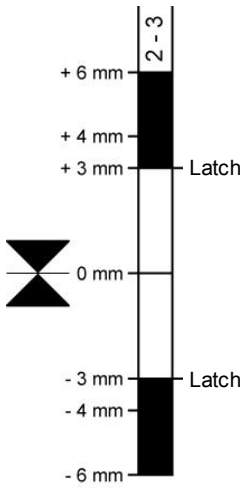


Terminals 1-3:

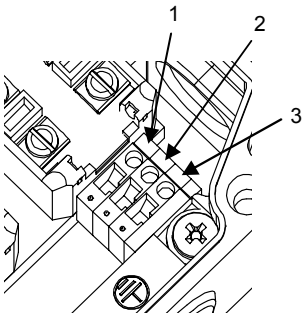
1) +24 VDC
2) Rope tension indication
3) 0 VDC

Rated operational voltage, U_e: 10-30 VDC
Rated operational current, I_e: 50 mA
Utilization category: DC13

NB: Protected against polarity reversal and short-circuit.



Operating diagram



Connection terminal

Stop-Line is equipped with sensors monitoring the tension of the rope. The sensors provide a signal which can be sent to a signal circuit or connected directly to a signal light, indicating that the tension of the rope should be readjusted to prevent an unintended stop.

Electrical function test

Reset rope safety system by pulling at the blue grip of the emergency stop impact button.

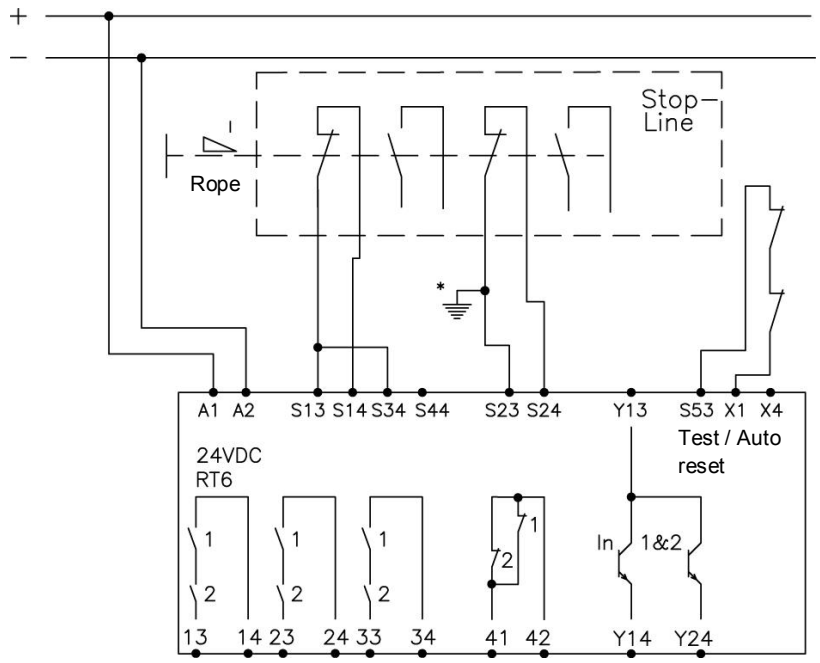
1) Start the machine.

2) Actuate the rope or the emergency button:

a. The safety contacts ⊖ will open immediately. The machine shall stop.

b. The safety contacts ⊖ will close after pulling at the blue grip again.

