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GE Interlogix
Industrial

Introduction

The Safer Switch for Safety Interlocks

GE Interlogix Industrial is a market leader in the development and manufacture of safety interlock switches and position sensors for industrial applications. Whether it's a new machine design or a retrofit to increase operator safety on an existing machine, GE Interlogix Industrial GuardSwitches™ and mechanical safety interlocks provide the best fit for your application.

All GE Interlogix Industrial GuardSwitches™ are non-contact, magnetic devices consisting of a switch and a magnet actuator. They are extremely tolerant of misalignment and the build-up of dirt, grease and other contaminants. The typical air gap between actuator and switch is 0.5" to 1.0". This allows easy installation and a margin for the usual "settling out" shift that occurs in machine guard doors and gates.

GE Interlogix Industrial GuardSwitches™ actuate through wood, aluminum, stainless steel or any other nonferrous material. This allows the interlock switches to be concealed in the machine for added protection against tampering. In addition, all switching elements are hermetically sealed, so they can be installed in dirty or corrosive environments.

The 300-BT Series non-contact GuardSwitches™ offer superior defeat resistance, ease of installation and are **"CE"** and **Semi S2** compliant when used with our INT Safety Monitor Relays.

GE Interlogix Industrial also has a complete line of mechanical safety interlock switches which include key-operated, solenoid release, rope pulls, hinged and slotted. All mechanical switches are positive opening and **"CE"** compliant.

GE Interlogix Industrial has safety switches to meet all applications and they comply with published standards.

GE Interlogix Industrial position sensors have earned their reputation for quality. They are built for durability and dependability. Most are conservatively rated at 100,000 cycles under full load and 10,000,000 cycles under dry circuit. Every reed connection is hand soldered and the reeds in all modes are environmentally sealed.

A tradition of excellence

Our reputation for durability and dependability is based on meticulous manufacturing standards and stringent testing procedures. Our world-class manufacturing has earned **ISO 9001** certification for quality. GE Interlogix Industrial manufacturing standards and attention to detail virtually eliminate out-of-box failures. **All switches are tested before they leave the factory–100% of the time.**

For the best protection from danger in the workplace and the highest level of defeat resistance, GE Interlogix Industrial sets the standard.

A Safer Workplace

Automation continues to create hazards for employees in the workplace, making their safety a major concern for manufacturers worldwide. This concern has led to the creation of OSHA guidelines, ANSI standards, semiconductor and robotics standards and the European Machinery Safety Directive.

OSHA Guidelines

Section 1910.12 states:

(a) **Machine guarding —** (1) Types of guarding. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are — barrier guards, two-hand tripping devices, electronic safety devices, etc.

(2) General requirements for machine guards. Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself.

ANSI Standards

ANSI (the American National Standard) B11.19-1990 Section 5.5, E5.5, and E5.51 reads:

5.5.1 When required by the performance requirements of the safeguarding, the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle. This requirement does not apply to those components whose function does not affect the safe operation of the machine tool.

E5.5 Control reliability is also known as control component failure and is not merely component redundancy. Control reliability implies "fail-safe". However, failsafe is an order of reliability which includes any and all possible component failure combinations including multiple and simultaneous. Thus, a true fail-safe condition and this magnitude of reliability are not practically achievable.

In its section B11.19-1990, ANSI states:

"A component may fail open, closed or to the point that its intended function is no longer viable. All failures should be considered in the evaluation of the system.

Some electromechanical systems utilize relays that have contacts that can fail closed while the other contacts on the same relay continue to function. Other relays have contacts that can fail open while the other contacts on the same relay continue to function. Because of this fact, only relay types that prevent this occurrence from happening should be used.

Electromechanical systems that require redundancy and checking of relay contacts should use relays that are designed with mechanical linkages to provide a positive relation between normally open and normally closed contacts to check the contact operation. Solid-state devices do not have a mutually exclusive normally open - normally closed contact arrangement. Other methods must be used to monitor the performance of these devices."

Risk Categories: European Standard EN-954-1

Requirement of the safety related control circuit to meet the various categories are listed in section 7 of EN 954-1, but in general their requirements are as follows:

Category B: Safety devices and control systems at a minimum must be designed, selected and assembled to meet the operational requirements of design limits and influence of the processed materials and other external influences. Most domestic appliances fall into this category, and providing the components are correctly specified (load, switching frequency, etc.), then no other special features are required.

Category 1: All conditions of B apply, but the safety related system must use "well tried" principles and components, see 7.2.2 EN (TC114/JWG 6).

Category 2: All conditions of B apply, but in addition the machine shall be prevented from starting if a fault is detected on power up. This suggests the use of an interface relay with redundancy and self checking on energization. Single channel operation is permitted providing that the input devices (E Stop buttons, gate switches) are tested for operation on a regular basis.

Category 3: All conditions of B apply, but the complete safety control system shall be designed so that any single fault shall not lead to the loss of the safety function and where practical, the single fault shall be detected. This now calls for not only redundancy in the interface relay but also in the input devices, pointing to dual channel systems.

Category 4: All conditions of B apply, but now single fault detection is imperative and calls for not only redundancy in the input and output devices, but also for self-checking and cross monitoring. Again dual channel controls are called for.

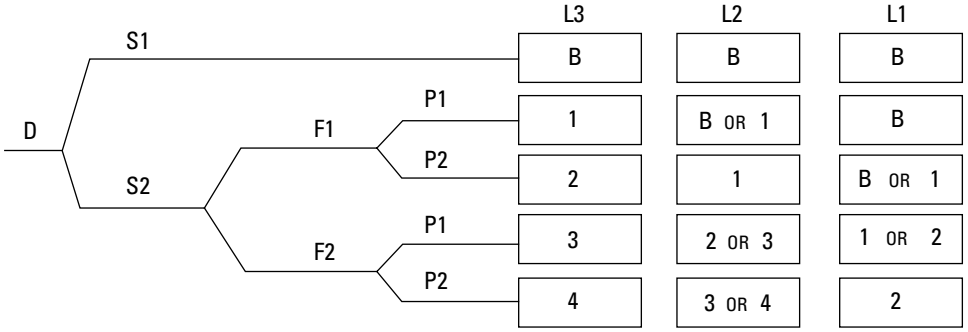
Risk Assessment

The primary purpose of risk assessment is to reduce the level of risk associated with a particular piece of machinery. The end result is to increase worker safety. Though risk assessment does rely on judgmental decisions, quantitative models have proven useful in assessing alternative safety measures and to determine which gives better protection.

Structured risk assessment involves evaluating:

- Severity of the potential risk,
- Frequency of exposure to the potential hazard,
- Possibility of avoiding the hazard if it occurs, and
- Likelihood of occurrence if a safety interlock fails.

To assist industries with evaluating potential risk, the European Machinery Directive provides quantitative guidelines based upon five defined levels of risk. These levels range from the lowest risk category in which the severity of injury is slight and/or there is relatively little likelihood of occurrence, to the highest risk category in which the likelihood of a severe injury is relatively high.



B, 1, 2, 3, 4: Risk Category

S: Severity of potential injury

- S1: Slight injury (bruise)
- S2: Severe injury (amputation or death)

F: Frequency of exposure to potential hazard

- F1: Infrequent exposure
- F2: Frequent to continuous exposure

P: Possibility of avoiding the hazard if it occurs (generally related to the speed/frequency of movement of hazard point and distance to hazard point)

- P1: Possible
- P2: Less possible

L: Likelihood of occurrence (if an interlock fails)

- L1: Very unlikely
- L2: Unlikely
- L3: Highly likely

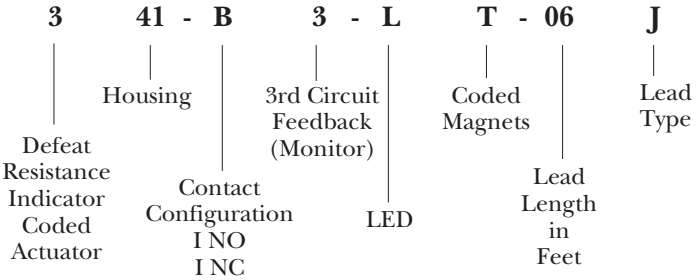
A Tradition of Excellence

The industry's most complete line of contact and non-contact products. GE Interlogix Industrial safety interlock switches are used to detect the opening of guards—including doors, gates and/or removable covers—that prevent access to dangerous parts of a machine, and to help deter tampering with the guards or the internal machine controls. As with all GE Interlogix Industrial products, the safety interlock switches are in full compliance with the most current and required standards. These include IMQ, CE, VDE, UL, CSA, IEC, EN and Semi S2 standards. Class of protection is IP65 to IP67 (Type 12 to Type 4).

Reading GE Interlogix Industrial Part Numbers

Part Number Matrix

Typical part number — 341-B3LT-06J

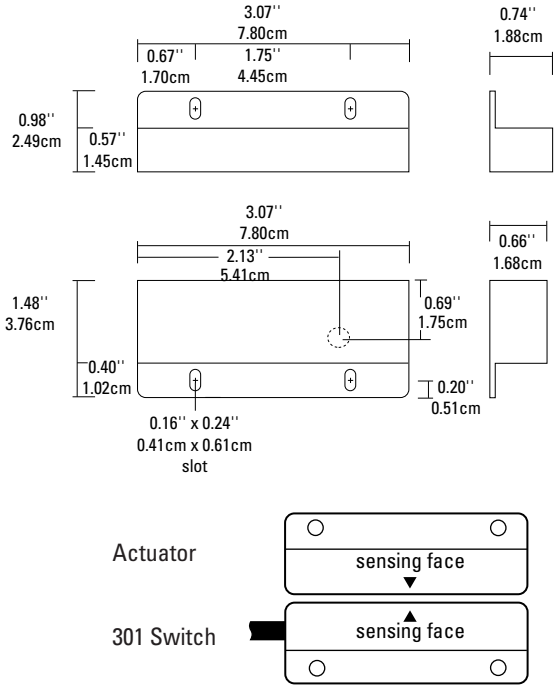


Safety Switch

301-BT GuardSwitch

Applications

- Requiring Highly Defeat Resistant Switches
- Meets ANSI, Semi S2 & European Safety Standard for the Highest Machine Risk Category 4 when used with the INT Safety Relay
- Packaging Machinery
- Pharmaceutical Equipment
- Semiconductor Equipment
- Machine Tool Equipment
- Food Processing Machinery



General Specifications

Enclosure	Folded 304 Stainless Steel
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 4, 4X, 5, 12, 12K
Protection Class	IP 66
Response Time (individual circuits)	1 msec The two circuits do not switch simultaneously and depend on the speed of the guard closure. A delay less than 50 msec is typical.
Life Cycles	100,000 Under Full Load;Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/4 SJTOW (K) / 0.34" (0.86cm) 22/4 PVC Jacketed (J) / 0.19" (0.48cm) 22/6 PVC Jacketed (J) / 0.21" (0.53cm)
UL/CSA/TUV	All Models

File E 122942 LR89176 U9880128199005 When used with INT Safety Monitor Relay

Electrical Specifications (Applies to all models)

Circuit	Circuit	Contact	Load	MAX Switching	MAX Switching
1	Switch	N.O.	40W/VA	48VAC/VDC	1.0ADC, 0.7AC
2	Tamper	N.C.	10W/VA	48VAC/VDC	0.3A
2	w/optional LED	N.C.	0.1–1.4W	48VDC(3V drop)	30mA
3	Monitor	N.O.	10W/VA	48VAC/VDC	0.3ADC, 0.3AC

Order Information

Part Number	Contact[2] Configuration	Sense Range[3] Minimum	Sense Range[3] Maximum	Break Range	Lead Length
301-BT-12(J)or(K)	DPST: 1 N.O., 1 N.C.	0.3"(0.8cm)	0.6"(1.5cm)	1.2"(3.0cm)	12' (3.6m)
301-BT-12(J)-NH[1]	DPST: 1 N.O., 1 N.C.		0.6"(1.5cm)	1.2"(3.0cm)	12' (3.6m)
301-BLT-12(J)OR(K)	DPST: 1 N.O., 1 N.C. w/ LED	0.3"(0.8cm)	0.6"(1.5cm)	1.2"(3.0cm)	12' (3.6m)
301-B3T-12(J)	TPST:2 N.O., 1 N.C.	0.3"(0.8cm)	0.6"(1.5cm)	1.2"(3.0cm)	12'(3.6m)
301-B3LT-12(J)	TPST:2 N.O., 1 N.C. w/LED	0.3"(0.8cm)	0.6"(1.5cm)	1.2"(3.0cm)	12'(3.6m)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 NH–no minimum sense range

2 Configuration with actuator away from the switch

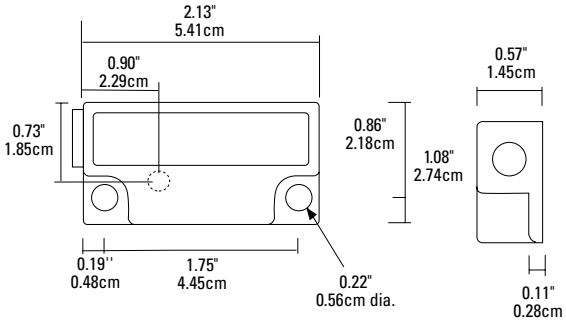
3 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

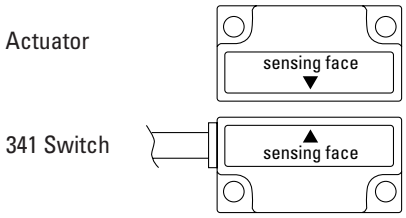
Safety Switch

341-BT GuardSwitch

Applications

- Requiring Highly Defeat Resistant Switches
- Meets ANSI, Semi S2 & European Safety Standard for the Hightest Machine Risk Category 4 when used with the INT Safety Relay
- Washdown Environments
- Packaging Machinery
- Pharmaceutical Equipment
- Semiconductor Equipment
- Food Processing Machinery





General Specifications

Enclosure	Kynar® Polyvinylidene Flouride with sonic welded lid
Temperature Range	14°F to 150°F (-10°C to 65°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 4, 4X, 5, 12, 12K, 13
Protection Class	IP 67
Response Time (individual circuits)	1 msec The two circuits do not switch simultaneously and depend on the speed of the guard closure. A delay less than 50 msec is typical.
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/4 SJTOW (K) / 0.34" (0.86cm) 22/4 PVC Jacketed (J) / 0.19" (0.48cm) 22/6 PVC Jacketed (J) / 0.21" (0.53cm)
UL/CSA/TUV	All Models

File E 122942 LR89176 U9880128199005 When used with INT Safety Monitor Relay

Electrical Specifications (Applies to all models)

Circuit No.	Circuit Type	Contact Configuration	Load Rating	MAX Switching Voltage	MAX Switching Current
1	Switch	N.O.	10W/VA	48VAC/VDC	0.2A
2	Tamper	N.C.	10W/VA	48VAC/VDC	0.2A
2	w/optional LED	N.C.	0.1–1.4W	48VDC(3V drop)	30mA
3	Monitor	N.O.	10W/VA	48VAC/VDC	0.2A

Order Information

Part Number	Contact[1] Configuration	Sense Range[2] Minimum	Sense Range[2] Maximum	Break[2] Range	Lead Length
341-BT-06(K)	DPST: 1 N.O., 1 N.C.	0.12"(0.3cm)	0.38"(1.0cm)	0.75"(1.9cm)	6' (1.8m)
341-BT-12(J)OR(K)	DPST: 1 N.O., 1 N.C.	0.12"(0.3cm)	0.38"(1.0cm)	0.75"(1.9cm)	12' (3.6m)
341-BLT-12(K)	DPST: 1 N.O., 1 N.C. w/ LED	0.12"(0.3cm)	0.38"(1.0cm)	0.75"(1.9cm)	12' (3.6m)
341-B3T-12(J)	TPST: 2 N.O., 1 N.C.	0.12"(0.3cm)	0.38"(1.0cm)	0.75"(1.9cm)	12' (3.6m)
341-B3LT-12(J)	TPST: 2 N.O., 1 N.C. w/LED	0.12"(0.3cm)	0.38"(1.0cm)	0.75"(1.9cm)	12' (3.6m)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

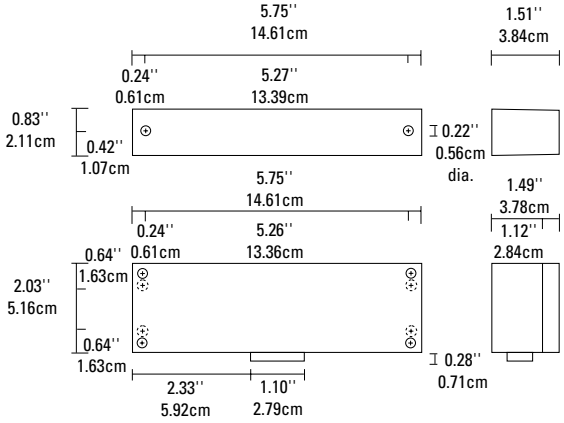
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

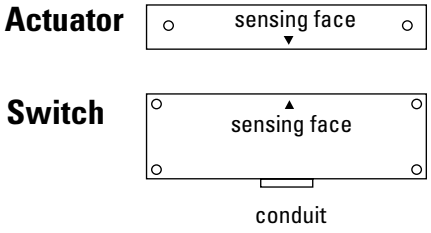
Safety Switch

371-BT GuardSwitch Explosion Proof

Applications

- Requiring Explosion-Proof Enclosure for Hazardous Locations
- Meets ANSI, Semi S2 & European Safety Standard for the Highest Machine Risk Category 4 when used with the INT Safety Relay
- UL Enclosure Classified for Use in Hazardous Locations:
  Class I, Group B, C, D
  Class II, Group E, F, G
  Class III, Divisions 1 & 2





General Specifications

Enclosure	UL Explosion Proof Black Anodized, Die Cast Aluminum
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 5
Protection Class	IP 64
Response Time (individual circuits)	1 msec The two circuits do not switch simultaneously and depend on the speed of the guard closure. A delay less than 50 msec is typical.
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Conduit Connection	1/2" Threaded NPT
UL/CSA/TUV	All Models

File E 122942 LR89176 U9880128199005 When used with INT Safety Monitor Relay

Electrical Specifications

Circuit No.	Circuit Type	Contact Configuration	Load Rating	MAX Switching Voltage	MAX Switching Current
1	Switch	N.O.	40W/VA	48VAC/VDC	1.0ADC, 0.7AC
2	Tamper	N.C.	10W/VA	48VAC/VDC	0.3A

Order Information

Part Number	Contact[1] Configuration	Sense Range[2] Minimum	Sense Range[2] Maximum	Break Range	Terminal Type
371-BT	DPST: 1 N.O., 1 N.C.	0.3"(0.8cm)	0.6"(1.5cm)	1.2"(3.0cm)	#6 screws

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

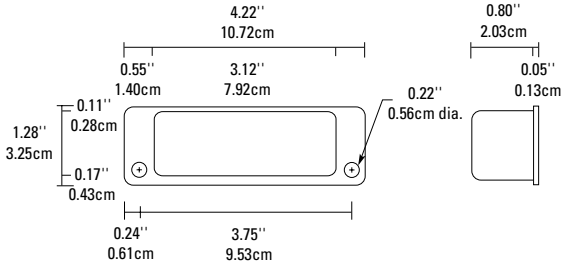
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

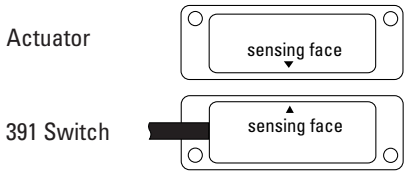
Safety Switch

391-BT GuardSwitch

Applications

- Machine Tool Machinery
- Withstands Corrosive and Extreme Washdown Environments
- Packaging Machinery
- Food Processing Machinery
- Presses
- Meets ANSI, Semi S2 & European Safety Standard for the Highest Machine Risk Category 4 when used with the INT Safety Relay





General Specifications

Enclosure	Seamless 304 Stainless Steel
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 4, 4X, 5, 12, 12K
Protection Class	IP 67
Response Time (individual circuits)	1 msec The two circuits do not switch simultaneously and depend on the speed of the guard closure. A delay less than 50 msec is typical.
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/4 SJTOW (K) / 0.34" (0.86cm) 22/4 PVC Jacketed (J) / 0.19" (0.48cm)
UL/CSA/TUV	All Models

File E 122942 LR89176 U9880128199005
When used with INT Safety Monitor Relay

Electrical Specifications

Circuit No.	Circuit Type	Contact Config.	Load Rating	MAX Switching Voltage	MAX Switching Current
1	Switch	N.O.	40W/VA	48VAC/VDC	1.0ADC, 0.7AC
2	Tamper	N.C.	10W/VA	48VAC/VDC	0.3A
2	w/optional LED	N.C.	0.1–1.4W	48VDC(3V drop)	30mA

Order Information

Part Number	Contact[1] Configuration	Sense Range[2] Minimum	Sense Range[2] Maximum	Break Range	Lead Length
391-BT-06(K)	DPST: 1 N.O., 1 N.C.	0.3"(0.8cm)	0.6"(1.5cm)	1.2"(3.0cm)	6' (1.8m)
391-BLT-12(J)	DPST: 1 N.O., 1 N.C. w/ LED	0.3"(0.8cm)	0.6"(1.5cm)	1.2"(3.0cm)	12' (3.6m)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

Series 300-BT Safety Switches

Installation Instructions

Mounting Configurations

The interlock switch and actuator should be mounted in only three configurations for actuation:

Figure 1

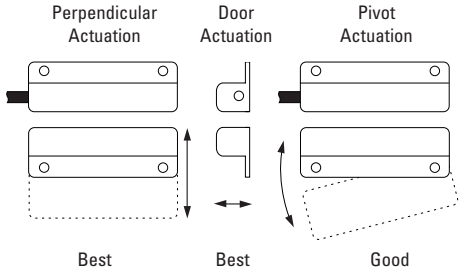
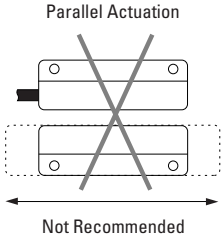
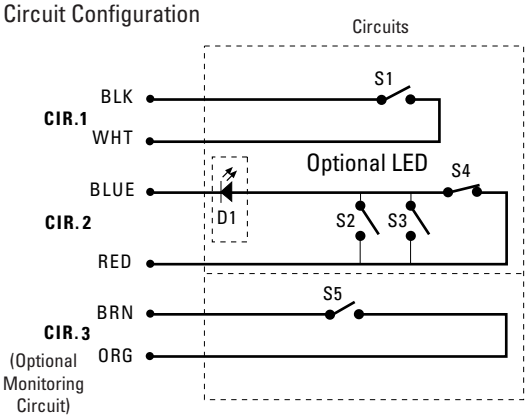


Figure 2



The parallel actuation can result in on/off/on (double actuation) signal if the actuator passes by the switch rather than coming to rest in proximity to it. This is NOT a recommended configuration for safety interlock applications.

Circuit Configuration



*Circuits shown with magnet actuator away from switch.

S1 Normally open reed switch, closed when actuator is within specified sense range

S2, S3 Normally open reed switches, will close if misaligned or tampered with a standard magnet

S4 Biased closed reed switch, open when actuatior is between specified sense range

S5 Normally open reed switch, closed when actuator is within specified sense range

N.O. circuit: Black and white wires.
N.C. biased tamper circuit: Red and blue wires.
N.O. monitor circuit: Orange and brown wires.

Installation

1. Position the switch and actuator so the labels are reading in the same direction.
2. Mount the switch on the stationary frame of the machine and mount the actuator on the moveable guard, door or gate. Keep the switch and actuator within the listed sense range.

   See Figure 1 and Figure 2 for recommended mounting configurations.
3. Mounting on a ferrous material will effect the sense range a minimum of 50%. However, a 1/4" non-ferrous spacer positioned under the actuator and/or switch should restore most of the lost sense range.
4. For best protection against operator defeat, mount with non-removable screws, bolts or nuts (see Accessories).
5. **CAUTION: When not used with a INT safety relay particular care must be taken to determine the actual load of the switch circuit. High voltage transients from coils, motors, contactors, and solenoids must be considered. Transient protection, such as back-to-back zener diodes (TransZorb®) or an RC network, is recommended for such loads to ensure that maximum ratings of the switch are not exceeded. Not recommended to be used with tungsten filament loads because of high current inrush surges. Line capacitance and load capacitance must be considered. Excessive line capacitance can be caused by cable lengths over 50' when using a maximum 48 VAC. A resistor can be added in series to limit the inrush current (at least 48 Ohms for 24V applications). The resistor can be added in series just before the load. The voltage drop and the power rating of the resistor must be considered.**
   Voltage drop =I•R; Watts = I^2R
   (I = maximum continuous current of the load).
6. When mounting the switch on an ungrounded machine, ground the switch housing by connecting your ground lead to one of the switch mounting screws.

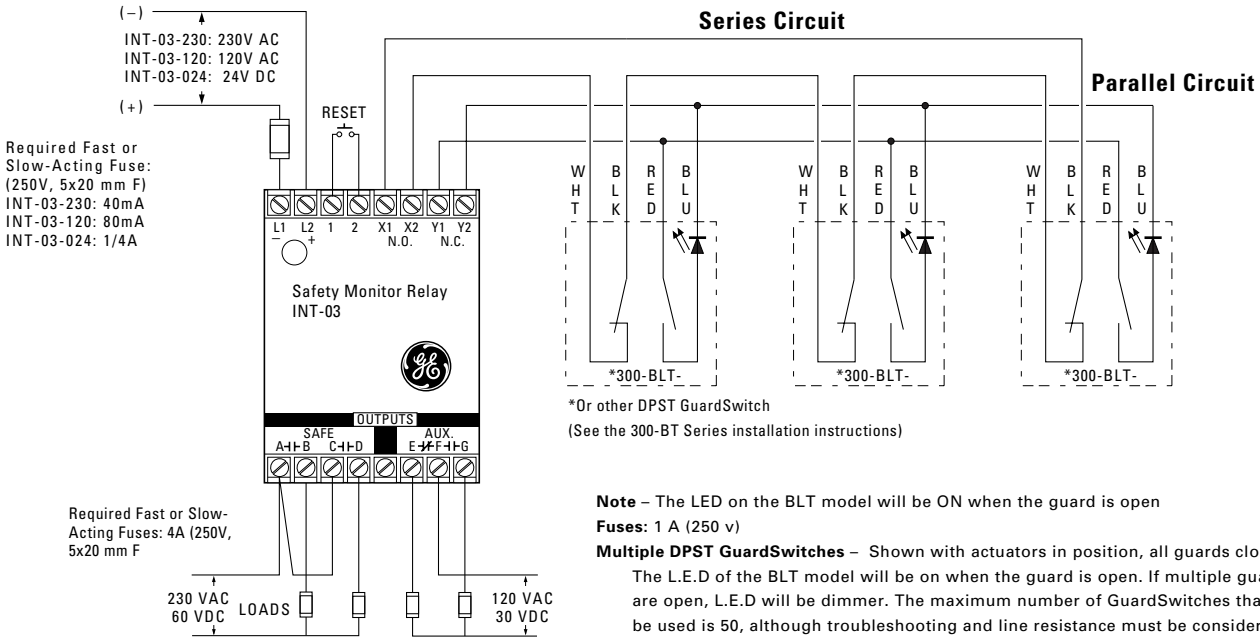
Installation Instructions

Wiring Diagram For Category 3

Inputs shown with safety gates/guards in closed position.

When guards are closed, safe outputs are closed.

One 300-BT Series GuardSwitch required for each safety gate, one INT relay for each machine.



Note – The LED on the BLT model will be ON when the guard is open

Fuses: 1 A (250 v)

Multiple DPST GuardSwitches – Shown with actuators in position, all guards closed. The L.E.D of the BLT model will be on when the guard is open. If multiple guards are open, L.E.D will be dimmer. The maximum number of GuardSwitches that can be used is 50, although troubleshooting and line resistance must be considered. (Do not exceed 30 Ohms of combined contact and line resistance. Each GuardSwitch will have less than 0.5 Ohms of resistance.)

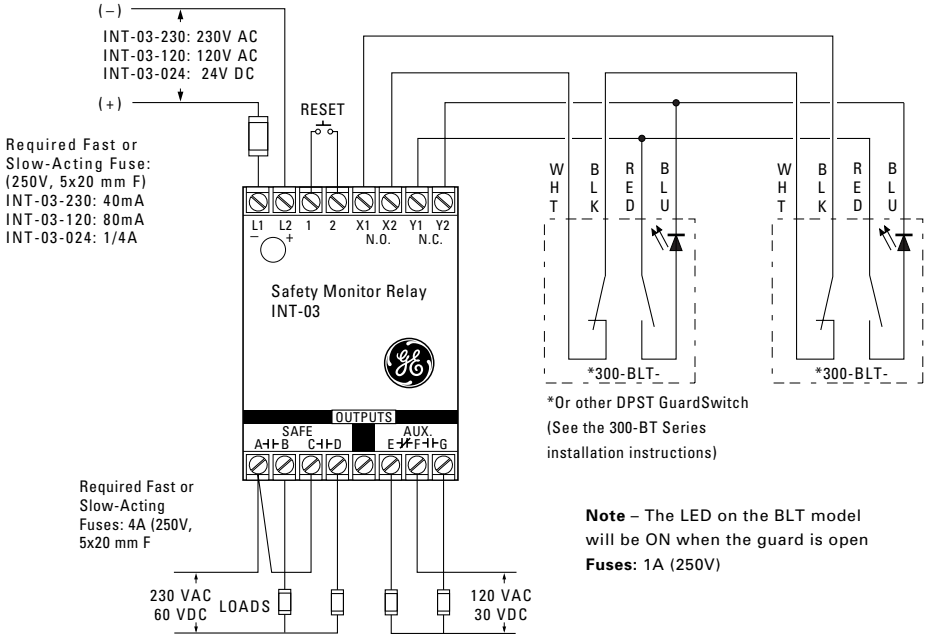
Wiring Diagram For Category 4

Inputs shown with safety gates/guards in closed position.

When guards are closed, safe outputs are closed.

Two 300-BT Series GuardSwitches with one INT relay are required for each safety gate.

When first applying the GuardSwitch Monitor Relay, the inputs must be cycled to check for proper operation before the output contact close. To cycle the inputs, the guard must be opened and then closed. This start-up test is sufficient; however, we recommend that the proper operation of the switches and relay be checked at least every 24 hours.



Note – The LED on the BLT model will be ON when the guard is open

Fuses: 1A (250V)

Series 300-BT Safety Switches

Installation Instructions

CE Compliance Information

These switches are TÜV certified for CE applications only when used with the INT Series Safety Monitor Relays. See Risk Category 3 and Category 4 wiring diagrams.

