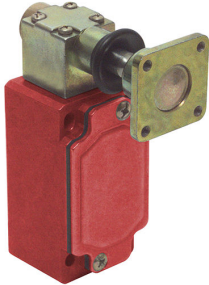




SI-LM40 Series Safety Limit Switch




Datasheet

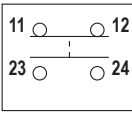
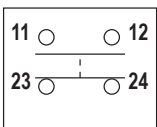
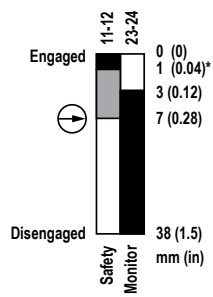
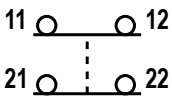
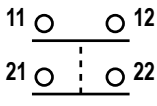
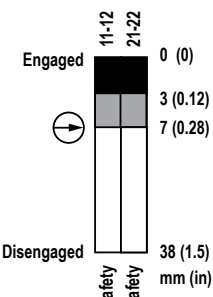
SI-LM40 Series Limit Switch Style with Flexible In-Line Actuator



-  Positive-opening safety contacts (IEC 60947-5-1) (not dependent upon springs)
- Standard limit switch design
- In-line actuator; flexes in all directions
- Metal housing
- Spring-loaded actuator base
-  Protective Earth Terminal (IEC 60947-1) on models with metal housings

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

Models

Kit Model ¹	Actuator Type	Interlock Body	Contact Configuration (Actuator Engaged)	Contact Configuration (Actuator Removed)	Switching Diagrams ²
SI-LM40MKVD	SI-QM-90A (Flexible, In-Line)	SI-LM40KVD with Metal Housing			
SI-LM40MKVE		SI-LM40KVE with Metal Housing			

Contacts: Open
 Closed
 Transition



WARNING: Spare Actuators

Spare actuators must NEVER be used to bypass or otherwise defeat the protective function of a safety switch. To do so may create an unsafe situation which may lead to serious injury or death.

¹ A kit contains an interlock and actuator. Individual interlock bodies or actuators are for replacement purposes only.
² * Please note that only 1 mm (0.04 inches) of movement will open the closed contact.



Important **Information** Regarding the Use of Safety Switches

In the United States, the functions that Banner safety switches are intended to perform are regulated by the Occupational Safety and Health Administration (OSHA). Whether or not any particular safety switch installation meets all applicable OSHA requirements depends upon factors that are beyond the control of Banner Engineering Corp. These factors include the details of how the safety switches are applied, installed, wired, operated, and maintained.

Banner Engineering Corp. has attempted to provide complete application, installation, operation, and maintenance instructions. This information is found in the instruction manual packaged with each safety switch. In addition, we suggest that any questions regarding the use or installation of safety switches be directed to the factory applications department at the telephone numbers or address shown below.

Banner Engineering Corp. recommends that safety switches be applied according to the guidelines set forth in international (ISO/IEC) standards listed below. Specifically, Banner Engineering Corp. recommends application of these safety switches in a configuration which meets safety category 4, per ISO 13849 (EN954-1).

In addition, the user of Banner safety switches has the responsibility to ensure that all local, state, and national laws, rules, codes, and regulations relating to the use of Banner safety switches in any particular application are satisfied. Extreme care is urged that all legal requirements have been met and that all installations and maintenance instructions are followed.

