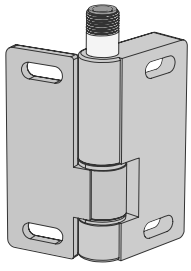
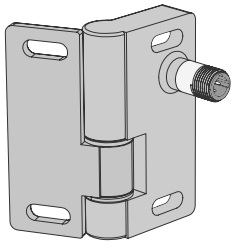
SI-HG80 Features

SI-HG80 Series Safety Interlock Switches Encapsulated in a Load-bearing Hinge

- Safety switch is integrated and encapsulated into a load-bearing hinge, providing a high degree of protection from intentional defeat
- Identical in appearance to non-switching blank hinge (see "Accessories" on page 6)
- Switch components concealed inside the hinge are protected from mechanical impact, providing superior performance to actuator-activated safety switches; rated IEC IP67
- Hinge operates to a full 180° range of motion; safety switching point (guard-closed position) is adjustable over the full 0° to 180°operating range
- Hinge can support an axial load of 750 N and more than 1,000 N in radial direction
- When properly interfaced or used with an appropriate controller, two SI-HG80D.. switches can achieve safety category 4, per ISO 13849
- Robust zinc die-cast housing is corrosion-resistant
- Typical applications include:
  - Hinged covers and guards to machines
  - Hinged doors and gates in safety fencing systems
  - Modular aluminum framing

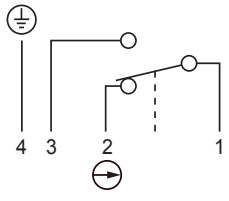
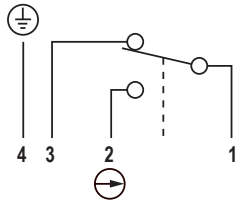
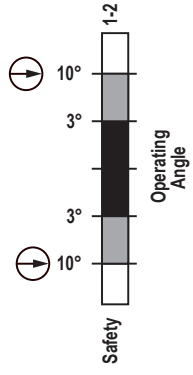


Model with an inline QD connector



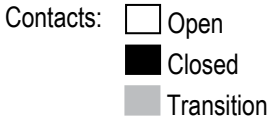
Model with a right-angle QD connector

SI-HG80 Models

Model	QD Connection	Contact Configuration (Closed State)	Contact Configuration (Open State)	Switching Diagram
SI-HG80DQD	Inline QD Fitting			
SI-HG80DQDR	Right-angle QD Fitting			

NOTE: Terminal #3 is non-safety.

Switching diagram key



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.

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ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

WARNING:

- **Read this Section Carefully Before Installing the System**
- **Failure to follow these instructions could result in serious injury or death.**
- If all mounting, installation, interfacing, and checkout procedures are not followed properly, this Banner Engineering Corp. device cannot provide the protection for which it was designed.
- The user is responsible for ensuring that all local, state, and national laws, rules, codes, or regulations relating to the installation and use of this control system in any particular application are satisfied. Ensure that all legal requirements have been met and that all technical installation and maintenance instructions contained in this manual are followed.
- The user has the sole responsibility to ensure that this Banner Engineering Corp. device is installed and interfaced to the guarded machine by Qualified Persons, in accordance with this manual and applicable safety regulations. A Qualified person is a person who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work.

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 the application of these safety switches in a configuration that meets safety category 4, per ISO 13849.

It is the responsibility of the machine designer, controls engineer, machine builder, and/or maintenance electrician to apply and maintain this product in full compliance with all applicable regulations and standards. The product can provide the required safety function only it if is properly installed, properly operated, and properly maintained. This manual attempts to provide complete installation, operational, and maintenance instructions. Reading the manual completely is highly recommended. Please direct any questions regarding the application or use of this product to a Banner Engineering Applications Engineer at the locations listed in this document.

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

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

ANSI B11 Standards for Machine Tools Safety

ANSI B11.19 Performance Requirements for Risk Reduction Measures: Safeguarding and Other Means of Reducing Risk

NFPA 79 Electrical Standard for Industrial Machinery

ANSI/RIA R15.06 Safety Requirements for Industrial Robots and Robot Systems

Applicable European and International Standards

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

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 13857 Safety of Machinery – Safety Distances to Prevent Hazard Zones Being Reached

ISO 13849-1 Safety of Machinery – Safety-Related Parts of Control Systems – Part 1: General Principles for Design

EN 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

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

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

ISO 14120 Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards

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Mechanical Installation

WARNING:
- **Properly Install the Interlocked Guards**
- Failure to follow these guidelines could result in serious injury or death.
- At a minimum, the interlocked guard must prevent hazards when not fully closed and must prevent access to the hazards through any opening in the guard.
- Install the safety switches and actuators so they cannot be easily defeated and are not used as a mechanical or end-of-travel stop. Mount at least one switch in a positive mode and verify it opens the normally closed contact when the guard opens.
- The user must refer to the relevant regulations and comply with all necessary requirements. See ANSI B11.19, or ISO 14119 and ISO 14120, or the appropriate standard.

