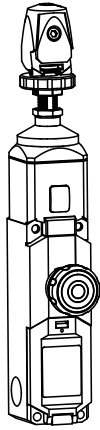


Rope Pull Emergency Stop Switches



User Instructions

RP-LS42F-xxLE Series 42 mm Latching Switches with Rope/Cable Actuators



- Positive-opening safety contacts (IEC 60947-5-1), not dependent upon springs
- Both safety contacts latch open when rope is pulled, broken, or if tension is reduced; requires manual reset (IEC 60947-5-5)
- Compliant with ANSI B11.19, ANSI NFPA79, IEC/EN 60204-1 and ISO 13850 Emergency Stop requirements
- Heavy-duty thermoplastic housing (polyamide), rated IP67, suitable for demanding industrial environments; insulated device
- Innovative quick-connect design provides quick, easy rope fixing and tensioning on RP-LS42F-..LE models
- RP-LS42F-..LE models have an integrated emergency stop button
- Rope spans of 25 m (82 ft), 37.5 m (125 ft), and 75 m (245 ft), depending on model
- Monitoring contacts operate opposite the safety contacts, for monitoring by another device or interfaced with EZ-LIGHT® indicators
- Tension indicator window indicates proper rope tension for operation or safety contacts latched open (the rope pull or the E-stop button is actuated)

Models

Maximum Rope Length / Force			Rope Connection	E-Stop Button
75 m (246.1 ft) / 300 N	38 m (124.7 ft) / 175 N	25 m (82.0 ft) / 100 N		
RP-LS42F-75LE	RP-LS42F-38LE	RP-LS42F-25LE	Turnbuckle	Yes

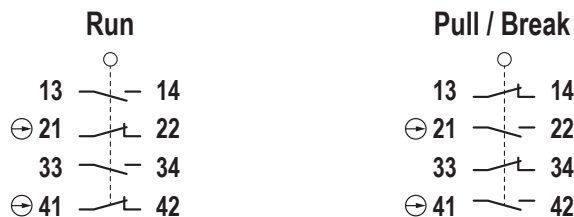


Figure 1. Contact State

NOTE: This symbol for a positive-opening safety contact (IEC 60947-5-1) is used in the switching diagram to identify the point in actuator travel where the normally-closed safety contact is fully open.

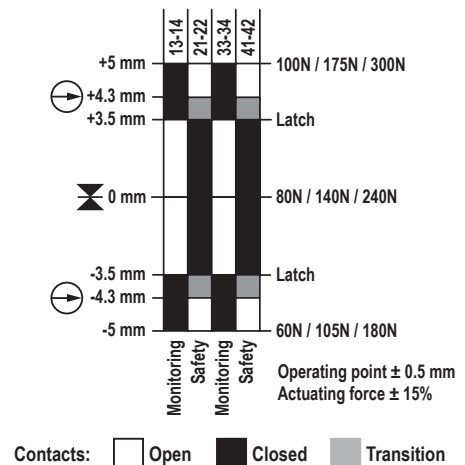


Figure 2. Switching Diagram



Important... Read this before proceeding!

The user is responsible for satisfying all local, state, and national laws, rules, codes, and regulations relating to the use of this product and its application. Banner Engineering Corp. has made every effort to provide complete application, installation, operation, and maintenance instructions. Please contact a Banner Applications Engineer with any questions regarding this product.

The user is responsible for making sure that all machine operators, maintenance personnel, electricians, and supervisors are thoroughly familiar with and understand all instructions regarding the installation, maintenance, and use of this product, and with the machinery it controls. The user and any personnel involved with the installation and use of this product must be thoroughly familiar with all applicable standards, some of which are listed within the specifications. Banner Engineering Corp. makes no claim regarding a specific recommendation of any organization, the accuracy or effectiveness of any information provided, or the appropriateness of the provided information for a specific application.