EC Declaration of Conformity
According to EC machinery Directive 89/392/EEC, Annex II C

We herewith declare,	GE Interlogix Industrial 12345 SW Leveton Drive Tualatin, OR 97062 USA

that the following described safety components in our delivered version complies with the appropriate basic safety and health requirement of the EC Machinery Directive 89/392/EEC based on its design and type, as brought into circulation by us. In case of alteration of the safety components not agreed upon by us, this declaration will lose its validity.

Description of the safety component	Guard Switch monitoring relays; Proximity switches
Safety component type:	INT-01-024, 120, 230; INT-02-024, 120, 230; INT-03-024, 120, 230; INT-04-024, 120, 230; INT-05-024, 120, 230; INT-06-024, 120, 230 301/303-B, BT, B3T; 341/343-B, BT, B3T; 371-B, BT; 381-B, BT; 391-B, BT; 430-B
Safety Function:	Safety gate/guard interlock system.
Applicable EC Directives	EC Machinery Directive (89/392/EEC) EC Low Voltage Directive (73/23/EEC) EC Directive of Electromagnetic Compatibility (89/336/EEC)
Applicable Harmonized Standards	EN 60204-1 EN 1088 EN 954-1, category 3,4 IEC 947-5-3 EN 50178 IEC 664-1, IEC 60664 EN 60529 EN 50081-2, EN 50082-2 IEC 68, part 2-1, 2-2, 2-3, 2-6, 2-14, 2-27, 2-30
Notified Body (according to annex VII):	TUV Product Service GmbH Westendstr. 199 D-80339 Munchen Germany
Responsible for:	EC type-examination (EC type examination certificate no. U 98 01 28199 003)
Authorized Signature:	Geraldine F. Williams .....
Title of signatory: REV. 09/07/99	Manager

For a full-sized signed version, see page 26.

Declaration of Conformity
available upon request.

European Directives

Machinery Directive (89/392/EEC)
EMC Directive (89/336/EEC)
Low Voltage Directive (73/23/EEC)

Specific European Standards

EN60204-1	Safety of electrical equipment of industrial machines.
EN292 Part 1, 2	Safety of Machinery, basic terminology, technical principles.
EN954-1	Risk Assessment Category 3 or 4 depending on wiring method, see diagrams.
EN55081-2	Electromagnetic Emissions.
EN550082-2	Electromagnetic Immunity.
EN1088	Interlocking Devices.
EN 947-5-3	Control Circuit Devices.
EN 50178	Safety of Electrical Equipment.
IEC 664-1	Insulation requirements.
IEC 68	part 2-1, 2-2, 2-3, 2-8, 2-14, 2-27, 2-30.

Notes:

1. Humidity Rating: 30 to 95%
2. Environment: Pollution Degree II.
3. Correct use of this control devise is an essential part of proper machine cycle control.
4. Failure to follow ALL instructions could lead to serious bodily injury or death.
5. Maintenance to be done by qualified personnel only.
6. The connecting cables between the INT devices and the switches must be located in an IP 23 type enclosure (minimum).
7. The mounting for the switch and the acuator must be accomplished per this specification.
8. Non-removable hardware must be used for installation.
9. The housing of the 300-BT Series GuardSwitches must be connected to the PE (Primary Earth) ground circuit via a lock washer on the mounting screw. The PE ground symbol must be placed adjacent to the screw.

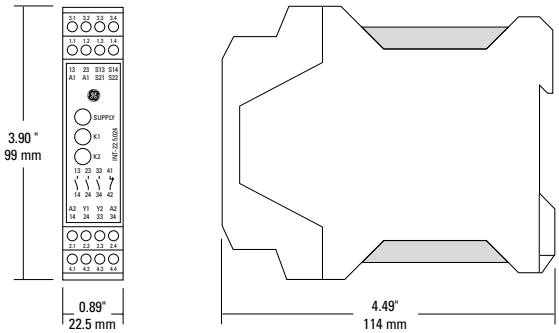
GuardSwitch™ Safety Monitor Relay

INT-22.5–024

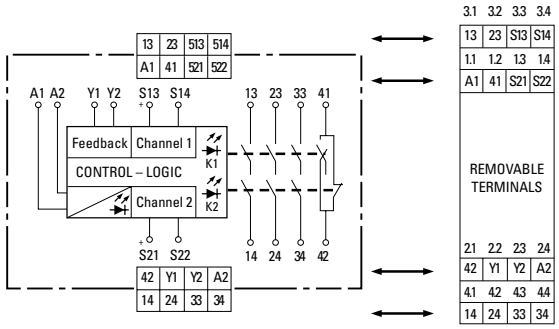
Applications

- Designed for use with 300-BT Series GuardSwitch
- Space saving profile
- Meets European Machine Safety Standards, Risk Category 4
- Requires both normally-open and normally-closed inputs
- Inhibits machine restart in case of component failure
- Low current for longer GuardSwitch life
- DIN Rail or panel mount
- LED power indicator
- Manual restart only

Dimensions



Connections



The safety monitor relay INT-22.5-024 is used to monitor switching elements on guards or protective installations, and to generate a safety output signal (enable). Depending on the type of construction, the protective installation can be defined as: protective gate, protective door, housing, cover, enclosure, shield etc. The INT-22.5-024 meets the requirements of EN 201 and EN 422 Type I & II. Sensors and a safety switching device (analyzing unit) form the safety circuit for "non-contacting position switches with safety functions" in accordance with DIN VDE 0660 Part 209 and EN 61496-1.

After the supply voltage has been applied to terminals A1/A2 the starting inhibiting circuit prevents an unintentional start-up of the safety relay. The device can be enabled after the start-up test has been preformed by opening and closing the guard door or gate. With this operation the simultaneous activation of both switching elements is tested. If the test is passed the device is only enabled when the guard door or gate is closed and the feedback circuit is closed as well. If a malfunction occurs in the external contactors connected to the item, the feedback loop at terminals Y1/Y2 can prevent the INT-22.5-024 from being enabled. It is possible to recognize any manipulation and failure in the safety circuit.

The INT-22.5-024 is equipped with four removable terminals. This feature allows a quick installing/removing operation. The terminal locations are coded and not interchangeable. The position of the door or gate is checked by means of the cross monitoring feature via the two channels S13/S14 and S21/S22. After the supply voltage has been applied, the starting inhibiting circuit prevents an unintentional start-up of the safety monitor/relay.

LISTED

Technical Data

INT-22.5-024

Function According to EN 60204-1	Safety Monitor Relay
Function Display	3 LED, green (Supply, K1-Actuation, K2-Simultaneity)
Function Diagram	FD 0221-21 W1

Power Supply Data

Rated Voltage U_N	24 V AC/DC
Rated Consumption at 50 Hz and Un (AC)	3.7 VA
Rated Consumption at 50 Hz and U_N (AC)	2.3 W
Rated Consumption at Un (DC)	1.8 W
Residual Ripple	2.4 V_{ss}
Rated Frequency	50 to 60 Hz
Operating Voltage Range	0.85 to 1.1 x U_N

Control Circuit only for Supplying the Control Inputs

DC Isolation Between the Supply Circuit and the Control Circuit	no
Line Resistance in Y1/Y2, S13/S14 and S21/S22 (at U_N)	≤ 70 Ω
Control Outputs Y1, S13, S21:	
Rated Output Voltage	≤24 V DC
Rated Current Y1/S13, S21	20/12 mA
Rated Short-Circuit Current l_K max.	1100 mA
Fuse	AC/DC: PTC-Resistance
Response Time	2 s
Recovery Time	3 s
Control Inputs Y2, S14, S22:	
Rated Current Input Y2/S14, S22	20/12 mA
Minimum Switch- ON Time t_M an S14, S22	100 ms
Simultaneity Time t_S for S14, S22	300 ms
Release Time t_R	20 ms
Recovery Time t	200 ms

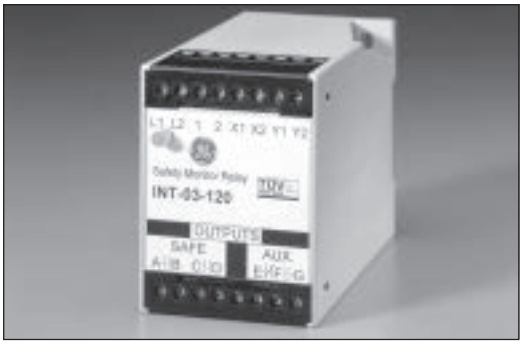
Output Circuit

Contact Equipment:	3 N.O. Safety Contact 1 N.C. Control Contact
Contact Type	Forced Contact
Contact Material	Ag-Alloy; Gold-Plated
Switching Voltage U_n	230/230 V AC/DC
Maximum Rated Current l_n per Contact	6 A
Maximum Total Current for all Contacts	12 A
Application Category According to EN 60947-5-1: 1991	AC-15: U_e 230 V AC, l_e 6 A* DC-13: U_e 24 V DC, l_e 6 A ** DC-13: U_e 24 V DC, l_e 3 A * *3600 Switch/h ** 360 Switch/h
Short-Circuit Protection, Max. Fuse Element Class gG	6 A
Permissible Switching Frequency	3600 Switching Cycles/h
Mechanical Lifetime	10 x 10^6 Switching Cycles

General Data

Creepage and Clearance Distances Between Circuits According to DIN VDE 0110-1:04.97: Rated Withstand Voltage	4 kV
Over-Voltage Category	lll
Contamination Level	3 Outside, 2 Inside
Design Voltage	300 V
Test Voltage U_{eff} 50 Hz acc. to DIN VDE 0110-1, Table A.1	2.21 kV
Protection Class Housing/Terminals acc. to DIN VDE 0470 Sec. 1:11.92	lP 40/lP 20
Radiated Noise/Noise Immunity	EN 50081–1:03.93,–2:03.94 EN 50082-2:1995
Safety Category 4 & Stop Category 0	EN 954–1, EN 60204–1
Ambient Temperature, Working Range	–13 to 131 (–25 to +55) °F/ °C
Dimension Diagram: SNT 4453 K/SNT 4453 K-A	K 2-1/K 2-2
Connection Diagram	KS 0358-1
Max. Wire Cross Section (flexible/single core)	1 x 2.5 or 2 x 0.5/1 x 2.5 or 2 x 0.75 mm^2
Weight	0.21 kg
Approvals	BG, CSA, UL

Order Information	Electrical Specifications	
Part Number	**Power Input A1/A2**	**RequiredFuse**
INT-22.5-024	24VAC/DC	AC/DC: PTC-Resistance



INT Monitor Relay "Integrity Series"

INT-03 Series

Applications

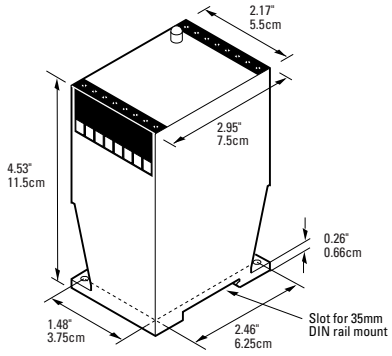
- Meets European Machine Safety Standards, Risk Category 4
- Designed for use with 300-BT Series GuardSwitch™
- Requires both normally-open and normally-closed inputs
- Inhibits machine restart in case of component failure
- Provides 2 safe outputs plus a form C output for signaling
- Low current for longer GuardSwitch life
- DIN Rail or panel mount
- LED power on indicator

The INT-03-024 or INT-03-120, Safety Monitor Relay is intended for use as a part of a safety circuit in guard interlock applications. It is a safety relay which uses positive-guided relays, configured for self-checking, to inhibit machine start-up in the event of an internal component failure.

Both normally-open and normally-closed inputs are required. Multiple N.O. contacts can be wired in series while multiple N.C. contacts can be wired in parallel. Upon failure of either the N.O. or N.C. contact, the relay will prevent restart.

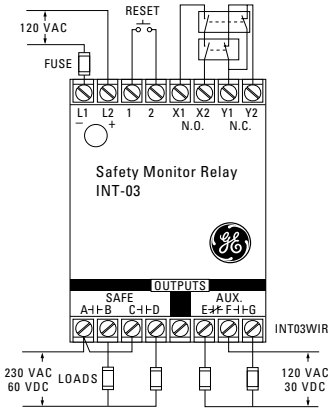
The INT-03 relay can also monitor contacts on external relays for controlling expansion block relays (INT-05 and INT-06).

Panel Mount Dimensions



Wiring

Door Open Configuration



	AUX CONTACTS		
Power	**Guards**	**E,F**	**F,G**
Off	Open or Closed	Closed	Open
On	Closed	Closed	Open
On	Open	Open	Closed

U9880128199003

General Specifications

UL/TUV	All Models
Control Inputs (X1, X2 & Y1, Y2 terminals)	
Open-circuit voltage	24VDC
Closed-circuit current	24mA
Max. contact resistance	30 Ohms
Simultaneity	500 ms typical
Safe Outputs (A,B/C,D terminals)	
Voltage	230 VAC/60VDC
Current	4A (resistive)
Resonse time	< 100 ms
Fuse	4A, 250V, 5 x 20 mm, F/T
AUX. Signaling Outputs (E,F,G terminals) (SPDT)	
Voltage	120 VAC/30VDC
Current	1A (resistive)

Note: Transient protection is required across the load when switching an inductive load.

Operation

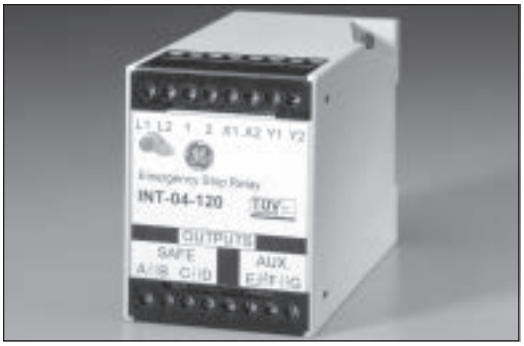
A. With a RESTART button from Terminal 1 to 2, INT-03 energizes after all guards are in place and RESET button is pressed (monitored contacts must also be closed).

B. With a jumper from Terminal 1 to 2, INT-03 energizes when all guards are in place (autostart).

C. With no connection from Terminal 1 to 2, INT-03 will not energize.

Order Information	Electrical Specifications	
Part Number	**Power Input (L1.L2)**	**Required Fuse**
INT-03-024	24VDC±20%	Fast Acting 1/4 A (250V, 5 x 20mm, F/T)
INT-03-120	120VAC+10%, - 20%, 50/60 Hz, 5VA	Fast Acting 80mA (250V, 5 x 20 mm, F/T)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!



Emergency-Stop Safety Relay

INT-04 Series

Applications

- Monitors both contacts on E-stop buttons
- Incorporates loop break detection for floor mat sensing
- Provides 2 safe outputs plus a form C output for signaling
- Inhibits machine restart in case of component failure
- DIN Rail or panel mount
- LED power on indicator

The INT-04-024 or INT-04-120 Safety Relay is intended for use as part of a safety circuit in emergency-stop or safety floor mat sensing applications. It is a safety relay which uses positive-guided relays, configured for self-checking, to inhibit machine start-up in the event of an internal component failure.

The INT-04 relay can also monitor contacts on external relays for controlling expansion block relays (INT-05 and INT-06).

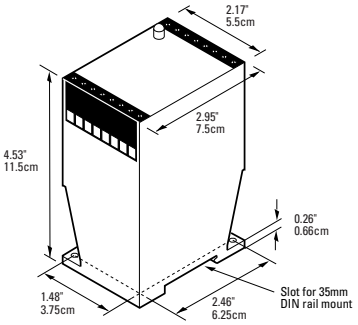
As E-Stop Relay

Both contacts on E-stop buttons are monitored to ensure both have opened and closed to allow machine restart. Multiple contacts can be wired in series. Upon failure of either contact, the relay will prevent restart.

As Safety Floor Mat Relay

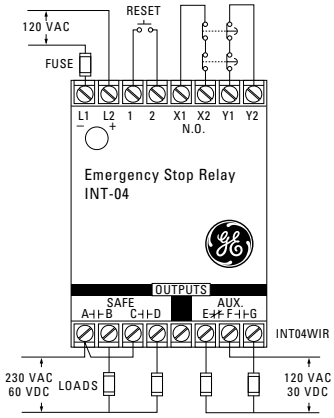
The INT-04 monitors both loops of a safety floor mat. The safety outputs of the INT-04 turn off when an operator steps on the mat. The relay incorporates loop break detection to turn off if one of the loops breaks or becomes disconnected.

Panel Mount Dimensions



Wiring

Door Open Configuration



		AUX CONTACTS		
Power	**Reset(1,2)**	**E-Stops**	**E,F**	**F,G**
Off	Open or Closed	Open or Closed	Closed	Open
On	Open	Open or Closed	Closed	Open
On	Open or Closed	Open	Closed	Open
On	Closed	Closed	Open	Closed

Reset "Open" is prior to initiating a cycle.
Reset "Closed" can be momentary or maintained.

File E 122942

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General Specifications

UL/TUV	All Models
Control Inputs (X1, X2 & Y1, Y2 terminals)	
Open-circuit voltage	24VDC
Closed-circuit current	24mA
Max. contact resistance	30 Ohms
Simultaneity	500 ms typical
Safe Outputs (A,B/C,D terminals)	
Voltage	230 VAC/60VDC
Current	4A (resistive)
Response time	< 100 ms
Fuse	4A, 250V, 5 x 20 mm, F/T
AUX. Signaling Outputs (E,F,G terminals)	
Voltage	120 VAC/30VDC
Current	1A (resistive)

Note: Transient protection is required across the load when switching an inductive load.

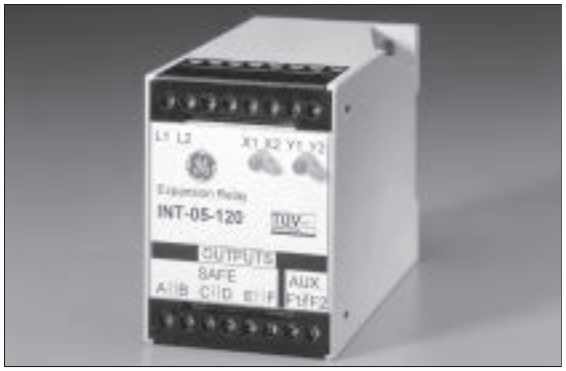
Operation

E-Stop: The INT-04 energizes after E-stop button contacts are closed and RESET button is pressed (monitored contacts must also be closed).

Floor Mat: The 2 floor mat loops connect from terminal X1 to X2 and Y1 to Y2. The INT-04 energizes after RESET button is pressed with no object on mat. It turns off when a heavy enough object operator is on mat.

Order Information	Electrical Specifications	
Part Number	**Power Input (L1.L2)**	**Required Fuse**
INT-04-024	24VDC± 15%,100mA	Fast Acting 1/4 A (250V, 5 x 20 mm F/T)
INT-04-120	120VAC+10%, - 20%, 50/60 Hz, 5VA	Fast Acting 80mA (250V, 5 x 20 mm F/T)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!



Safety Expansion Relay

INT-05 Series

Applications

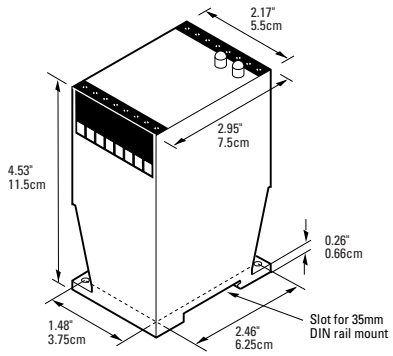
- Adds 3 safe outputs when used with Sentrol safety relays INT-03 and INT-04
- Maintains safety circuit integrity by providing feedback to INT-03 or INT-04 to inhibit machine restart in case of component failure
- Electrical isolation between input and output
- Switches AC or DC loads
- DIN rail or panel mount
- LEDs indicate relay status

The INT-05-024 or INT-05-120 Expansion Safety Relay is intended for use as part of a safety circuit. It provides three additional safe output contacts when used with the INT-03 Safety Monitoring Relay or INT-04 Emergency-Stop Safety Relay.

The INT-05 uses positive-guided relays along with feedback contacts to the INT-03 or INT-04 safety relay to prevent machine start-up in the event of a component failure.

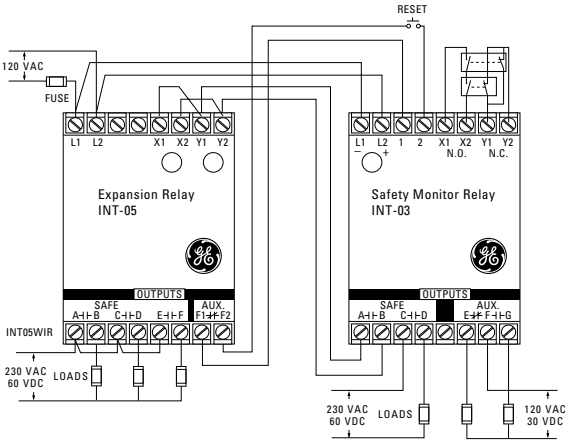
Voltage to the INT-05 is switched thru the contacts of the INT-03 or INT-04. If a component failure occurs, the feedback loop to the INT-03 or INT-04 prevents machine restart.

Panel Mount Dimensions



Wiring

Door Open Configuration



File E 122942

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General Specifications

UL/TUV	All Models
Control Inputs (X1, X2 & Y1, Y2 terminals)	
Open-circuit voltage	24VDC
Closed-circuit current	24mA
Max. contact resistance	30 Ohms
Simultaneity	500 ms typical
Safe Outputs (A,B/C,D/E,F terminals)	
Voltage	230 VAC/60VDC
Current	4A (resistive)
Response time	ON:< 40 ms, OFF:<30 ms
Fuse	4A, 250V, 5 x 20 mm, F/T
AUX. Signaling Outputs (F1,F2 terminals)	
Voltage	120 VAC/30VDC
Current	1A (resistive)

Note: Transient protection is required across the load when switching an inductive load.

Operation

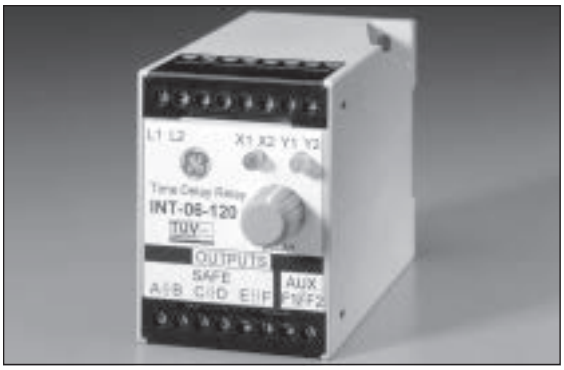
A. With voltage applied to control inputs via INT-03 or INT-04 output contacts, relay energizes

B. With control voltage removed, relay de-energizes

C. If an internal failure has occurred, feedback loop will not close thereby disabling INT-03 or INT-04

Order Information	Electrical Specifications	
Part Number	**Power Input (L1.L2)**	**Required Fuse**
INT-05-024	24 VDC± 15%	Fast Acting 1/4 A (250V, 5 x 20 mm,F/T)
INT-05-120	120 VAC+10%, - 20%, 50/60 Hz, 5VA	Fast Acting 80mA (250V, 5 x 20 mm,F/T)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!



Safety Expansion Relay With Time Delay Opening

INT-06 Series

Applications

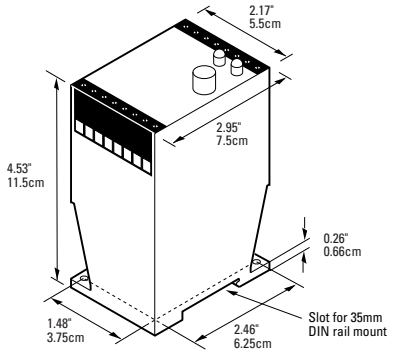
- Adds 3 safe, time-delay outputs when used with GE safety relay INT-03 or INT-04
- Maintains safety circuit integrity by providing feedback to INT-03 or INT-04 to inhibit machine restart in case of component failure
- Electrical isolation between input and output
- Switches AC or DC loads
- DIN rail or panel mount
- LEDs indicate relay status

The INT-06-024 or INT-06-120 Expansion Safety Relay with Time Delay Opening is intended for use as part of a safety circuit. It provides three additional safe output contacts when used with the INT-03 Safety Monitor Relay or INT-04 Emergency-Stop Safety Relay. The time delay is adjustable from 1 to 25 seconds to allow for controlled stops for high inertia loads.

The INT-06 uses positive-guided relays along with feedback contacts to the INT-03 or INT-04 safety relay to prevent machine start-up in the event of a component failure.

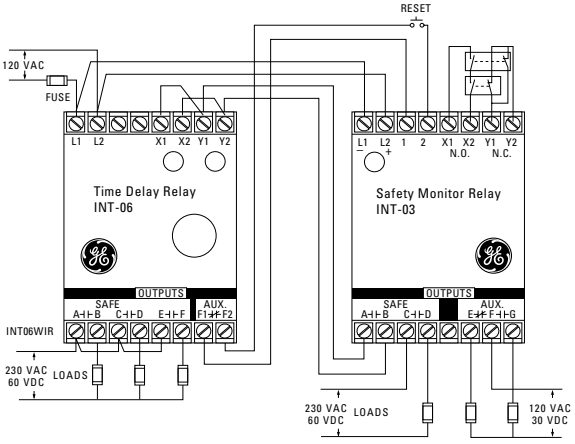
Input voltage to the INT-06 is switched thru the contacts of the INT-03 or INT-04. If a component failure occurs, the feedback loop to the INT-03 or INT-04 prevents machine restart.

Panel Mount Dimensions



Wiring

Door Open Configuration



General Specifications

UL/TUV	All Models
Control Inputs (X1, X2 & Y1, Y2 terminals)	
Open-circuit voltage	12VDC
Closed-circuit current	<10mA
Max. contact resistance	30 Ohms
Simultaneity	500 ms typical
Safe Outputs (A,B/C,D/E,F terminals)	
Voltage	230 VAC/60VDC
Current	4A (resistive)
Response time	ON: <50 ms OFF: adjustable from 1 to 25 seconds
Fuse	4A, 250V, 5 x 20 mm, F/T
AUX. Signaling Outputs (F1,F2 terminals)	
Voltage	120 VAC/30VDC
Current	1A (resistive)

Note: Transient protection is required across the load when switching an inductive load.

File E 122942

U 9880128199003

Operation

A. With voltage applied to control inputs via INT-03 or INT-04 output contacts, relay energizes.

B. With control voltage removed, relay de-energizes after selected time delay.

C. If an internal failure has occurred, feedback loop will not close thereby disabling INT-03 or INT-04.

Order Information	Electrical Specifications	
Part Number	**Power Input (L1.L2)**	**Required Fuse**
INT-06-024	24VDC± 20%	Fast Acting 1/4 A (250V, 5 x 20 mm F/T)
INT-06-120	120VAC+10%, - 20%, 50/60 Hz, 5VA	Fast Acting 80mA (250V, 5 x 20 mm F/T)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

INT Monitor Relay "Integrity Series"

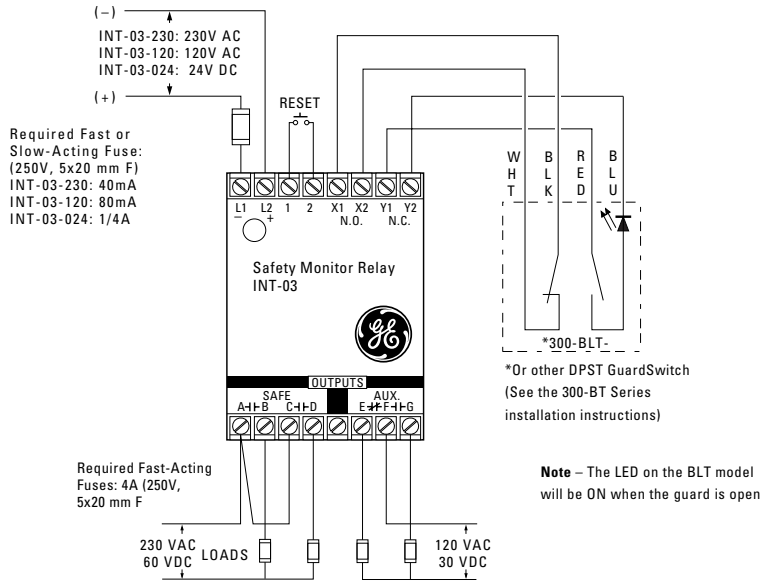
Installation Instructions

Typical Wiring Diagram

Inputs shown with safety gates/guards in closed position.

When guards are closed, safe outputs are closed.

One 300-BT Series GuardSwitch is required for each safety gate.



Note – The LED on the BLT model will be ON when the guard is open

Installation

1. Mount the relay on a 35mm DIN rail or panel. See Dimensions.
2. Connect the wiring for the switches and relay. See Wiring Diagrams. (For proper operation, DO NOT jumper terminal 1 to terminal 2. Use a momentary button.) For floor mat applications, connect the two floor mat loops from terminal X1 to X2 and from Y1 to Y2.

   CAUTION! The relay is available in either a 24 VDC, 120 VAC, or 230 VAC model. Make sure correct model is used before applying power.
3. Use one of the following methods to energize the relay:
   - For E-stop installations, close all E-stop button contacts and monitored contacts, and then press the START button.
   - For floor mat installations, press the START button without an object on the mat.