Connection example: Stop-Line connected to safety relay RT6



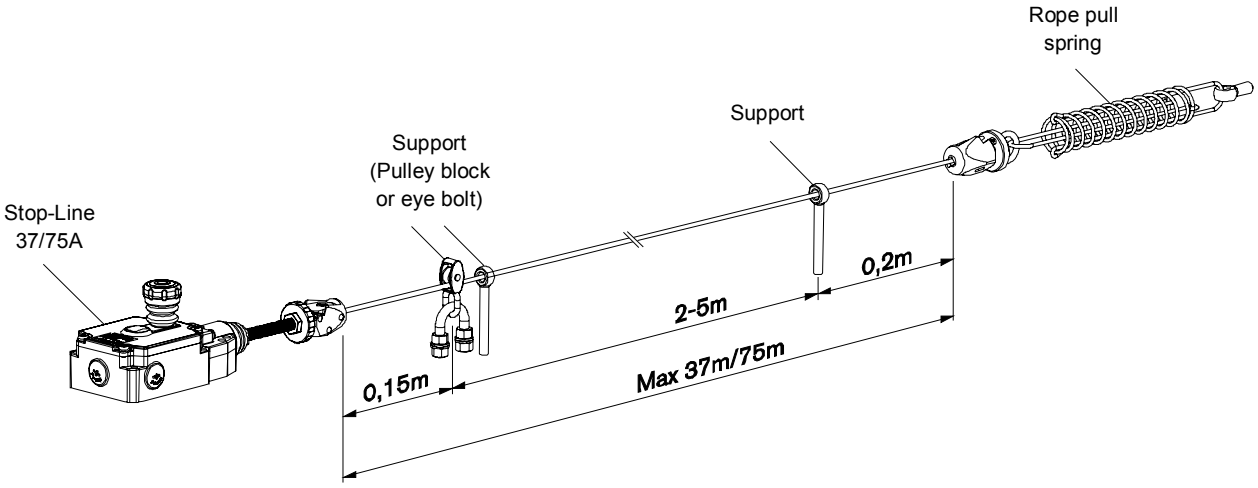
*) AC-relays only

NB: Connection shows Stop-Line with correct rope tension (machine allowed to run).

The electrical connection conforms to the highest safety level.

4 Installation and maintenance

Installation overview



The rope should be mounted at least 20 mm from the underlying surface. If the rope 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. Use the quick-fix head to set the proper tension. After installation, pull the rope strongly several times and then adjust the tension to compensate for any extensions due to deformations.

Selection of system components

For the proper use and a safety conformable design of the rope pull system it is necessary to provide a spring at the counter bearing. In such a way it is possible to actuate the rope at any point of the line independently from the direction of the actuation. To accomplish this demand in a quick and easy way we recommend the use of the rope pull springs with an integrated over-expansion protection (see table 1). Optionally, a conventional spring can be used (see table 2). In this case a rope bridge has to be mounted underneath the conventional spring for over-expansion protection purpose. Keep in mind that the use of a conventional spring results in a rather time-consuming installation. More fastening, installation and rope material is optionally available. The conventional spring is not provided, and shall only be seen as an example. See the section *Accessories and spare parts* for a detailed overview.

A – Rope pull spring

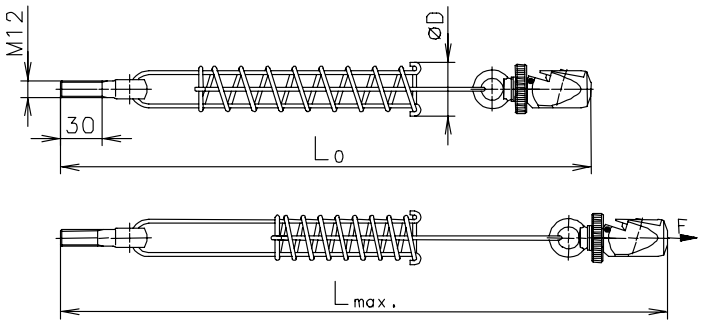


Table 1		
Type	75 A	37 A
Article number	**2TLJ020043R0000**	**2TLJ020043R0100**
$L_{0\ min.}$[mm]	483	383
$L_{max.}$ [mm]	653	487
ØD [mm]	51	42
The rope pull springs are equipped with a quick fastening device and an eye bolt (size M12 x 50 acc. DIN 444)		

B – Conventional spring (opposite spring) – Example

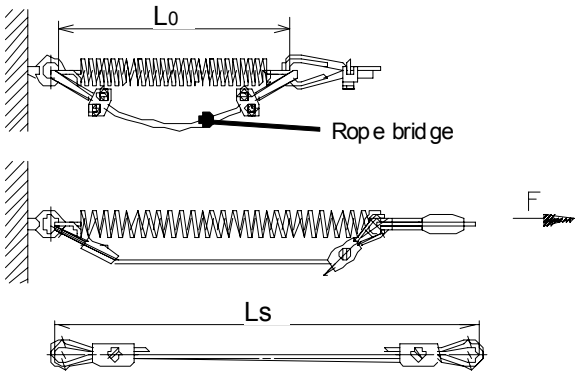


Table 2		
$L_{0\ min.}$[mm]	201	180
Ls [mm]	300	300
Spring rate	3,5	2,5

During installation and adjustment of the rope pull switch the variations in physical length due to the variations in temperature must be considered.

Table 3 shows the permissible bracing length as a function of the expected ambient temperature difference.