WARNING: Not a Safeguarding Device

An Emergency Stop Device is not considered a safeguarding device because it requires an overt action by an individual to stop machine motion or hazards.

A safeguarding device limits or eliminates an individual's exposure to a hazard *without action by the individual or others*. Because an individual must actuate the device for it to function, these devices do not fit the definition of a safeguarding device and cannot be substituted for required safeguarding. Refer to the relevant standards to determine those requirements.

Overview

Models RP-LS42F-xxLE are rope pull (cable pull) emergency stop switches in compact, limit switch style housings made of high impact thermoplast. When used with steel wire rope, they can provide continual access along the span for emergency stop actuation. Red PVC-covered 3 mm diameter wire rope is recommended (see [Rope Pull Hardware](#) on page 11). The rope pull system is the switch(es), the rope, supporting hardware, tensioning springs/hardware, and anchor points.

When the rope is properly tensioned, the red arrows are centered in the tension indicator window, the safety contacts at terminals 21/22 and 41/42 are closed, and the monitoring contacts at terminals 13/14 and 33/34 are opened (see [Tensioning the Rope](#)). The safety contacts open when there is a cable-pull or cable-break situation, and remain open until the built-in reset button is manually reset (see [Figure 2](#) on page 1). The safety contacts can be interfaced in either a single-channel or dual-channel method (see [Hookup](#) on page 7). Terminals 13/14 and 33/34 are for non-safety monitoring purposes only.

Emergency Stop Considerations

ANSI NFPA 79, ANSI B11.19, IEC/EN 60204-1, and ISO 13850 specify emergency stop requirements for rope (cable) pull installations, including the following:

- Be located where emergency shutdown is required
- Be continuously operable, easily visible, and readily accessible. Do not mute or bypass
- Provide constant tension of the rope or cable pull
- The rope or cable pull, as well as any flags or markers, must be colored RED
- The rope or cable pull must have the capability to react to a force in any direction. This may require a spring at the anchor point or an opposing rope pull switch
- The switch must have:
 - A self-latching function that requires a manual reset after actuation
 - Have direct opening operation
 - Detect a slack condition or a break of the rope or cable



WARNING: Emergency Stop Functions

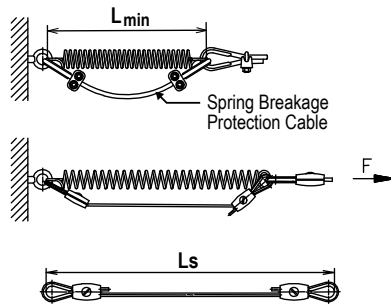
Do not mute or bypass any Emergency Stop device. ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 require that the Emergency Stop function remain active at all times.

Assemble the Spring Breakage Protection Cable (such as RPAK-C2SBP-1) and the thimble/clamp loop at the end of the rope, as shown in [Figure 4](#) on page 4. Keep the rope's PVC cover intact along its complete length, except where it attaches to the clamps at either end. Use Tensioning Spring RPA-S2-1 for the 25 m and the 38 m switches in straight line applications and RPA-S3-1 for 75 m applications or in any application in which the direction changes.

For applications using a Tensioning Spring Assembly (such as RPA-S4-1 or RPA-S6-1):

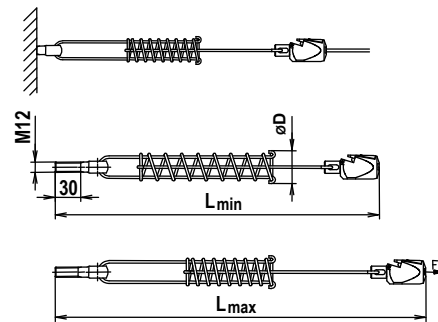
Install the rope using the steps below. See [Figure 5](#) on page 4 and [Figure 7](#) on page 5.

