

Safety Switches

Non-Contact Switches

Ferrogard™ 1, 2, 20 & 21



Description

The Ferrogard range of magnetically actuated safety switches offers non-contact reliability together with tolerance to misalignment. They are designed to be installed so that when a guard door is opened, the action of the magnetic actuator being removed from the switch opens the N.C. safety contacts which are intended for the isolation of control power to a machine primary control element.

The FRS1, FRS2, FRS20, FRS21 are rectangular housings. Sealed to IP67 (NEMA 6P), these Ferrogards are ideal for wet environments.

Unlike some magnetic switches the Ferrogards have protected safety contacts to help ensure that they do not fail to danger. In addition, some versions have independent auxiliary signal contacts to indicate the guard condition.

All Ferrogards have internal non-resettable overload protection on the safety contact. They should be protected by an external fuse rated as shown in the Specifications table.

Features

- Non-contact actuation
- High tolerance to misalignment
- High switching current (up to 2 A AC, 1 A DC)
- Plastic rectangular housing (IP67)
- Cable or quick-disconnect (QD) connections

Specifications

| Safety Ratings | |
|--|--|
| Standards | EN954-1, ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, ISO14119, ANSI B11.19, AS4024.1 |
| Safety Classification | Cat. 1 Device per EN954-1 Dual channel interlocks suitable for Cat. 3 or 4 systems |
| Functional Safety Data | B10d: > 2 x 10 ⁶ operations at min. PFH _D : > 3 x 10 ⁻⁷ MTTF _D : > 385 years |
| Note: For up-to-date information, visit http://www.ab.com/Safety/ | Dual channel interlock may be suitable for performance levels PLe or PLd (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on application characteristics |
| Certifications | CE Marked for all applicable directives and cULus |
| Outputs (Guard Door Closed, Actuator in Place) | |
| Safety Outputs | FRS1: 1 N.C., FRS2: 1 N.C., FRS20: 2 N.C., FRS21: 2 N.C. |
| Auxiliary Outputs | FRS1: None, FRS2: 1 N.O., FRS20: None, FRS21: 1 N.O. |
| Operating Characteristics | |
| Operating Distance, Make [mm (in.)] | Safety: 12 (0.47); Auxiliary: 15 (0.59) |
| Operating Distance, Break [mm (in.)] | Safety: 23 (0.91); Auxiliary: 26 (1.02) |
| Fuses, External | FRS1, 2 & 21: 1.6 A (Bussmann BK/60 A-1.6 A) max. FRS20: 0.4 A (Bussmann BK/60 A-400 mA) max. |
| Environmental | |
| Enclosure Type Rating | IP67 (NEMA 6P) |
| Operating Temperature [C (F)] | -10...+55° (+14...+131°) |
| Relative Humidity | 5...95% |
| Shock | 50 g |
| Vibration | 7 g; 50...200 Hz |
| Radio Frequency | IEC 61000-4-3, IEC 61000-4-6 |
| Physical Characteristics | |
| Actuator/Housing Material | Molded ABS plastic |
| Weight [g (lbs)] | FRS 1—Sensor: 35 (0.08)/Actuator: 85 (0.19) FRS 2—Sensor: 40 (0.09)/Actuator: 85 (0.19) FRS 20—Sensor: 43 (0.09)/Actuator: 85 (0.19) FRS 21—Sensor: 43 (0.09)/Actuator: 85 (0.19) |
| Color | Red |

- * Usable for ISO 13849-1:2006 and IEC 62061. Data other than B10d is based on:
- Usage rate of 1op/10 mins., 24 hrs/day, 360 days/year, representing 51840 operations per year
 - Mission time/Proof test interval of 38 years

Safety Switches
Non-Contact Switches
 Ferrogard™ 1, 2, 20 & 21

Product Selection

| Safety Contact Switching Capability | Safety Contacts | Auxiliary Contacts | Connection | Type | Cat. No. |
|-------------------------------------|-----------------|--------------------|--------------------|--------|-------------|
| 250V AC, 2 A max | 1 N.C. | — | 2 m Cable | FRS 1 | 440N-G02001 |
| | | | 4 m Cable | | 440N-G02004 |
| | | | 6 m Cable | | 440N-G02022 |
| | | | 8 m Cable | | 440N-G02041 |
| | | | 10 m Cable | | 440N-G02015 |
| | | 1 N.O. | 2 m Cable | FRS 2 | 440N-G02002 |
| | | | 4 m Cable | | 440N-G02014 |
| | | | 6 m Cable | | 440N-G02038 |
| | | | 8 m Cable | | 440N-G02033 |
| | | | 10 m Cable | | 440N-G02019 |
| | 2 N.C. | — | 15 m Cable | FRS 20 | 440N-G02043 |
| | | | 20 m Cable | | 440N-G02040 |
| | 2 N.C. | 1 N.O. | 4-Pin Micro QD | FRS 21 | 440N-G02093 |
| | | | 2 m Cable | | 440N-G02055 |
| | | | 4 m Cable | | 440N-G02061 |
| | | | 6 m Cable | | 440N-G02060 |
| | | | 10 m Cable | | 440N-G02059 |
| 24V DC, 1 A | 1 N.C. | 1 N.O. | 6-Pin AC Micro QD§ | FRS 2 | 440N-G02098 |
| | | | 2 m Cable | | 440N-G02092 |
| | 2 N.C. | — | 4-Pin Micro QD | FRS 20 | 440N-G02094 |
| | | | 4 m Cable | | 440N-G02085 |
| | | 1 N.O. | 4-Pin Micro QD | FRS 21 | 440N-G02090 |
| | | | 2 m Cable | | 440N-G02058 |
| | | | 4 m Cable | | 440N-G02077 |
| 6 m Cable | 440N-G02083 | | | | |
| 6-Pin Micro QD | 440N-G02099 | | | | |