INT Monitor Relay "Integrity Series"

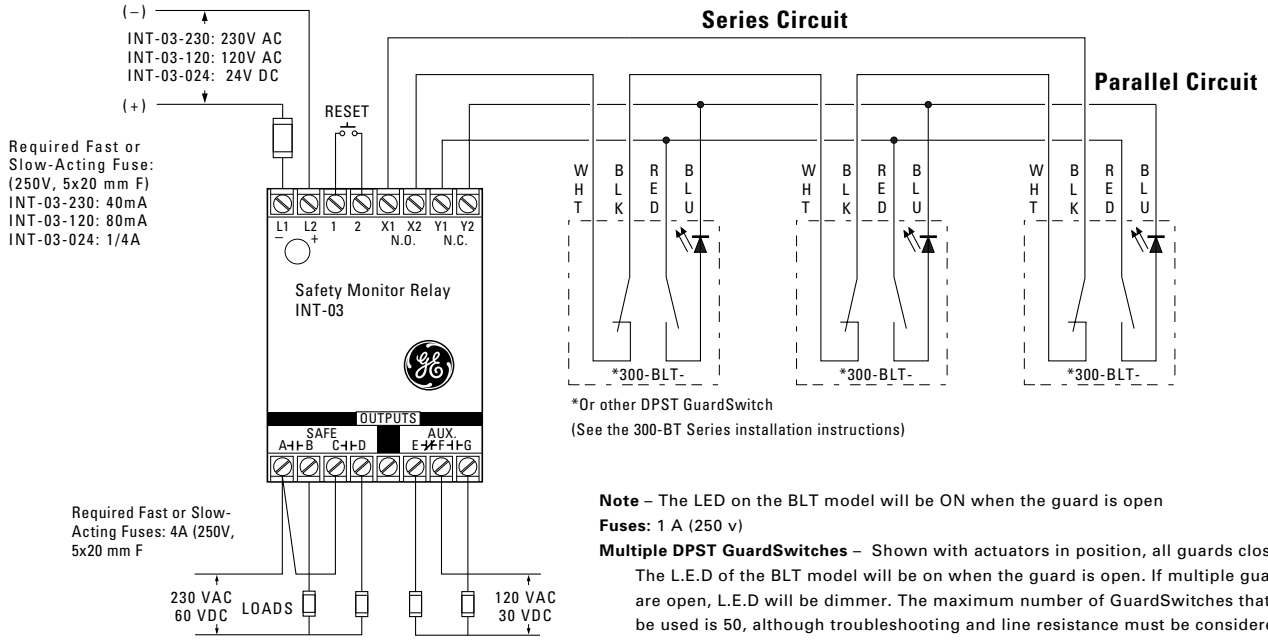
Installation Instructions

Wiring Diagram For Risk Category 3

Inputs shown with safety gates/guards in closed position.

When guards are closed, safe outputs are closed.

One 300-BT Series GuardSwitch required for each safety gate.



Note – The LED on the BLT model will be ON when the guard is open

Fuses: 1 A (250 v)

Multiple DPST GuardSwitches – Shown with actuators in position, all guards closed. The L.E.D of the BLT model will be on when the guard is open. If multiple guards are open, L.E.D will be dimmer. The maximum number of GuardSwitches that can be used is 50, although troubleshooting and line resistance must be considered. (Do not exceed 30 Ohms of combined contact and line resistance. Each GuardSwitch will have less than 0.5 Ohms of resistance.)

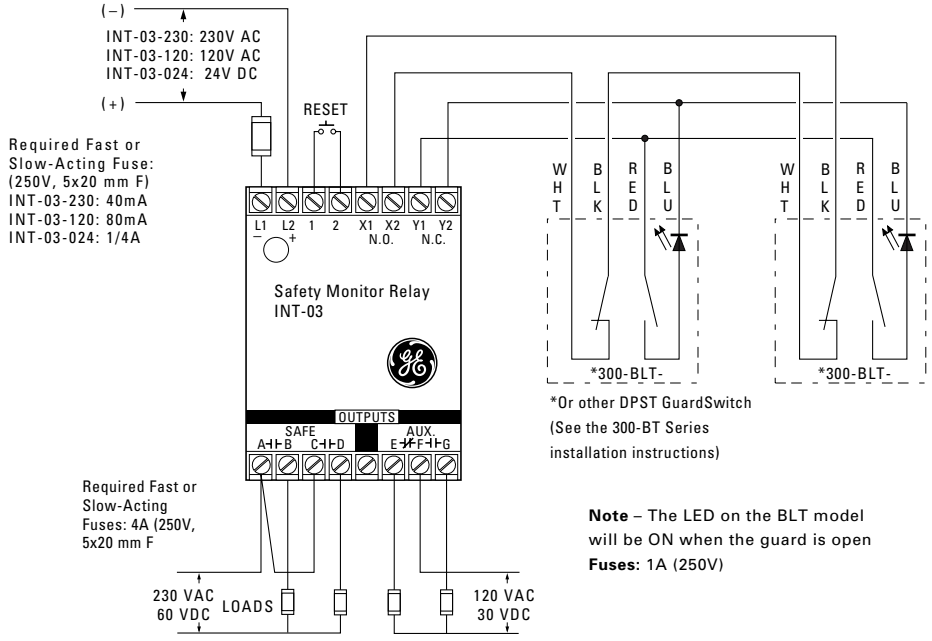
Wiring Diagram For Risk Category 4

Inputs shown with safety gates/guards in closed position.

When guards are closed, safe outputs are closed.

Two 300-BT Series or other DPST GuardSwitches with one INT relay are required for each safety gate.

When first applying the GuardSwitch Monitor Relay, the inputs must be cycled to check for proper operation before the output contact close. To cycle the inputs, the guard must be opened and then closed. This start-up test is sufficient; however, we recommend that the proper operation of the switches and relay be checked at least every 24 hours.



Note – The LED on the BLT model will be ON when the guard is open

Fuses: 1A (250V)

Installation Instructions

Declaration of Conformity available upon request.

CE Compliance Information

European Directives

Machinery Directive (89/392/EEC)
EMC Directive (89/336/EEC)
Low Voltage Directive (73/23/EEC)

Specific European Standards

EN60204-1	Safety of electrical equipment of industrial machines.
EN292 Part 1, 2	Safety of Machinery, basic terminology, technical principles.
EN954-1	Risk Assessment Category 3 or 4 depending on wiring method, see diagrams.
EN55081-2	Electromagnetic Emissions.
EN550082-2	Electromagnetic Immunity.
EN1088	Interlocking Devices.
EN 947-5-3	Control Circuit Devices.
EN 50178	Safety of Electrical Equipment.
IEC 664-1	Insulation requirements.
IEC 68	part 2-1, 2-2, 2-3, 2-8, 2-14, 2-27, 2-30.

Notes:

1. Unit must be installed in a IP 54 type enclosure.
2. Humidity Rating: 30 – 95%
3. Environment: Pollution Degree II.
4. A primary disconnect device that meets EN requirements must be installed.
5. Correct use of this control devise is an essential part of proper machine cycle control.
6. Failure to follow ALL instructions could lead to serious bodily injury or death.
7. Maintenance to be done by qualified personnel only.
8. If a 42.4V – 230V output circuit is connected to the relay contacts, the insulation of any wiring associated with the switches must be rated to 250 VAC. If any devices connected to the unit have metal housings, the housings must be connected to a PE ground circuit.
9. If the monitor relay is in a safe state, the system must not be used until the problem has been corrected. Injury or death to personnel may result from attempts to use the machine under such conditions. The monitor relay contains no field-replaceable components. Return to factory for all repairs.
10. The connecting cables between the INT devices and the switches must be located in an IP 23 type enclosure (minimum).
11. The mounting for the switch and the actuator magnet must be accomplished per this specification.
12. Non-removable hardware must be used for installation.
13. The housing of the 301-BT, 371-BT, 381-BT and 391-BT must be connected to the PE (Primary Earth) ground circuit via a lock washer on the mounting screw. The PE ground symbol must be placed adjacent to the screw.

EC Declaration of Conformity

According to EC machinery Directive 89/392/EEC, Annex II C

We herewith declare,	GE Interlogix Industrial 12345 SW Leveton Drive Tualatin, OR 97062 USA

that the following described safety components in our delivered version complies with the appropriate basic safety and health requirement of the EC Machinery Directive 89/392/EEC based on its design and type, as brought into circulation by us. In case of alteration of the safety components not agreed upon by us, this declaration will lose its validity.

Description of the safety component	Guard Switch monitoring relays; Proximity switches
Safety component type:	INT-01-024, 120, 230; INT-02-024, 120, 230; INT-03-024, 120, 230; INT-04-024, 120, 230; INT-05-024, 120, 230; INT-06-024, 120, 230 301/303-B, BT, B3T; 341/343-B, BT, B3T; 371-B, BT; 381-B, BT; 391-B, BT; 430-B
Safety Function:	Safety gate/guard interlock system.
Applicable EC Directives	EC Machinery Directive (89/392/EEC) EC Low Voltage Directive (73/23/EEC) EC Directive of Electromagnetic Compatibility (89/336/EEC)
Applicable Harmonized Standards	EN 60204-1 EN 1088 EN 954-1, category 3,4 IEC 947-5-3 EN 50178 IEC 664-1, IEC 60664 EN 60529 EN 50081-2, EN 50082-2 IEC 68, part 2-1, 2-2, 2-3, 2-6, 2-14, 2-27, 2-30
Notified Body (according to annex VII):	TUV Product Service GmbH Westendstr. 199 D-80339 Munchen Germany
Responsible for:	EC type-examination (EC type examination certificate no. U 98 01 28199 003)
Authorized Signature:	Geraldine F. Williams
Title of signatory:	Manager

REV. 09/07/99

Mechanical Safety Switches

General Description

Safety switches are used to detect the opening of machine guard doors, gates or panels and to prevent physical access to dangerous areas of the machine. Safety switches are designed to help deter tampering with either the internal machine controls or guards while in an unsafe condition.

All mechanical safety switches are equipped with positive opening contacts that open any normally closed contacts to assure machine shutdown when an unsafe condition is detected.

Safety switches are furnished completely assembled, ready to mount to the machine.

Approvals

According to European Standard:	EN 60947-5-1
According to International Standard:	IEC 947-5-1
According to UL Standard:	UL508

Positive Opening Contacts

In conformance with: IEC 337-1, IEC 947-5-1, VDE 0660-206

Class of Protection

IP65 to IP67 (Type 12 to Type 4)

International Approvals

IMQ	
CE	
VDE	
UL	File Number E131787
CSA	File Number JLR93682

How to read the part number

F R 6 9 2 - D

F D 9 9 3 - F

Enclosure

FR/FP/FS	Plastic, one conduit entry
FD	Metal, one conduit entry
FX	Plastic, two conduit entries

Contacts

6	1NO + 1NC
9	2NC

Operating Key

D/F	Straight Key
D1/F1	Right Angle Key
D2/F2	Jointed Key
D3/F3	Adjustable Jointed Key

(Shown with straight key)

Key-Operated Safety Switches

FR 692-D / FX 692-D / FD 693-F

Description

GE Interlogix Industrial Key-Operated Safety Switches utilize a removable stainless steel key to provide a positive means of turning the control power off should an access panel, door, gate, guard, etc. be opened during machine operation.

When the key is removed from the switch, the normally closed contacts are mechanically forced open. This opens the safety circuit turning off the control power in the machine— disabling the machine. Since the switch contacts can only be closed when the key is installed in the switch, the machine cannot be re-started until the door, gate, guard, etc. is closed.

General Specifications

Enclosure		
FR, FX, FP series	Polymeric glass-reinforced, self extinguishing, shockproof thermal-plastic providing double insulation	
FD series	Die cast metal w/ baked epoxy powder coating	
Compliance		
Low Voltage Directive	73/23/CEE	
Directive	93/68/CEE	
Machinery Directive	89/392/CEE	
Conduit entry		
FD, FR series	(One entry)	PG 13.5
FX series	(Two entries)	PG 13.5
Adapter not furnished	Order P/N	IN12135
Mechanical endurance		
Life Cycle	1 million operations	
Operating temperature range	- 13° to +175°F (-25° to +80° C)	
Maximum activating speed	19.5 inches / sec (0.5m/s)	
Minimum activating speed	0.039 inches / sec (1mm/s)	

Order Information[1]		Electrical Specifications		
Model Number	**Body Material**	**Contact[2] Config.**	**Contact Operating Voltage, Max.**	**Short Circuit Protection, Max.**
FR 692-D1	Thermal Plastic	1 N.O. + 1 N.C.	600 VAC, 300 VDC[4]	10A fuse
FR 992-D1	Thermal Plastic	2 N.C.	600 VAC, 300 VDC[4]	10A fuse
FX 692-D1	Thermal Plastic	1 N.O. + 1 N.C.	600 VAC, 300 VDC[4]	10A fuse
FX 992-D1	Thermal Plastic	2 N.C.	600 VAC, 300 VDC[4]	10A fuse
FD 693-F1	Die Cast Metal	1 N.O. + 1 N.C.	600 VAC, 300 VDC[4]	10A fuse
FD 993-F1	Die Cast Metal	2 N.C.	600 VAC, 300 VDC[4]	10A fuse
FP 693-F1	Thermal Plastic	1 N.O. + 1 N.C.	600 VAC, 300 VDC[4]	10A fuse
FP 993-F1	Thermal Plastic	2 N.C.	600 VAC, 300 VDC[4]	10A fuse

Contact rating[3]

UL/CSA	10A A600/Q300[4]					
IEC	**AC15**			**DC13**		
Volts	**250**	**400**	**500**	**24**	**125**	**250**
Current (A)	6	3	1	6	1.1	0.4

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Switches are furnished standard with D1 or F1 (90º) key. Other key styles available on Accessories page.

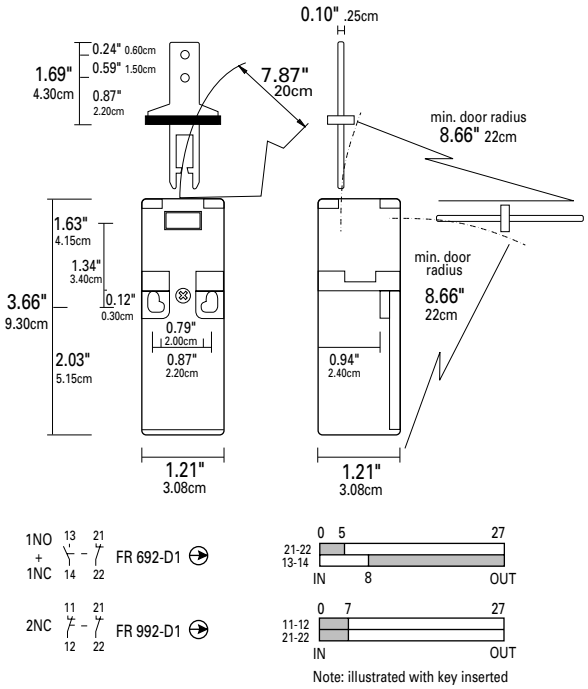
2 Configuration with key in

3 POSITIVE DOUBLE BREAK CONTACTS. Electrically isolated contacts allow different voltages placed on contact poles.

4 UL508

FR 692-D
FR 992-D

one conduit entry



Note: illustrated with key inserted

General Specifications (continued)

Standards

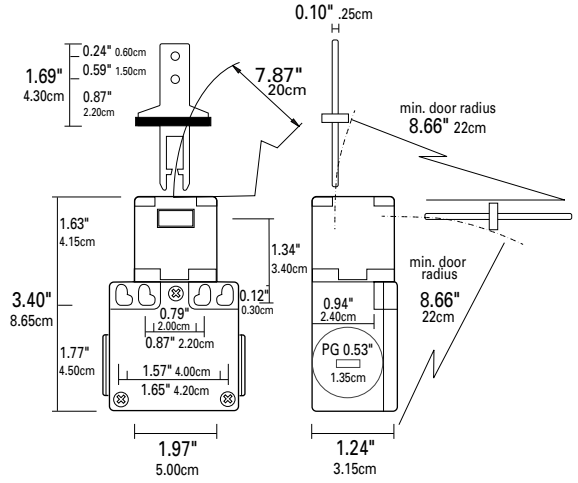
Safety Switch is in compliance with standards: UL508, CSA C22-2 nr.14, VDE 0113, CEI EN 60947-5-1, EN 292, EN 418, EN 1088, EN 60204, EN 60947-5-1, IEC 204, IEC 337-1, IEC 947-5-1, NFC 63-140, VDE0113, VDE 0660, BG-GS-ET-15. Positive Break Contacts are in compliance with standards: CEI EN60947-5-1, EN 60947-5-1, IEC 947-5-1, VDE 0660-206.

Protection class

FR, FX, FP Series	IP 65 (according to IEC529)
FD Series	IP 66 (according to IEC529)
Terminal Screws	Captive with self-lifting pressure plates
Minimum Door Radius	(FR 692-D/FX 69 2-D, FP693-F)
Side	7.87" (20.0cm)
Front	8.66" (22.0cm)
	(FD 693-F)
Side	11.8" (30.0cm)
Front	17.7" (45.0cm)

FX 692-D
FX 992-D

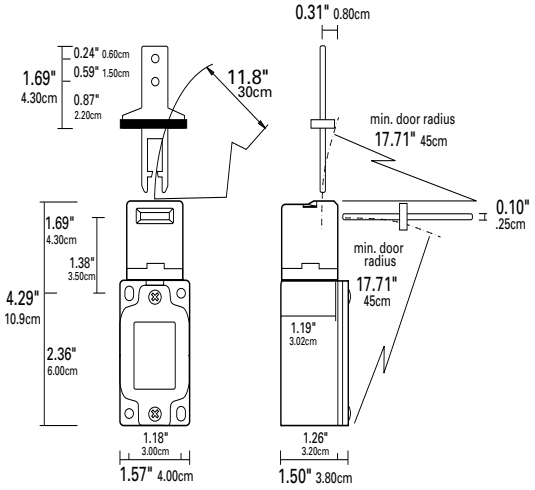
two conduit entries



Note: illustrated with key inserted

closed contact
opened contact

FP 693-F / FP 993-F



Note: illustrated with key inserted

Figure 1

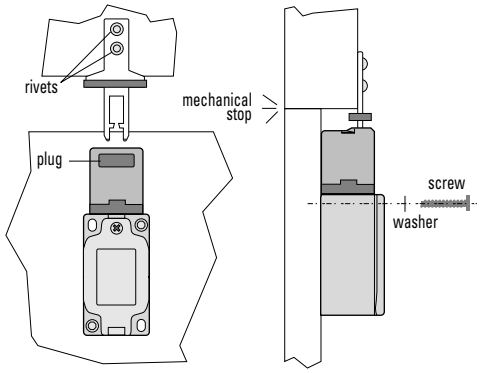


Figure 2

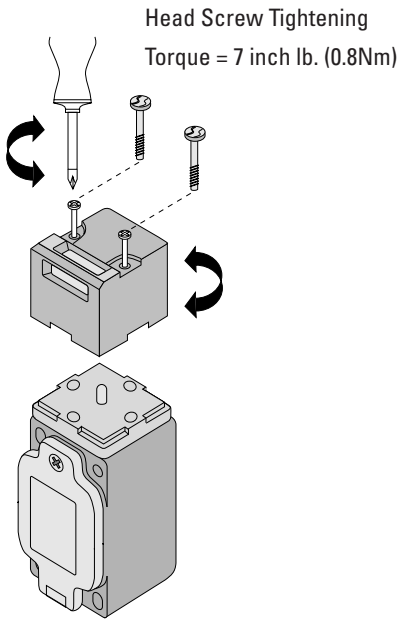
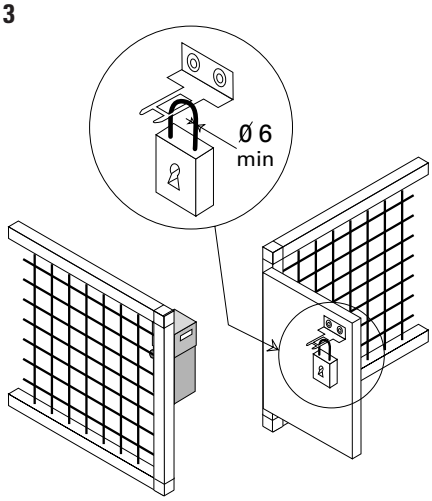


Figure 3



Installation

1. Safety circuits must be connected to the normally closed (NC) contact (11-12 or 21-22). Contacts are normally closed when the key is inserted into the switch. The contacts are opened when the key is removed from the switch. Normally open (NO) contacts (13-14) are for indicating circuits and are not for use in the safety circuit.
2. Mount the switch and key into the machine using tamper resistant fasteners (not supplied). Always use washers under the switch mounting fasteners to prevent the fasteners from pulling through the switch mounting holes. See figure 1.
3. The head of the switch can be rotated in 4 x 90 degree steps allowing 8 different key entry positions. To rotate the head, insert the key, remove the 4 head attachment screws, rotate the head into the proper position, reinsert the head attachment screws. It is recommended the head be locked into position by replacing 2 of the 4 head attachment screws with tamper proof screws (not provided). See figure 2.
4. Always insert the dust protection plug into the unused port in the key head.
5. When the key is removed from the switch, take care to protect the key entrance from dust and dirt.
6. Verify proper Safety Switch operation before placing the machine in service. Key Operated Safety Switches can protect areas where an operator can physically enter.
7. To prevent accidental closing of the door with the operator inside, padlocks can be placed through the hole in the switch key. Minimum diameter of the lock shank is 1/4" (6mm). See Figure 3.
8. **The switch is not to be used as a mechanical stop.**

Key-Operated Safety Switches with Solenoid

FS 2096-D024-F

Description

GE Interlogix Industrial Key-Operated Safety Switches with Solenoid Release utilize a removable stainless steel key to provide a positive means of turning the control power off should an access panel, door, gate, guard, etc. be opened during machine operation. This series of switches also includes a solenoid built into the switch and is used to protect an area where access is to be strictly controlled. Prime candidates for this series of safety switches are equipment that cannot be shutdown in mid cycle, machines that have large mechanical inertia, high temperatures or other areas that cannot be immediately entered.

The Key Operated Safety Switch with Solenoid Release denies access to the protected area until the operator electrically allows the release of the key. There are two versions of the Key-Operated Safety Switch with Solenoid Release, Series "D" (de-energized) and "E" (energized). With the key removed, access is allowed through the guard, gate, etc., to be opened. Since the safety switch contacts can only be closed when the key is installed in the switch, the machine cannot be restarted until the guard, gate, etc., is closed. This re-establishes the protection around the machine.

The Series "D" switch locks in the key when the solenoid is "de-energized" (without power). To remove the key, power must be applied to the solenoid, which transfers the contacts. Reinserting the key, when the power is removed from the solenoid transfers the contacts and locks the key in place until power is applied to the solenoid. If power is lost, the Series "D" switch is equipped with a manual release to allow key removal.

The Series "E" switch locks in the key when the solenoid is "energized" (powered up). The key is unlocked when power is removed from the solenoid. The key must be in place before powering up the Series "E" switch or the contacts will not be transferred. CAUTION: The Series "E" switch will also allow the key to be removed should there be a power failure. This is an important consideration when using this Series in safety applications.

General Specifications

Enclosure

Polymeric glass-reinforced, self-extinguishing, shockproof thermal-plastic providing double insulation

Standards

Use of this device implies compliance with standards:
EN 954-1, EN 60 204-1, EN 1088, UL508, IEC 947-5-1, EN 1088, BG-GS-ET-19, EN50081-1, EN50082-2, 89/392/CEE, 73/23/CEE, 89/336/CEE, 93/68/CEE.

Order Information[1]		Electrical Specifications		
Model Number	**Body Material**	**Contact[2] Config.**	**Contact Operating Voltage, Max.**	**Short Circuit Protection, Max.**
FS 2096-D024-F1	Thermal Plastic	2 N.C. + 1 N.O.	600 VAC, 300 VDC[4]	10A fuse
FS 2096-E024-F1	Thermal Plastic	2 N.C. + 1 N.O.	600 VAC, 300 VDC[4]	10A fuse

Contact rating[3]						
UL/CSA	10A A600/Q300[4] (UL 508)					
IEC	**AC15**			**DC13**		
Volts	**250**	**400**	**500**	**24**	**125**	**250**
Current (A)	3	1	6	1.1	0.4	

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

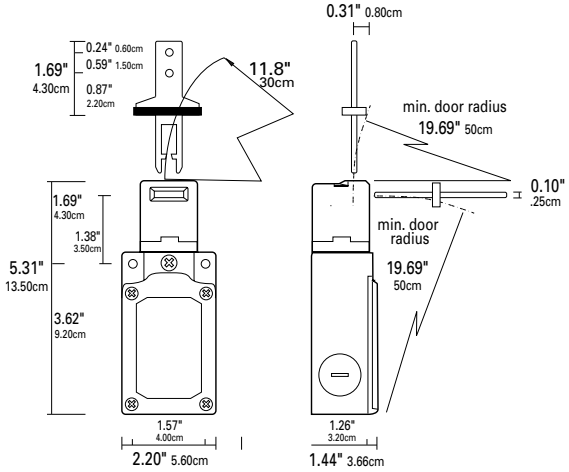
1 Switches are furnished standard with F1 (90º) key. Other key styles available on Accessories page.
Switches are available with either a Power Key Release Solenoid type (D24) or a Power Key Retain Solenoid type (E24).
Solenoid types are NOT convertible in the field.

2 Configuration with key in

3 POSITIVE DOUBLE BREAK CONTACTS. Electrically isolated contacts allow different voltages placed on contact poles.

4 UL508

FS 2096-D024-F
FS 2096-E024-F



LISTED

Figure 1

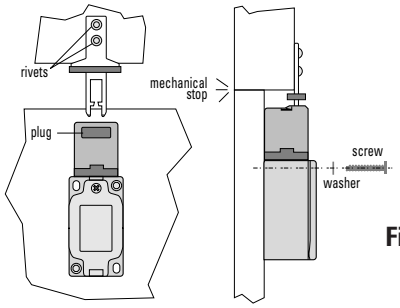
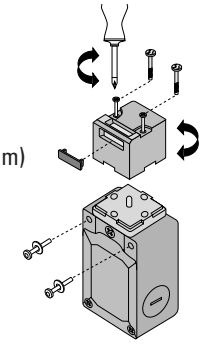
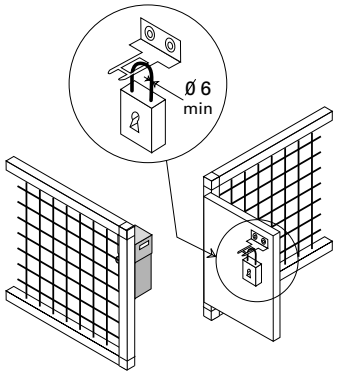


Figure 2



Head Screw Tightening
Torque = 7 inch lb. (0.8Nm)

Figure 3



General Specifications (continued)

Conduit entry		
One entry	PG 13.5	
Adapter not furnished	Order P/N	IN12135
Mechanical endurance		
Life Cycle	800,000 operations	
Operating temperature range	- 13º to +140ºF (-25º to +60º C)	
Maximum activating speed	19.5 inches / sec (0.5m/s)	
Minimum activating speed	0.039 inches / sec (1mm/s)	
Maximum Opening Frequency	120 Openings per hour	
Maximum Holding Force	225 lbs. (1,000 N)	
Protection class	IP 66 (according to IEC529)	
Terminal Screws	Captive with self-lifting pressure plates	
Minimum Door Radius		
Side	11.8" (30cm)	
Front	19.7" (50cm)	
Positive Double Break Contacts		
Solenoid		
Operating Voltage	24 Volts AC/DC (+10%/-10%)	
Inrush Current	96 VA (0.1 sec)	
Holding Current	20 VA	

NOTE: Switch contacts are pilot duty and are not switchable to sustain a motor load.

Installation

1. Safety circuits must be connected to the normally closed (NC) contact (11-12 or 21-22). Contacts are normally closed when the key is inserted into the switch. The contacts are opened when the key is removed from the switch. Normally open (NO) contacts (13-14) are for indicating circuits and are not for use in the safety circuit.
2. Mount the switch and key into the machine using tamper resistant fasteners (not supplied). Always use washers under the switch mounting fasteners to prevent the fasteners from pulling through the switch mounting holes. See figure 1.
3. The head of the switch can be rotated in 4 x 90 degree steps. The head of the switch has 2 key openings allowing 8 different key entry positions. To rotate the head, insert the key, remove the 2 head attachment screws, rotate the head into the proper position, reinsert the head attachment screws. It is recommended the head be locked into position by replacing the 2 head attachment screws with tamper proof screws (not provided). See figure 2.
4. Always insert the dust protection plug into the unused port in the key head.
5. When the key is removed from the switch, take care to protect the key entrance from dust and dirt.
6. Verify proper Safety Switch operation before placing the machine in service. Key Operated Safety Switches with Solenoid Release can protect areas where an operator can physically enter.
7. To prevent accidental closing of the door with the operator inside, padlocks can be placed through the hole in the switch key. Minimum diameter of the lock shank is 1/4" (6mm). See figure 3.
8. The switch is not to be used as a mechanical stop.

Hinge-Operated Safety Switches

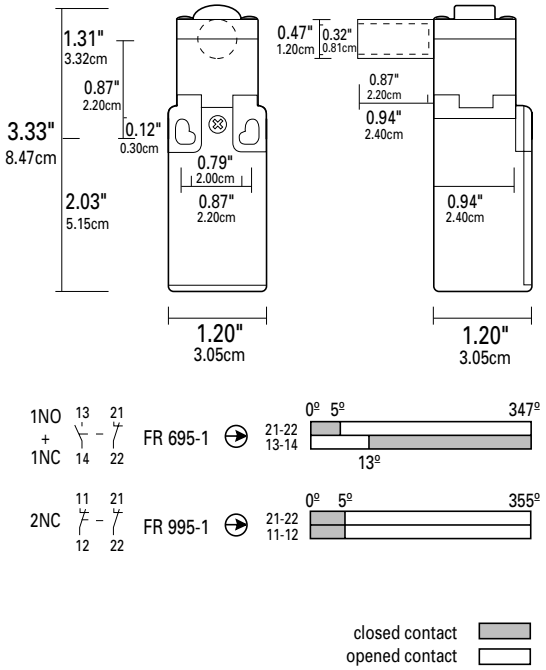
FR 695-1

Description

GE Interlogix Industrial Hinge Operated Safety Switches utilize a rotating shaft to provide a positive means of turning the control power off should an access panel, door, gate, guard, etc. be rotated open during machine operation.

The switch operating shaft is designed to be in line with the rotation point of the door and uses the opening force of the door to rotate the safety switch operating shaft. When the access panel, door, gate, guard, etc. is rotated to the "open" position, the normally closed contacts in the safety switch are mechanically forced open turning off the control power in the machine—disabling the machine. Since the switch contacts can only be closed when the shaft is rotated to the closed position, the machine cannot be re-started until the door, gate, guard, etc. is closed.

FR 695-1 / FR 995-1



General Specifications

Enclosure

Polymeric glass-reinforced, self-extinguishing, shockproof thermal-plastic providing double insulation

Compliance

Low Voltage Directive	73/23/CEE
Directive	93/68/CEE
Machinery Directive	89/392/CEE

Conduit entry

One entry	PG 13.5	
adapter not furnished	Order PIN	IN12135

Mechanical endurance

Life Cycle	1 million operations
Operating temperature range	- 13º to +175ºF (-25º to +80º C)

Standards

Safety Switch is in compliance with standards: UL508, CSA C22-2 nr.14, CEI EN 60947-5-1, EN 292, EN 418, EN 1088, EN 60204, EN 60947-5-1, IEC 204, IEC 337-1, IEC 947-5-1, NFC 63-140, VDE 0113, VDE 0660, BG-GS-ET-15. Positive Break Contacts are in compliance with standards: CEI EN 60947-5-1, EN 60947-5-1, IEC 947-5-1, VDE 0660-206.