- Strip away a minimum of 100 mm to 150 mm (4 in to 6 in) of the red rope sheathing. Additional length of red sheathing maybe required to be removed depending on total slack in the rope.
- Using a 4 mm hex wrench, loosen the set screw on the switch fitting.
- Insert the cable into the center hole in the clamp, pull the excess rope through, and loop the rope back through the clamp.
- Pull the cut end of the rope out from the side hole until there is no excess rope in the clamp.
- Make sure that no red sheathing is within the clamping mechanism.



	RP-LS42F-25xx/-38xx	RP-LS42F-75xx
Tensioning Spring	RPA-S2-1	RPA-S3-1
L _{min}	180 mm	201 mm
L _s	300 mm	300 mm
Spring Rating	2.5	3.5

Figure 4. Individual Tension Springs



	RP-LS42F-25xx/-38xx	RP-LS42F-75xx
Tensioning Spring Assembly	RPA-S6-1	RPA-S4-1
L _{min}	362 mm	465 mm
L _{max}	466 mm	635 mm
ØD	42 mm	50 mm

Figure 5. Tension Spring Assembly

- Route the rope using pulleys (recommended) or eye bolts at each support point (securely/rigidly mounted) as described in [Figure 6](#) on page 5.



Important: Always use a pulley when changing the direction of the rope or routing the rope around a corner, regardless of the angle. Minimize friction at all supports and change of direction; do not run rope through conduit or other tubing.

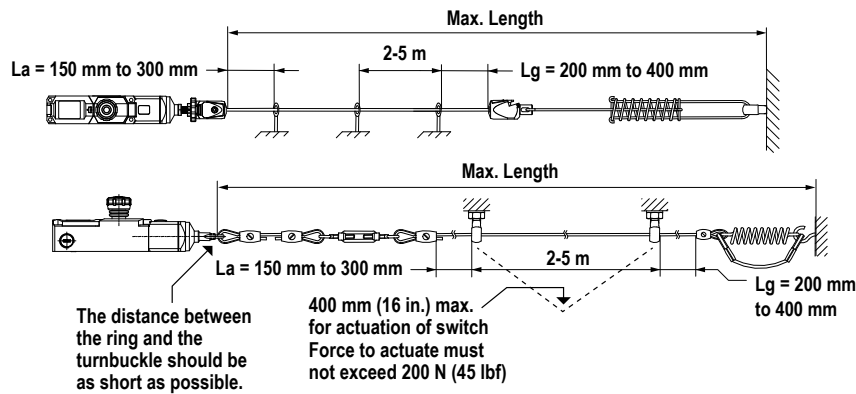


Figure 6. Assembly of Rope and Hardware

5. Models RP-LS42F-..LE with integral turnbuckle:

These models have their own integral turnbuckle and clamp to tension the rope and to hold it in place. This innovative design provides for quick and easy rope fixing and tensioning, and requires no external turnbuckle, nor any additional clamp at the switch end of the rope. To install the rope, as shown in Figure 7 on page 5:

- a. Strip away a minimum of 100 mm to 150 mm (4 in to 6 in) of the red rope sheathing. Additional length of red sheathing maybe required to be removed depending on total slack in the rope.
- b. Using a 4 mm hex wrench, loosen the set screw on the switch fitting.
- c. Insert the cable into the center hole in the clamp, pull the excess rope through, and loop the rope back through the clamp.
- d. Pull the cut end of the rope out from the side hole until there is no excess rope in the clamp.
- e. Make sure that no red sheathing is within the clamping mechanism.
- f. When affixing at the switch (with integral turnbuckle), after the rope has been strung the complete length, pull the cable so that the approximate tension is achieved.
- g. When the tension is correct, tighten the set screw to hold the rope firmly in place.
- h. Make sure that the cut ends of the rope do not present a hazard (cutting, scraping, snagging, etc.). Electrical/plastic tape or plastic tubing can be used to cover any sharp ends of the rope.