Note: Contacts are described with the guard door closed, that is, actuator in place. Switch is shipped complete with actuator.
 § For connector ratings see 3-9.

Safety Switches

Non-Contact Switches

Ferrogard™ 1, 2, 20 & 21

Recommended Logic Interfaces

| Description | Safety Outputs | Auxiliary Outputs | Terminals | Reset Type | Power Supply | Cat. Page No. | Cat. No. |
|---|------------------------------|------------------------------|-------------------|----------------------------------|---------------------------|---------------|-------------|
| Single-Function Safety Relays for 2 N.C. Contact Switch | | | | | | | |
| MSR127RP | 3 N.O. | 1 N.C. | Removable (Screw) | Monitored Manual | 24V AC/DC | 5-26 | 440R-N23135 |
| MSR127TP | 3 N.O. | 1 N.C. | Removable (Screw) | Auto./Manual | 24V AC/DC | 5-26 | 440R-N23132 |
| MSR30T | 2 N.O. Solid State | 1 N.O. Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC | 5-16 | 440R-N23198 |
| Single-Function Safety Relays for 1 N.C. & 1 N.O. Contact Switch | | | | | | | |
| MSR9T | 2 N.O. | 1 N.C. | Fixed | Auto./Manual | 24V AC/DC | 5-14 | 440R-F23027 |
| MSR33RT | 2 N.O. Solid State | 1 N.O. | Removable | Auto. or Monitored Manual | 24V DC SELV | 5-18 | 440R-F23200 |
| Modular Safety Relays | | | | | | | |
| MSR211P Base 2 N.C. only | 2 N.O. | 1 N.C. and 2 PNP Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC from the base unit | 5-84 | 440R-H23176 |
| MSR220P Input Module | — | — | Removable | — | 24V DC | 5-86 | 440R-H23178 |
| MSR310P Base | MSR300 Series Output Modules | 3 PNP Solid State | Removable | Auto./Manual Monitored Manual | 24V DC | 5-102 | 440R-W23219 |
| MSR320P Input Module | — | 2 PNP Solid State | Removable | — | 24V DC from the base unit | 5-106 | 440R-W23218 |

Note: For additional Safety Relays connectivity, see page 5-12.
 For additional Safety I/O and Safety PLC connectivity, see page 5-116.
 For application and wiring diagrams, see page 10-1.

Connection Systems

| Description | Connection to Distribution Box | 6-Pin Micro (M12) |
|------------------|--------------------------------|-------------------|
| | 4-Pin Micro (M12) | 1 N.C. & 1 N.O. |
| Cordset | 889D-F4AC-* | 889R-F6ECA-* |
| Patchcord | 889D-F4ACDM-* | 889R-F6ECRM-* |
| Distribution Box | 898D-P4†KT-DM4 | 898R-F68MT-A5 |
| Shorting Plug | 898D-41KU-DM | 898R-P61MU-RM |
| T-Port | 898D-43KY-D4 | — |

* Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
 * Replace symbol with 1 (1 m), 2 (2 m), 3 (3 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
 † Replace symbol with 4 or 8 for number of ports.

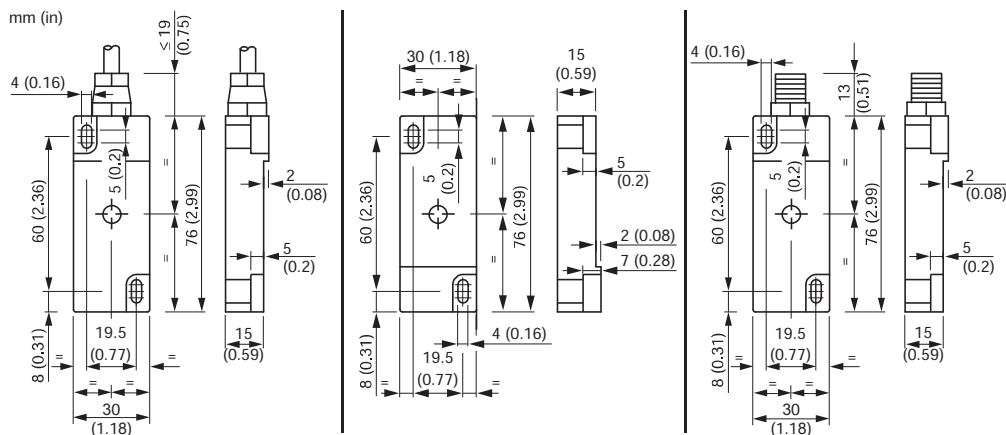
Note: For additional information, see the Safety Connection System section (page 7-1) of this catalog.