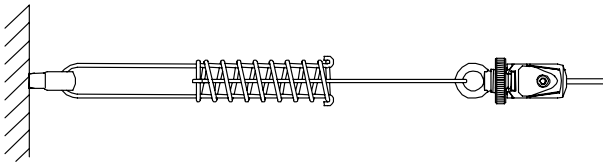
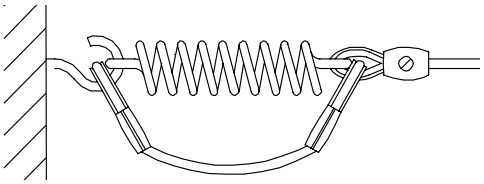
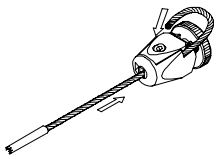
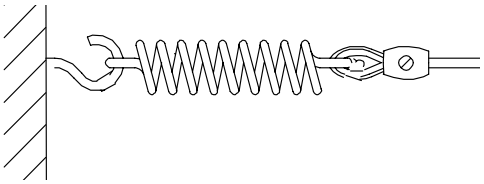
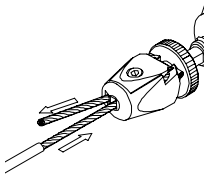
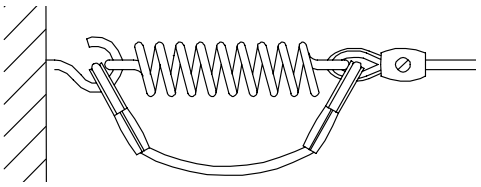
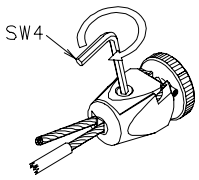
In addition the table describes for the Stop-Line types the maximum bracing length in applications with different spring forces. Furthermore a selection of the suitable switching device with respect to the expected variations in temperature is possible.

Table 3

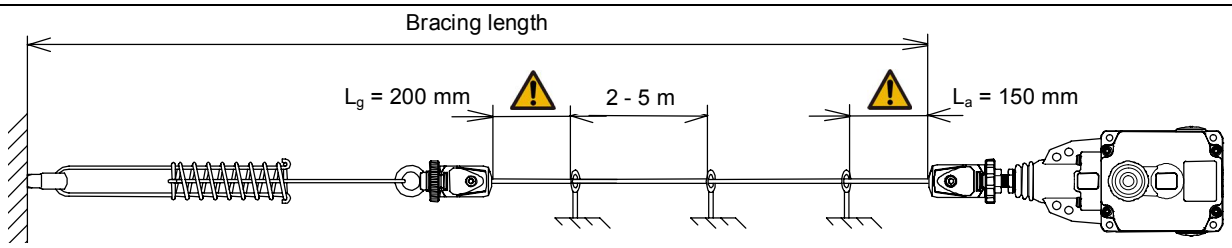
	Bracing length Lmax. in meter [m]																																						
	1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m	22m	24m	26m	28m	30m	32m	34m	36m	38m	40m	42m	44m	46m	48m	50m	55m	60m	65m	70m	75m
Max. variation in temperature in °C.	+/-55 °c																																							
	+/-50 °c																																							
	+/- 45 °c																																							
	+/- 35 °c																																							
	+/- 25 °c																																							
	+/- 20 °c																																							
	+/- 13 °c																																							
	+/- 7 °c																																							
	+/- 4,5 °c																																							
Stop-Line 37A	Bracing length max. 37,5 meters																																							
Stop-Line 75A	Bracing length max. 75 meters																																							

Installation sequence

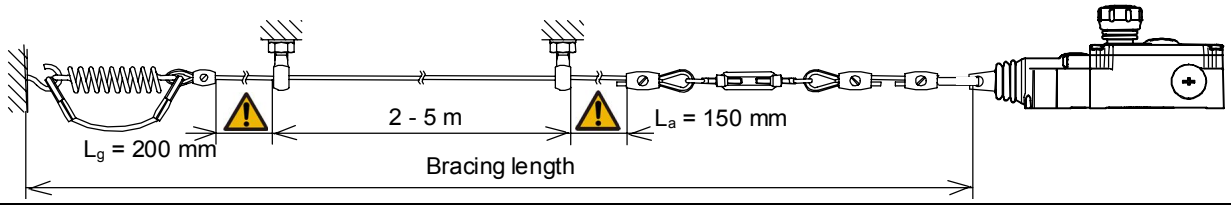
The installation sequence for type B shall only be seen as an example of an alternative solution, as the conventional spring is not provided by ABB/Jokab Safety.

1	A Mount bearing point with rope pull spring; install the pull rope: the sheath of the rope at those points where the rope gets clamped must be removed. Insert rope into the quick fastening head as shown below and tighten.	B Mount bearing point with opposite conventional spring; install the pull rope: Fix the rope as shown with thimble and rope clamp. Install a rope bridge to protect the opposite conventional spring from over-expansion. Use also thimble and rope clamp.
		