Protection class	IP 65 (according to IEC529)
Terminal Screws	Captive with self-lifting pressure plates
Door Operating Radius	4º to OPEN the normally closed contact 8º to CLOSE the normally open contact *Switch is in the normal position when the door is CLOSED*

Order Information		Electrical Specifications		
Model Number	**Body Material**	**Contact[1] Config.**	**Contact Operating Voltage, Max.**	**Short Circuit Protection, Max.**
FR 695-1	Thermal Plastic	1 N.O. + 1 N.C.	600 VAC, 300 VDC[3]	10A fuse
FR 995-1	Thermal Plastic	2 N.C.	600 VAC, 300 VDC[3]	10A fuse

Contact rating[2]						
UL/CSA	10A A600/Q300[3]					
IEC	**AC15**			**DC13**		
Volts	**250**	**400**	**500**	**24**	**125**	**250**
Current (A)	6	3	1	6	1.1	0.4

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with door/gate closed

2 POSITIVE DOUBLE BREAK CONTACTS. Electrically isolated contacts allow different voltages placed on contact poles.

3 UL508

Figure 1

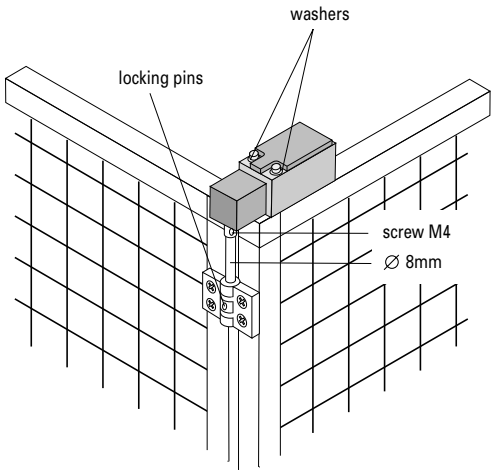
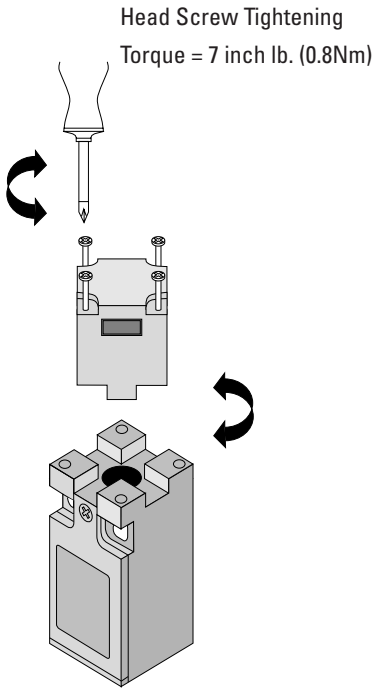


Figure 2



Installation

1. Safety circuits must be connected to the normally closed (NC) contact (11-12 or 21-22). The normally closed contacts are opened when the door is rotated past 4º and normally open (NO) contacts (13-14) are closed when the switch is rotated past 8º. Normally open contacts are for indicating circuits and are not for use in the safety circuit.
2. Mount the switch using tamper resistant fasteners (not supplied). Always use washers under the switch mounting fasteners to prevent the fasteners from pulling through the switch mounting holes. See figure. 1.
3. The head of the switch can be rotated in 4 x 90 degree steps allowing 4 different shaft rotating positions. To rotate the head, remove the 4 head attachment screws, rotate the head into the proper position, reinsert the head attachment screws. It is recommended the head be locked into position by replacing 2 of the 4 head attachment screws with tamper proof screws (not provided). See figure 2.
4. The switch is to be used with the rotating hinge pin of the door. Attach the Hinge Operated Safety Switch to the machine at the door swing centerline. Extend the door hinge pin into the Hinge Operated Safety Switch operating tube using the M4 set screw provided. Verify operation of the entire assembly including the operating point for the normally closed safety contact and once verified as correct drill a hole through the hinge pin/operating tube assembly to permanently lock the hinge pin into the operating tube using the roll pin provided. See figure 1.
5. Verify proper Safety Switch operation before placing the machine in service. Safety Switches can protect areas where an operator can physically enter.
6. **The switch is not to be used as a mechanical stop**.

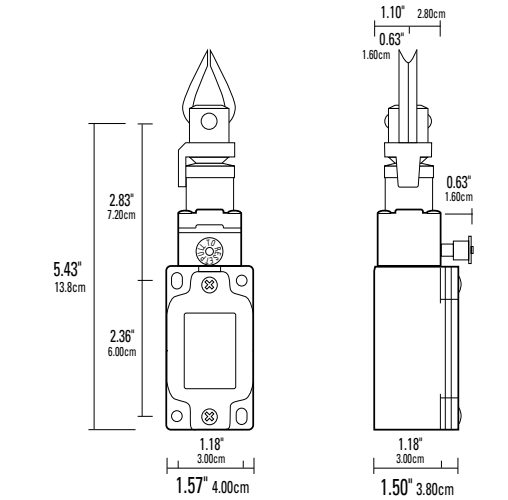
Top-Entrance Rope Safety Switches

FD 678

Description

These rope operated safety switches are installed on machines or belts. They enable the stop command at any point of the machine simply by pulling the rope by hand. Being equipped with a self-checking function, they constantly test their right operation and signal by the opening of the contacts, if an accidental loosening or break of the rope may happen. These safety switches maintain the contacts open after operation, even if the rope is released.

FD 678 / FD 978



The maximum cable length is 4 ft (12m) with eye bolts

General Specifications

Enclosure

Die cast metal w/ baked epoxy powder coating

Compliance

Low Voltage Directive	73/23/CEE
Directive	93/68/CEE
Machinery Directive	89/392/CEE

Conduit entry

One entry	PG 13.5	
Adapter not furnished	Order P/N	IN12135

Mechanical endurance

Life Cycle	1 million operations
Operating temperature range	- 13° to +175°F (-25° to +80° C)
Minimum Activating Speed	0.039 inches/sec (1mm/sec)

Standards

Safety Switch is in compliance with standards: UL508, CSA, EN 292, EN 418, EN 1088, EN 60204, EN 60947-5-1, IEC 204, IEC 947-5-1. Positive Break Contacts are in compliance with standards: EN 60947-5-1, EN 60947-5-1.

Protection class	IP 66 (according to IEC529, CE 170-1)
Terminal Screws	Captive with self-lifting pressure plates

Operating Force

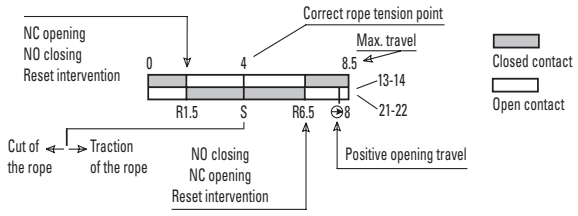
Minimum	14 lbs. (64 N)
Maximum	18 lbs. (83 N)

Recommended Maximum Operating Distance

Without intermediate supports	19.5 feet (6 meter)
With intermediate support	39.4 feet (12 meter)

(Intermediate support every 9.8 feet (3 meters))

How to read diagrams



Order Information			Electrical Specifications		
Model Number	**Body Material**	**Reset Operation**	**Contact[1] Config.**	**Contact Operating Voltage, Max.**	**Short Circuit Protection, Max.**
FD 678	Die Cast Metal	Manual	1 N.O.+1 N.C.	600 VAC, 300 VDC[3]	10A fuse
FD 978	Die Cast Metal	Manual	2 N.C.	600 VAC, 300 VDC[3]	10A fuse

Contact rating[2]

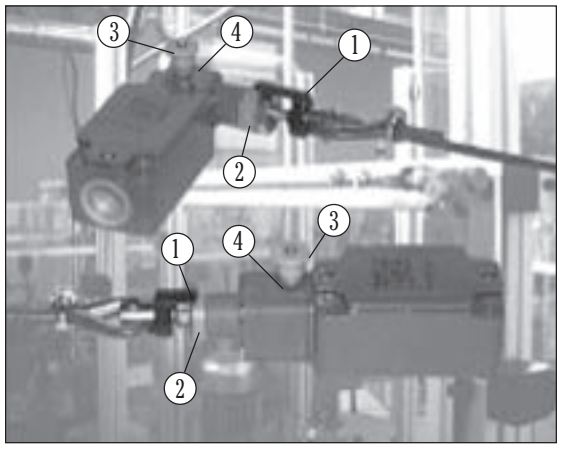
UL/CSA	10A A600/Q300[3]					
IEC	AC15			DC13		
Volts	**250**	**400**	**500**	**24**	**125**	**250**
Current (A)	6	3	1	6	1.1	0.4

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with rope in tension

2 POSITIVE DOUBLE BREAK CONTACTS. Electrically isolated contacts allow different voltages placed on contact poles.

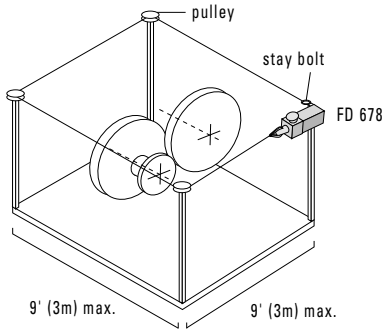
3 UL508

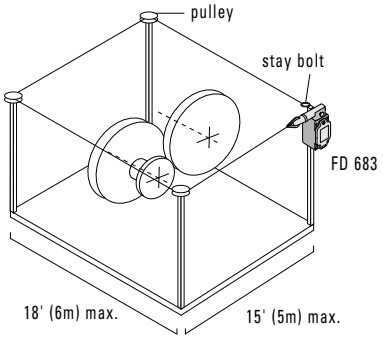


Installation

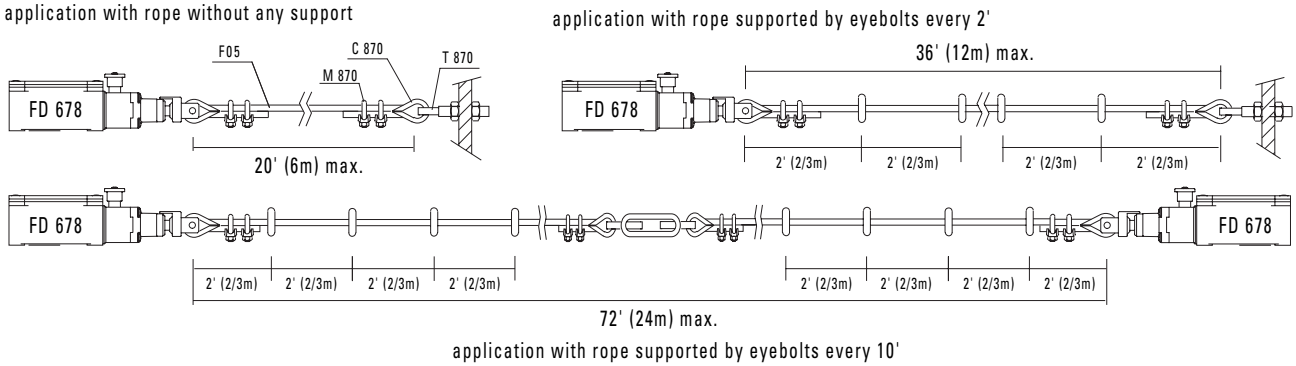
- Tighten the rope connected to the switch until the indicator's end (1), reaches about half of the green ring (2).
  Afterwards, pull the pommel (3) to close the safety contacts inside the switch (a green ring (4) will appear).
- The safety circuit must be connected to the contacts NC (21-22 or 11-12). The contacts 13-14 shall be used for signals only.
- It is recommended to use only original accessories (rope, thimble, etc.), otherwise the declared performances will not be guaranteed.

Installation Examples

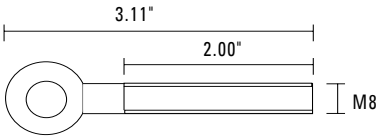




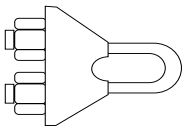
Rope Installation



Accessories



T 870
stay bolt suitable for setting the rope in tension correctly (1 pc.)



M 870
rope clamp (2 or 4 pcs.)

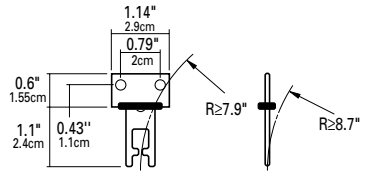
C 870
thimble (1 pc.)

F 05-100
Rope: 100m (~300')
5mm Diameter (~$^{3}/_{16}$")

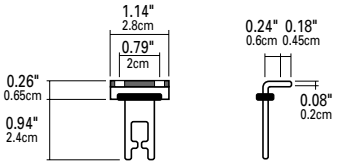
Accessories

Key Operators

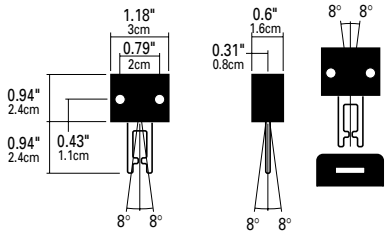
D



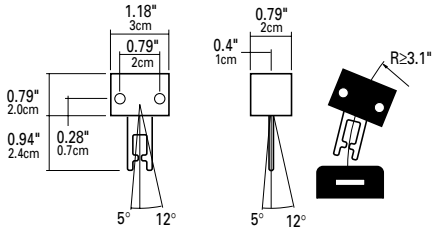
D1



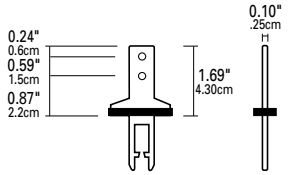
D2



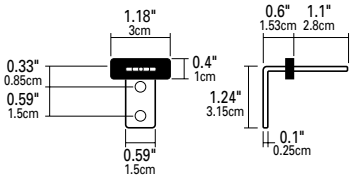
D3



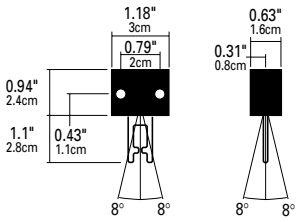
F



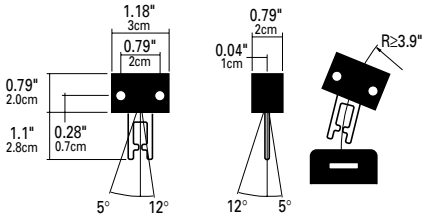
F1



F2



F3



Key Operators for FR Series
Key Operated Safety Switches

Model Number	Accessory Description
D	Straight Key Operator
D1	90 Degree Key Operator
D2	Jointed Key Operator
D3	Adjustable Jointed Key Operator

Key Operators for FD, FP, FS Series
Key Operated Safety Switches

Model Number	Accessory Description
F	Straight Key Operator
F1	90 Degree Key Operator
F2	Jointed Key Operator
F3	Adjustable Jointed Key Operator

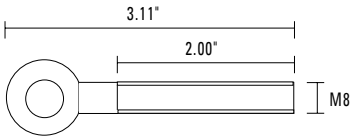
Rope Accessories for Rope Pull Switches

Model Number	Accessory Description
T870	Rope Guide
M870	Rope Clamp
C870	Rope Thimble

General Accessories

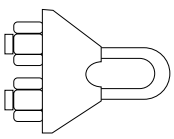
Model Number	Accessory Description
IN 12135	PG 13.5 to 1/2" NPT Cable Adaptor
PGT1	Cable Entrance Cap
PG 13.5	Cable Gland 0.35"-0.47" dia.

Rope Accessories for Rope Pull

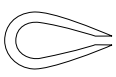


T 870
stay bolt suitable for setting the rope in tension correctly (1 pc.)

F 05-100
Rope: 100m (~300')
5mm Diameter (~3/16")



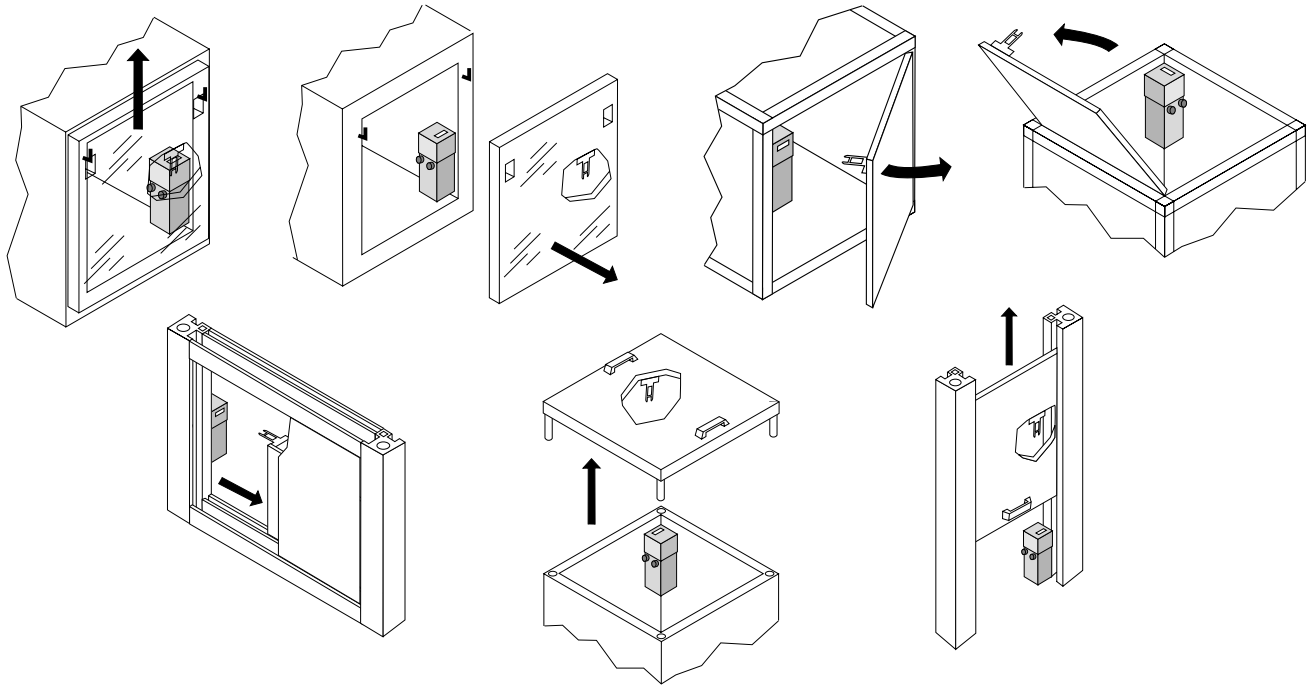
M 870
rope clamp (2 or 4 pcs.)



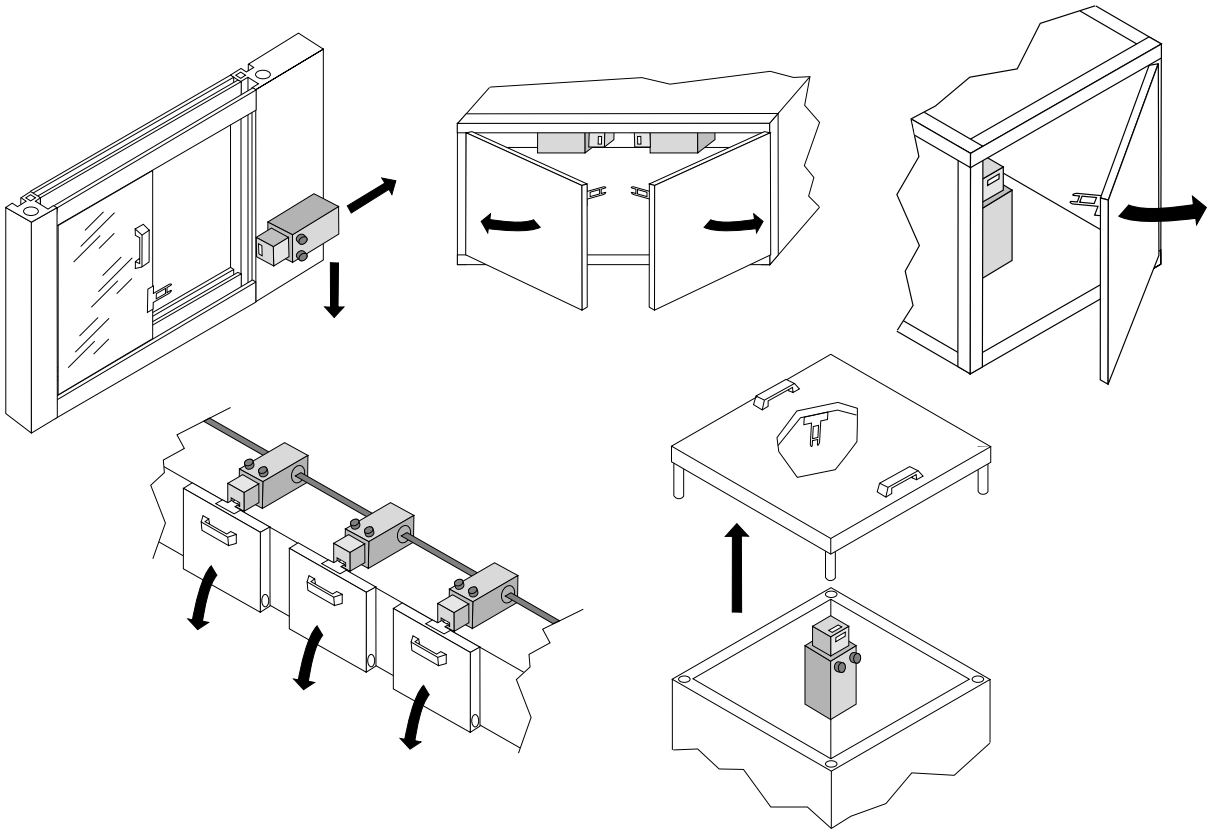
C 870
thimble (1 pc.)

Installation Examples

FR 692-D / FX 692-D / FD 693-F

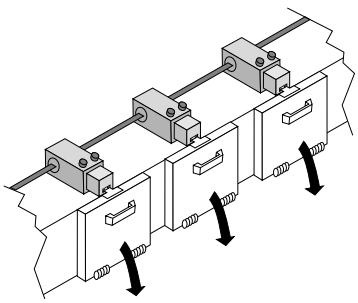


FS 2096-D024-F
FS 2096-E024-F

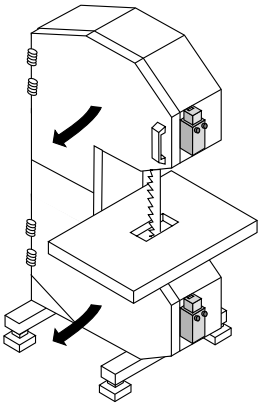


FD 6R2-F / FD 9R2-F

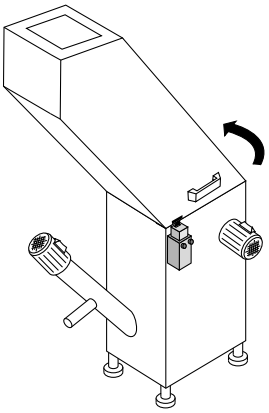
tile machine



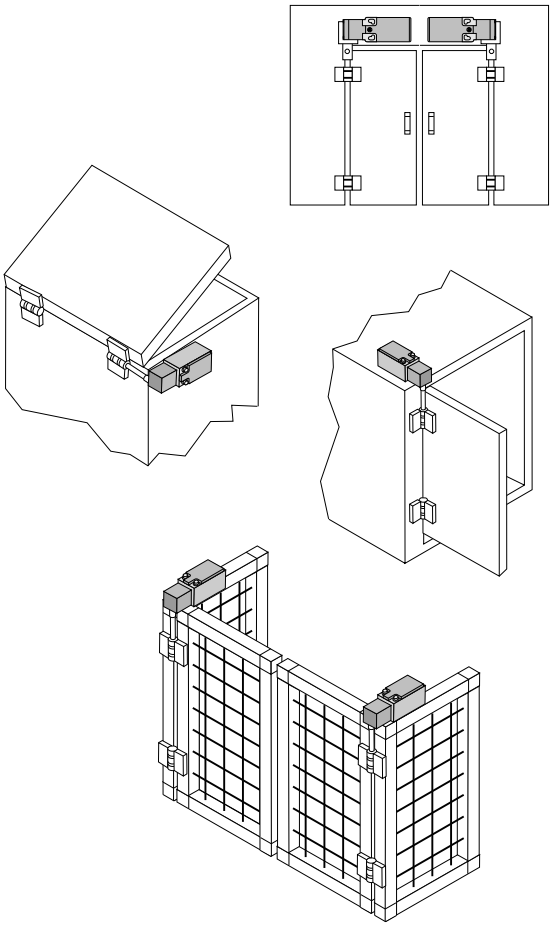
wood-working machine



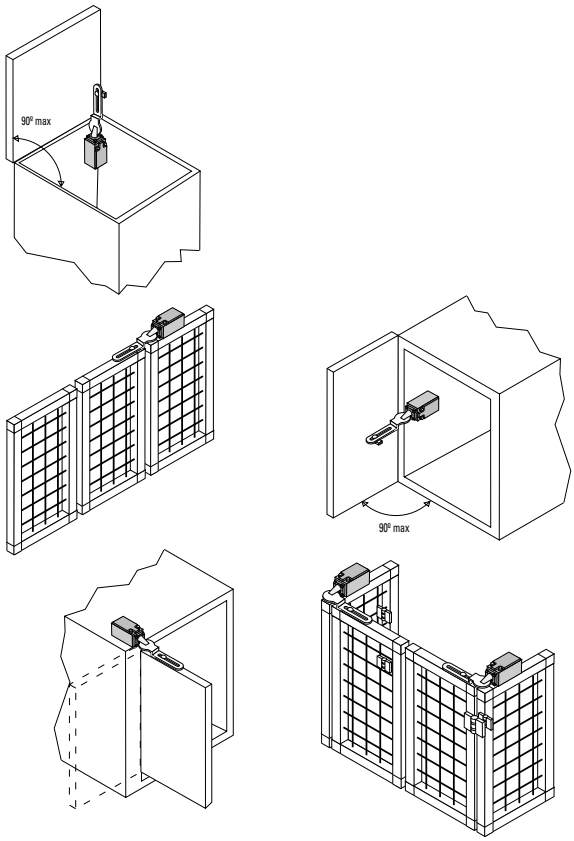
granulator, biotriturator



FR 695-1 / FR 995-1



FR 677-1 / FR 977-1



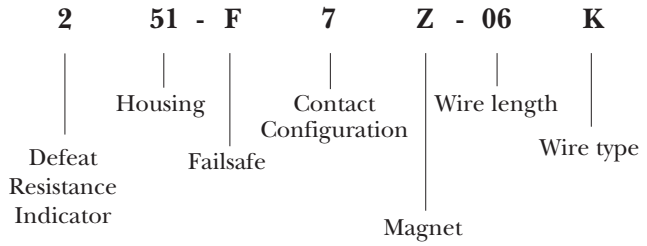
FailSafe Guardswitches™

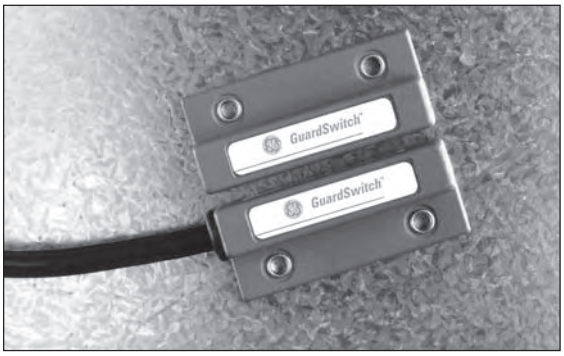
The FailSafe Guardswitch is designed as a safety interlock to be attached to a machine's guard or door. Unlike a standard reed switch interlock, the circuit had been designed to have an "open" failure mode. If the main reed sticks closed when the guard opens, the in-line fuse will blow, opening the circuit. If the watchdog reed sticks closed when the guard closes, the in-line fuse will blow, opening the circuit. The circuit will draw up to 4.0A to blow the fuse in less than 200ms.

Reading GE Interlogix Industrial Part Numbers

Part Number Matrix

Typical part number — 251-F7Z-06K



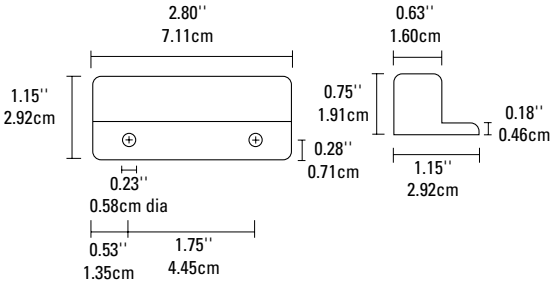


Patented Non-Contact Safety Interlock Switch

251 F7 GuardSwitch

Applications

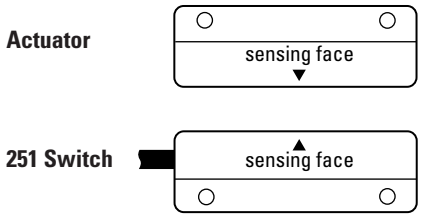
- Requiring a "Fail-Safe" Switch
- Waste Compactors
- Mixers, Blenders and Dryers
- Packaging Machinery
- Food Products Machinery



General Specifications

Enclosure	Polyurethane Enamel-Coated Aluminum
Temperature Range	-40 ℉ to 150 ℉ (-40 ℃ to 65 ℃)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4X, 5, 6, 12, 12K
Protection Class	IP 67
Response Time	5 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	SJTOW-A (K) 18/3 AWG / 0.33" (0.84cm)
UL/CSA	All Models

Note: The F7 model has a patented "watch-dog" circuit which, when switch failure occurs, the fused watch-dog circuit will draw 4.0 Amps. The voltage supply must have a current capacity of 4.0 Amps. This results in an open, fail-safe condition.