Accessories

| Description | Cat. No. |
|----------------------|-------------|
| Replacement Actuator | 440N-A02005 |

Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



Typical Wiring Diagrams

| | | FRS1 | FRS2 | FRS20 | FRS21 |
|---|-----------|--------|-----------------|----------|-----------------|
| | | 1 N.C. | 1 N.C. + 1 N.O. | 2 N.C. | 2 N.C. + 1 N.O. |
| 4-Pin Micro (M12) | | — | | | — |
| 6-Pin Micro (M12) | | — | — | — | |
| Cordset 889D-F4AC-* or Cable Versions | Brown | — | Safety A | Safety A | — |
| | Blue | — | — | — | — |
| | Black | — | Aux A | Safety B | — |
| | White | — | — | — | — |
| Cordset 889R-F6ECA-* | Red/White | — | — | — | Safety A |
| | Red/Black | — | — | — | — |
| | Red | — | — | — | Safety B |
| | Red/Blue | — | — | — | — |
| | Green | — | — | — | Aux A |
| Cable Versions | Safety A | Brown | Blue | Brown | Black |
| | | Blue | White | Blue | White |
| | Safety B | — | Yellow | Black | Red |
| | | — | Green | White | Blue |
| Aux A | — | — | — | Yellow | |
| | | | | | Green |

* Replace symbol with 2 (2 m), 5 (5 m) or 10 (10 m) for standard cable lengths.

Non-Contact Switches

Ferrogard™ 3, 4 & 5



Description

The Ferrogard range of magnetically actuated switches offers non-contact reliability together with tolerance to misalignment. They are designed to be installed so that when a guard door is opened, the action of the magnetic actuator being removed from the switches opens the N.C. safety contacts which are intended for the isolation of control power to a machine primary control element.

The FRS 3, 4 and 5 have terminal connections. The user must drill a hole in the housing at a convenient location to allow the wiring to enter the housing. The cover is secured with anti-tamper security screws.

Unlike some magnetic switches the Ferrogards have protected safety contacts to help ensure that they do not fail to danger. In addition, some versions have independent auxiliary signal contacts to indicate the guard condition.

All Ferrogards have internal non-resettable overload protection on the safety contact. They should be protected by an external fuse rated as shown in the Specifications table.

Features

- Non-contact actuation
- High tolerance to misalignment
- High switching current (up to 2 A)
- Various contact arrangements
- Terminal connections

Specifications

| Safety Ratings | |
|---|--|
| Standards | EN954-1, ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, ISO14119, ANSI B11.19, AS4024.1 |
| Safety Classification | Cat. 1 Device per EN954-1 Dual channel interlocks suitable for Cat. 3 or 4 systems |
| Functional Safety Data * | B10d: > 2 x 10 ⁶ operations at min. PFH _D : > 3 x 10 ⁻⁷ MTTF _D : > 385 years |
| Note: For up-to-date information, visit http://www.ab.com/Safety/ | Dual channel interlock may be suitable for performance levels PLe or PLd (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on application characteristics |
| Certifications | CE Marked for all applicable directives and cULus |
| Outputs (Guard Door Closed, Actuator in Place) | |
| Safety Outputs | FRS3: 1 N.C., FRS4: 1 N.C., FRS5: 1 N.C. |
| Auxiliary Outputs | FRS3: 1 N.C., FRS4: 1 N.O., FRS5: None |
| Operating Characteristics | |
| Operating Distance, Make [mm (in.)] | Safety/Auxiliary: FRS 3—12 (0.47); FRS 4—12 (0.47); FRS 5—12 (0.47) |
| Operating Distance, Break [mm (in.)] | Safety/Auxiliary: FRS 3—24 (0.94); FRS 4—10 (0.39); FRS 5—12 (0.47) |
| Auxiliary Contact Switching Capability, Min | 300V DC, 250V AC 0.5 A including inrush |
| Safety Contact External Fusing | ≤1.6 A quick blow |
| Environmental | |
| Enclosure Type Rating | IP65 (NEMA 13) |
| Operating Temperature [C (F)] | -10...+65° (+14...+149°) |
| Relative Humidity | 5...95% |
| Shock | IEC 68-2-27, 30 g, 11 ms |
| Vibration | IEC 68-2-6, 10...200 Hz |
| Radio Frequency | IEC 61000-4-3, IEC 61000-4-6 |
| Physical Characteristics | |
| Housing Material | Molded ABS plastic |
| Actuator Material | Molded ABS plastic |
| Color | Red |