	1.1A ⇩	1.1B ⇩
		
	1.2A ⇩	1.2B ⇩
		
	1.3A ⇩	
		

2 A



B



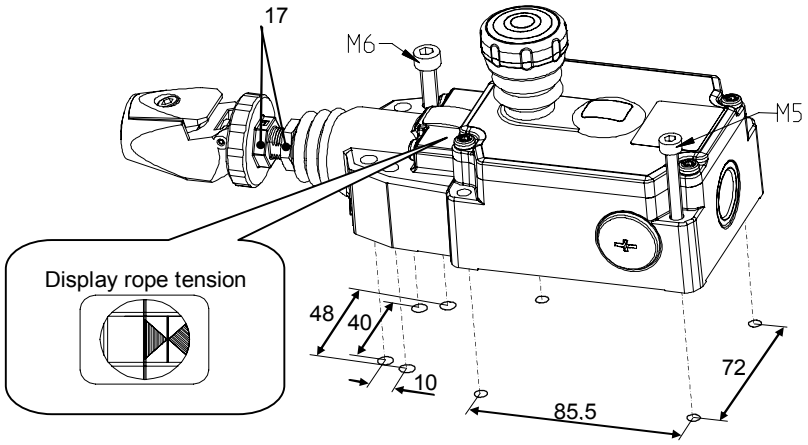
Note the position of the rope supports. The first rope support next to the switch shall measure L_a = 150 mm. Make sure the distance L_g = 200 mm on the counter spring end to ensure a sufficient triggering travel range for the switch. Set up rope supports within a distance of 2 – 5 meters between each other.

3

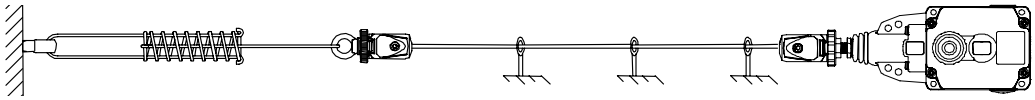
Mount the Stop-Line switching devices with 4 screws (M5 size). Max. fastening torque: M = 2 Nm.

⚠ Warning!

Emergency-Stop switching devices have to be mounted in such a way that the rope or the emergency stop button can be reached without obstacles in hazardous situations.

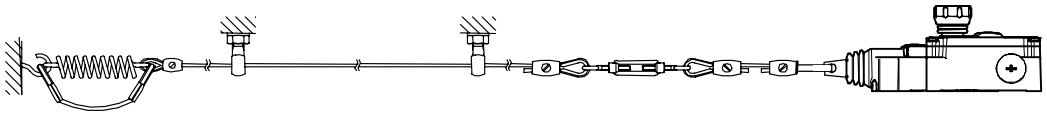


4 A

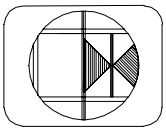


Connect the pull rope with the quick fastening head (see item 1). Re-tension the pull rope.

B



Connect the pull rope with the turnbuckle as shown (3x rope clamp with thimble).



Display rope tension

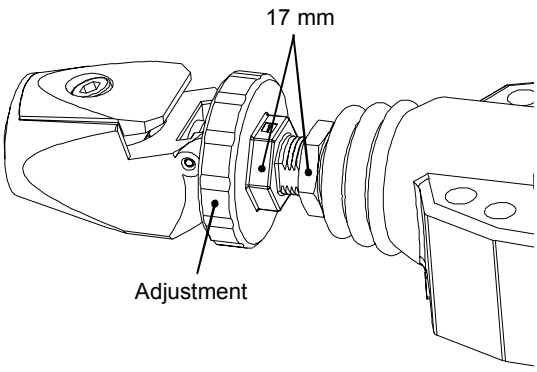
5

⚠ Warning!

The basic adjustment shall happen at a temperature which corresponds with the prevailing operating temperature. In case of large variations in ambient temperature the pull rope is subject to variations in length. Large rope lengths could under such circumstances lead to frequent changes of the basic adjustment.

Corrective action: re-adjustment (see below) or reduction of the rope length.

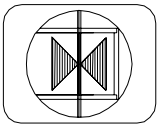
A



Manually adjust the rope assembly by turning the adjusting screw or using an open-ended spanner (width across flats 17 mm) until the arrow tips of the "rope tension" indicator are aligned with the marking.