All mounting hardware is supplied by the user. Fasteners must be of sufficient strength to guard against breakage. Use of permanent fasteners or locking hardware is recommended to prevent loosening or displacement of the actuator and the switch body. The mounting holes in the switch body and the actuator accept M6 screws (see "Dimensions" on page 6).

Ensure that excessive force is not exerted by the weight and swing of the guard, gate, or door (see " Specifications " on page 5).

Position blank hinges (if used) and the hinge switch(es) on the guard or gate while it is in its fully closed and latched position. Verify that the axis of rotation is identical for all hinges used. (Typically, this can be accomplished by using a straight edge along the long flat edge to ensure the switch bodies are parallel.) After the mounting hardware is secure, check the rotation of the guard or gate for misalignment and binding.

NOTE: A safety switch must be installed in a manner that discourages tampering or defeat.

CAUTION: Do not use the switch as an end stop. The operating angle of the switch must be limited by outer end stops.

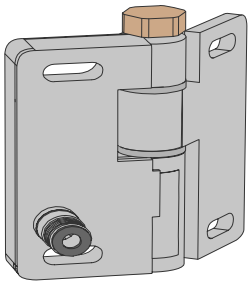
Setting the Switch Point

CAUTION:
Remove Set Screw Head.

Shear off the hexagonal head of the set screw after it is set, and before using the switch. If not, the safe activation of the switch cannot be ensured.

1. Ensure the hinge switches (and blind hinges, if used) are properly mounted and the guard or gate swings freely throughout its range of motion without binding. If binding is noticed, repeat the mechanical installation procedures.
2. Place the guard in its closed and latched position.
   After the switch point is set, it cannot be changed. Before proceeding, verify the installation is correct and the resulting switching action is what is expected.
3. Tighten the hexagonal set screw head with a 13 mm open-ended wrench (rotate clockwise when the switch is mounted vertically and the nut is on top).

Hinge switch with set screw head in place



4. Continue tightening until the set screw head shears completely off the switch (approximately 22 N·m). When the screw head shears off, the switch point is set.

NOTE: After you start tightening the set screw, do not change the position of the switch until the setting process is complete.

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Electrical Installation

CAUTION:

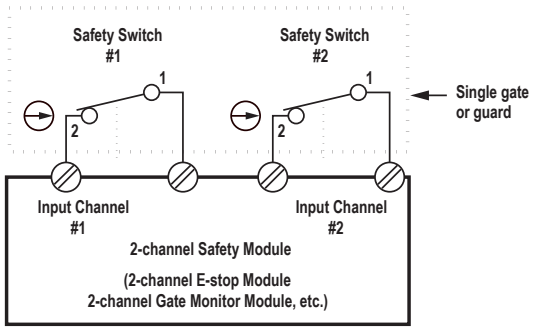
- **Safety switch installation**
- Using only one safety switch per interlock guard is not recommended.
- Use two safety switches for each interlock guard to achieve control reliability or Safety Category 4 (per ISO 13849-1) of a machine stop circuit.
- In addition, normally-closed (N.C.) safety contacts from each of the two safety switches should be connected to the two separate inputs of a two-channel safety monitoring device. This is required to monitor 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:

- **Connecting safety switches in series**
- Monitoring multiple guards with a series connection of multiple safety interlock switches is not a Safety Category 4 Application (per ISO 13849-1). A single failure can be masked or not detected at all. The loss of a safety stop signal or an inappropriate reset can lead to serious injury or death.
- When such a configuration is used, procedures must be performed regularly to verify proper operation of each switch. Correct all failures immediately (for example, immediately replace a failed switch).

As shown, a normally-closed (N.C.) safety contact (that is, a safety contact that is closed when the actuator is engaged) from each of two safety switches per interlock guard must connect to a 2-channel safety module or safety interface to achieve a control reliable interface to the master stop control elements of a machine. Examples of appropriate safety modules include 2-channel emergency stop (E-stop) safety modules and gate monitor safety modules.