- * Usable for ISO 13849-1:2006 and IEC 62061. Data other than B10d is based on:
- Usage rate of 1op/10 mins., 24 hrs/day, 360 days/year, representing 51840 operations per year
 - Mission time/Proof test interval of 38 years

Product Selection

| Safety Contact Switching Capability | Connection Type | Housing Material | Safety Contacts | Auxiliary Contacts | Type | Cat. No. |
|-------------------------------------|-----------------|------------------------|-----------------|--------------------|-------|-------------|
| 250V AC 2 A max | Terminals | Red Molded ABS Plastic | 1 N.C. | 1 N.C. | FRS 3 | 440N-G02003 |
| | | | | 1 N.O. | FRS 4 | 440N-G02008 |
| | | | | — | FRS 5 | 440N-G02009 |

Note: Contacts are described with the guard door closed, that is, actuator in place.

Recommended Logic Interfaces

| Description | Safety Outputs | Auxiliary Outputs | Terminals | Reset Type | Power Supply | Cat. Page No. | Cat. No. |
|--------------------------------------|------------------------------|------------------------------|-------------------|----------------------------------|---------------------------|---------------|--------------------|
| Single-Function Safety Relays | | | | | | | |
| MSR127RP | 3 N.O. | 1 N.C. | Removable (Screw) | Monitored Manual | 24V AC/DC | 5-26 | 440R-N23135 |
| MSR127TP | 3 N.O. | 1 N.C. | Removable (Screw) | Auto./Manual | 24V AC/DC | 5-26 | 440R-N23132 |
| MSR126T | 2 N.O. | None | Fixed | Auto./Manual | 24V AC/DC | 5-24 | 440R-N23117 |
| MSR30T | 2 N.O. Solid State | 1 N.O. Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC | 5-16 | 440R-N23198 |
| Modular Safety Relays | | | | | | | |
| MSR210P Base 2 N.C. only | 2 N.O. | 1 N.C. and 2 PNP Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC from the base unit | 5-82 | 440R-H23176 |
| MSR220P Input Module | — | — | Removable | — | 24V DC | 5-86 | 440R-H23178 |
| MSR310P Base | MSR300 Series Output Modules | 3 PNP Solid State | Removable | Auto./Manual Monitored Manual | 24V DC | 5-102 | 440R-W23219 |
| MSR320P Input Module | — | 2 PNP Solid State | Removable | — | 24V DC from the base unit | 5-106 | 440R-W23218 |

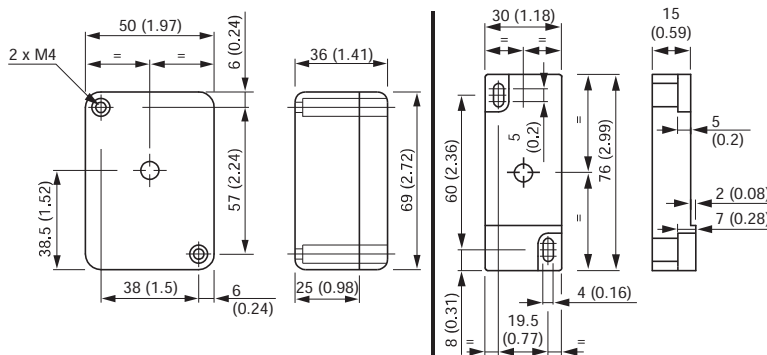
Note: For additional Safety Relays connectivity, see page 5-12.
 For additional Safety I/O and Safety PLC connectivity, see page 5-116.
 For application and wiring diagrams, see page 10-1.

Accessories

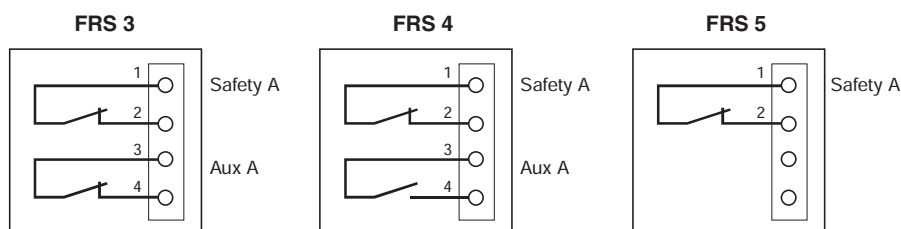
| Description | Cat. No. |
|----------------------|-------------|
| Replacement Actuator | 440N-A02005 |

Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



Typical Wiring Diagrams



Safety Switches

Non-Contact Switches

Ferrogard™ 6, 9,10, 13 & 14



Description

The Ferrogard range of magnetically actuated safety switches offers non-contact reliability together with tolerance to misalignment. They are designed to be installed so that when a guard door is opened, the action of the magnetic actuator being removed from the switch opens the N.C. safety contact which is intended for the isolation of control power to a machine primary control element.