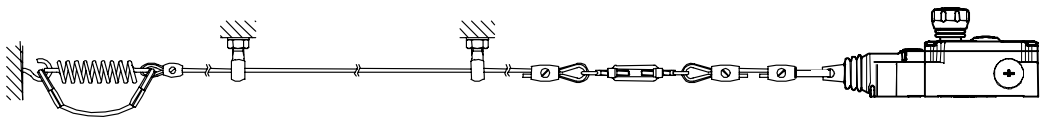
While doing so, brace the quick-action clamping head to prevent the rope twisting.

After adjustment, secure the adjustment screw by locking the hexagon nut.



Display rope tension

B



Adjust the turnbuckle in such a way that the arrowheads in the display correspond with the check mark.

6

⚠ Mechanical function test

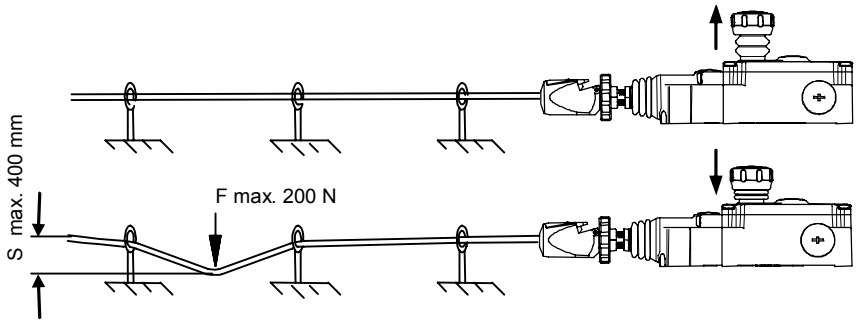
Pull emergency stop impact button at blue grip

- safety contacts closed -

Actuate pull rope

- safety contacts opened -

Repeat function check with actuation of the emergency stop impact button.



Apply multiple forceful actuating strokes after the installation to cause deformation of parts and/or rope elongation. If necessary (normally the case) readjust the regulating screw or the turnbuckle.

Safety instructions

- All system parts have to be attached to such grounding machine parts which safely can accommodate the appearing forces.
- A straight guided rope will result in less friction force in the rope pull system. In rope pull systems with a system length of more than 25m, only pulley blocks (i.e. no eye bolts) may support the rope.
- If the rope gets deflected in the line (max. degree of deflection <180°) special pulley blocks have to be used.
- Positioning the rope supports in odd intervals prevents from rope vibrations which could lead to erratic tripping of the rope pull system.
- Sufficient space in between the rope supports will secure unmistaken grasp and actuation of the rope.
- The wire should be mounted at least 20 mm from the underlying surface.

⚠ **Warning!** An improper installation or manipulation of the rope pull switch will render the personal protection function useless and can cause serious or fatal injuries.

Maintenance

- The tie pin shall be lubricated once a year with some grease (free from resin and acid).
- The rope pull system shall be inspected and maintained in regular intervals. The extent of the intervals depends from the ambient conditions and the operating conditions.
- Check the proper rope tension as well as the Emergency-Stop function of the pull rope and adjust if necessary.
- After maintenance or service the system function shall be tested through multiple actuations of the rope. Assure that the switching device latches duly and can be unlocked again.
- In case that the switch element or the latching device fails the complete rope pull switch must be replaced. The defective rope pull switch can be returned to the nearest ABB/Jokab Safety Service Office or reseller for inspection.

⚠ **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.