File E 122942

LR89176

Order Information	Electrical Specifications								
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Voltage Range (AC/DC)**	**Switch Current Max. (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Break Range Nominal**	**Break at Failure Max.**	**Lead Length**
251-F7Z-12K	N.O.	100VA	100-120V AC	0.83A	0.5 Ohms	1.0" (2.5cm)	1.8" (4.5cm)	2.7" (6.8cm)	12' (3.6m)
150-Z	Actuator Only								

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

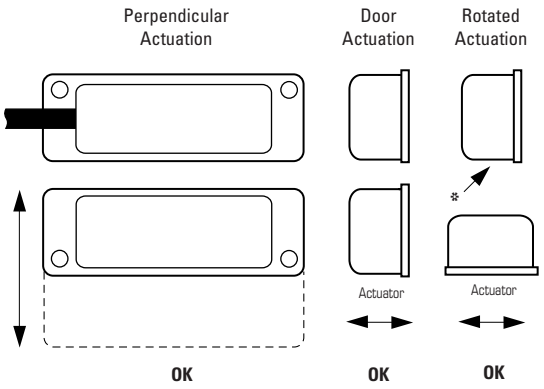
1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

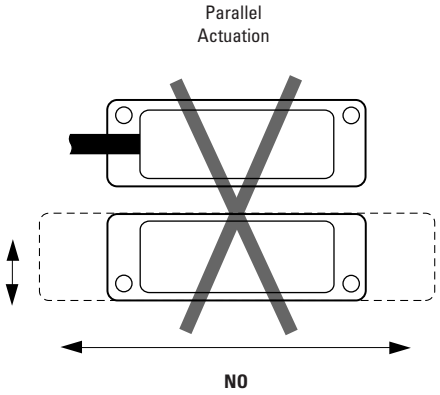
Installation Instructions

Mounting Configurations

Figure 1 —



* Actuation surface



Installation

Mounting Instructions

1. Do not wire the switch until it is mounted and tested. (See testing)
2. Select a mounting location where the switch and actuator can be installed with their labels reading in the same direction.
3. Mount the switch on the stationary frame of the machine and the actuator on the moveable guard, door or gate.
4. For best protection against operator defeat, mount with non-removeable screws, bolts, or nuts. (See accessories)
5. The switch and actuator must be mounted so that the actuator moves in one of the approved directions (Figure 1).
6. Parallel actuation is NOT recommended and may cause switch failure. An on/off/on (double actuation) signal may result when the actuator passes by the switch rather than coming to rest in proximity to it.
7. When mounting on a hinged gate or door, mount the switch and actuator at least 6" away from the hinges so a more face to face approach is achieved.
8. The actuator can be mounted at a 90° rotation.
9. Keep the switch and actuator within the listed sense range (see specific switch electrical specifications).
10. Mounting on a ferrous (steel) material will reduce the sense range a minimum of 50%. A 1/4" nonferrous (plastic or aluminum) spacer installed under the actuator and switch will restore most of the lost gap.
11. When mounting a metal switch to an ungrounded machine, connect the ground lead to one of the switch mounting screws.

CAUTION — Particular care must be taken to determine the actual load of the switch circuit.

1. **Surges from coils, motors, contactors, solenoids and tungsten filaments must be considered.**
2. **Transient protection, such as back-to-back zener diodes (Transorb) or an RC network, is recommended for such loads to ensure that maximum ratings of the switch are not exceeded.**
3. **Line capacitance and load capacitance must be considered. An in-line resistor can be added to limit the inrush current.**
4. **The resistor can only be added in series with the last red wire just before the load.**
5. **The voltage drop and the power rating of the resistor must be considered.**

   Voltage drop = I • R
   Watts = I^2 • R
   (I = maximum continuous current of the load)

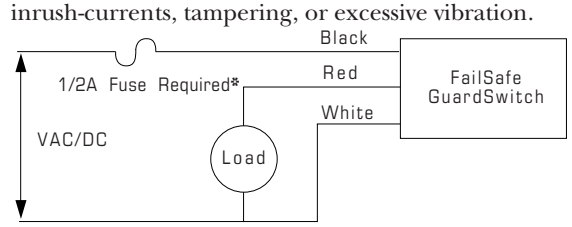
Note—If the installation instructions are not followed carefully, the switch may not work properly or fulfill its failsafe function, or it may fail prematurely.

Testing & Wiring Instructions

Wiring for one FailSafe GuardSwitch™

Figure 2

Add a 1/2 amp *fast-acting* fuse* in series to protect the switch from premature failure caused by inrush-currents, tampering, or excessive vibration.

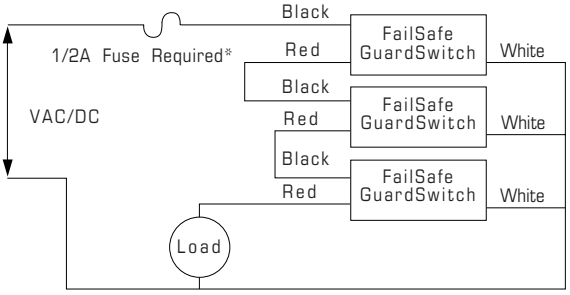


* Use fast-acting Littlefuse 216, fast-acting Microfuse or fast-acting Pico II fuse up to 1/2 Amp.

Wiring for two to ten FailSafe GuardSwitches™ in series

Figure 3

Add a 1/2 amp *fast-acting* fuse in series to protect the switch from premature failure caused by inrush-currents, tampering, or excessive vibration.



* Use fast-acting Littlefuse 216, fast-acting Microfuse or fast-acting Pico II fuse up to 1/2 Amp.

Testing

After mounting the switch and actuator, test the switch for proper operation. Test with circuit disconnected from source and load. For multiple switches in series, test one switch at a time with all other guard doors closed. Then:

1. Hook the black and white leads of the switch to an Ohmmeter. Move the gate or door open and closed several times slowly. At all times the meter should read O.L. or "open."
2. Hook the Ohmmeter to the black and red leads of the switch. Move the door or gate open and closed. The meters should read O.L. when the actuator is away and it should read less than 1 Ohm when the actuator is in range.
3. Hook the Ohmmeter to the white and red leads of the switch. Move the door or gate open and closed. The meter should read 500-100 ohms when the actuator is away and it should read O.L. when the actuator is in range.

Wiring

1. After the switch and actuator have been mounted and tested, wire the FailSafe GuardSwitch™ as shown in Figure 2.
2. For wiring 2 to 10 FailSafe GuardSwitches™ in series, see Figure 3. (Do not exceed 10 switches in a series).
3. Failure to install in-line fuse voids warranty.

Troubleshooting

If the in-line fuse blows or the GuardSwitch™ remains open:

1. Check the application for premature failure caused by inrush-currents, tampering, excessive vibration and misalignment.
2. Disconnect all three wires of GuardSwitch™ and test according to testing instructions, steps 1-3.
3. If the GuardSwitch™ fails any of the three tests, it must be replaced.
4. Replace the in-line fuse if blown.

Accessories

Part Number	Tamper proof screws & screwdriver
1953	#6 x 3/4"L Tampruf Roundhead Screw
1954	#8 x 1-1/2"L Tampruf Roundhead Screw
1955	Tampruf® Screwdriver

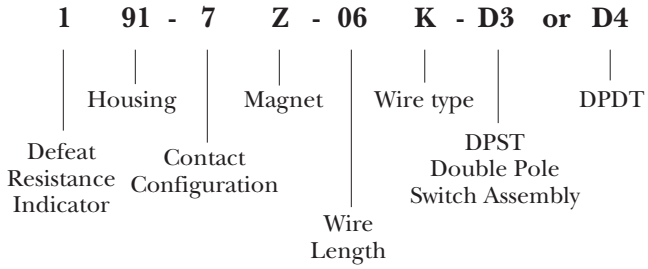
Industrial Interlock Switches

GE Interlogix Industrial is the market leader in the development and manufacture of interlock switches for industrial applications. We produce a full line of interlock switches and position sensors.

Reading GE Interlogix Industrial Part Numbers

Part Number Matrix

Typical part number — 191-7Z-06K-D3 or D4

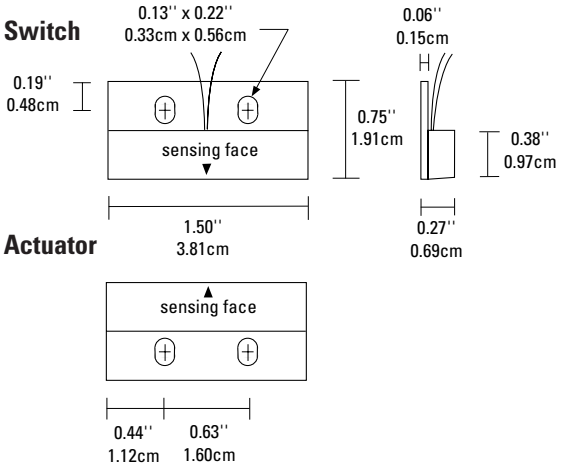


Non-Contact Interlock/Position Switch

104 GuardSwitch

Applications

- Mail Sorting Machines
- Gaming Industry
  - Drop Doors
  - Player Tracking
  - Bill Validators
  - Access Doors
- Scissor Lifts
- Position Sensing



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Type/O.D.	22/2 Flying Lead (V) AWG /0.05"(0.13cm) 22/3 Flying Lead (V) AWG /0.05"(0.13cm)
UL/CSA/CUL	All Models

c UL us — File E 122942

LR 89176

Order Information	Electrical Specifications							
Part Number	**Contact[1] Config.**	**Load Rating (AC/DC)**	**Switching Voltage Maximum (AC/DC)**	**Switching Current Maximum (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Break Range Nominal**	**Lead Length**
104-1U-03V	N.O.	15VA	120V (@0.11A)	0.5A (@30V)	0.2 Ohms	0.5" (1.3cm)	1.3" (3.3cm)	3'(0.9m)
104-2U-03V	SPDT	15VA	120V (@0.11A)	0.5A (@30V)	0.2 Ohms	0.5" (1.3cm)	1.3" (3.3cm)	3'(0.9m)
104-U	Actuator Only							

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

Non-Contact Interlock/Position Switch

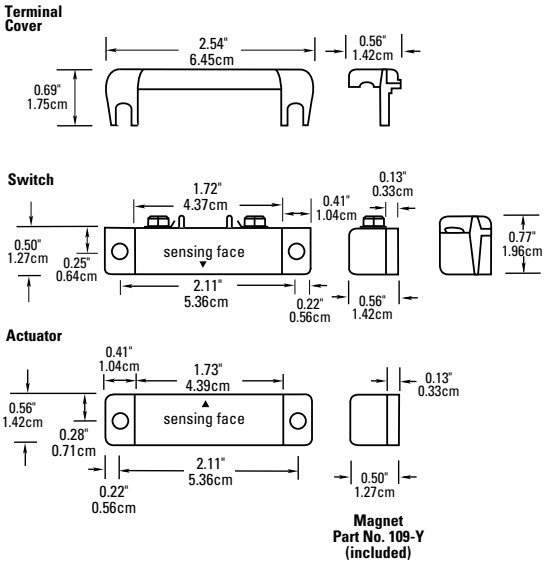
109 GuardSwitch

Applications

- Economical Position Sensing
- Terminal Requirement
- Non-Wash Down Environments

General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1
Protection Class	IP 62
Response Time	1 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Connection	Screw Terminals
UL/CUL	All Models



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File E 122942

Order Information	Electrical Specifications										
Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Nominal	Break Range Nominal	Terminal Type
109-3Y	N.C.	100VA	84W	120V (@0.8A)	28V (@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	0.5" (1.3cm)	1.2" (3.0cm)	#6 screw
109-6Y	N.O.	25VA	25W	120V (@0.2A)	120V(@0.2A)	1.0A (@25V)	1.0A (@25V)	0.2 Ohms	1.0" (2.5cm)	2.0" (5.0cm)	#6 screw
109-7Y	N.O.	100VA	84W	120V (@0.8A)	28V (@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	0.5" (1.3cm)	1.2" (3.0cm)	#6 screw
109-Y	Actuator Only										

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

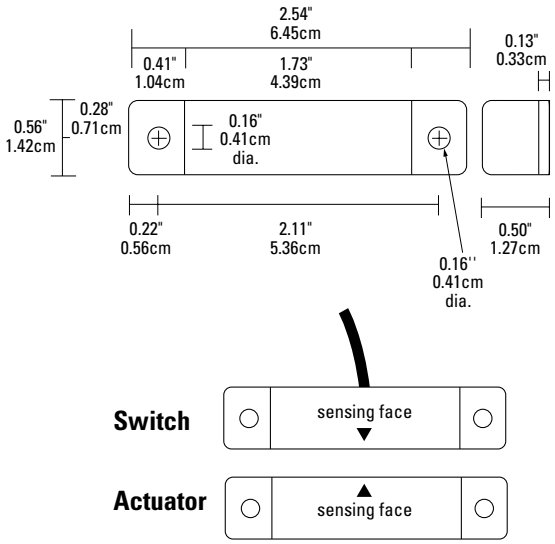
3 Rated at 3.0A for 6,000 cycles only. Other ratings are at 100,000 cycles.

Non-Contact Interlock/Position Switch

111 GuardSwitch

Applications

- Gaming Industry
  - Drop Doors
  - Player Tracking
  - Bill Validators
  - Access Doors
- Farm Equipment
- Emergency Vehicles
- Position Sensing



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40 ℉ to 180 ℉ (-40 ℃ to 80 ℃)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/2 (J) / 0.24" (0.62cm)
UL/CSA	All Models

c UL us — File E 122942

CSA — LR8917 S

Order Information **Electrical Specifications**

Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Nominal	Break Range Nominal	Lead Length
111-6Y-06(J)	N.O.	25VA	25W	120V (@0.2A)	120V (@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.0" (2.5cm)	2.0" (5.1cm)	6' (1.8m)
111-6Y-12(J)	N.O.	25VA	25W	120V (@0.2A)	120V (@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.0" (2.5cm)	2.0" (5.1cm)	12' (3.6m)
111-7Y-12(J)	N.O.	100VA	84W	120V (@0.8A)	28V (@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	0.7" (1.8cm)	1.2" (3.0cm)	12' (3.6m)
111-Y	Actuator Only										

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Rated at 3.0A for 6,000 cycles only. Other ratings are at 100,000 cycles.

Non-Contact Interlock/Position Switch

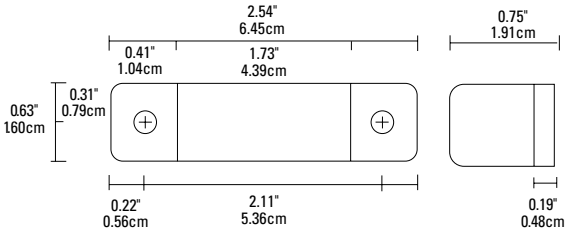
115 GuardSwitch

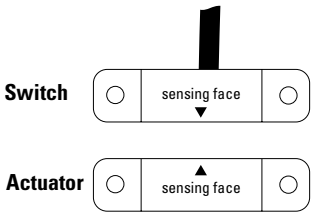
Applications

- Packaging Industry
- Farm Equipment
- Waste Compactors
- Emergency Vehicles
- Position Sensing

General Specifications

Enclosure	Nylon 6/6
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4X, 5, 6, 12, 12K
Protection Class	IP 67
Response Time	1msec; 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/2 SJTOW (K) / 0.30" (0.76cm) 18/3 SJTOW (K) / 0.33" (0.84cm) 18/4 SJTOW (K) / 0.34" (0.86cm)
UL/CSA	All Models





File E 122942

LR8917 S

Order Information	Electrical Specifications											
Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Nominal	Break Range Nominal	Lead Length
115-3Y-12K	N.C.	100VA	84W	120V(@0.8A)	28V(@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	0.7" (1.8cm)	1.2" (3.0cm)	12'(3.6m)
115-4Y-06K	SPDT	100VA	84W	120V(@0.8A)	28V(@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	0.7" (1.8cm)	1.2" (3.0cm)	6'(1.8m)
115-4Y-12K	SPDT	100VA	84W	120V(@0.8A)	28V(@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	0.7" (1.8cm)	1.2" (3.0cm)	12'(3.6m)
115-6Y-06K	N.O.	25VA	25W	120V(@0.2A)	120V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.0" (2.5cm)	2.0" (5.1cm)	6'(1.8m)
115-6Y-12K	N.O.	25VA	25W	120V(@0.2A)	120V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.0" (2.5cm)	2.0" (5.1cm)	12'(3.6m)
115-7Y-06K	N.O.	100VA	84W	120V(@0.8A)	28V(@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	0.7" (1.8cm)	1.2" (3.0cm)	6'(1.8m)
115-7Y-12K	N.O.	100VA	84W	120V(@0.8A)	28V(@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	0.7" (1.8cm)	1.2" (3.0cm)	12'(3.6m)
115-8Y-06K	N.O.	150VA	NA	120V(@1.25A)	NA	1.25A(@120V)[4]	NA	NA	1.0" (2.5cm)	1.5" (3.8cm)	6'(1.8m)
115-8Y-12K	N.O.	150VA	NA	120V(@1.25A)	NA	1.25A(@120V)[4]	NA	NA	1.0" (2.5cm)	1.5" (3.8cm)	12'(3.6m)
115-8Y-06K-SER25[5]	N.O.	150VA	NA	120V(@1.25A)	NA	1.25A(@120V)[4]	NA	NA	1.0" (2.5cm)	1.5" (3.8cm)	6'(1.8m)
115-8Y-12K-SER25[5]	N.O.	150VA	NA	120V(@1.25A)	NA	1.25A(@120V)[4]	NA	NA	1.0" (2.5cm)	1.5" (3.8cm)	12'(3.6m)
115-6Y-06K-D6	2 N.O.	25VA	25W	120V(@0.2A)	100V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.0" (2.5cm)	2.0" (5.1cm)	6'(1.8m)
115-6Y-12K-D6	2 N.O.	25VA	25W	120V(@0.2A)	100V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.0" (2.5cm)	2.0" (5.1cm)	12'(3.6m)
115-Y	Actuator Only										

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Rated at 3.0A for 6,000 cycles only. Other ratings are at 100,000 cycles.

4 Can withstand inrush surge up to 4 amps. Voltage Drop 1.5V, minimum switch current of 30mA.

5 SER25 — Maximum 25 switches in series, triac output.

Non-Contact Interlock/Position Switch

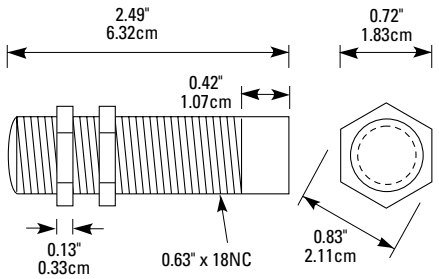
125 GuardSwitch

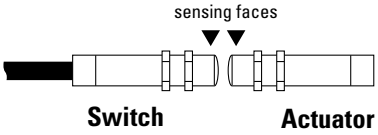
Applications

- Food Processing
- Textile Machines
- Elevator Lifts
- Position Sensing
- Proximity Switches

General Specifications

Enclosure	Nickel-plated Aluminum
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec; (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/2 SJTOW (K) / 0.30" (0.76cm)
UL/CSA	All Models





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File E 122942

INTERLOCK SWITCH
100 SERIES

Order Information	Electrical Specifications										
Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Nominal	Break Range Nominal	Lead Length
125-6Y-06K	N.O.	25VA	25W	120V(@0.2A)	120V(@0.2A)	0.7A(@35V)	1.0A(@25V)	0.2 Ohms	0.6" (1.5cm)	1.4" (3.6cm)	6'(1.8m)
125-7Y-06K	N.O.	100VA	84W	120V(@0.8A)	28V(@3.0A)	3.0A(@34V)[3]	3.0A(@28V)[3]	1.0 Ohms	0.5" (1.3cm)	0.9" (2.3cm)	6'(1.8m)
125-Y	Actuator Only										

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Rated at 3.0A for 6,000 cycles only. Other ratings are at 100,000 cycles.

4 Can withstand inrush surge up to 4 amps. Voltage Drop 1.5V, minimum switch current of 30mA.

Magnetic Door Position Switch

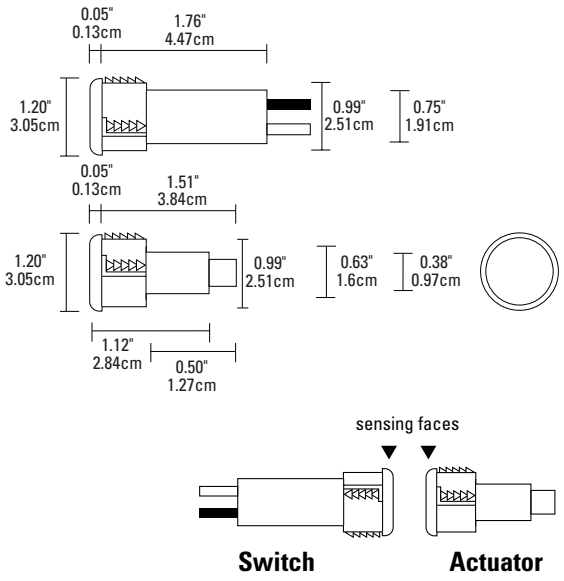
126 GuardSwitch

Applications

- Closet Door Switch
- Environmental Controls

General Specifications

Enclosure	ABS Plastic with Protective Nylon
Switch Sleeve	
Temperature Range	-40°F to 180°F (-40°C to 80°C)
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	10 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	12 AWG (AX) / 0.13" (0.33cm) Flex Conduit (X) / 0.58" (1.5cm)
UL/CSA	All Models



File E 122942

New York
Calendar # 40018

Order Information	Electrical Specifications AC ONLY							
Part Number	**Contact[1] Config.**	**Load Rating (AC)**	**Switching Voltage Maximum (AC)**	**Switching Current[3] Maximum (AC)**	**Voltage Drop**	**Sense Range[2] Nominal**	**Break Range Nominal**	**Lead Length**
126-EY-01AX	N.C.	150VA	120V AC	1.25A	1.5V	1.0" (2.5cm)	1.5" (3.8cm)	1' (0.3m)
126-EY-06X	N.C.	150VA	120V AC	1.25A	1.5V	1.0" (2.5cm)	1.5" (3.8cm)	6' (1.8m)
126-8Y-01AX	N.O.	150VA	120V AC	1.25A	1.5V	1.0" (2.5cm)	1.5" (3.8cm)	1' (0.3m)
126-EY-03AX	N.C.	150VA	120V AC	1.25A	1.5V	1.0" (2.5cm)	1.5" (3.8cm)	3' (0.9m)
126-Y	Actuator Only							

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

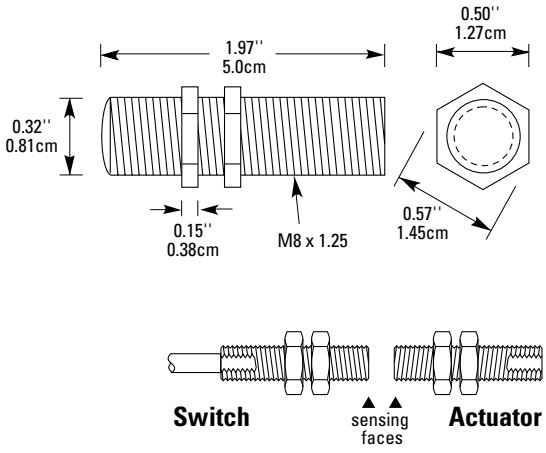
3 Can withstand inrush surge up to 4 amps. Voltage Drop 1.5V, minimum switch current of 30mA.

Non-Contact Interlock/Position Switch

128C GuardSwitch

Applications

- Semi-conductor Equipment
- Packaging Machinery
- Farm Implement
- Conveyers
- Position Sensing
- Economical Proximity Switch Replacement



General Specifications

Enclosure	Stainless Steel Threaded Barrel with 2 Jam Nuts
Dimensions	M8 dia. x 1.25 Thread x 50mm Long
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4X, 5, 6, 12, 12K
Protection Class	IP 67
Response Time	1 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	22/2 Jacketed / 0.24" (0.62cm)
UL/CSA	All Models

c UL us — File E 122942

CSA — LR89176

INTERLOCK SWITCH
100 SERIES

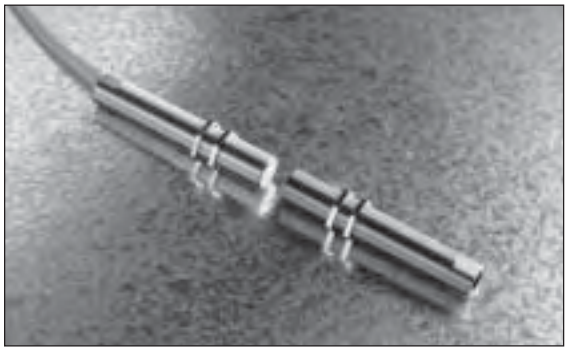
Order Information	Electrical Specifications				ACTUATOR SOLD SEPARATELY			
Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Lead Length
128C-6N-06(J)	N.O.	25VA	25W	120V(@0.2A)	120V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	6'(1.8m)
128C-6N-12(J)	N.O.	25VA	25W	120V(@0.2A)	120V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	12'(3.6m)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

Sense range[2]			
Actuator Options	Make, Min.	Break, Max.	Actuator Description
128C-U	0.15	1.00	Alnico Magnet in M8x1.25x50 stainless steel threaded barrel w/2 jam nuts
129-X	0.35	1.35	Alnico Magnet in M12x1x70 stainless steel threaded barrel w/2 panel nuts
1057	0.85	2.15	Bare Alnico Magnet 3/8" dia. x 1-1/2" long
1830	0.15	0.65	Rare Earth 0.375" dia. x 0.12" thick w/#4 countersink hole
IND1835	0.40	1.00	Rare Earth 0.6" dia. x 0.12" thick w/#4 countersink hole

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

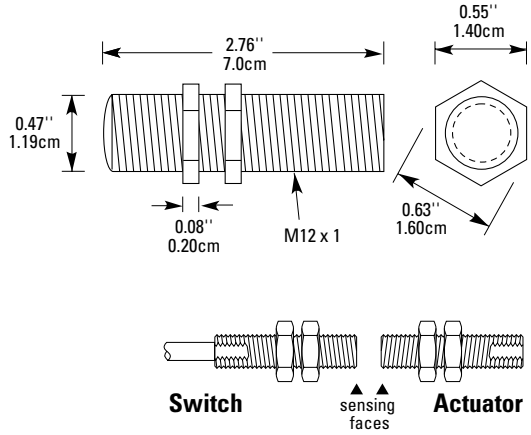


Non-Contact Interlock/Position Switch

129 GuardSwitch

Applications

- Position Sensing
- Semi-conductor Equipment
- Economical Proximity Switch Replacement
- Packaging Machinery
- Farm Implement
- Conveyers



File E 122942

LR89176

General Specifications

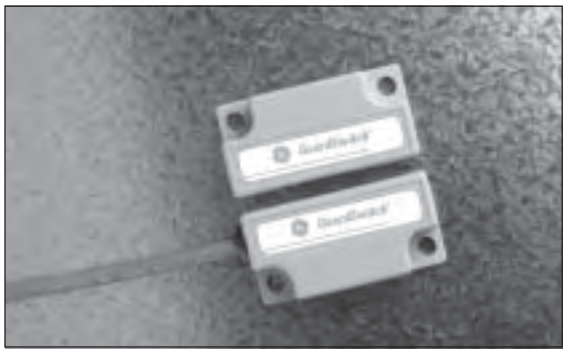
Enclosure	Stainless Steel Threaded Barrel Panel Nuts
Dimensions	M12 dia. x 1 Thread x 70mm Long
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4X, 5, 6, 12, 12K
Protection Class	IP 67
Response Time	1 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	22/2 Jacketed (J) / 0.24" (0.62cm) 22/4 Jacketed (J) / 0.19" (0.48cm)
UL/CSA	All Models

Order Information	Electrical Specifications					ACTUATOR SOLD SEPARATELY			
Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Lead Length
129-6N-06(J)	N.O.[2]	25VA	25W	120V(@0.2A)	120V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	6'(1.8m)
129-6N-12(J)(-D6)(-DG)	N.O.[2]	25VA	25W	120V(@0.2A)	120V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	12'(3.6m)

[1]Configuration with actuator away from the switch[2] D6=DPST: 2 N.O., DG=DPST: 1 N.O., 1 N.C. 15VA[3]Rated at 3.0A for 6,000 cycles only. Other ratings are at 100,000 cycles

Sense range[4]					
Actuator Options	129-6 -DG Make, Min.	129-6 -DG Break, Max.	129-6 -D6 Make, Min.	129-6 -D6 Break, Max.	Actuator Description
128C-U	0.25	0.80	0.15	1.00	Alnico Magnet in M8x1.25x50 stainless steel threaded barrel w/2 jam nuts
129-X	0.45	1.10	0.35	1.35	Alnico Magnet in M12x1x70 stainless steel threaded barrel w/2 panel nuts
1057	0.90	1.75	0.85	2.15	Bare Alnico Magnet 3/8" dia. x 1-1/2" long
1830	0.25	0.55	0.15	0.65	Rare Earth 0.375" dia. x 0.12" thick w/#4 countersink hole
IND1835	0.50	0.85	0.40	1.00	Rare Earth 0.6" dia. x 0.12" thick w/#4 countersink hole

4 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.



Non-Contact Interlock/Position Switch

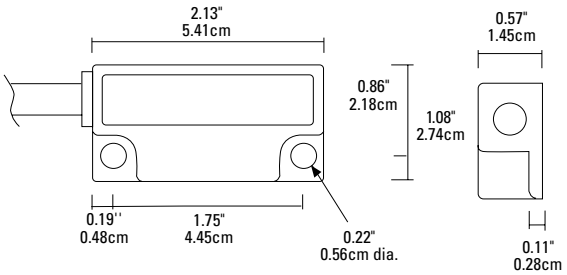
141 GuardSwitch

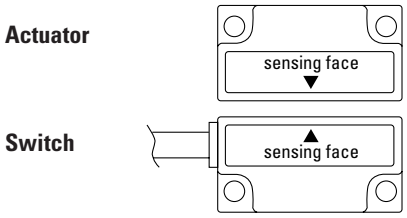
Applications

- Commercial Dishwashing Machine
- Parts Cleaning Machines
- Chemical Environments

General Specifications

Enclosure	Kynar® Polyvinylidene Flouride with sonic welded lid
Temperature Range	14°F to 150°F (-10°C to 65°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4X, 5, 6, 12, 13
Protection Class	IP 67
Response Time	10 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/2 SJTO / 0.29" (0.74cm)
UL/CSA	All Models





File E 122942

File LR 89176

Order Information	Electrical Specifications						
Part Number	**Contact[1] Config.**	**Load Rating Max.(AC/DC)**	**Switching Voltage Max.(AC/DC)**	**Switching Current Max.(AC/DC)**	**Sense Range[2] Nominal**	**Break Range Nominal**	**Lead Length**
141-8Y-06M	N.O.	150VA/NA	120V(@1.25A)/NA	1.25A[4]/NA	1"(2.5cm)	1.2"(3cm)	6'(1.8m)
141-18Y-03M	N.O.	220VA/NA	220V(@1.0A)/NA	1.0A/NA	0.7"(1.8)	1.6"(4.1cm)	3'(0.9m)
141-Y	Actuator Only						

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Can withstand inrush surge up to 4 amps, voltage drop 1.5V, minimum switch current of 30 mA, triac output.