The FRS 6, 9, 10, 13, and 14 sensors and actuators incorporate slim housings to accommodate narrow mounting areas. They are environmentally sealed to IP67 (NEMA 6P), which makes them ideal for wet environments. These Ferrogard switches have two active sensing faces allowing more flexible mounting options.

Unlike some magnetic switches the Ferrogards have protected safety contacts to help ensure that they do not fail to danger.

All Ferrogards have internal non-resettable overload protection on the safety contact. They should be protected by an external fuse rated as shown in the Specifications table.

Features

- Non-contact actuation
- High tolerance to misalignment
- High switching current (up to 3 A)
- Two sensing faces
- IP67 (NEMA 6P) Rating
- Slim housings
- Stainless steel models available

Specifications

| Safety Ratings | |
|--|---|
| Standards | EN954-1, ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, ISO14119, ANSI B11.19, AS4024.1 |
| Safety Classification | Cat. 1 Device per EN954-1 Dual channel interlocks suitable for Cat. 3 or 4 systems |
| Functional Safety Data * | B10d: > 2 x 10 ⁶ operations at min. PFH _D : > 3 x 10 ⁻⁷ MTTFd: > 385 years Dual channel interlock may be suitable for performance levels PLe or PLd (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on application characteristics |
| Note: | For up-to-date information, visit http://www.ab.com/Safety/ |
| Certifications | CE Marked for all applicable directives and cULus |
| Outputs (Guard Door Closed, Actuator in Place) | |
| Safety Outputs | 1 N.C. 1 N.C. |
| Auxiliary Outputs | — 1 N.C. |
| Operating Characteristics | |
| Operating Distance, Make [mm (in.)] | 12 (0.47) |
| Operating Distance, Break [mm (in.)] | 23 (0.91) |
| Environmental | |
| Enclosure Type Rating | IP67 (NEMA 6P) |
| Operating Temperature [C (F)] | -10...+65° (+14...+149°) |
| Relative Humidity | 5...95% |
| Shock | IEC 68-2-27, 30 g, 11 ms |
| Vibration | IEC 68-2-6, 10...55 Hz |
| Radio Frequency | IEC 61000-4-3, IEC 61000-4-6 |
| Physical Characteristics | |
| Actuator/Housing Material | Molded ABS plastic |
| Weight [g (lb)] | Sensor/Actuator FRS 6—28 (0.06)/70 (0.15) FRS 9—28 (0.06)/70 (0.15) FRS 10—28 (0.06)/70 (0.15) |
| Color | Red |

* Usable for ISO 13849-1:2006 and IEC 62061. Data other than B10d is based on:
 - Usage rate of 1op/10 mins., 24 hrs/day, 360 days/year, representing 51840 operations per year
 - Mission time/Proof test interval of 38 years

Product Selection

| Safety Contact Switching Capability | Safety Contacts | Auxiliary Contacts | Housing Material | Type | Connection | Cat. No. |
|-------------------------------------|-----------------|--------------------|------------------------|----------------|-------------|--------------------|
| 250V AC, 2 A | 1 N.C. | — | Red Molded ABS Plastic | FRS 6 | 2 m Cable | 440N-G02023 |
| | | | | | 4 m Cable | 440N-G02028 |
| | | | | | 6 m Cable | 440N-G02032 |
| | | | | | 10 m Cable | 440N-G02013 |
| 24V DC, 1 A | | | | FRS 9 | 2 m Cable | 440N-G02044 |
| | | | | | 4 m Cable | 440N-G02075 |
| | | | | | 6 m Cable | 440N-G02082 |
| | | | | | 10 m Cable | 440N-G02089 |
| 110V AC, 3 A | | | | FRS 10 | 2 m Cable | 440N-G02045 |
| | | | | | 4 m Cable | 440N-G02088 |
| 250V AC, 2 A | 1 N.C. | Stainless Steel | FRS 13 | 2 m Cable | 440N-G02154 | |
| | | | | 4 m Cable | 440N-G02155 | |
| | | | | 4-Pin Micro QD | 440N-G02160 | |
| 24V DC, 1 A | | | FRS 14 | 2 m Cable | 440N-G02156 | |
| | | | | 4 m Cable | 440N-G02157 | |
| | | | | 4-Pin Micro QD | 440N-G02161 | |

Note: Contacts are described with the guard door closed, that is, actuator in place.