Application Assistance
 Toll Free: 1-888-3-SENSOR (1-888-373-6767)
 Email: sensors@bannerengineering.com
 9714 Tenth Avenue North
 Minneapolis, MN 55441

U.S. **Regulations** Applicable to Use of Banner Safety Switches

OSHA Code of Federal Regulations: Title 29, Parts 1900 to 1910

Available from: Superintendent of Documents, Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250-7954, Tel: 202-512-1800

U.S. Standards Applicable to Use of Banner Safety Switches

ANSI B11 Standards for Machine Tools Safety

Contact: Safety Director, AMT – The Association for Manufacturing Technology, 7901 Westpark Drive, McLean, VA 22102, Tel.: 703-893-2900

Applicable European and **International** Standards

ISO/TR 12100-1 (EN 292-1 & -2) Safety of Machinery – Basic Concepts, General Principles for Design

ISO 13852 (EN 294) Safety of Machinery—Safety Distances to Prevent Danger Zones Being Reached by the Upper Limbs

ISO 13853 (EN 811) Safety of Machinery—Safety Distances to Prevent Danger Zones Being Reached by the Lower Limbs

ISO 13849-1 Safety-Related Parts of Control Systems

ISO 13855 (EN 999) The Positioning of Protective Equipment in Respect to Approach Speeds of Parts of the Human Body

ISO 14119 (EN 1088) Interlocking Devices Associated with Guards – Principles for Design and Selection

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

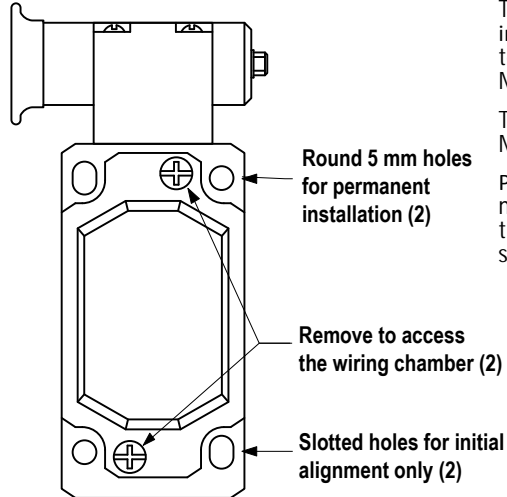
IEC 60947-5-1 Low Voltage Switchgear – Electromechanical Control Circuit Devices

Contact: Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5704, Tel.: 800-854- 7179

Installation Instructions

Mechanical Installation

All mounting hardware is supplied by the user. The fasteners must be of sufficient strength to guard against incidental breakage. Use of permanent fasteners or locking hardware is recommended to prevent loosening or displacement of the actuator and switch body.



The slotted holes in the switch body must **ONLY** be used for alignment during installation. The round 5 mm holes (only) must be used for permanent mounting to prevent loosening or displacement of the actuator and the switch body. Only M5 (#10) screws (customer supplied), should be used.

There are four holes on a mounting pattern of 30 × 60 mm. The actuator has four M4 tapped mounting holes on a 26 mm (1.02 in) square pattern (see Dimensions).

Position the switch, with its actuator fully engaged, in the mounting location and mark the mounting holes. Drill the required holes and fasten the switch body and the actuator in place. After the mounting hardware is secure, check the actuator/switch engagement for misalignment and binding.

The actuator is spring-loaded to allow positive pressure to be applied when the guard is closed. However, the switch must never serve as the mechanical end stop for a guard door or gate. Positive pressure for the actuator engagement is desirable, because only 1 mm (0.04 in) of actuator travel from the point of full engagement is required to open the safety contact.



Important:

1. A safety switch must be installed in a manner that discourages tampering or defeat. Mount each switch to prevent bypassing of the switching function at the terminal chamber.
2. A switch and its actuator must never be used as a mechanical stop.
3. Ensure proper placement of gasket when rotating the head. Failure to do so will reduce the environmental rating.



WARNING: Hazard Point

It must not be possible for personnel to reach any hazard point through an opened guard (or any opening) before hazardous machine **motion** has completely stopped.

Please reference OSHA CFR 1910.217 and ANSI B11 standards for information on determining safety distances and safe opening sizes for your guarding devices.

Electrical Installation



CAUTION: Electrical Installation

Two safety switches must be used for each interlock guard to achieve control reliability or Safety Category 4 (per ISO 13849-1, EN 954-1) of a machine stop circuit. Use of only one safety switch per interlock guard is not recommended.