Non-Contact Interlock/Position Switch

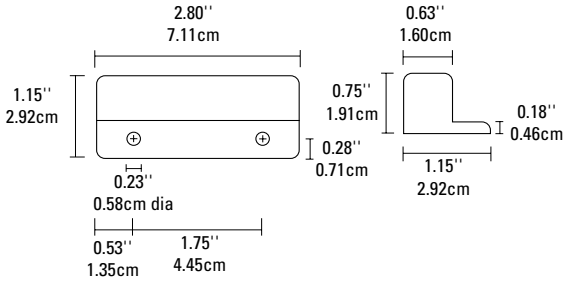
151 & 153 GuardSwitch

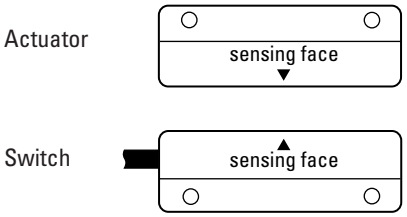
Applications

- Packaging Machines
- Food Processing Machines
- Waste Compactors
- Mixers, Blenders, and Dryers

General Specifications

Enclosure	Polyurethane Enamel-Coated Aluminum
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	4, 4X, 5, 6, 12, 12K
Protection Class	IP 67
Response Time	1 msec; 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit Load
Types/O.D.	18/2 SJTOW (K) / 0.30" (0.76cm)
(Armored cable available)	18/4 SJTOW (K) / 0.34" (0.86cm)
UL/CSA	All Models





File E 122942 LR89176

Order Information **Electrical Specifications**

Part Number[1]	Contact[2] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[3] Nominal	Break Range Nominal	Lead Length
151-6Z-06K	N.O.	25VA	25W	120V (@0.2A)	120V (@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.5" (3.8cm)	2.0" (5.1cm)	6' (1.8m)
151-6Z-12K	N.O.	25VA	25W	120V (@0.2A)	120V (@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.5" (3.8cm)	2.0" (5.1cm)	12' (3.6m)
151-7Z-06K	N.O.	100VA	84W	120V (@0.8A)	28V (@3.0A)	3.0A (@34V)[4]	3.0A (@28V)[4]	1.0 Ohms	1.2" (3.0cm)	1.8" (4.6cm)	6' (1.8m)
153-7Z-06K	N.O.	100VA	84W	120V (@0.8A)	28V (@3.0A)	3.0A (@34V)[4]	3.0A (@28V)[4]	1.0 Ohms	1.2" (3.0cm)	1.8" (4.6cm)	6' (1.8m)
151-7Z-12K	N.O.	100VA	84W	120V (@0.8A)	28V (@3.0A)	3.0A (@34V)[4]	3.0A (@28V)[4]	1.0 Ohms	1.2" (3.0cm)	1.8" (4.6cm)	12' (3.6m)
153-7Z-12K	N.O.	100VA	84W	120V (@0.8A)	28V (@3.0A)	3.0A (@34V)[4]	3.0A (@28V)[4]	1.0 Ohms	1.2" (3.0cm)	1.8" (4.6cm)	12' (3.6m)
151-7Z-06K-D3	DPST,N.O.,N.C.	100VA	84W	120V (@0.8A)	28V (@3.0A)	3.0A (@28V)[4]	3.0A (@28V)[4]	1.0 Ohms	1.2" (3.0cm)	1.8" (4.6cm)	6' (1.8m)
151-8Z-12K	N.O.	150VA	NA	120V (@0.8A)	NA	1.25A (@120V)[5]	NA	NA	1.4" (3.5cm)	2.1" (5.3cm)	12' (1.8m)
150-Z	Actuator Only										

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 The part number 153 is the same as 151 in all respects except the cable exits 151 left and 153 right.
2 Configuration with actuator away from the switch
3 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.
4 Rated at 3.0A for 6,000 cycles only. Other ratings are at 100,000 cycles.
5 Can withstand inrush surge up to 4 amps. Voltage Drop 1.5V, minimum switch current, 30mA, triac output.

Non-Contact Interlock/Position Switch

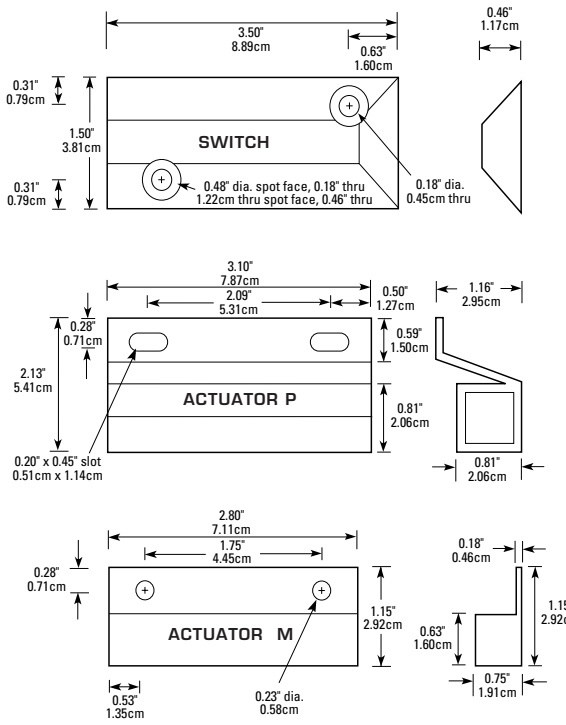
166 GuardSwitch

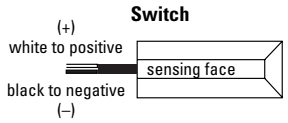
Applications

- Low Profile Requirements
- Overhead Doors
- Boom Trucks
- Emergency Vehicles
- Rugged Outdoor Use

General Specifications

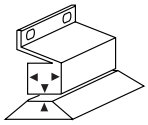
Enclosure	Epoxy-coated aluminum
Temperature Range	-40 °F to 180 °F (-40 °C to 80 °C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4X, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/2 SJTOW (K) / 0.30" (0.76cm)
UL/CSA	All Models





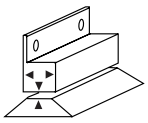
Actuator P

- points to valid sensing face



Actuator M

- points to valid sensing face



File E 122942 LR 89176

Order Information	Electrical Specifications	DC ONLY						
Part Number	**Contact[1] Config.**	**Load Rating (DC)**	**Switching Voltage Maximum (DC)**	**Switching Current Maximum (DC)**	**Voltage Drop**	**Sense Range[2] Nominal**	**Break Range Nominal**	**Lead Length[3]**
166-RM-06K	N.C.	100W	24V (@4.0A)	5.0A (@20V)	1.5V	1.6" (4.0cm)	2.1" (5.3cm)	6' (1.8m)
166-RN-06K[4]	N.C.	100W	24V (@4.0A)	5.0A (@20V)	1.5V	Switch Only	Switch Only	6' (1.8m)
166-P	Actuator P Only							
150-Z	Actuator M Only							

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

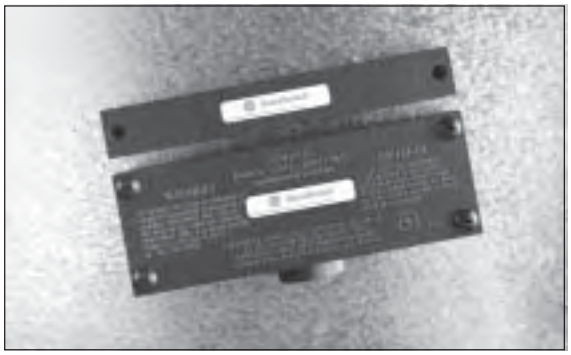
Note: This switch cannot be used for AC applications. In DC applications it is polarity sensitive white to positive, black to negative.

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Armored cable available

4 Switch only

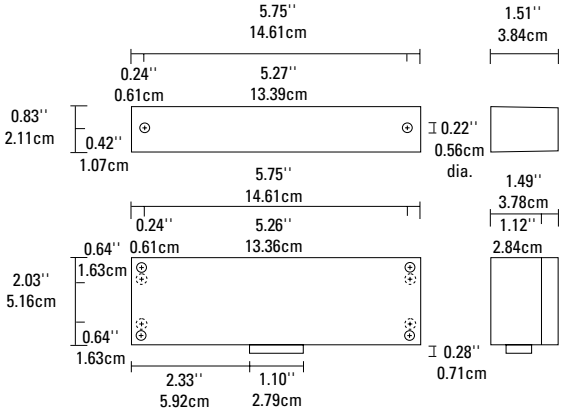


Non-Contact Interlock/Position Switch

171 GuardSwitch Explosion Proof

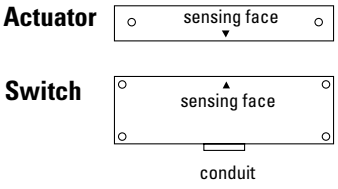
Applications

- Explosive Environments
  - Automotive Paint Companies
  - Industrial Paint Companies
  - Grain Mills
  - Chemical/Toxic Environments
  - Fertilizer Manufacturers
- Enclosure UL classified for hazardous locations classes:
  Class I, Group B, C, D
  Class II, Group E, F, G
  Class III, Divisions 1 & 2



General Specifications

Enclosure	UL Explosion proof, Die Cast Aluminum
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 5
Protection Class	IP 64
Response Time	1 msec; 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Conduit Connection	1/2" Threaded NPT
UL	Enclosure Only



LISTED

Order Information	Electrical Specifications										
Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Nominal	Break Range Nominal	Terminal Type
171-6Z	N.O.	25VA	25W	120V(@0.2A)	100V(@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.5"(3.8cm)	2.4"(6.1cm)	#6 Screw

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

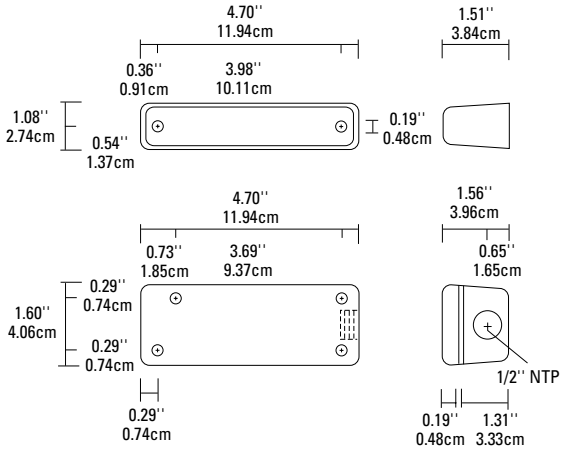
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

Non-Contact Interlock/Position Switch

181 GuardSwitch
1/2" Conduit Enclosure

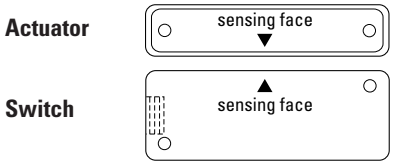
Applications

- Requiring Conduit Connection
- Non-wash Down Environment
- Heavy-duty Housing



General Specifications

Enclosure	Coated aluminum
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 5
Protection Class	IP 64
Response Time	1 msec; 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Conduit Connection	1/2" Threaded NPT



Order Information	Electrical Specifications										
Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Nominal	Break Range Nominal	Terminal Type
181-7Z	N.O.	100VA	84W	120V(@0.8A)	28V(@3.0A)	3.0A (@34V)[3]	3.0A (@28V)[3]	1.0 Ohms	1.4" (3.5cm)	1.8" (4.6cm)	#6 Screw

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

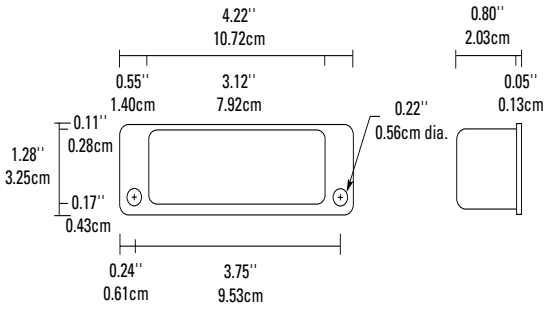
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.z

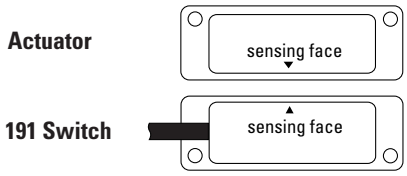
Non-Contact Interlock Position/Switch

191 GuardSwitch

Applications

- USDA approved
- Food Processing Machines
- Chemical Industry Machinery
- Wash-down Environments





General Specifications

Enclosure	Seamless 304 Stainless Steel
Temperature Range	-40 ℉ to 180 ℉ (-40 ℃ to 80 ℃)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4X, 5, 6, 12, 12K
Protection Class	IP 67
Response Time	1 msec; 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	18/2 SJTOW (K) / 0.30" (0.76cm) 18/4 SJTOW (K) / 0.34" (0.86cm)
UL/CSA	All Models

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Order Information	Electrical Specifications										
Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Nominal	Break Range Nominal	Lead Length
191-6Z-12K	N.O.	25VA	25W	120V (@0.2A)	120V (@0.2A)	0.7A (@35V)	1.0A (@25V)	0.2 Ohms	1.0" (2.5cm)	2.0" (5.1cm)	12' (3.6m)
191-7Z-06K	N.O.	100VA	84W	120V (@0.8A)	28V(@3.0A)	3.0A (@34V)	3.0A (@28V)[3]	1.0 Ohms	0.5" (1.3cm)	1.8" (4.6cm)	6' (1.8m)
191-7Z-12K-D3	DPST[3]	100VA	84W	120V (@0.8A)	28V(@3.0A)	3.0A (@34V)	3.0A (@28V)[3]	1.0 Ohms	0.5" (1.3cm)	1.8" (4.6cm)	12' (3.6m)
191-7Z-12K	N.O.	100VA	84W	120V (@0.8A)	28V(@3.0A)	3.0A (@34V)	3.0A (@28V)[3]	1.0 Ohms	0.5" (1.3cm)	1.8" (4.6cm)	12' (3.6m)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

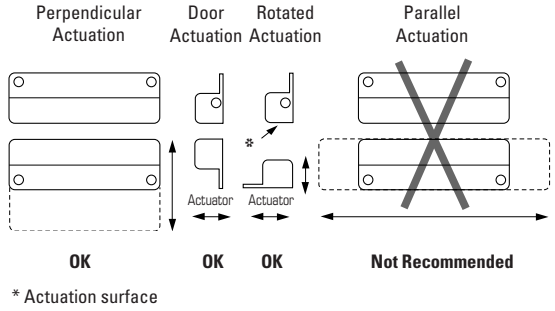
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 DPST: 1 N.O., 1 N.C

Installation Instructions

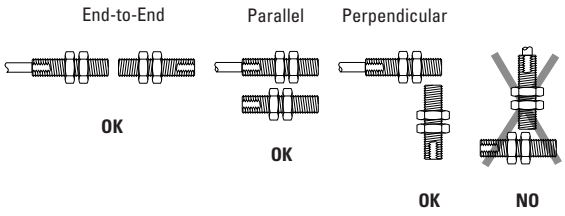
Surface Mounting Configurations

Figure 1



Barrel Switch Mounting Configurations

Figure 2



Installation

Mounting Instructions

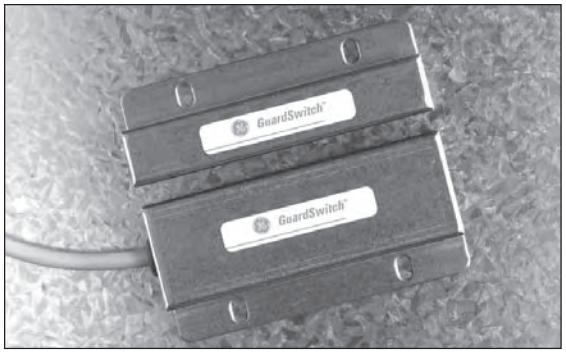
1. Select a mounting location where the switch and actuator can be installed with their labels reading in the same direction.
2. Mount the switch on the stationary frame of the machine and the actuator the moveable guard, door, or gate.

   Switches Models 125, 126, 128C & 129: Slightly over-drill holes for easy insertion. The switch and actuator should easily slide or screw into the predrilled holes – DO NOT force or hammer. This may damage switch.
3. For best protection against operator defeat, mount with non-removable screws, bolts, or nuts. (See accessories)
4. The switch and actuator must be mounted so that the actuator moves in one of the approved directions (Figure 1 and Figure 2).
5. Parallel actuation is NOT recommended except for barrel type switches. An on/off/on double actuation signal may result when the magnet passes by the switch.
6. When mounting on a hinged gate or door, mount the switch and actuator at least 6" away from the hinges so a more face to face approach is achieved.
7. The actuator can be mounted at a 90° rotation.
8. Keep the switch and actuator within the listed sense range (see specific switch electrical specifications).
9. Mounting on a ferrous (steel) material will reduce the sense range a minimum of 50%. A 1/4" nonferrous (plastic or aluminum) spacer installed under the actuator and switch will restore most of the lost gap.
10. When mounting a metal switch to an ungrounded machine, connect the ground lead to one of the switch mounting screws.

CAUTION — Particular care must be taken to determine the actual load of the switch circuit.

1. **Surges from coils, motors, contactors, solenoids and tungsten filaments must be considered.**
2. **Transient protection, such as back-to-back zener diodes (Transorb) or an RC network, is recommended for such loads to ensure that maximum ratings of the switch are not exceeded.**
3. **Line capacitance and load capacitance must be considered. An in-line resistor can be added to limit the inrush current.**
4. **The resistor can only be added in series with the last wire just before the load.**
5. **The voltage drop and the power rating of the resistor must be considered.**

   Voltage drop = I • R
   Watts = I^2 • R
   (I = maximum continuous current of the load)

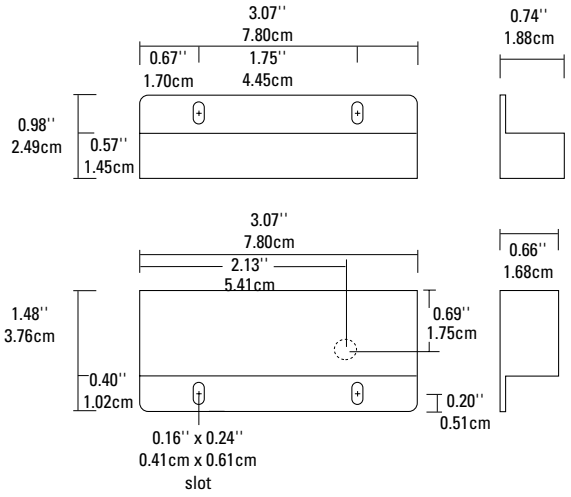


Interlock Switch

301 GuardSwitch

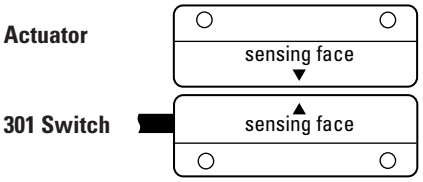
Applications

- Requiring Highly Defeat Resistant Switches
- Grinder Machines
- Augur Machines
- Chopper Machines



General Specifications

Enclosure	Folded 304 Stainless Steel
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 4, 4X, 5, 12, 12K
Protection Class	IP 66
Response Time	1 msec (5.4 VA); 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	SJTOW (K) 18/2 AWG / 0.30" (0.76cm) SJTOW (K) 18/4 AWG / 0.34" (0.86cm)
UL/CSA	All Models



File E 115761 LR89176

Order Info. Electrical Specifications

Part Number	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Max.	Sense Range[2] Min.	Break Range	Lead Length
301-CT-06K	N.O.	2.5VA	2.5W	30V(@0.08A)	30V(@0.08A)	0.18A(@13.8V)	0.18A(@13.8V)	0.5 Ohms	0.75"(1.9cm)	0.375"(1.0cm)	1.2"(3.0cm)	6' (1.8m)
301-CT-12K	N.O.	2.5VA	2.5W	30V(@0.08A)	30V(@0.08A)	0.18A(@13.8V)	0.18A(@13.8V)	0.5 Ohms	0.75"(1.9cm)	0.375"(1.0cm)	1.2"(3.0cm)	12' (3.6m)
301-CT-12K-CD	DPST	2.5VA		30V(@0.08A)	30V(@0.08A)	0.18A(@13.8V)	0.18A(@13.8V)	0.5 Ohms	0.75"(1.9cm)	0.375"(1.0cm)	1.2"(3.0cm)	12' (3.6m)
301-DT-06K[4]	N.O.	150VA	NA	120V @1.25A	NA	1.25A(@120V[3])	NA	NA	0.75"(1.9cm)	0.375"(1.0cm)	1.2"(3.0cm)	6' (1.8m)
301-DT-12K[4]	N.O.	150VA	NA	120V @1.25A	NA	1.25A(@120V[3])	NA	NA	0.75"(1.9cm)	0.375"(1.0cm)	1.2"(3.0cm)	12' (3.6m)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Can withstand inrush surge up to 4 amps. Voltage drop is 1.5V, minimum switch current, 30 mA, triac output.

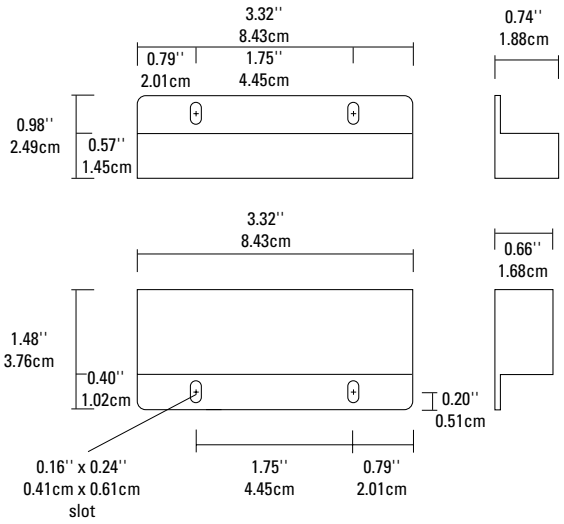
4 Do not exceed 10 switches in series.

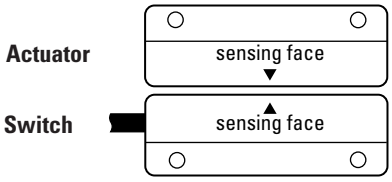
Interlock Switch

302 GuardSwitch

Applications

- Requiring Highly Defeat Resistant Switches
- Grinder Machines
- Augur Machines
- Chopper Machines





General Specifications

Enclosure	Folded 304 Stainless Steel
Temperature Range	-40 ℉ to 180 ℉ (-40 ℃ to 80 ℃)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 4, 4X, 5, 12, 12K
Protection Class	IP 66
Response Time	1 msec (5.4VA); 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	Armored Cable (A) 3/16" Stainless Steel with two 18/2 AWG wires / 0.28" (0.59cm)
UL/CSA	All Models

File E 115761 LR89176

Order Info. Electrical Specifications

Part No.	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Max.	Sense Range[2] Min.	Break Range	Lead Length
302-DT-06A[4]	N.O.	150VA	NA	120V @1.25A	NA	1.25A(@120V[3])	NA	NA	0.75"(1.9cm)	0.375"(1.0cm)	1.2"(3.0cm)	6' (1.8m)

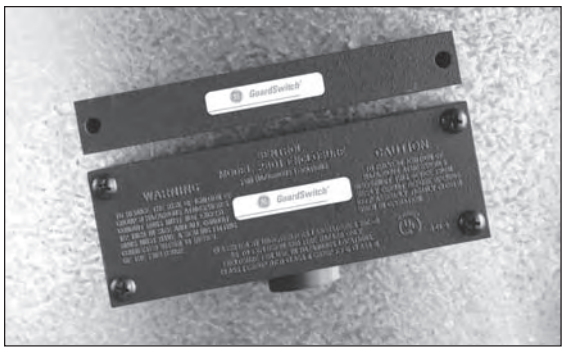
Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Can withstand inrush surge up to 4 amps. Voltage drop is 1.5V, minimum switch current, 30 mA, triac output.

4 Do not exceed 10 switches in series.

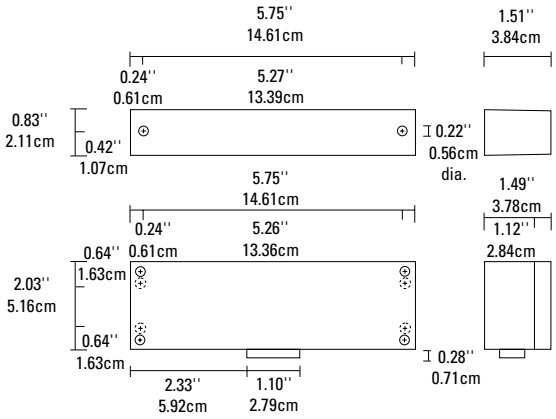


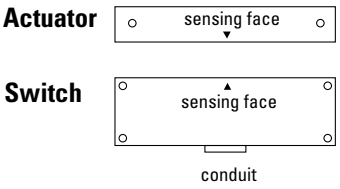
Interlock Switch

371 GuardSwitch Explosion Proof

Applications

- Explosive Environments
  - Automobile Paint Booths
  - Industrial Paint Booths
  - Chemical/Toxic Environments
  - Fertilizer Manufacturers
  - Grain Mills
- Requiring Highly Defeat Resistant Switches
- Enclosure UL classified for hazardous locations classes:
  Class I, Group B, C, D
  Class II, Group E, F, G
  Class III, Divisions 1 & 2





General Specifications

Enclosure	UL Explosion Proof, Black Anodized Die Cast Aluminum
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 5
Protection Class	IP 64
Response Time	1 msec (5.4VA); 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Conduit Connection	1/2" Threaded NPT
UL	All Models

File E 22942

Order Info. — Electrical Specifications

Part No.	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Max.	Sense Range[2] Min.	Break Range	Terminal Type
371-CT	N.O.	2.5VA	2.5W	30V(@0.08A)	30V(@0.08A)	0.18A(@13.8V)	0.18A(@13.8V)	0.5 Ohms	0.5"(1.3cm)	0.25"(0.635cm)	1.2"(3.0cm)	#6 Screws
371-DT[4]	N.O.	150VA	NA	120V(@1.25A)	NA	1.25A(@120V)[3]	NA	NA	0.5"(1.3cm)	0.25"(0.635cm)	1.2"(3.0cm)	#6 Screws

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Can withstand inrush surge up to 4 amps. Voltage drop is 1.5V, minimum switch current, 30 mA, triac output.

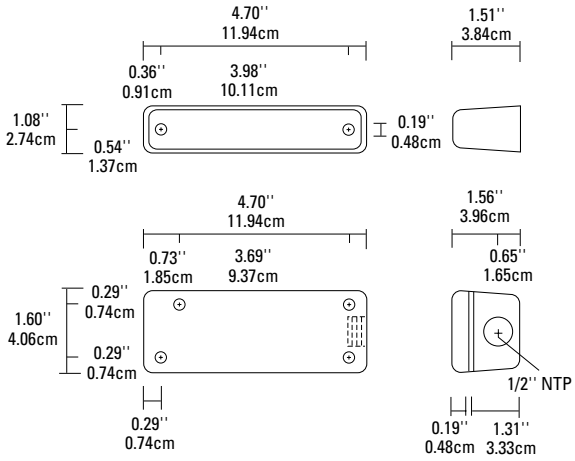
4 Do not exceed 10 switches in series.

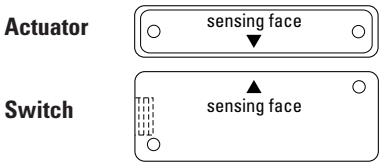
Interlock Switch

381 GuardSwitch
1/2" Conduit Enclosure

Applications

- Requiring Highly Defeat Resistant Switches
- Heavy-duty Housing
- Conduit Connection
- Terminals
- Non-wash down Environment





General Specifications

Enclosure	Coated Aluminum
Temperature Range	-40 ℉ to 180 ℉ (-40 ℃ to 80 ℃)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 5
Protection Class	IP 64
Response Time	1 msec (5.4VA); 10 msec (150VA)
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Conduit Connection	1/2" Threaded NPT
UL/CSA	All Models

c UL us — File E 122942

CSA — LR89176

Order Info. Electrical Specifications

Part No.	Contact[1] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[2] Max.	Sense Range[2] Min.	Break Range	Terminal Type
381-CT	N.O.	2.5VA	2.5W	30V(@0.08A)	30V(@0.08A)	0.18A(@13.8V)	0.18A(@13.8V)	0.5 Ohms	0.75"(1.9cm)	0.375"(1.0cm)	1.2"(3.0cm)	#6 Screw
381-DT[4]	N.O.	150VA	NA	120V(@1.25A)	NA	1.25A(@120V)[3]	NA	NA	0.75"(1.9cm)	0.375"(1.0cm)	1.2"(3.0cm)	#6 Screw

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

3 Can withstand inrush surge up to 4 amps. Voltage drop is 1.5V, minimum switch current, 30 mA, triac output.

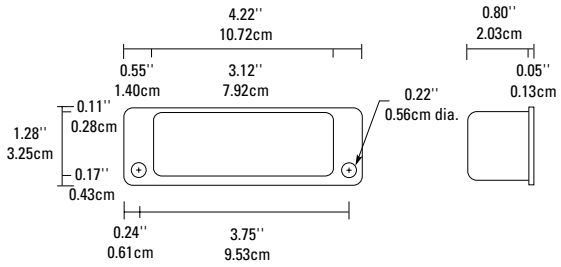
4 Do not exceed 10 switches in series.