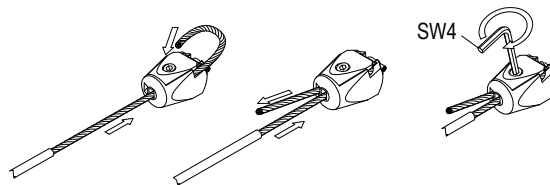


Figure 7. Install the Rope with Integral Turnbuckle

Tensioning the Rope

After the rope span components are installed, apply tension to the rope until the arrows in the tensioning indicator are centered on the line in the tension indicator window. This indicates sufficient rope tension. (Contacts 21/22 and 41/42 will close.) Course tensioning can be accomplished by pulling excess rope through the clamp until the tension indicator is approximately centered and then re-tightening the clamp. It is recommended that tensioning be accomplished at a median temperature to accommodate fluctuations.

1. Models RP-LS42F-..LE and Tensioning Spring Assembly with Integral Turnbuckle:

- a. Using a 17 mm wrench, make sure that the locking hex-nut is loose from the base of the switch.
- b. Using the thumb wheel, rotate the shaft of the switch until the arrows are centered on the tension indicator.
- c. Re-tighten the locking hex nut to the base of the switch (do not over tighten).

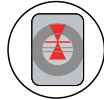


Figure 8. Tension Indicator Window: Too little tension shown

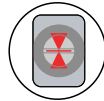


Figure 9. Tension Indicator Window: proper tension shown

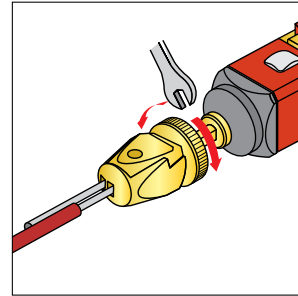


Figure 10. Applying tension to the rope (models RP-LS42F-..LE)

2. Reset the latch by pulling on the button until it catches in the armed position.

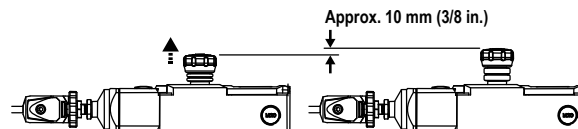


Figure 11. Reset the latch by achieving the proper tension and pulling the button

3. Pull hard on the rope until the switch trips, release, and reset the latch several times. If the arrows in the tensioning indicator window do not return to the correct position (centered on the line in the window), further tighten or loosen the rope tension as needed, until proper tension is shown.
4. Check the tension adjustment periodically to ensure proper operation.

Electrical Installation



WARNING: Shock Hazard and Hazardous Energy

Always disconnect power from the safety system (for example, device, module, interfacing, etc.) and the machine being controlled before making any connections or replacing any component.

Electrical installation and wiring must be made by Qualified Personnel and must comply with the relevant electrical standards and wiring codes, such as the NEC (National Electrical Code), ANSI NFPA 79, or IEC 60204-1, and all applicable local standards and codes.

Lockout/tagout procedures may be required. Refer to OSHA 29CFR1910.147, ANSI Z244-1, ISO 14118, or the appropriate standard for controlling hazardous energy.

Connection to a Machine

Electrical installation must be made by qualified personnel¹ and must comply with NEC (National Electrical Code), ANSI/NFPA 79 or IEC/EN 60204-1, and all applicable local standards. It is not possible to give exact wiring instructions for a device that interfaces to a multitude of machine control configurations. The following is general in nature; it is recommended to perform a risk assessment to ensure appropriate application, interfacing/hookup, and risk reduction (see ISO 12100 or ANSI B11.0).

Access the Wiring Chamber

Access the wiring chamber via the hinged door.

1. To open the wiring chamber, insert a flat screwdriver blade into the slot in the cover and pry the cover open.
2. Select the best wiring entrance, and remove the knockout.
3. If required, thread in the 1/2 in x 14 NPSM conduit adapter (supplied) or the optional M20 × 1.5 cable gland.

¹ A Qualified Person possesses a recognized degree or certificate or has extensive knowledge, training, and experience to solve problems relating to the emergency stop installation.