In addition, normally-closed safety contacts from each of the two safety switches should be connected to the two separate inputs of a 2-channel safety module or safety interface. This is required to provide monitoring for safety switch contact failure, and to provide the necessary reset routine, as required by IEC 60204-1 and NFPA 79 machine safety standards.



WARNING:

- A Series **Connection** of Safety Interlock Switches—Monitoring multiple guards with a series connection of multiple safety interlock switches is not a Safety Category 4 Application (per ISO 13849-1, EN 954-1).
- A single failure may be masked or not detected at all.
- When such a configuration is used, procedures must be performed regularly to verify proper operation of each switch.

Access to the Wiring Chamber

The wiring chamber is accessed via a cover plate. The metal switch body uses two screws to hold the cover plate on. A conduit adapter is supplied to convert the M20 x 1.5 thread to ½"-14 NPT. An accessory cable gland which fits the M20 x 1.5 thread is available.

Connection to the Machine

Two contacts are offered. The contact between terminals 11 and 12 or 21 and 22 is the safety contact, which is closed (i.e., it conducts) when the actuator is engaged. The normally open contact located between terminals 23 and 24 is considered a monitoring contact, which should not be used for safety switching.

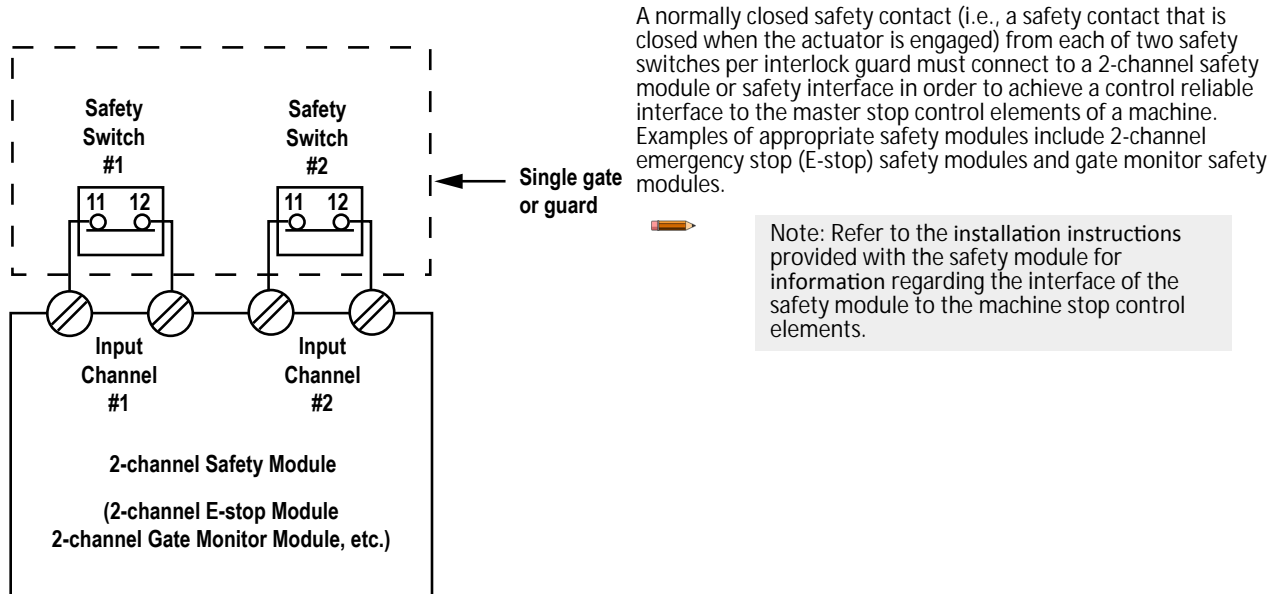


Figure 1. Connect two redundant safety switches per interlock guard to an appropriate 2-channel input safety module.