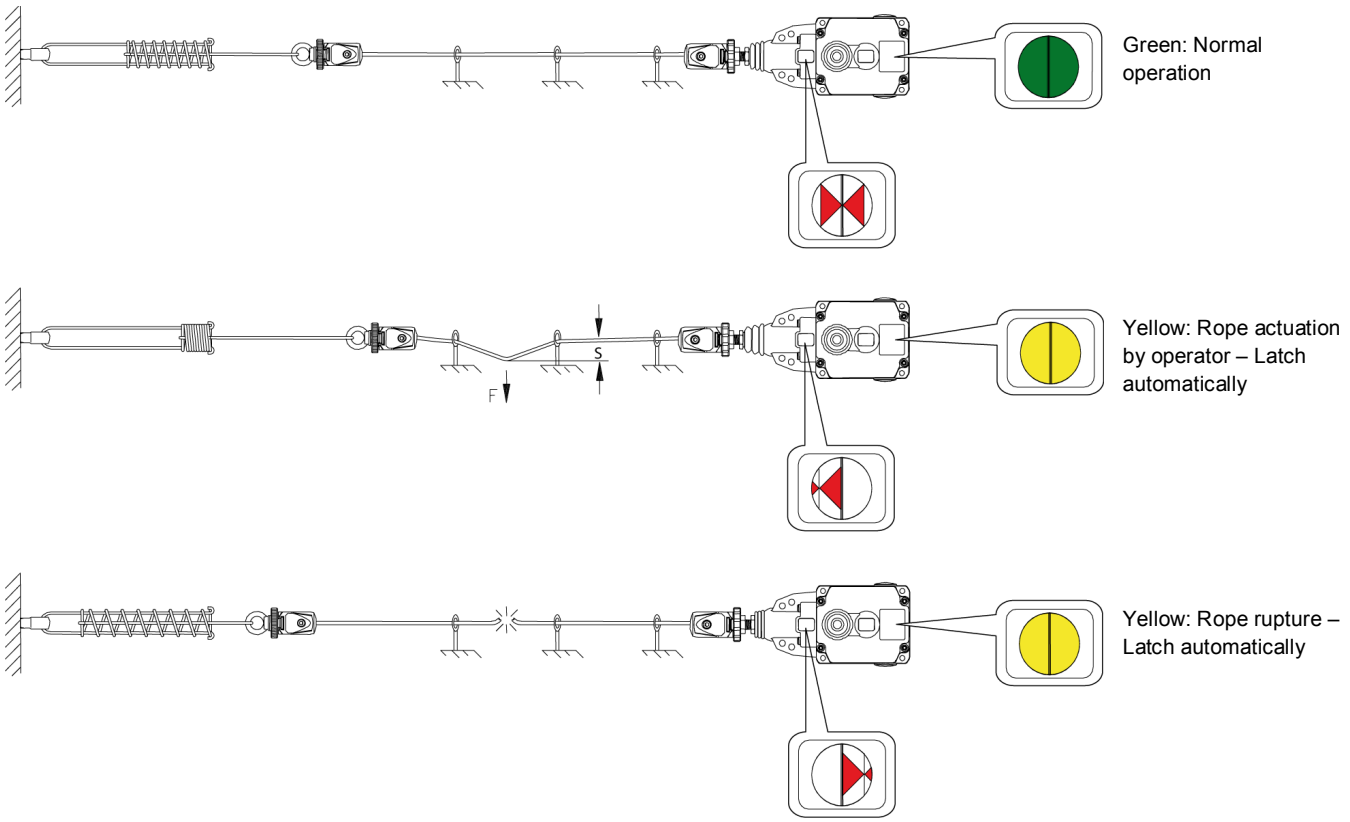
NB: If the mushroom-head slam button is damaged it must be replaced in order to be able to reset an activated emergency stop. Contact ABB/Jokab Safety for further instructions.

5 Operation

Switching status indicator of latching facility

The switching status of the latching facility and contacts can be seen through the integrated inspection window.

Yellow in the inspection window indicates that the safety rope pull switch is latched (break contacts open).
Green in the inspection window indicates that the device is ready for operation and the rope assembly is monitored (break contacts closed).



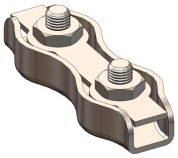
Switching status indicator

6 Model overview

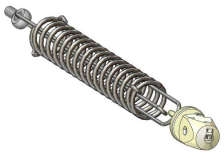
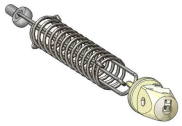
Type	Article number	Description
Stop-line 75A	2TLJ020041R0000	Stop-line 75A Safety rope pull switch
Stop-line 37A	2TLJ020042R0000	Stop-line 37A Safety rope pull switch

Accessories and spare parts

There are many accessories and spare parts available, contact ABB/Jokab Safety for more information.

Type	Article number	Description
	2TLJ020034R0200*	Eye Bolt M6x50
	2TLJ020034R0300	Thimble
	2TLJ020034R0400	Rope clamp for 3 mm
	2TLJ020034R0500	Rope 3 mm (sheath 4 mm)
	2TLJ020034R0600	Turnbuckle
	2TLJ020034R0900*	Eye Bolt M8x50
	2TLJ020034R1300	Swivel

*) In a system with a length of more than 25 m the rope may only be supported by pulley blocks.