To connect wires to the terminals:

1. Insert the screwdriver blade (flat, 2.5 mm) into the slot below the desired wiring terminal.
2. Twist the screwdriver blade 45° in the slot to open the terminal jaws; insert the wire (6 mm to 8 mm bare wire).
3. Hold the wire in place and remove the screwdriver.
4. Make sure that all wires are securely held and will not short to adjacent terminals (that is, no bent or stray strands of wire).
5. Snap the access cover shut (a click will be heard). Banner recommends securing the access cover with the supplied #2-28 × 0.25 screw to hinder unauthorized access and ensure IP67 environmental rating (do not over tighten the screw).

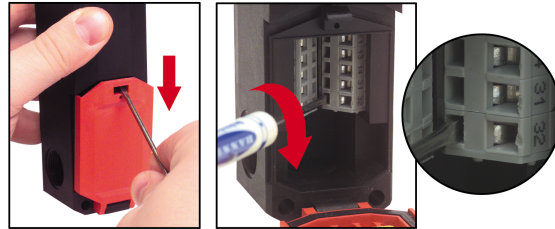


Figure 12. Accessing the wiring chamber

Hookup

These rope pull switches have redundant pairs of safety contacts, so they may be wired for either single-channel or dual-channel hookup to a safety module, safety controller, or E-stop circuit. Monitor contacts may be wired as desired to an external alarm device. A risk assessment will determine the appropriate level of safety circuit performance (integrity) and the means of interfacing the switch(es) with the machine control circuit.

Single-Channel Hookup: Wire contacts 21/22 or 41/42 together in series to the input of a safety module or E-stop circuit.

Dual-Channel Hookup: Wire contacts 21/22 and 41/42 independently to the inputs of a dual-channel safety module.

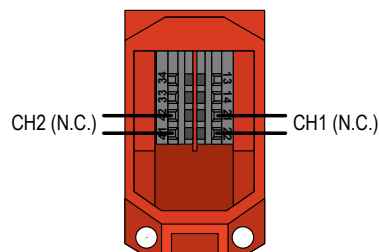


Figure 13. Safety Contacts at 21/22 and 41/42

To ensure the highest level of reliability (Control Reliable or Category 4, for example), wire the positively-driven safety contacts (terminals 21/22 and 41/42) in a dual channel hookup to a safety module (for example, ES-FA-9AA), safety controller (for example, SC22-3), or the safety related part of the machine control that complies with the required level of safety performance.

Two functions of the safety module or safety controller are:

1. To provide a means of monitoring the contacts of both safety switches for contact failure, and to prevent the machine from restarting if either switch fails.
2. To provide a reset routine after re-arming/resetting the rope pull switch (returning the safety contacts to their closed position). This prevents the controlled machinery from restarting by simply resetting the switch. This necessary reset function is required by ANSI B11.0 and ANSI/NFPA 79 machine safety standards.



WARNING: Safety Circuit Integrity

A risk assessment must be performed to determine the appropriate safety circuit integrity level or category to ensure the expected risk reduction is achieved and all relevant regulations and standards are met (see ANSI B11.0 and ANSI B11.19, ISO 12100 and ISO13849-1 or the appropriate standards).

**WARNING: Multiple Switching Devices**

Whenever two or more devices are connected to the same safety module (controller):

- Contacts of the corresponding pole of each switch must be connected together in series. *Never connect the contacts of multiple switches in parallel.* Such a parallel connection defeats the switch contact monitoring ability of the Module and creates an unsafe condition which may result in serious injury or death.
- Each device must be individually actuated (engaged), then released (or re-armed) and the safety module reset. This allows the module to check each switch and its wiring to detect faults.

This check must be performed during the prescribed checkouts. Failure to test each device individually in this manner may result in undetected faults and create an unsafe condition which may result in serious injury or death.