Recommended Logic Interfaces

| Description | Safety Outputs | Auxiliary Outputs | Terminals | Reset Type | Power Supply | Cat. Page No. | Cat. No. |
|--------------------------------------|------------------------------|------------------------------|-------------------|----------------------------------|---------------------------|---------------|--------------------|
| Single-Function Safety Relays | | | | | | | |
| MSR127RP | 3 N.O. | 1 N.C. | Removable (Screw) | Monitored Manual | 24V AC/DC | 5-26 | 440R-N23135 |
| MSR127TP | 3 N.O. | 1 N.C. | Removable (Screw) | Auto./Manual | 24V AC/DC | 5-26 | 440R-N23132 |
| MSR126T | 2 N.O. | None | Fixed | Auto./Manual | 24V AC/DC | 5-24 | 440R-N23117 |
| MSR30T | 2 N.O. Solid State | 1 N.O. Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC | 5-16 | 440R-N23198 |
| Modular Safety Relays | | | | | | | |
| MSR210P Base 2 N.C. only | 2 N.O. | 1 N.C. and 2 PNP Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC from the base unit | 5-82 | 440R-H23176 |
| MSR220P Input Module | — | — | Removable | — | 24V DC | 5-86 | 440R-H23178 |
| MSR310P Base | MSR300 Series Output Modules | 3 PNP Solid State | Removable | Auto./Manual Monitored Manual | 24V DC | 5-102 | 440R-W23219 |
| MSR320P Input Module | — | 2 PNP Solid State | Removable | — | 24V DC from the base unit | 5-106 | 440R-W23218 |

Note: For additional Safety Relays connectivity, see page 5-12.
 For additional Safety I/O and Safety PLC connectivity, see page 5-116.
 For application and wiring diagrams, see page 10-1.

Connection Systems

| Description | 4-Pin Micro (M12) |
|-------------|-------------------|
| Cordset | 889D-F4AC-* |
| Patchcord | 889D-F4ACDM-* |

* Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
 * Replace symbol with 1 (1 m), 2 (2 m), 3 (3 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
Note: For additional information, see page 7-1.

Accessories

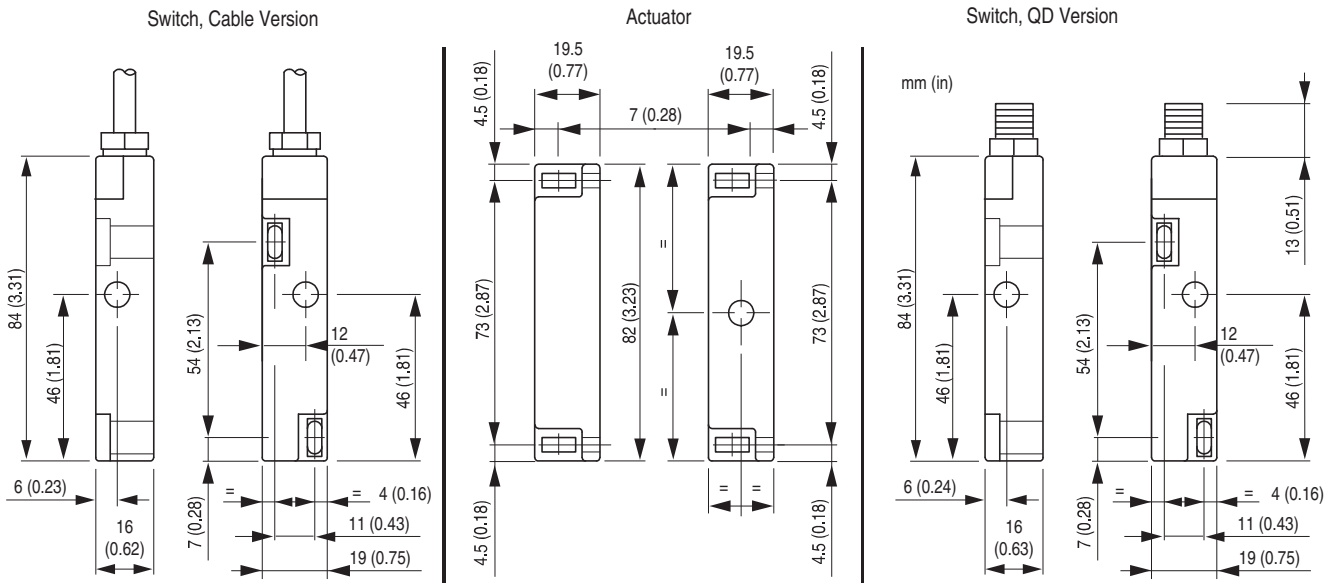
| Description | Cat. No. |
|---|-------------|
| FRS 6, 9, 10 Plastic Replacement Actuator | 440N-A02025 |
| FRS 13, 14 Stainless Steel Replacement Actuator | 440N-A02165 |