Two functions of the safety module or safety interface 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; and
2. to provide a reset routine after closing the guard and returning the safety switch contacts to their closed position. This prevents the controlled machinery from restarting by simply reinserting the safety switch actuators. This necessary reset function is required by ANSI B11 and NFPA 79 machine safety standards.

Use only a positively driven, normally closed safety contact from each switch for connection to the safety module. The normally open contact may be used for control functions that are not safety-related. A typical use is to communicate with a process controller. Refer to the installation instructions provided with the safety modules for more information regarding the interface of the safety module to the machine stop control elements.

Maintenance

Periodic Checks

Safety switches should be checked at each shift change or machine setup by a designated person for:

1. Breakage of the switch body or actuator,
2. Good alignment and full engagement of the actuator with the receptor,
3. Confirmation that the safety switch is not being used as an end stop,
4. Loosening of the switch or actuator mounting hardware, and
5. Verification that it is not possible to reach any hazard point through an opened guard (or any opening) before hazardous machine motion has completely stopped.

In addition, a qualified person should check for the following on a periodic schedule determined by the user based upon the severity of the operating environment and the frequency of switch actuations:

1. Check the wiring chamber for signs of contamination.
2. Check the contacts for signs of deterioration or damage.

3. Inspect the electrical wiring for continuity and damage.
4. Verify the wiring conforms to the instructions given in this datasheet.

A designated person is identified in writing by the employer as being appropriately trained to perform a specified checkout procedure. A qualified person possesses a recognized degree or certificate or has extensive knowledge, training, and experience to be able to solve problems relating to the safety switch installation (ANSI B30.2).

Repairs

Do not **attempt** any repairs to the safety interlocking switch. It contains no **field-replaceable** components. Return it to Banner Engineering for warranty repair or replacement.

Contact Banner Factory Application Engineering. They will attempt to troubleshoot the system from your description of the problem. If they conclude that a component is defective, they will issue a return merchandise authorization (RMA) number for your paperwork, and give you the proper shipping address.



Important: Pack the safety switches carefully. Damage that occurs in return shipping is not covered by warranty.

Specifications

Contact Rating

10 A at 24 V ac, 10 A at 110 V ac, 6 A at 230 V ac
 6 A at 24 V dc
 2.5 kV maximum transient tolerance
 NEMA A300 P300

Contact Material
 Silver-nickel alloy

Maximum Switching Speed
 10 operations per minute

Maximum Actuator Speed
 0.5 m/second (20 inches/second)

Minimum Actuator Engagement Radius
 150 mm (6 inches)

Actuator **Extraction** Force
 20 N (4.4 lbf)

Short Circuit **Protection**
 6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection.

Cable Entry
 M20 × 1.5 threaded entrance. Adapter supplied to convert M20 × 1.5 to ½" – 14 NPT threaded entrance

Construction
 Aluminum alloy die-cast housing

Weight
 0.31 kg (0.68 lb)

Environmental **Rating**
 IEC IP65

Operating Conditions
 –30 °C to +80 °C (–34 °F to +176 °F)

Certifications



European Rating

Use categories: AC15 and DC13 (IEC 60947-5-1)
 $U_i = 500$ V ac
 $I_{th} = 10$ A

40–60 Hz		
U_e (V)	$I_e/AC-15$ (A)	$I_e/DC-13$ (A)
24	10	6
110	10	1
230	6	0.4

Mechanical Life
 25,000 operations

Wire Connections

Screw terminals with pressure plates accept the following wire sizes –
 Stranded and solid: 20 AWG (0.5 mm²) to 16 AWG (1.5 mm²) for one wire
 Stranded: 20 AWG (0.5 mm²) to 18 AWG (1.0 mm²) for two wires

Required Overcurrent Protection



WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.