Maintenance/Checkout

At switch installation or replacement and at machine set up, a Designated Person² must test each switch for proper machine shutdown response and check the switch(es) and installation for proper operation, physical damage, mounting (looseness), and excessive environmental contamination. This must also take place on a periodic schedule determined by the user, based on the severity of the operating environment and the frequency of switch actuations. Adjust, repair, or replace components as needed. If inspection reveals contamination on the switch, thoroughly clean the switch and eliminate the cause of the contamination. Replace the switch and/or appropriate components when any parts or assemblies are damaged, broken, deformed, or badly worn; or if the electrical/mechanical specifications (for the environment and operating conditions) have been exceeded. Always test the control system for proper functioning under machine control conditions after performing maintenance, replacing the switch, or replacing any component of the switch.

Additional items that should be included in the checkout and/or regularly scheduled maintenance of a rope pull system:

- Check for proper rope tension and adjust as needed
- Verify free operation (no binding) of the rope and proper tripping when the rope is pulled
- Periodically lubricate the pulleys and other moving parts associated with the rope
- Repair any loose or damaged hardware, worn/frayed rope (cable), missing red rope sheathing or flags/markers (if used)
- Remove or clean off any contamination and eliminate its cause

Repairs

Contact Banner Engineering for troubleshooting of this device. Do not attempt any repairs to this Banner device; it contains no field-replaceable parts or components. If the device, device part, or device component is determined to be defective by a Banner Applications Engineer, they will advise you of Banner's RMA (Return Merchandise Authorization) procedure.



Important: If instructed to return the device, pack it with care. Damage that occurs in return shipping is not covered by warranty.

² A Designated Person is identified in writing by the employer as being appropriately trained to perform a specified checkout procedure.

Specifications

Contact Rating

3 A at 240 V ac max., 2.5 kV max. transient tolerance (U_{imp})

European Rating

$U_i = 250$ V ac, $I_{th} = 10$ A

Utilization categories: AC-15: U_e/I_e 240 V / 3 A

Rated conditional short-circuit current: 1000 A

Electrical Protection Class

II, protective insulation

Contact function

Slow make and break contacts, 2 N.C., 2 N.O. (Zb)

Direct Opening Operation acc. IEC/EN60947-5-1 Annex K

Contact Material

Silver-nickel alloy

Latching device

According to DIN EN 60947-5-5, IEC 60947-5-5, ISO 13850 (Compliant with ANSI B11.19)

Switching frequency

≤ 20 operations per minute

Maximum Rope Pull Length

See [Figure 3](#) on page 3

RP-LS42F-25xx: 25 m (82.0 ft); Force: 100 N

RP-LS42F-38xx: 38 m (124.7 ft); Force: 175 N

RP-LS42F-75xx: 75 m (246.1 ft); Force: 300 N

Wire Rope Diameter

2 mm to 5 mm (3 mm is recommended; see [Rope Pull Hardware](#) on page 11)

Mechanical Life

1×10^5 switching cycles (max.) acc. to IEC 60947-5-5

B10d

1×10^5 cycles

Short Circuit Protection

6 A Slow Blow (Type gG). Recommended external fusing or overload protection

Wire Connections

8 x cage clamp terminals

Conductor cross-sections: ≤ 1.5 mm² (16 AWG) stranded

Construction

Housing and cover: Polyamide PA 6 GV (UL94-V0)

Actuator: Zinc die-cast / Steel

Cable Entry

M20 x 1.5 threaded entrance (x3)

Adapter supplied to convert M20 x 1.5 to ½ in - 14 NPT threaded entrance

Environmental Rating

IEC IP67 acc. IEC/EN60529

The degree of protection specified applies solely to a properly closed cover and the use of an equivalent cable gland with adequate cable or conduit.