Safety Switches
Non-Contact Switches
 Ferrogard™ 6, 9,10, 13 & 14

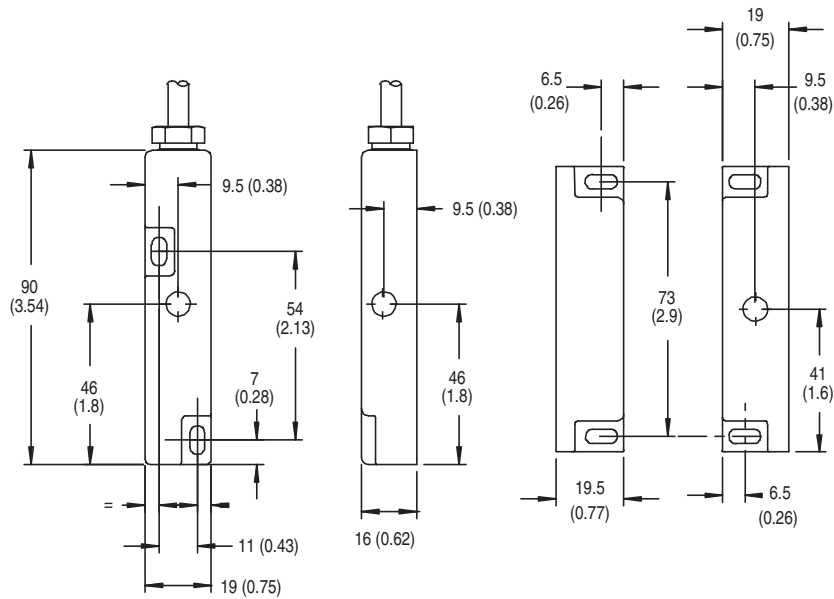
Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.

FRS 6, 9, 10



FRS 13, 14



3-Interlock
Switches

Typical Wiring Diagrams

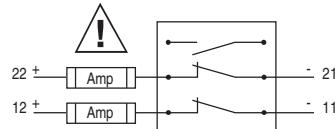
| | | FRS 6, 9, 10 | FRS 13, 14 |
|------------------------|----------|--------------|-----------------|
| | | 1 N.C. | 1 N.C. + 1 N.O. |
| 4-Pin Micro (M12) | | | |
| Cordset 889D-F4AC-* | Brown | Safety A | Safety A |
| | Blue | | |
| | White | — | Aux A |
| | Black | | |
| Cable Version | Safety A | Brown | Brown |
| | Aux A | Blue | Blue |
| | | — | Black |
| | | | Grey |

* Replace symbol with 2 (2 m), 5 (5 m) or 10 (10 m) for standard cable lengths.

External Fuse Safety Contacts



WARNING: All safety contacts fitted with internal non-resettable fuse and must be fused externally as detailed.



Recommended:
 *Bussman BK/GDA-1.6 A
 ** Bussman BK/GDA-400 mA
 ***Bussman BK/GDA-2.5 A

| | |
|---------------------------------|-------------------------------|
| FRS 1, 2, 3, 4, 5, 6, 13, 21 AC | AC ≤ 1.6 A* (F) IEC 60127-2 |
| FRS 9, 14, 2 DC, 20 DC, 21 DC | DC ≤ 0.4 A** (F) IEC 60127-2 |
| FRS 10 | AC ≤ 2.5 A*** (F) IEC 60127-2 |

Safety Switches

Non-Contact Switches

Ferrogard™ GD2



Description

The Ferrogard range of magnetically actuated safety switches offers non-contact reliability together with tolerance to misalignment. They are designed to be installed so that when a guard door is opened, the action of the magnetic actuator being removed from the switch opens the N.C. safety contacts which are intended for the isolation of control power to a machine primary control element.

The GD2 version has a stainless steel housing for added protection against inadvertent impacts to the housing. The contacts are completely sealed to meet IP68 (NEMA 6P) requirements, making them ideal for wet environments. The GD2 also has a wider temperature range than the plastic Ferrogard switches, making them useful in a wider range of applications.

Unlike some magnetic switches, the Ferrogards have protected safety contacts to help ensure that they do not fail to danger. In addition, some versions have independent auxiliary signal contacts to indicate the machine and guard condition.

All Ferrogards have internal non-resettable overload protection on the safety contact. They should be protected by an external fuse rated as shown in the Specifications table.

Features

- Non-contact actuation
- High tolerance to misalignment
- High switching current (up to 2 A AC, 1 A DC)
- Wide temperature range (-25...+125°C (-13...+257°F))
- Stainless steel housing
- Various contact arrangements