Interlock Switch

391 & 393 GuardSwitch

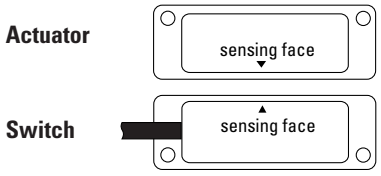
Applications

- USDA Approved Housing
- Food Processing Machines
- Rugged, Seamless SS Housing
- Requiring Highly Defeat Resistant Switches
- Wash-down and Corrosive Environments



General Specifications

Enclosure	304 Seamless Stainless Steel
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Encapsulated in Polyurethane
Response Time	1 msec (5.4VA); 10 msec (150VA)
NEMA Rating	1, 2, 3, 4, 4X, 5, 6, 12, 12X
Protection Class	IP 67
Life Cycles	100,000 Under Full Load; Up to 200,000,000 Under Dry Circuit
Lead Types/O.D.	SJTOW (K)/18/2, 0.30" (0.76cm)
UL/CSA	All Models



File E 122942 LR89176

Order Info. Electrical Specifications

Part No.[1]	Contact[2] Config.	Load Rating AC	Load Rating DC	Switching Voltage, Max. AC	Switching Voltage, Max. DC	Switching Current, Max. AC	Switching Current, Max. DC	Contact Resistance	Sense Range[3] Max.	Sense Range[3] Min.	Break Range	Lead Length
391-CT-06K	N.O.	2.5VA	2.5W	30V(@0.08A)	30V(@0.08A)	0.18A(@13.8V)	0.18A(@13.8V)	0.5 Ohms	0.8"(2cm)	0.1"(0.25cm)	1.2"(3.0cm)	6' (1.8m)
391-CT-12K	N.O.	2.5VA	2.5W	30V(@0.18A)	30V(@0.18A)	0.18A(@13.8V)	0.18A(@13.8V)	0.5 Ohms	0.8"(2cm)	0.1"(0.25cm)	1.2"(3.0cm)	12' (3.6m)
391-DT-06K[5]	N.O.	150VA	NA	120V @1.25A	NA	1.25A(@120V[4])	NA	NA	0.8"(2cm)	0.1"(0.25cm)	1.2"(3.0cm)	6' (1.8m)
391-DT-12K[5]	N.O.	150VA	NA	120V @1.25A	NA	1.25A(@120V[4])	NA	NA	0.8"(2cm)	0.1"(0.25cm)	1.2"(3.0cm)	12' (3.6m)
393-DT-06K[5]	N.O.	150VA	NA	120V @1.25A	NA	1.25A(@120V[4])	NA	NA	0.8"(2cm)	0.1"(0.25cm)	1.2"(3.0cm)	6' (1.8m)
393-DT-12K[5]	N.O.	150VA	NA	120V @1.25A	NA	1.25A(@120V[4])	NA	NA	0.8"(2cm)	0.1"(0.25cm)	1.2"(3.0cm)	12' (3.6m)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 The part number 391 and the 393 are the same in all respects except the cable exits 391 left and 393 right.

2 Configuration with actuator away from the switch

3 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

4 Can withstand inrush up to 4 amps. Voltage drop is 1.5V. Minimum switch current, 30 mA, triac output.

5 Do not exceed 10 switches in series.

Installation Instructions

The interlock switch and actuator should be mounted in only three configurations for actuation:

Figure 1

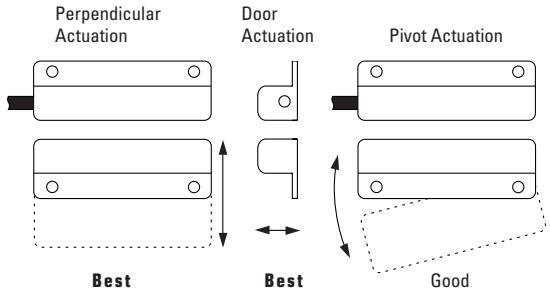
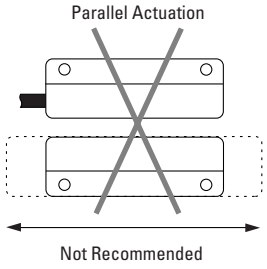


Figure 2



Installation

Mounting Instructions

1. Position the switch and actuator so the labels are reading in the same direction.
2. Mount the switch on the stationary frame of the machine and mount the actuator on the moveable guard, door or gate. To determine the optimum sense range, shown under the electrical specifications for each product, attach an ohmmeter to the black and white wires.

   The meter should read "Infinity" with the actuator away from the switch. Bring the actuator toward the switch until the meter reads 0 ohms. Mark this point and bring the actuator closer to the switch until the meter again reads "Infinity". Mark this point and position the actuator between the two marks. Align the actuator with the switch so the labels read in the same direction.

   * (For DT models, which incorporate a triac, the meter will read some resistance when the switch is "on," and the direct current (DC) from the meter may cause the switch to latch in the "on" state until the meter is disconnected.)

   The switch and actuator must be mounted so that the actuator moves in one of the approved directions (Figure 1).

   Parallel actuation is NOT recommended. An on/off/on (double actuation) signal may result when the actuator passes by the switch rather than coming to rest in proximity to it (Figure 2).
3. Mounting on a ferrous material will effect the sense range a minimum of 50 %. However, a 1/4" nonferrous spacer positioned under the actuator and/or switch should restore most of the lost sensor range.
4. For best protection against operator defeat, mount with non-removable screws, bolts or nuts (see Accessories).
5. When mounting a metal switch to an ungrounded machine, connect the ground lead to one of the switch mounting screws.

CAUTION — Particular care must be taken to determine the actual load of the switch circuit.

Surges from coils, motors, contactors, solenoids and tungsten filaments must be considered.

Transient protection, such as back-to-back zener diodes (Transorb) or an RC network, is recommended for such loads to ensure that maximum ratings of the switch are not exceeded.

Line capacitance and load capacitance must be considered. An in-line resistor can be added to limit the inrush current.

The resistor can only be added in series with the last wire just before the load.

The voltage drop and the power rating of the resistor must be considered.

Voltage drop = I • R
Watts = I^2 • R
(I = maximum continuous current of the load)

Setting the Standard

Pioneers in Position Sensors

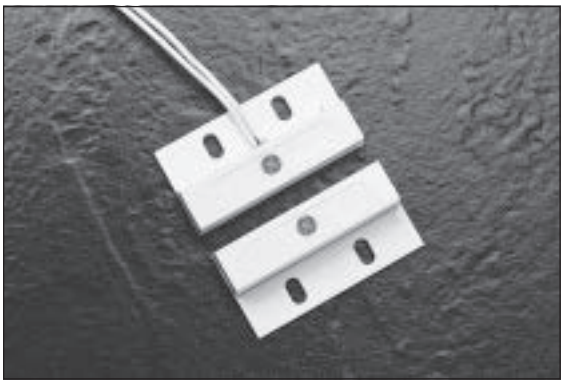
GE Interlogix Industrial has been a pioneer in the use of multiple reeds and "wide gapping" in our position sensors. We continue to lead the way in finding new and innovative solutions to problems that vex the industry.

Quality Reputation

Designed to make installation easier, GE Interlogix Industrial position sensors have earned their reputation for quality. They are built for durability and dependability. Most are conservatively rated at 100,000 cycles under full load, and 10,000,000 cycles under dry circuit.

Every reed connection is hand soldered and the reeds in all models are environmentally sealed. Like the GuardSwitch™ safety interlock switches, our position sensors are tested before they leave the factory — 100% of the time.

Our world-class manufacturing standards and attention to detail virtually eliminate all out-of-box failures. You can install GE Interlogix Industrial position sensors quickly and with every confidence in their reliability.

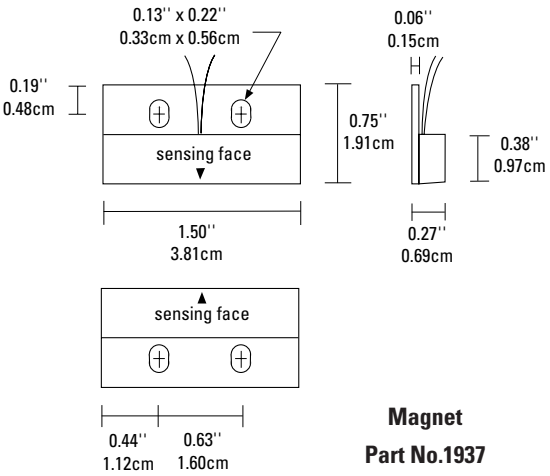


Miniature Flange Mount With Wire Leads

1032 Series

Applications

- Flanges for rapid mounting
- Convenient surface mounting
- Includes adhesive mounting strips
- Mounting screws



Magnet Part No.1937 (included)

General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color	Natural
UL/ULC Listed	All Models

c UL us LISTED

Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
1032-N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.6"(1.6cm)	1'
1032W-N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1.0"(2.5cm)	1'
1937-N	Actuator Only						

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

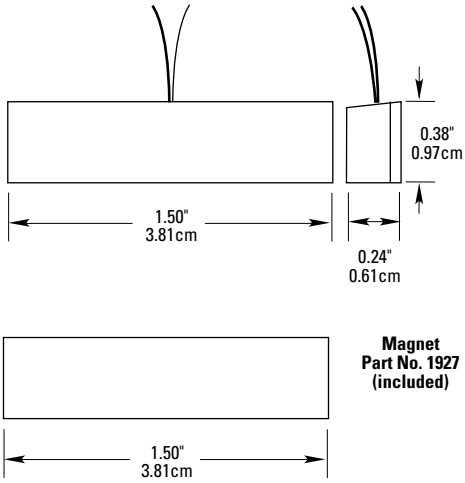
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

Miniature Self-Adhesive With Wire Leads

1035 Series

Applications

- Quick tape mounting: no screws or glues needed
- Urethane/acrylic tape bonding improves with age
- Convenient surface mounting



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color	Natural
UL/ULC Listed	All Models

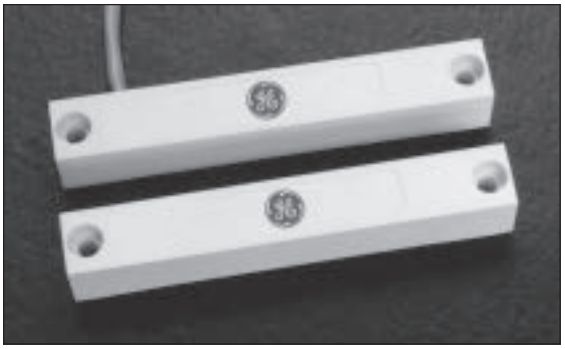
c UL us LISTED

Order Information	Electrical Specifications						
Part Number	Contact[1] Configuration	Load Rating (AC/DC)	Switching Voltage (AC/DC)	Switching Current (AC/DC)	Contact Resistance	Sense Range[2] Nominal	Lead Length
1035-N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.6"(1.6cm)	1'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

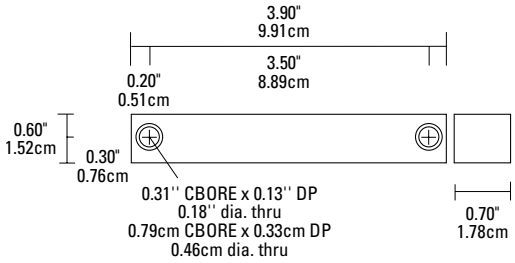


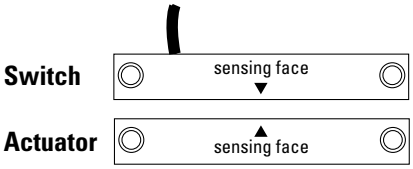
Surface Mount With Wire Leads

1045 Series

Applications

- Models for use on steel without time-consuming brackets
- Rugged construction
- Convenient surface mount wiring
- Mounting screws





General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	Jacketed #22 AWG / 0.187" (0.48cm)
Color	Grey
UL/ULC Listed	All Models

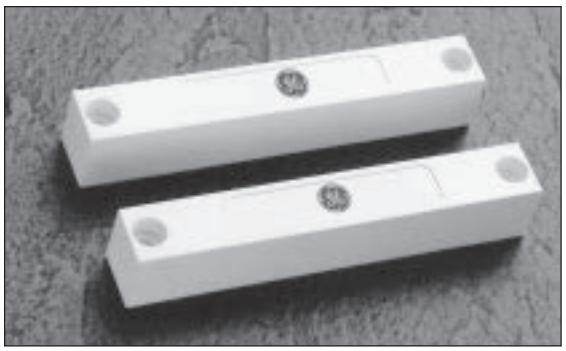
c UL us LISTED

Order Information	Electrical Specifications						
Part Number	Contact[1] Configuration	Load Rating (AC/DC)	Switching Voltage Maximum (AC/DC)	Switching Current Maximum (AC/DC)	Contact Resistance	Sense Range[2] Nominal	Lead Length
1045W-G	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	3.0" (7.6cm)	3'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.



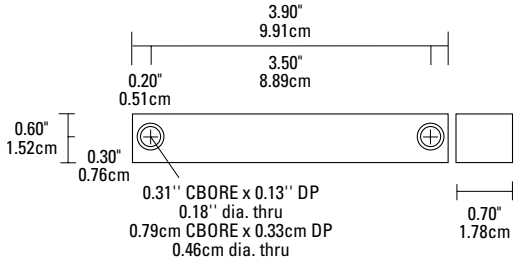
Industrial Screw Terminal

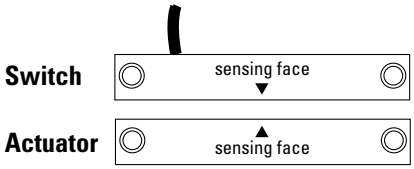
1045T Series

Applications

- Models for use on steel without time-consuming brackets
- Rugged construction
- Concealed terminals resist tampering and inadvertent shorting
- Easy clamping terminals speed installation
- Mounting screws

Test Points (Top)





General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically sealed reed switch
NEMA Rating	1
Protection Class	IP 62
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load 10,000,000 Under Dry Circuit
Connection	#6 screw terminal
Color Choices	Natural(N), Grey(G), Mahogany(M)
UL/ULC Listed	All Models

c UL us LISTED

Order Information	Electrical Specifications					
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance[3]**	**Sense Range[2] Nominal**
1045T-G, M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1.3" (3.2cm)
1047T-N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	1.3" (3.2cm)
1042TW-G, M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	3.0" (7.6cm)
1044TW-N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	3.0" (7.6cm)
1933-N	Actuator Only (For 1045T, 1046T, 1047T, 1047TH)					

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

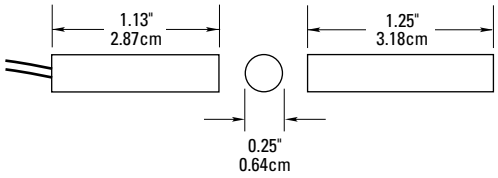
3 Biased for higher security applications

1/4" Diameter Switch With Wire Leads

1055 Series

Applications

- Economical
- Versatile
- Fits in limited space



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color	Natural
UL/ULC Listed	All Models

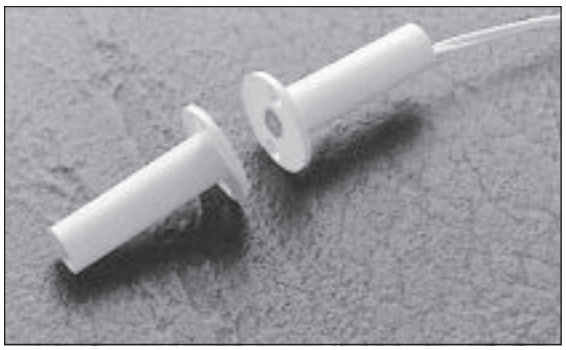
c UL us LISTED

Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
1055-N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.5" (1.3cm)	1'
1055W-N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1.3" (3.2cm)	1'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

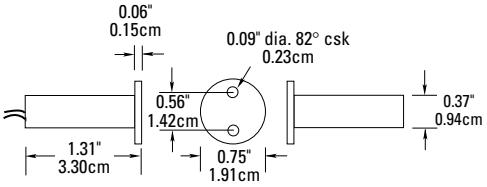


3/8" Diameter Flanged With Wire Leads

1072 Series

Applications

- Flanges for positive mounting; over-size holes
- Mounting screws included



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color	Natural
UL/ULC Listed	All Models

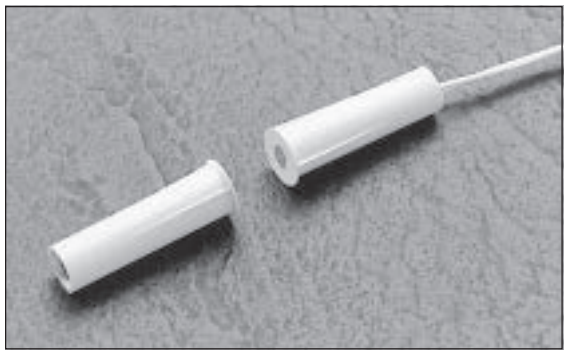
c UL us LISTED

Order Information	Electrical Specifications						
Part Number	**Contact Configuration[1]**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
1072-N	N.O.	7.5VA	100V	0.5A	0.2 Ohms	0.5" (1.3cm)	1'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

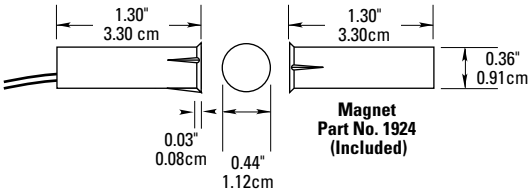


3/8" Diameter Press Fit With Wire Leads

1075 Series

Applications

- 3/8" press-fit mounting; no screws or glue needed
- Heavy-duty housing resists crushing



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color Choices	Natural(N), Mahogany(M)
UL/ULC Listed	All Models

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Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
1075-M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.5" (1.3cm)	1'
1075W-M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1.3" (3.2cm)	1'
1070-N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	0.5" (1.3cm)	1'
1924-M, N	Actuator Only						

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

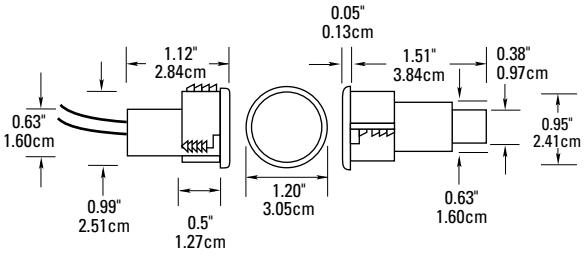
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

1" Diameter Steel Door With Wire Leads

1078 Series

Applications

- Special design for special mounting
- Self-lock mounting
- Rugged construction
- 15/16" dia. hole required
- UL approved for specific fire doors



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05"(0.15cm)
Color Choices	Natural(N), Mahogany(M), Grey(G)
UL/ULC Listed	All Models

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Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
1078-G, M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.5" (1.3cm)	1'
1078W-M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1.0" (2.5cm)	1'
1076-G, M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	0.5" (1.3cm)	1'
1076H-M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	0.5" (1.3cm)	1'
1076W-M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	1.0" (2.5cm)	1'
1076D-M, N	DPDT	3W/VA	30V	0.25A	0.2 Ohms	0.4" (1.0cm)	1'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

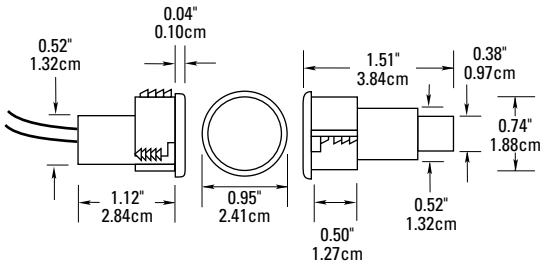
3 Biased for higher defeat resistance.

3/4" Steel Door With Wire Leads

1078C Series

Applications

- 3/4" diameter for easier drilling in metal
- Self-lock mounting
- Rugged construction



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color Choices	Natural(N), Mahogany(M), Grey(G)
UL/ULC Listed	All Models

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Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
1078C-G, M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.4" (1.0cm)	1'
1078CW-G, M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.8" (1.9cm)	1'
1076C-M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	0.4" (1.0cm)	1'
1076CW-M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	0.8" (1.9cm)	1'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

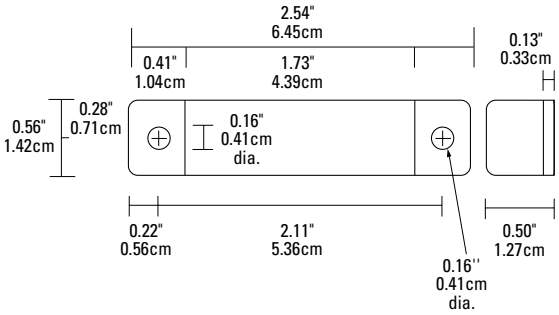
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

Screw Mount With Leads

1082 Series

Applications

- Convenient surface mounting
- Mounting screws included



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead/O.D.	#22 wire / 0.05" (0.15cm)
Color Choices	Natural(N), Mahogany(M), Grey(G)
UL Listed	All Models

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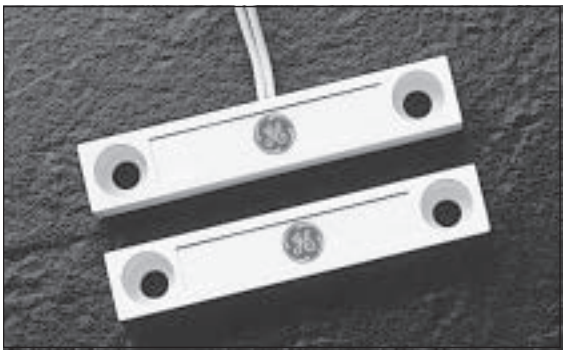
Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
1082-G, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1.0" (2.5cm)	1'
1084-M	SPDT	3W/VA	30V	0.25A	0.2 Ohms	1.0" (2.5cm)	1'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.



Screw Mount With Wire Leads

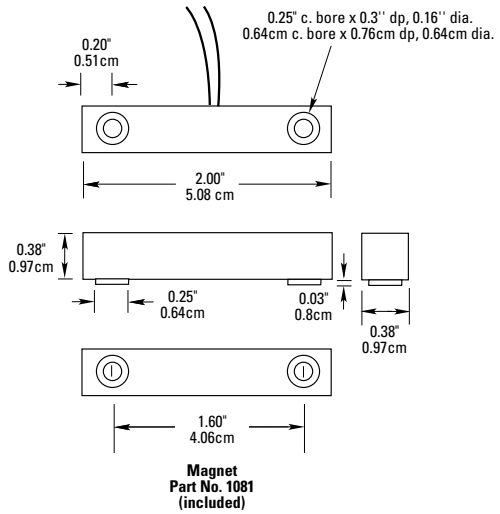
1085 Series

Applications

- Convenient surface mounting
- Mounting screws included

General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color Choices	Natural(N), Mahogany(M), Grey(G)
UL/ULC Listed	All Models



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Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
1085-G, M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.6" (1.6cm)	1'
1085W-M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1.5" (3.8cm)	1'
1086-N	N.C.	3W/VA	30V	0.25A	0.2 Ohms	0.6" (1.6cm)	1'
1086W-M	N.C.	3W/VA	30V	0.25A	0.2 Ohms	1.5" (3.8cm)	1'
1081-N	Actuator Only						

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

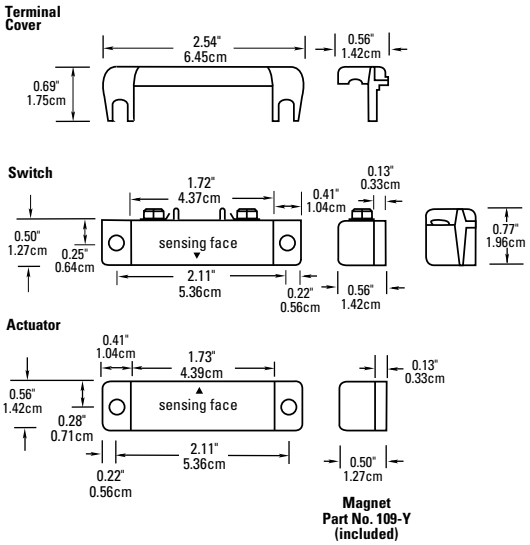
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

Screw Terminal

1085T Series

Applications

- Easy clamping terminals speed installation
- Convenient surface mounting
- Built-in resistors available; consult factory
- Cover, spacer, screws included



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch
NEMA Rating	1
Protection Class	IP 62
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Connection	#6 screw terminal
Color Choices	Natural(N), Mahogany(M), Grey(G)
UL/ULC Listed	All Models

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Order Information	Electrical Specifications					
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**
1085T-G, M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.8" (1.9cm)
1085TW-G, M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1.5" (3.8cm)
1084TW-N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	2.0" (5.1cm)
1086T-N	N.C.	3W/VA	30V	0.25A	0.2 Ohms	0.8" (1.9cm)
1087T-M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	0.8" (1.9cm)
1087TW-M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	1.5" (3.8cm)
1080T-N	Actuator Only (For 1082T, 1083T, 1084T, 1082TW, 1083TW, 1084TW					
1081T-N	Actuator Only (For 1085T, 1086T, 1087T, 1085TW, 1086TW, 1087TW)					

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

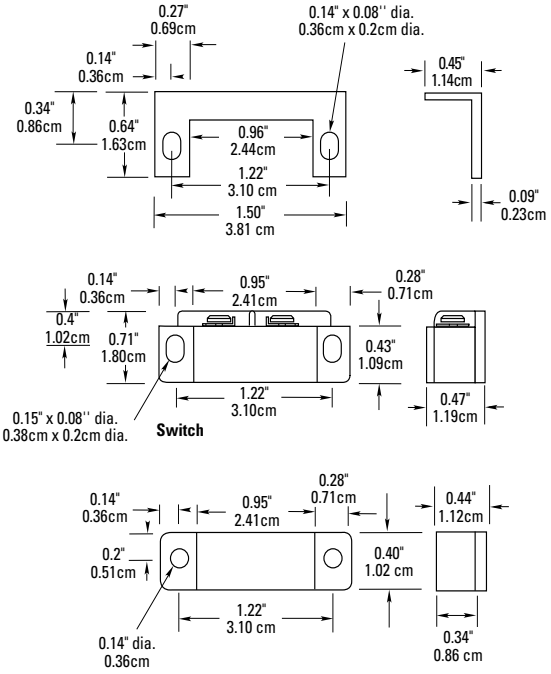
2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

Miniature With Screw Terminals

1135T Series

Applications

- Ideal for limited space applications
- Hermetically sealed switches resist corrosion and build up
- Ideal for use in dusty areas
- Cover, spacer, screws included



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General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch
NEMA Rating	1
Protection Class	IP 62
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Connection	#6 screw terminal
Color Choices	Natural(N), Mahogany(M)

Order Information	Electrical Specifications					
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**
1135T-N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	0.6" (1.6cm)
1136T-M	N.C.	3W/VA	30V	0.25A	0.2 Ohms	0.6" (1.6cm)

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

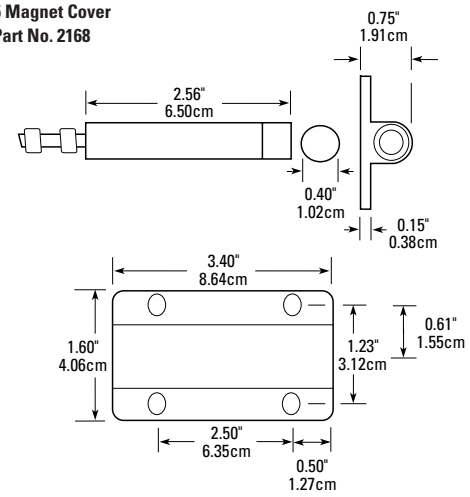
Magnapull™ Heavy Duty Magnetic Pull-Apart Cords

2100 Series

Applications

- Protect boats, trailers, heavy equipment
- Secures almost any loose item
- Positive magnetic retention
- Reed-actuated for high reliability
- Durable, heavy guage construction for long life
- Mounting hardware included

2105 Magnet Cover
Part No. 2168



General Specifications

Enclosure	ABS Plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load 10,000,000 Under Dry Circuit
Lead Types/O.D.	Stainless Steel Armored Cable with #22 wire / 0.28" (0.71cm)
Color	Grey

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Order Information	Electrical Specifications					
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Lead Length**
2105A-G	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	3'
2107A-G	SPDT	3W/VA	30V	0.25A	0.2 Ohms	3'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

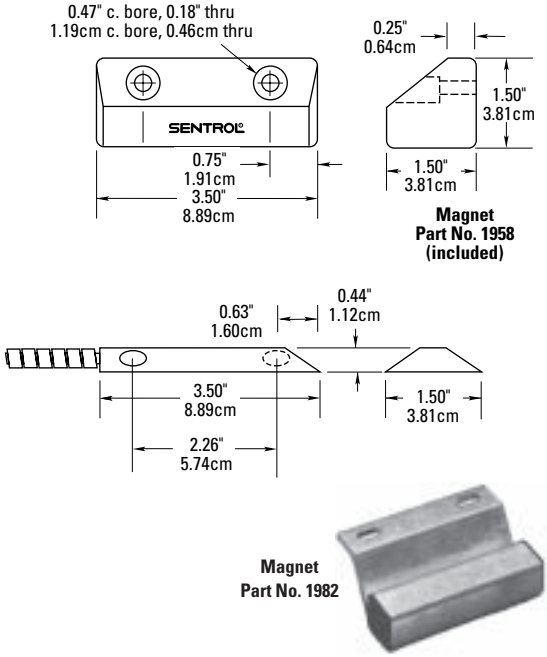
1 Configuration with actuator away from the switch

Miniature Surface Mount With Armored Cable

2200 Series

Applications

- Miniature, low-profile design
- Stainless steel armored cable for added reliability
- Wide working gap for overhead doors
- Small size less likely to be damaged by forklifts
- Aluminum bar stock resists corrosion in harsh environments
- Mounting hardware included
- Jacketed lead available



General Specifications

Enclosure	Aluminum (L)
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	Stainless Steel Armored Cable with #22 Wire / 0.28"(0.71cm)
UL/ULC Listed	All Models

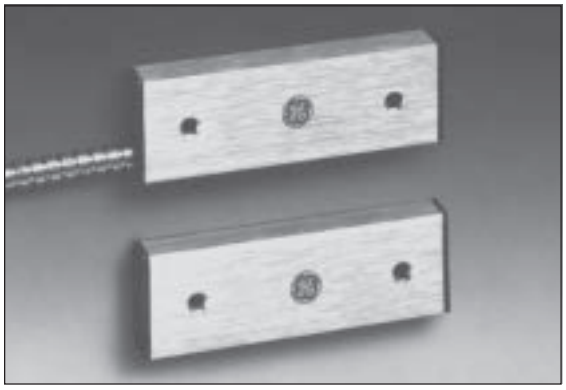
UL LISTED

Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Minimum**	**Lead Length**
2202A/2202AU-L	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	3.0" (7.6cm)	1.5'
2204A/2204AU-L	SPDT	3W/VA	30V	0.25A	0.2 Ohms	3.0" (7.6cm)	1.5'
2205AU-L	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	3.0" (7.6cm)	3'
2207A/2207AU-L	SPDT	3W/VA	30V	0.25A	0.2 Ohms	3.0" (7.6cm)	3'
1982	Flange Mount Universal Actuator Only						