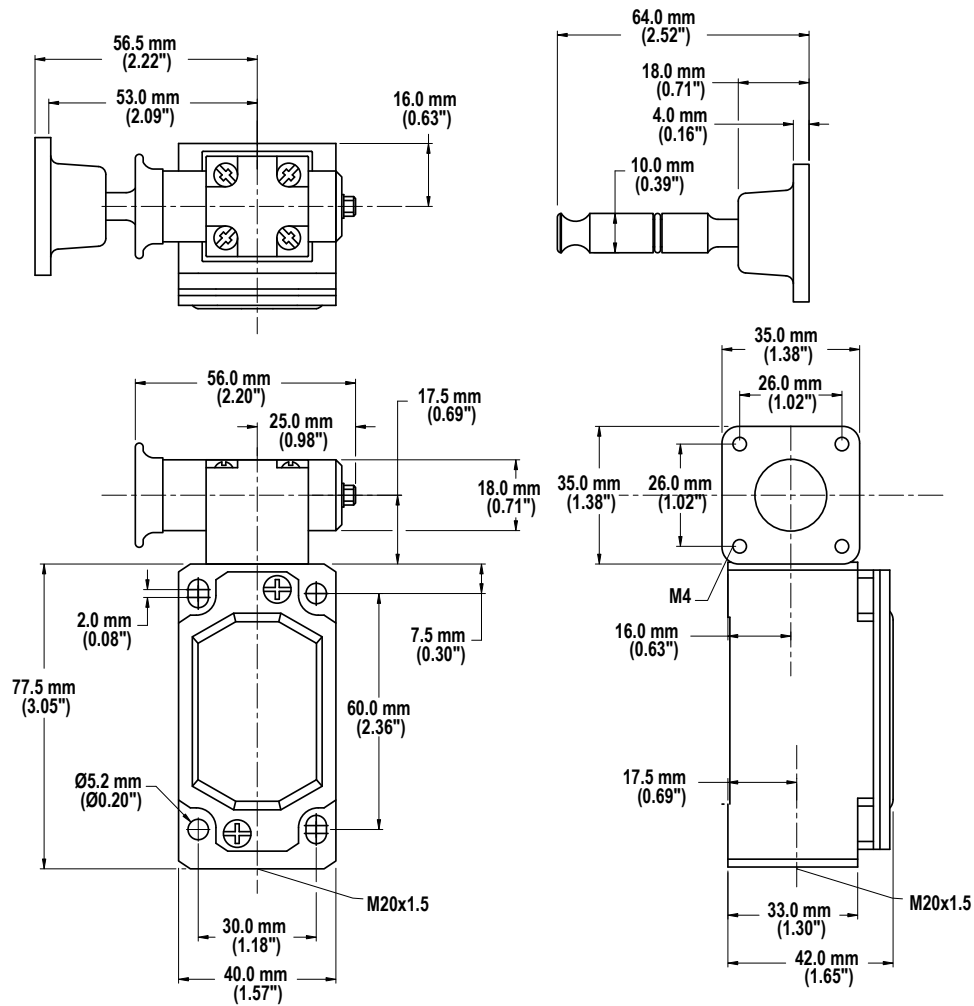
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.

Supply wiring leads < 24 AWG shall not be spliced.

For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Dimensions



Accessories

Cable Glands

Model	Size	For Cable Diameter	Dimensions	Used With
SI-QM-CGM20	M20 × 1.5 Metal	5.0 to 12.0 mm (0.20 to 0.47 inches)		SI-LM40 Safety Interlock Switches SI-QM100 Safety Interlock Switches RP-RM83 Rope Pull Switches RP-LM40 Rope Pull Switches RP-QM72/QMT72 Rope Pull Switches RP-QM90 Rope Pull Switches

Conduit Adapter Replacement Part

Model	Size	Thread Conversion	Dimensions	Used With
SI-QM-M20	½ in-14 NPT Metal	M20 × 1.5 to ½ in-14 NPT		SI-LM40 Safety Interlock Switches SI-QM100 Safety Interlock Switches RP-RM83 Rope Pull Switches RP-LM40 Rope Pull Switches RP-QM72/QMT72 Rope Pull Switches RP-QM90 Rope Pull Switches

One conduit adapter is supplied with each switch.

Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.

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