Hinge Wiring to Safety Module



Two functions of the safety module or safety interface are to:

1. 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. 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 closing the guard. This necessary reset function is required by ANSI B11 and NFPA 79 machine safety standards.

Use only the positively driven, normally closed safety contact (between pins 1 and 2) from each switch for connection to the safety module. A typical use of the normally open (N.O.) contact 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.

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

Refer to the installation instructions provided with the safety module for information regarding the interface of the safety module to the machine stop control elements.

Periodic Checks

A designated person[1] should perform the following safety switch checks at each shift change or machine setup.

Banner Engineering highly recommends performing the System checkouts as described. However, a qualified person[2] (or team) should evaluate these generic recommendations considering their specific application and determine the appropriate frequency of checkouts. This will generally be determined by a risk assessment, such as the one contained in ANSI B11.0. The result of the risk assessment will drive the frequency and content of the periodic checkout procedures and must be followed.

1. Check the switch body for damaged or broken parts.
2. Confirm the safety switch is not being used as an end stop.
3. Verify it is not possible to reach any hazard point through an opened guard (or any opening) before hazardous machine motion has completely stopped.
4. Verify the hinge swings freely throughout its total operating range.
5. Tighten any loosened mounting hardware.

[1] A designated person is identified in writing by the employer as being appropriately trained to perform a specified checkout procedure.
[2] A person who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work

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6. Check for signs of deterioration or damage.
7. Check for signs of tampering or defeat to the switch or to the wiring interface to the machine.

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.

Obtain assistance with product repairs by contacting your local Banner Engineering Corp distributor or by calling Banner directly at (763) 544-3164. Access literature translated into your native language on the Banner website at www.bannerengineering.com or contact Banner directly at (763) 544-3164.

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

WARNING:
- **Do not abuse the module after failure**—If an internal fault has occurred and the module will not reset, do not tap, strike, or otherwise attempt to correct the fault with a physical impact to the housing.
- Failure to follow these instructions could result in serious injury or death.
- An internal relay might have failed in such a manner that its replacement is required. If the module is not immediately replaced or repaired, multiple simultaneous failures might accumulate such that the safety function cannot be guaranteed.

Specifications

Contact Rating

Rated Isolation Voltage (U_i): 250 V

Rated Impulse Withstand Voltage (U_{imp}): 2.5 kV

Conventional Thermal Current (I_{the}): 3A

Rated Supply Voltage (U_e): 230 V AC, 60 V DC

Utilization Category:

DC-13, 60 V DC/0.5 A
AC-15, 230 V AC/1.5 A

Short Circuit Protection

4 A gG melting fuse. Recommended external fusing or overload protection.

Rated Conditional Short-Circuit Current: 1000 A

Wire Connections

4-pin M12 C-Code (dual keyed) quick-disconnect (QD) fitting. Cables are ordered separately; see "Accessories" on page 6

Weight

0.40 kg (0.88 lb)

$B10_d$

2×10^6 cycles (at 10% of the nominal electrical load)

Application Notes

To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge (see "Accessories" on page 6).

Minimum Switching Speed

20 operations per minute

Mechanical Life

1 million operations

Force Exerted by Guard per Switch

Axial: 750 N (165 lbf) maximum

Radial: 1000 N (220 lbf) maximum

Operating Range

0° to 180°

Construction

Zinc Die-cast (GD-Zn)

Environmental Rating

NEMA 4, IEC IP67

Operating Conditions

Temperature: -25° to +70° C (-13° to +158° F)

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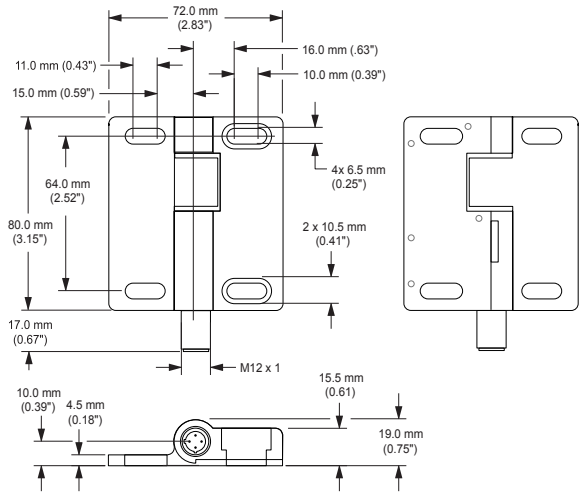
Certifications

Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

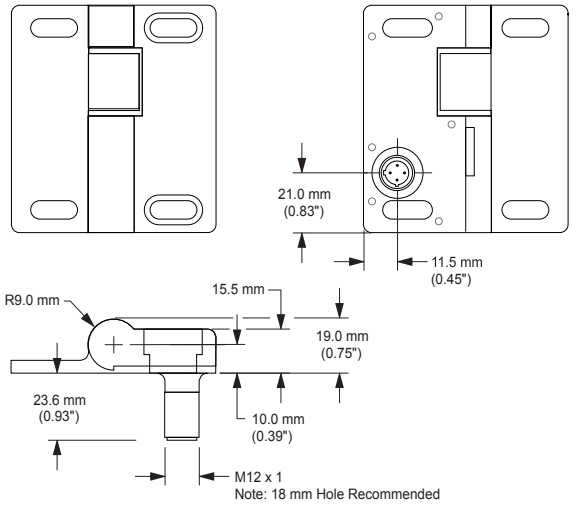
Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

Dimensions

Model SI-HG80DQD

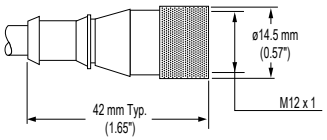
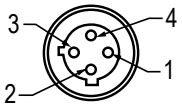
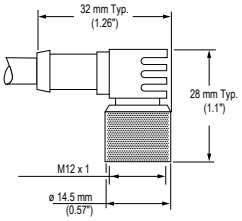
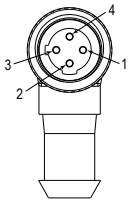


Model SI-HG80DQDR



Accessories

4-Pin M12 Dual Key Cordsets—Single Ended

Model	Length	Style	Dimensions	Pinout (Female)	
MQEAC-406	1.83 m (6 ft)	Straight			1 = Red/Black 2 = Red/White 3 = Red 4 = Green
MQEAC-415	4.57 m (15 ft)				
MQEAC-430	9.14 m (30 ft)				
MQEAC-406RA	1.83 m (6 ft)	Right-Angle			
MQEAC-415RA	4.57 m (15 ft)				
MQEAC-430RA	9.14 m (30 ft)				

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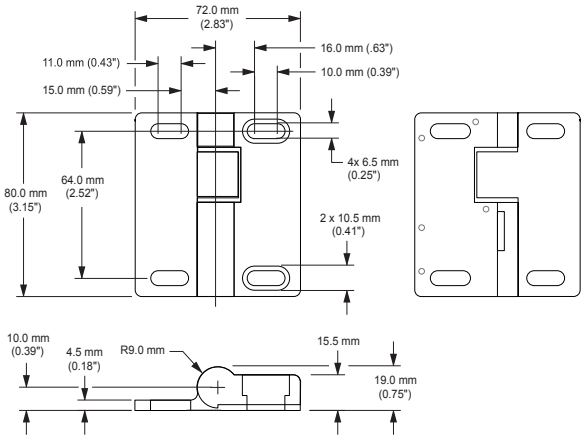
Blank Hinge		
Model	**Description**	**Dimensions**
SI-HG80A	Same mechanical specifications as SI-HG80 Series Hinge Switches	

EU/UK Declaration of Conformity (DoC)

Banner Engineering Corp. herewith declares that these products are in conformity with the provisions of the listed directives and all essential health and safety requirements have been met. For the complete DoC, please go to www.bannerengineering.com.

Product	Directive
SI-HG80 Hinge Safety Interlock Switch	EU: Machinery Directive 2006/42/EC
	UKCA: Machinery (Safety) Regulation 2008

Representative in EU: Spiros Lachandidis, Managing Director, **Banner Engineering BV** Park Lane | Culliganlaan 2F bus 3 | 1831 Diegem, BELGIUM

Representative in UK: Tony Coghlan, Managing Director, **Turck Banner LTD** Blenheim House | Blenheim Court | Wickford, Essex SS11 8YT | Great Britain

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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For patent information, see www.bannerengineering.com/patents.

Document title: SI-HG80 Hinge Wing Safety Interlock Switch
Part number: 46735
Revision: F
Original Instructions
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46735

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