Type	Article number	Description
	2TLJ020043R0000	Pull rope spring QF75
	2TLJ020043R0100	Pull rope spring QF37
	2TLJ020043R0200	Deflection pulley Ø 75 mm
	2TLJ020043R0300	Pulley block, fixed
	2TLJ020043R0400	Pulley block, hinged
	2TLJ020043R0600	Fastener for pulley block
Installation kit 1	2TLJ020043R1200	2TLJ020034R0500 x 25 2TLJ020034R0400 x 6 2TLJ020034R0300 x 6 2TLJ020034R0600 x 1 2TLJ020034R0900 x 8
Installation kit 2	2TLJ020043R1300	2TLJ020034R0500 x 40 2TLJ020043R0100 x 1 2TLJ020043R0300 x 9 2TLJ020043R0600 x 9

7 Technical data

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

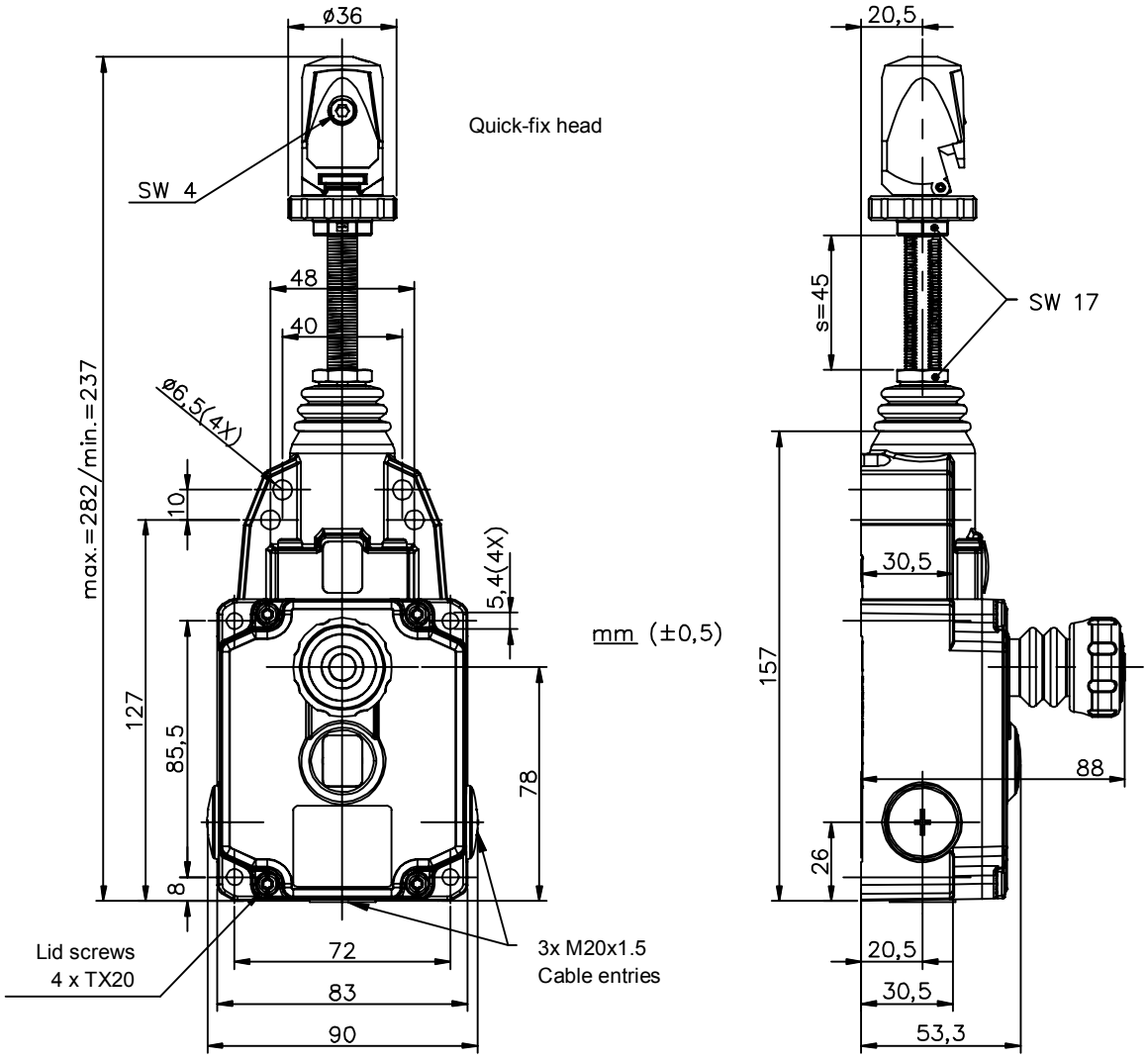
Electrical characteristics	
Rated isolation voltage (U_i)	250 V
Rated impulse withstand voltage (U_{imp})	2.5 kV
Conventional thermal current (I_{the})	10 A
Utilization category	AC-15, U_e/I_e 240 V / 3 A, U_e/I_e 120 V / 6 A DC-13, U_e/I_e 250 V / 0.27 A, U_e/I_e 125 V / 0.55 A
Direct opening action ⊖	Acc. to IEC/EN 60947-5-1, Annex K
Short-circuit protection	Fuse 6 A DII Type gG