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ±20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

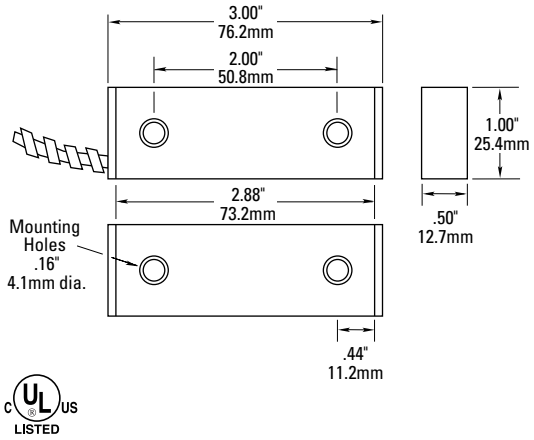


Aluminum Housing Armored Cable Wide Gap

2500 Series

Applications

- Mounting brackets available for gates, garage doors, freezers
- Rugged construction for long life
- Convenient surface mounting
- 2507AH is polarity-sensitive with reference to magnet direction



c UL us LISTED

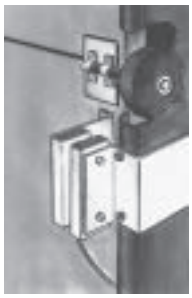
General Specifications

Enclosure	Brushed anodized aluminum with ABS plastic end caps (L)
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	Stainless Steel Armored Cable with #22 wire / (0.28") (0.71cm)
UL/ULC Listed	Most Models

Mounting Kits for 2500 Series

1092A Garage Door Track
Mounting Kit for Model 2505A

Includes:
1- 1940 bracket
1-1912 bracket
1-2505A contact,
mounting screws
and instructions



1094A Curtain Door
Mounting Kit for Model 2507AH

Includes:
1- 1941 bracket
1-1942 bracket
1-2507AH contact,
mounting screws
and instructions

Order Information	Electrical Specifications						
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Sense Range[2] Nominal**	**Lead Length**
2505A-L	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	3.0" (7.6cm)	3'
2507A-L	SPDT	3W/VA	30V	0.25A	0.25 Ohms	3.0" (7.6cm)	3'
2507AD[4]-L	DPDT	3W/VA	30V	0.25A	0.25 Ohms	1.5" (3.8cm) Min	3'
2507AH[3,4]-L	SPDT	3W/VA	30V	0.25A	0.25 Ohms	0.8" (1.9cm) Min	3'

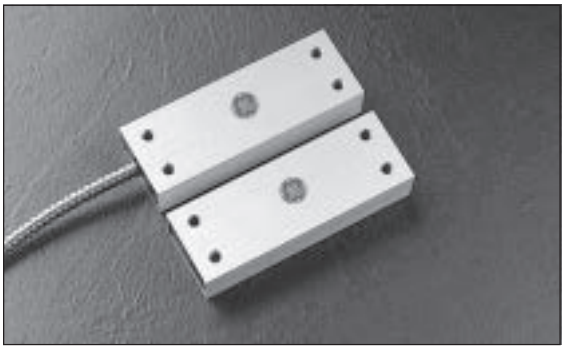
Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ± 20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

3 Note: 2507AH biased type temperature rating: -20°F to 150°F (-28°C to 65°C).

4 Not ULC Listed

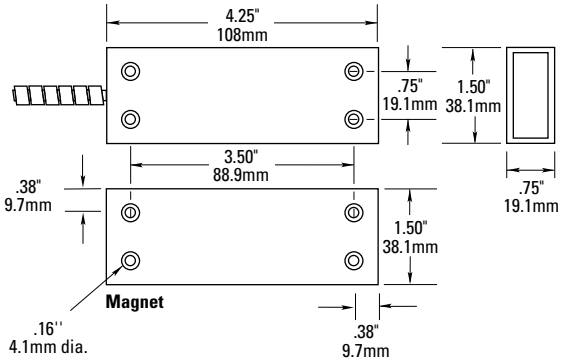


Anodized Alloy Housing with Armor Cable

2700 Series

Applications

- Triple-biased reeds make defeat of switch with external magnet virtually impossible
- Magnetic field tamper for added protection
- Factory compensated for effects of steel
- Available for several applications
  - overhead door
  - outside gate



General Specifications

Enclosure	Anodized Aluminum (L)
Temperature Range	-20°F to 150°F (-28°C to 65°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 4, 4x, 5, 6, 12
Protection Class	IP 67
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	Stainless Steel Armored Cable with #22 wire / 0.28" (0.71cm)
UL Listed	All Models

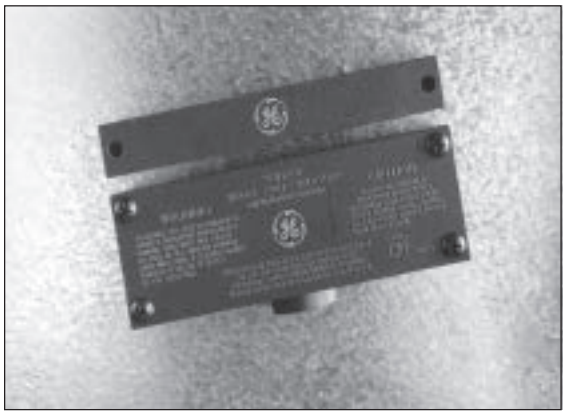
c UL us LISTED

Order Information	Electrical Specifications							
Part Number	Contact[1] Configuration	Load Rating (AC/DC)	Switching Voltage (AC/DC)	Switching Current (AC/DC)	Contact Resistance	Sense Range[2] Minimum	Sense Range Maximum	Lead Length
2707A-L	SPDT	3W/VA	30V	0.25A	1.5 Ohms	0.18" (0.5cm)	0.6" (1.6cm)	3'
2707 AD-L	DPDT	3W/VA	30V	0.25A	1.5 Ohms	0.18" (0.5cm)	0.6" (1.6cm)	3'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ± 20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

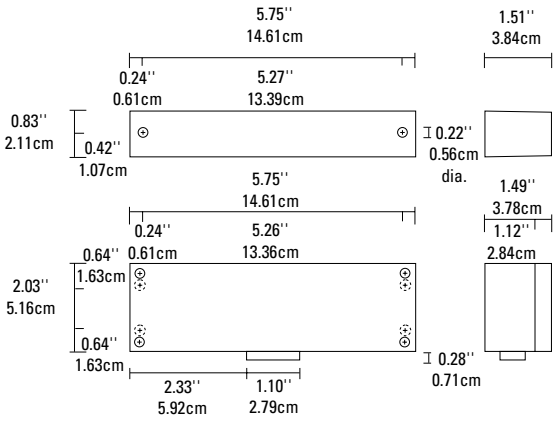


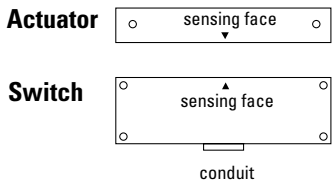
Explosion-Proof With Terminals

2800T Series

Applications

- Explosion-proof; UL listed for hazardous location classes:
  - Class I Group C, D
  - Class II Group E, F, and G
  - Class I Group B housing available
- Options include remote test, resettable current limiting devise, custom modifications available
- Switch has pry-tamper plate





c UL us LISTED

General Specifications

Enclosure	UL Explosion Proof, Die Cast Aluminum
Temperature Range	-40°F to -180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Reed Switch Encapsulated in Polyurethane
NEMA Rating	1, 2, 3, 5, 12
Protection Class	IP 64
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Conduit Connection	1/2" Thread NPT
UL Listed	All Models

Order Information	Electrical Specifications					
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Sense Range[2] Nominal**	**Terminal Type**
2807T-M	SPDT	3W/VA	30V	0.25A	0.18" (0.5cm) to 0.62" (1.6cm)	#6 Screw
2845T-M	N.O.	7.5W/VA	100V	0.5A	1.0" (2.5cm)	#6 Screw
2847T-M	SPDT	3W/VA	30V	0.25A	1.0" (2.5cm)	#6 Screw

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with actuator away from the switch

2 Proximity of ferrous materials usually reduces sense range — typically by 50%. The shape and type of material cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications. As measured on a nonferrous surface. Gap distances are nominal make distance ± 20%. Gap Specifications are for switch to make. Break distance is approximately 1.1 to 1.5 times make.

Recessed Roller Plunger With Wire Leads

3008 Series

Applications

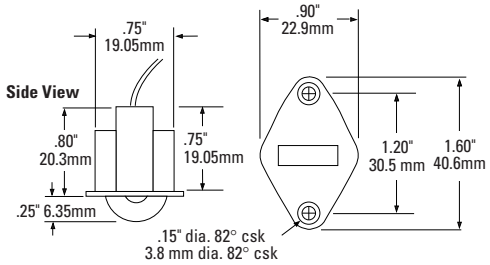
Model 3008 “Shorty”

- Short housing (3/4") fits in tight quarters
- Ideal for replacing short mechanical switches
- Flow-through design to ensure operation in dirty environments

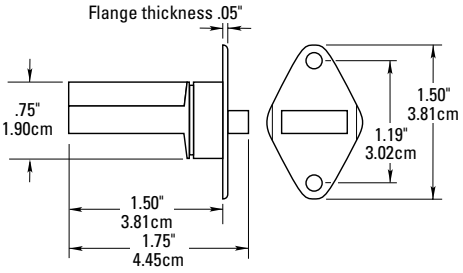
Model 3007

- Versatile; three different mounting configurations
- Ideal for doors
- Works as plunger or ball switch
- Flanges for reliable, positive retention
- Spacers, mounting screws included

Model 3008



Model 3007



General Specifications

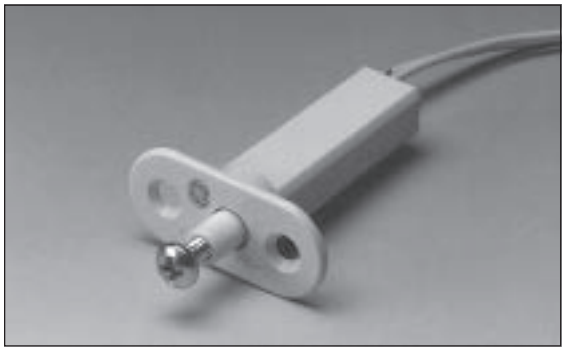
Enclosure	ABS plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Contact Housing is made of flame-retardant ABS plastic. Reed switch is protected and held in place by a polyurethane potting material
NEMA Rating	1
Protection Class	IP 62
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color Choices	Natural(N), Mahogany(M)
UL Listed	All Models

UL LISTED

Order Information	Electrical Specifications					
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Load Length**
3008-M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1'
3007-M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	1'

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with plunger out.

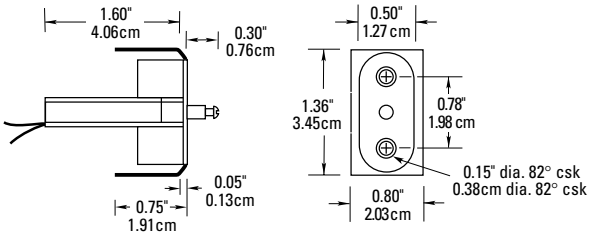


Recessed Pin Plunger

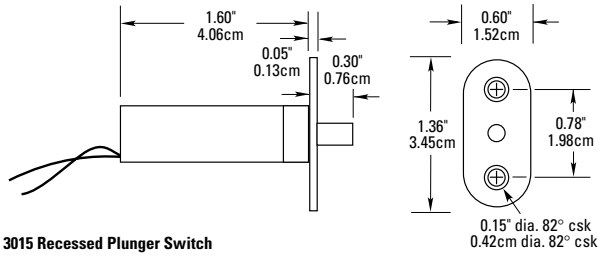
3010 Series

Applications

- Model 3015 available in plate mount or clip mount configuration
- Model 3025 plunger self-adjusts to proper reach
  - Pulling out on plunger shunts switch
  - Disconnection while servicing equipment is unnecessary

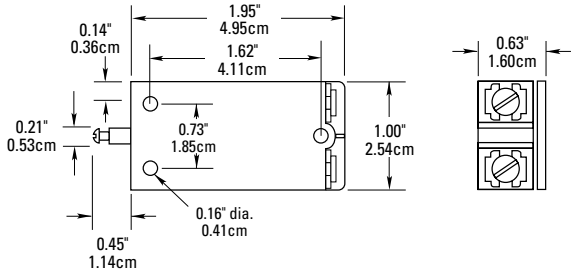


3012 Clip Mount Plunger



3015 Recessed Plunger Switch

Includes: 1– Adjustable #6 x 32 1/2" Phillips screw



3025 Tamper Switch

UL LISTED

General Specifications

Enclosure	ABS plastic
Temperature Range	-40°F to 150°F (-40°C to 65°C)
Environmental	Contact Housing is made of flame-retardant ABS plastic. Reed switch is protected and held in place by a polyurethane potting material
NEMA Rating	1
Protection Class	IP 62
Response Time	1 msec max.
Life Cycles	100,000 Under Full Load, 10,000,000 Under Dry Circuit
Lead Types/O.D.	#22 wire / 0.05" (0.15cm)
Color Choices	Natural(N), Mahogany(M)
UL Listed	All Models

Order Information	Electrical Specifications					
Part Number	**Contact[1] Configuration**	**Load Rating (AC/DC)**	**Switching Voltage (AC/DC)**	**Switching Current (AC/DC)**	**Contact Resistance**	**Lead Length**
3012-M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1'
3015-M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	1'
3027-M, N	SPDT	3W/VA	30V	0.25A	0.2 Ohms	1'
3025T-M, N	N.O.	7.5W/VA	100V	0.5A	0.2 Ohms	#6 Screw Terminal

Warning— Each electrical rating is an individual maximum and cannot be exceeded!

1 Configuration with plunger out.

Magnets & Accessories

3/8" dia. x 1 1/2" L

Part Number 1057

Ceramic
1/2" dia. x 1/4" thick

Part Number 1802

1/4" dia. x 5/8" L

Part Number 1804

Rare Earth
Mini-Max standard gap
3/8" dia. x 1/8" thick

Part Number 1830

Rare Earth
Mini-Max wide gap
5/8" dia. x 1/8" thick

Part Number IND1835

3/8" dia. x 2 1/2" L

Part Number 1923

Part Number 1955

Part Number 1956

Tampruf® Screws

Installation Tools for Tampruf® Screws

- Tampruf screwdriver (1955)
- Fits 1/4" drive for #6 and #8 screws (1956)
  (Bit not included with screwdriver)

Tampruf® Roundhead Metal/Wood Screw

- #6 x 3/4" L
- Cadmium plated
- Case hardened

Tampruf® Roundhead Metal/Wood Screw

- #8 x 1-1/2" L
- Cadmium plated
- Case hardened

Part Number 1953

Part Number 1954

Appendix

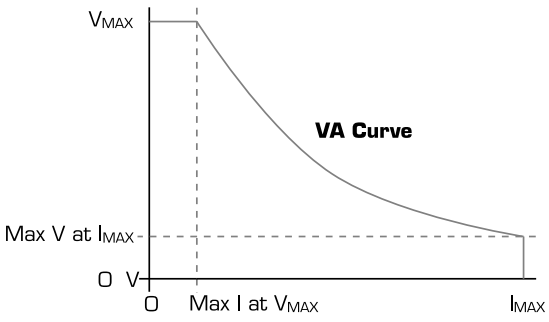
Maximum VA Rating

Most GE Interlogix Industrial products are based on reed switch technology. Reeds are fast mechanical switches which are magnetically actuated. Inherent in their design are contacts in close proximity. This facilitates the "magnetic circuit" necessary for actuation. It also puts strict limitations on the amount of power which a given switch can handle. The power rating curve of a generic reed switch has the shape shown in figure 1.

V max is the ABSOLUTE MAXIMUM allowable voltage which the switch can EVER see (including switching transients). Above this level internal arcing will occur and damage the switch. However, there are conditions where a voltage less than V max will overload the switch. See VA rating below.

I max is the ABSOLUTE MAXIMUM allowable current which the switch can EVER carry (including switching transients). Above this level serious degrading of reed contacts which can cause the switch to stick closed, producing an extreme safety hazard for interlock applications. Remember also, there are conditions where currents less than I max will overload the switch. See VA rating below.

Figure 1



Example

Switch Rating: 15 VA, 120 V, 0.5A

Maximum Current at 120 Volts:

$$A = {}^{VA}/_{V} = {}^{15}/_{120} = 0.125 \text{ A}$$

Maximum Voltage at 0.5 Amps:

$$V = {}^{VA}/_{A} = {}^{15}/_{0.5} = 0.125 \text{ A}$$

VA Curve

This curve indicates the power limitation for the load which a given switch can handle, and cuts a big chunk out of the square defined by V max and I max:

V max can only be approached if the current is severely limited.

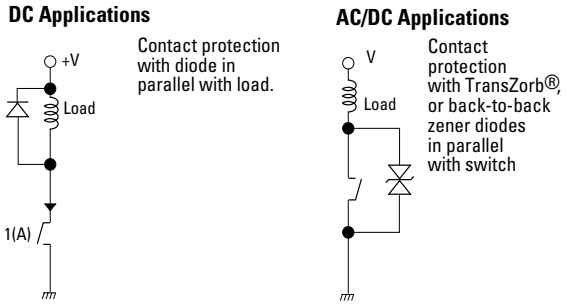
I max can only be approached if the voltage is severely limited.

The load power rating for GE Interlogix Industrial switches is always stated in Volt-Amps. In DC applications Volts times Amps always yields power in Watts. However, in AC applications this is true only with a unity Power Factor. In general, for AC applications apparent power exceeds real power. Real Power is measured in Watts. Apparent Power is measured in Volt-Amps.

Appendix

Recommended Protection Circuits

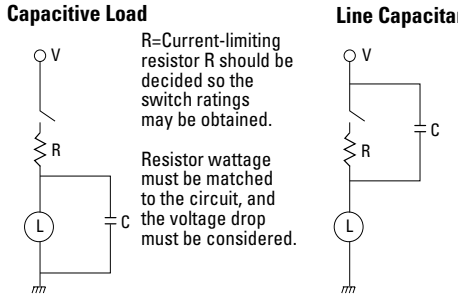
Figure 1



Protection Circuits — Inductive Loads

If the GuardSwitch™ is applied in a circuit that has an inductive electromechanical device such as a relay, solenoid, or contactor, the energy stored in that device will provide an inverse voltage to the GuardSwitch™ when the interlock opens. If this inductive back EMF exceeds the electrical rating of the switch, a protection circuit is required to prevent premature interlock failure. Two recommended protection circuits for inductive loads are shown in Figure 1.

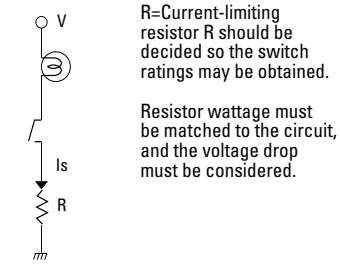
Figure 2



Protection Circuits —Capacitance Loads

Capacitive loads or long cable runs that exceed 50 feet are prone to high inrush currents, which if they exceed the electrical rating of the switch, will cause premature interlock failure. This inrush can be reduced by a resistor as shown in the circuits in Figure 2.

Figure 3



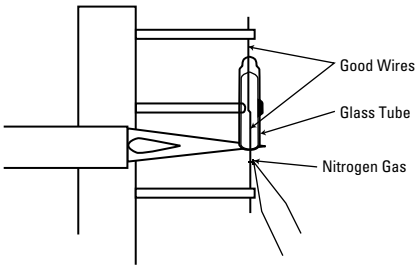
Protection Circuits —Lamp Loads

Tungsten lamp loads are a less obvious source of transient surges, yet are equally damaging to the interlock. Cold lamp filaments can have a resistance 10 times smaller than already glowing filaments, causing an inrush 10 times greater than the steady state current. If the inrush load exceeds the electrical rating of the GuardSwitch™, a protection circuit such as illustrated in Figure 3 should be used. GE Interlogix Industrial's triac (-8, -18, -E, -DT) switches can switch up to 150 VA without added protection.

Appendix

Reed Switch Assembly

Figure 1



Reed assembly begins with the special forming of the magnetic wires to give them the proper shape and flexibility. Next, the blades are plated with rhodium, ruthenium, tungsten, or gold to give them a very hard surface with good electrical conductivity. Two of the reed wires are then critically positioned in a small glass tube. A nitrogen gas stream is directed through the tube as heat is applied to the upper end of the tube. The heat melts the tip of the tube around the wire to form a seal. The heat is moved to the other end of the tube and it too is melted to form the second seal. The second seal secures the second wire and forms a hermetic seal with the glass tube filled with nitrogen.
See Figure 1.

Reed Switch Types

There are three different types of reed switches in general use. They are, Form A (two wire, normally open), Form B (two wire, normally closed) and Form C (three wire, normally open and normally closed). Form C reeds are also called single pole-double throw (SPDT) switches.

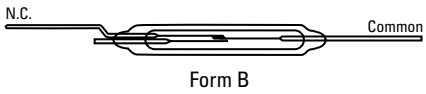
Form A-Normally Open (N.O.)

Figure 2

Form A reeds are switches that are normally open when there is no magnetic field near them and closed when a magnet is in proximity. The “normally open” title is the common electrical description for switches whose non-actuated condition is open (switch contacts are not touching and no electrical current can flow.) See Figure 2.

Form B-Normally Closed (N.C.)

Figure 3



Form B reeds are switches that are normally closed when there is no magnetic field near and open when a magnet is in proximity. The “normally closed” title is the common electrical description for switches whose non-actuated condition is closed. See Figure 3.

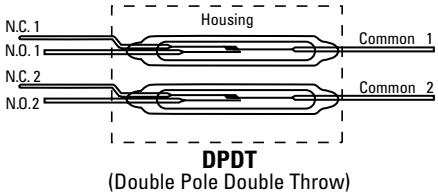
Form C-Single Pole Double Throw (SPDT)

Figure 4

Form C reeds are switches that can be either normally open or normally closed. Form C switches have three wires: the center or Common wire, the normally closed wire and the normally open wire. In the non-actuated condition, current flows in the common wire and out the closed wire as noted in Form B above. In the operated condition the common element switches from the closed wire to the open wire allowing current to flow from common to the normally open wire as noted in the Form A description above. See figure 4.

Double Pole Double Throw-DPDT

Figure 5



Double Pole Double Throw contacts are created by assembling two Form C reeds in the same switch housing. DPDT contacts can be used in circuits to perform separate functions at the same time. The two switches have independent sense ranges. Usually one contact is connected to the safety circuit and the second switch is connected to an indicator or status light. See Figure 5.

Appendix

Reed Switch Assembly

Reed Switch Sensitivity

The gap distance noted for a reed contact is the distance between the actuating magnet and the contact when the reed operates. Gap distance is defined by the size of the magnet and reed sensitivity. Reed sensitivity is measured in terms of how much magnetism it takes to operate the switch and is measured in ampere turns. To explain, electrical current flowing through wire creates a magnetic field around the wire. When this wire is wrapped around a reed switch the magnetism is felt by the reed proportional to the number of turns around the reed. Therefore, amps in the wire times the number of turn equals amp-turns. Standard reed sensitivities are 10 to 70 amp-turns for safety and position switches. Wide gap contacts have reed sensitivities of 6 to 10 amp-turns. In the last few years reed switch manufacturers have been able to supply reliable Form A reeds that meet the wide gap sensitivity requirements which has allowed lower cost wide gap contacts. Reed manufacturers have not been able to manufacture high sensitivity Form C reeds therefore, wide gap and SPDT contacts are created by performing a wide gap operation during contact assembly. The wide gap operation is accomplished by gluing a small magnet to the reed to give it a boost in sensitivity. Wide gapping a reed causes the contact to become polarity sensitive. When mounting a wide gap Form B and C contacts the installer must insure that the actuator magnet is installed observing proper polarity.

Other terms that are associated with switch gap are make, break and differential.

Switch “make” is the term used to note switch actuation and usually applies to the gap distance between the switch and magnet when the switch operates.

Switch “break” is the term used to note switch deactivation or “drop out”. Break also is used on reference to switch-magnet gap when the switch opens.

“Differential” is distance between switch gap at make and the switch gap at break. This is also known as the hold distance or hysteresis and it can be a significant distance with some wide gap contacts.

How Temperature Affects Reeds

A general rule to remember in considering temperature affects on reeds contacts is: As temperature increases magnetism decreases. As temperature decreases magnetism increases. In very hot conditions switch gaps are reduced. In most situations this is not a problem because safety and position contacts are mounted inside and are protected from temperature extremes. In high temperatures reed contacts perform well if they are set up at mid gap distance while ambient temp is 50 to 90 degrees F. Caution should be used when installing coded magnet switches in potential high temperature environments because the gap tolerance for coded magnet switches is narrow, sometimes only 0.4 inches. Loss of magnetism here will cause false signals or improper operation.

Appendix

Figure 6

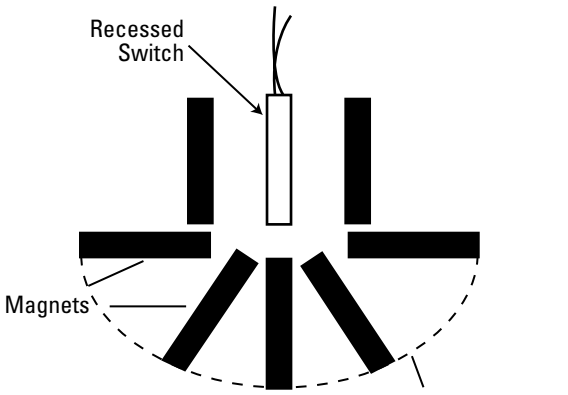


Figure 1
Acceptable Magnet
Mounting Positions

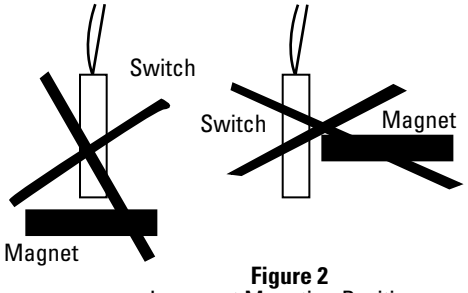


Figure 2
Incorrect Mounting Positions

Reed Switch Assembly

In cold conditions standard contacts work very well, even below -40°F. Wide gap and high sensitivity switches however will latch in extremely cold conditions. In temperatures below freezing the wide gap magnet in the switch increases in magnetism and can cause the reed to remain closed when the control magnet is withdrawn. Use non-biased, standard gap contacts where temperatures are likely to go below 20°F.

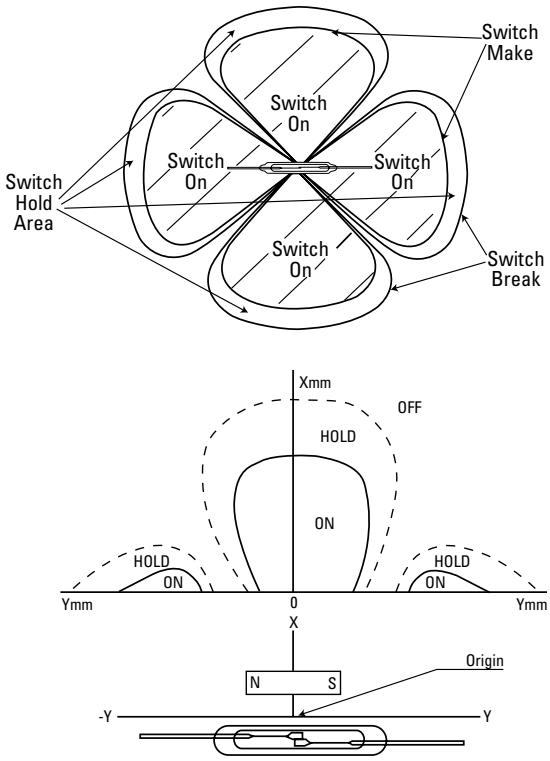
Magnet-Switch Orientation

There are several ways of arranging switch and magnet orientation to fit installation needs and there are some mounting arrangements that must be avoided. Surface mounted contacts are normally mounted side by side and recessed contacts are usually mounted end to end. With both mounting methods it is important to observe the proper magnet-switch polarity.

In these examples the magnet movement relative to the contact position causes the switch to operate. Figure 6 demonstrates correct and incorrect magnet positions with respect to Series 100 contact. Avoid contact mounting where the switch and magnet are positioned to form a “T”. In this orientation the center of the magnet and/or the center of the switch has zero magnetism and the switch will not work.

Figure 7 is a clover leaf diagram of magnetic operational zones around a reed switch. Each leaf represents an area where a magnet can be positioned to operate the switch. Please note that the make and break zones are different in that the magnet must be close to cause switch make but once made, the switch will stay operational beyond the make distance, out to the break distance.

Figure 7



Warnings & Warranty

Warnings

Nominal sense range is measured on a non-ferrous surface. Proximity of ferrous material usually reduces sense range—typically by 50%. The shape of the material and type of material can cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

All electrical ratings are individual maximums. Exceeding any one specification (including inrush) may result in switch failure. In selecting a part number, the transient surges from coils, contactors, motors, solenoids and tungsten loads must be considered.

Warranty

All products of GE Interlogix Industrial are sold with a limited warranty as specified below:

Because the manufacturer does not install, adjust, place or operate this device the manufacturer cannot guarantee the performance of this interlock device. Therefore, there are no express warranties (except as stated herein below) or implied warranties (including any warranty of merchantability or fitness) attached to the sale or use of this product.

In lieu of all other express warranties or any implied warranties MANUFACTURER EXPRESSLY WARRANTS against defects in material and workmanship in safety interlock and interlock switches for five (5) years and all other devices for one (1) year from the date of manufacture. During the warranty period, the manufacturer will repair or replace, at its sole option, free of charge, any defective unit returned freight prepaid. This warranty shall remain in full force and effect for the above stated periods from the date of manufacture provided that the unit: is owned by the original purchaser; was properly installed and operated; has not been subjected to abuse or misuse; and, has not been repaired, altered, or modified outside manufacturer's authorized facilities.

The foregoing states the buyer's sole and exclusive remedy for any breach of warranty or for any claim, whether sounding in contract, tort, strict liability or negligence, based upon any defect in this device. Manufacturer shall in no event be responsible for any incidental or consequential damages incurred by the buyer.

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Certain items protected under one or more of the following patents:

4,210,888 and 5,233,323. Other patents pending.