Operating Conditions

Temperature: -25 °C to $+70$ °C (-13 °F to $+158$ °F) (no freezing / no condensation)

Mounting

4 x M5 (#10) screws (on flat and stiff surface) Max. torque = 2 Nm

Weight

RP-LS42F-xxLE: approximately 0.69 kg (1.43 lbs)

Application Notes

Failure to follow the installation guidelines and procedures can result in the ineffective or non-operation of the rope pull switch system that could create an unsafe condition.

Standards

VDE 0660 T100, DIN EN 60947-1, IEC 60947-1

VDE 0660 T200, DIN EN 60947-5-1, IEC 60947-5-1

VDE 0660 T210, DIN EN 60947-5-5, IEC 60947-5-5

ISO 13850 (Compliant with ANSI B11.19 and ANSI NFPA 79)

EU-Conformity

According to directive 2006/42/EC and 2006/95/EC

Approvals

DGUV, cCSA_{US} A300 (same polarity only)

Certifications



Dimensions

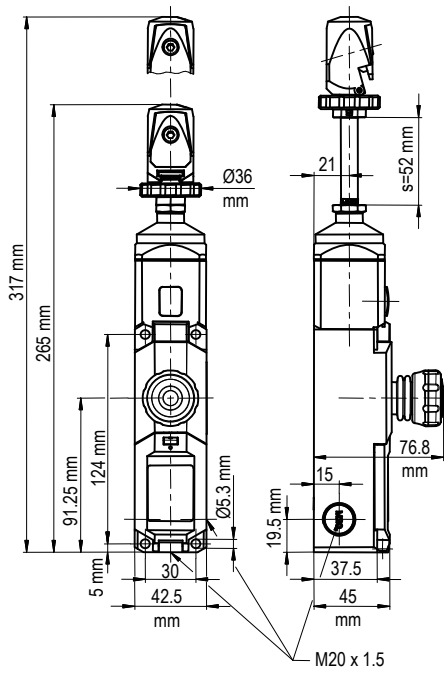


Figure 14. RP-LS42F-xxLE Series

Accessories for RP-LS42F..

EZ-LIGHTS

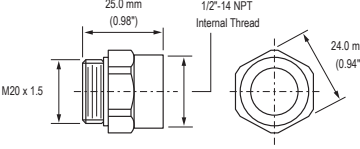
See datasheet p/n 171472 for additional information.

Model	Number of Colors	Color	Connection	Quantity	Product Image
SI-K30LGRX7P	2	GREEN/RED indication	130 mm (5 in) flying lead wires	1 each	
SI-K30LRXX7P	1	RED indication		1 each	

Cable Gland



Model	Size	For Cable Diameter	Dimensions	Used With
SI-QS-CGM20	M20 × 1.5 Plastic	5.0 to 12.0 mm (0.20 to 0.47 inches)		SI-QS90 Safety Interlock Switches SI-LS100 Safety Interlock Switches SI-LS31 Safety Interlock Switches SI-LS42 Safety Interlock Switches RP-LS42 Rope Pull Switches

Conduit Adapter (Supplied)

Model	Size	Thread Conversion	Dimensions	Used With
SI-QS-M20	½ in-14 NPT Plastic	M20 × 1.5 to ½ in-14 NPT		SI-QS90 Safety Interlock Switches SI-LS100 Safety Interlock Switches SI-LS31 Safety Interlock Switches SI-LS42 Safety Interlock Switches RP-LS42 Rope Pull Switches

Rope Pull Hardware

For additional sizes, see www.bannerengineering.com.