General	
Protection class	IP67 acc. to IEC/EN 60529
Ambient temperature	-30…+80°C (no freezing or condensation)
Size	See drawing
Weight	0.94 kg
Material	Enclosure: Al-die cast Cover: Al-die cast Actuator: Zn-die cast/Steel Emergency stop: PA, glass fibre reinforced
Colour	Enclosure: Black Cover: Yellow Emergency stop: Blue (bottom), red (top)
Contacts	2 NC, 2 NO (Zb) (2 built-in switches S1+S2)
Latching device	Acc. To IEC 60947-5-5, EN 60947-5-5, EN ISO 13850 (EN 418)
Cable access	3 x M20 x 1.5
Connection	8 screw terminals (M3.5)
Conductor cross-sections	Solid: 0.5 ... 1.5 mm^2 Litz wire with ferrules: 0.5 ... 1.5 mm^2
Mounting	4 x M6 or 4 x M5
Mechanical life	Max. 1 x 10^5 switching cycles acc. to IEC 60947-5-5
Max. switching frequency	≤ 20/min
Reset method	Pull of the emergency stop acc. to IEC/EN 60947-5-5
Max. rope length	Stop-Line 35A: 37.5 m Stop-Line 75A: 75 m
Rope ∅	D = ∅ 2 – 5 mm

Safety / Harmonized standards	
Conformity	European Machinery Directive 2006/42/EC CE EN ISO 12100-1,-2, EN 60947-1, IEC 60947-1, EN 60947-5-1, IEC 60947-5-1, EN 60947-5-5, IEC 60947-5-5, EN 954-1, EN ISO 13849-1, EN 60204-1, EN ISO 13850
EN ISO 13849-1	B_{10d}: 2 x 10^5 SFF: 0.995 λS/h: 5 x 10^{-8} λD/h: 5 x 10^{-8} λDD/h: 5 x 10^{-8} (1/3600 Hz)
Certifications	$_cCSA_{us}$ A 300

Dimensions

Stop-Line dimensions



NB: All measurements in millimetres.

CAD model

1) Visit www.jokabsafety.com.

2) Choose language **English** in the menu at the top of the page.

3) In the menu to the left, choose **Products**.

4) A list of products is now shown. Choose **3D CAD files**. This will open a new window called “Jokab Safety AB – SolidComponents”.

5) In the new window there is a menu to the left, showing different product categories. Stop-Line belongs to the category **Emergency stops**, find it in the list and click it. If the language changed in the new window, click the corresponding flag at the top of the page to choose language again (Swedish, English or German available).

6) Choose **Stop-Line** in the list now shown.

7) Choose a preferred format in the scroll down list next to ”CAD-format” (SolidWorks, ProE, Sat, Step, Parasolid, Iges, Dwg, Dxf).

8) Click the **save icon** in front of the desired product (”Stop-Line 75A” etc).

9) The product will now be added to the list of downloads. Click the **save icon** again in the new list to start the download.

8 EC Declaration of conformity

EC Declaration of conformity

(according to 2006/42/EC, Annex2A)

We	ABB AB JOKAB SAFETY Varlabergsgatan 11 SE-434 39 Kungsbacka Sweden	declare that the safety components of ABB AB make with type designations and safety functions as listed below, is in conformity with the Directives 2006/42/EC 2006/95/EC
Person authorised to compile the technical file		Lars-Magnus Felth ABB AB JOKAB Safety Varlabergsgatan 11 SE-434 39 Kungsbacka Sweden
Product		**Certificate**
Emergency stop device Smile, versions 10EA, 10EAK, 11EA, 12EA, 11EAR		11-SKM-CM-0103
Emergency stop device INCA 1		11-SKM-CM-0103
Emergency stop wire Stop Line		
Emergency stop wire JSNY10		
Notified Body		Inspecta Sweden AB Box 30100 SE-104 25 Stockholm Sweden Notified Body No. 0409
Used harmonized standards		EN ISO 12100:2010, EN 954-1:1996, EN ISO 13849-1:2008/AC:2009, EN 60204-1:2007+A1, EN ISO 13850:2008

Mats Linger
PRU Manager
Kungsbacka 2011-03-04

www.abb.com
www.jokabsafety.com

Original