Model	Description	Length/Quantity	
RPA-C2-10	Wire rope 3 mm steel wire rope with 0.25 mm red PVC jacket (unterminated)	10 m (32.8 ft)	
RPA-C2-20		20 m (65.6 ft)	
RPA-C2-40		40 m (131.2 ft)	
RPA-C2-50		50 m (164.0 ft)	
RPA-C2-80		80 m (262.4 ft)	
RPA-T2-4	Thimble Thimble for 3 mm wire rope	4 each	
RPA-CC2-4	Clamp Clamp for 3 mm wire rope	4 each	
RPA-TA1-1	Turnbuckle #4 Turnbuckle	1 each	
RPA-EB1-1	Eye Bolt ¼ in-20 Eye bolt (3 in bolt shaft)	1 each	
RPA-P1-1	Pulley Hanging pulley for in-line use	1 each	
RPA-DP1-1	Pulley Pulley for corner turns (<180°)	1 each	
RPA-S2-1	Tensioning Spring	Tensioning spring #2	
RPA-S3-1		Tensioning spring #3	
RPA-S4-1	Tensioning Spring Assembly	Tensioning spring with built-in eye bolt (used with customer supplied M12x50 nut), cable thimble, clamping, tensioning, and overload protection	
RPA-S6-1			

Rope Pull Hardware Kits



NOTE: Tensioning springs ordered separately

Kit Model	3 mm Rope (Length)	Thimbles (Each)	Clamps (Each)	Eye Bolts (Each)	In-Line Pulleys (Each)	Turnbuckle (Each)
RPAK-C2SBP-1	0.5 m (1.5 ft)	2	2	-	-	-
RPAK-CH2-10	10 m (32.8 ft)	4	4	3	-	-
RPAK-CHP2-10		4	4	3	3	-
RPAK-CH2-10-TA		4	4	3	-	1
RPAK-CHP2-10-TA		4	4	3	3	1
RPAK-CH2-20	20 m (65.6 ft)	4	4	6	-	-
RPAK-CHP2-20		4	4	6	6	-
RPAK-CH2-20-TA		4	4	6	-	1
RPAK-CHP2-20-TA		4	4	6	6	1
RPAK-CH2-40	40 m (131.2 ft)	4	4	11	-	-
RPAK-CHP2-40		4	4	11	11	-
RPAK-CH2-40-TA		4	4	11	-	1
RPAK-CHP2-40-TA		4	4	11	11	1
RPAK-CH2-50	50 m (164.0 ft)	4	4	14	-	-
RPAK-CHP2-50		4	4	14	14	-
RPAK-CH2-50-TA		4	4	14	-	1
RPAK-CHP2-50-TA		4	4	14	14	1
RPAK-CH2-80	80 m (262.4 ft)	4	4	21	-	-
RPAK-CHP2-80		4	4	21	21	-
RPAK-CH2-80-TA		4	4	21	-	1
RPAK-CHP2-80-TA		4	4	21	21	1

U.S. Application Standards

ANSI B11.0 Safety of Machinery; General Requirements and Risk Assessment

ANSI B11.19 Performance Criteria for Safeguarding

ANSI NFPA 79 Electrical Standard for Industrial Machinery

International/European Standards

ISO 12100 Safety of Machinery – General Principles for Design — Risk Assessment and Risk Reduction

ISO 13850 (EN 418) Emergency Stop Devices, Functional Aspects – Principles for Design

IEC 62061 Functional Safety of Safety-Related Electrical, Electronic and Programmable Control Systems

ISO 13849-1 (EN 954-1) Safety-Related Parts of Control Systems

IEC 60204-1 Electrical Equipment of Machines Part 1: General Requirements

IEC 60947-1 Low Voltage Switchgear – General Rules

IEC 60947-5-1 Low Voltage Switchgear – Electromechanical Control Circuit Devices

IEC 60947-5-5 Low Voltage Switchgear – Electrical Emergency Stop Device with Mechanical Latching Function

EC Declaration of Conformity (DoC)

Banner Engineering Corp. herewith declares that the RP-LS42F-...LE Series 42 mm Latching Switches and Rope/Cable Actuators are in conformity with the provisions of the Machinery Directive 2006/42/EC and all essential health and safety requirements have been met.

Representative in EU: Peter Mertens, Managing Director Banner Engineering Europe. Address: Park Lane, Culliganlaan 2F, 1831 Diegem, Belgium.

Banner Engineering Corp Limited Warranty

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