Specifications

| Safety Ratings | | | |
|--|---|--------|--------|
| Standards | EN954-1, ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, ISO14119, ANSI B11.19, AS4024.1 | | |
| Safety Classification | Cat. 1 Device per EN954-1 Dual channel interlocks suitable for Cat. 3 or 4 systems | | |
| Functional Safety Data * | B10d: > 2 x 10 ⁶ operations at min. PFH _D : > 3 x 10 ⁻⁷ MTTFD: > 385 years Dual channel interlock may be suitable for performance levels PLe or PLd (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on application characteristics | | |
| Note: | For up-to-date information, visit http://www.ab.com/Safety/ | | |
| Certifications | CE Marked for all applicable directives and cULus | | |
| Outputs (Guard Door Closed, Actuator in Place) | | | |
| Safety Outputs | 1 N.C. | 2 N.C. | 2 N.C. |
| Auxiliary Outputs | 1 N.O. | — | 1 N.O. |
| Operating Characteristics | | | |
| Operating Distance, Make [mm (in.)] | Safety: 12 (0.47); Auxiliary: 15 (0.59) | | |
| Operating Distance, Break [mm (in.)] | Safety: 23 (0.91); Auxiliary: 26 (1.02) | | |
| Environmental | | | |
| Enclosure Type Rating | IP68 (NEMA 6P) | | |
| Operating Temperature [C (F)] | -25...+125° (-13...+257°) | | |
| Relative Humidity | 5...95% | | |
| Shock | IEC 68-2-27, 30 g, 11 ms | | |
| Vibration | IEC 68-2-6, 10...200 Hz | | |
| Radio Frequency | IEC 61000-4-3, IEC 61000-4-6 | | |
| Physical Characteristics | | | |
| Housing Material | Stainless Steel; BS3146 ANC4B (316L) | | |
| Actuator Material | Stainless Steel; BS3146 ANC4B (316L) | | |
| Weight [g (lbs)] | Sensor: 156 (0.34); Actuator: 168 (0.37) | | |

- * Usable for ISO 13849-1:2006 and IEC 62061. Data other than B10d is based on:
- Usage rate of 1op/10 mins., 24 hrs/day, 360 days/year, representing 51840 operations per year
 - Mission time/Proof test interval of 38 years

Product Selection

| Safety Contact Switching Capability | Safety Contacts | Auxiliary Contacts | Connection | Type | Cat. No. |
|-------------------------------------|-----------------|--------------------|-------------------|------------|--------------------|
| 250V AC, 2 A max. | 2 N.C. | — | 3 m Cable | FRS 20 GD2 | 440N-G02113 |
| | 1 N.C. | 1 N.O. | 3 m Cable | FRS 2 GD2 | 440N-G02112 |
| | 2 N.C. | | 3 m Cable | FRS 21 GD2 | 440N-G02117 |
| 24V DC, 1 A max. | 1 N.C. | 1 N.O. | 3 m Cable | FRS 2 GD2 | 440N-G02118 |
| | | | 10 m Cable | FRS 2 GD2 | 440N-G02147 |
| | 2 N.C. | — | 3 m Cable | FRS 20 GD2 | 440N-G02119 |
| | 2 N.C. | 1 N.O. | 3 m Cable | FRS 21 GD2 | 440N-G02123 |
| | | | 6 m Cable | FRS 21 GD2 | 440N-G02143 |
| | | | 10 m Cable | FRS 21 GD2 | 440N-G02137 |
| | | | 8-Pin Micro (M12) | FRS 21 GD2 | 440N-G02149 |

Note: Contacts are described with the guard door closed, that is, actuator in place. Switch is shipped with complete actuator.

Recommended Logic Interfaces

| Description | Safety Outputs | Auxiliary Outputs | Terminals | Reset Type | Power Supply | Cat. Page No. | Cat. No. |
|--------------------------------------|------------------------------|------------------------------|-------------------|----------------------------------|---------------------------|---------------|--------------------|
| Single-Function Safety Relays | | | | | | | |
| MSR127RP | 3 N.O. | 1 N.C. | Removable (Screw) | Monitored Manual | 24V AC/DC | 5-26 | 440R-N23135 |
| MSR127TP | 3 N.O. | 1 N.C. | Removable (Screw) | Auto./Manual | 24V AC/DC | 5-26 | 440R-N23132 |
| MSR126T | 2 N.O. | None | Fixed | Auto./Manual | 24V AC/DC | 5-24 | 440R-N23117 |
| MSR30T | 2 N.O. Solid State | 1 N.O. Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC | 5-16 | 440R-N23198 |
| Modular Safety Relays | | | | | | | |
| MSR210P Base 2 N.C. only | 2 N.O. | 1 N.C. and 2 PNP Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC from the base unit | 5-82 | 440R-H23176 |
| MSR220P Input Module | — | — | Removable | — | 24V DC | 5-86 | 440R-H23178 |
| MSR310P Base | MSR300 Series Output Modules | 3 PNP Solid State | Removable | Auto./Manual Monitored Manual | 24V DC | 5-102 | 440R-W23219 |
| MSR320P Input Module | — | 2 PNP Solid State | Removable | — | 24V DC from the base unit | 5-106 | 440R-W23218 |

Note: For additional Safety Relays connectivity, see page 5-12.
 For additional Safety I/O and Safety PLC connectivity, see page 5-116.
 For application and wiring diagrams, see page 10-1.

Connection Systems

| Description | 8-Pin Micro (M12) |
|-------------|-------------------|
| Cordset | 889D-F8AB-* |
| Patchcord | 889D-F8ABDM-* |

* Replace symbol with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
 * Replace symbol with 1 (1 m), 2 (2 m), 3 (3 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
Note: For additional information, see page 7-1.

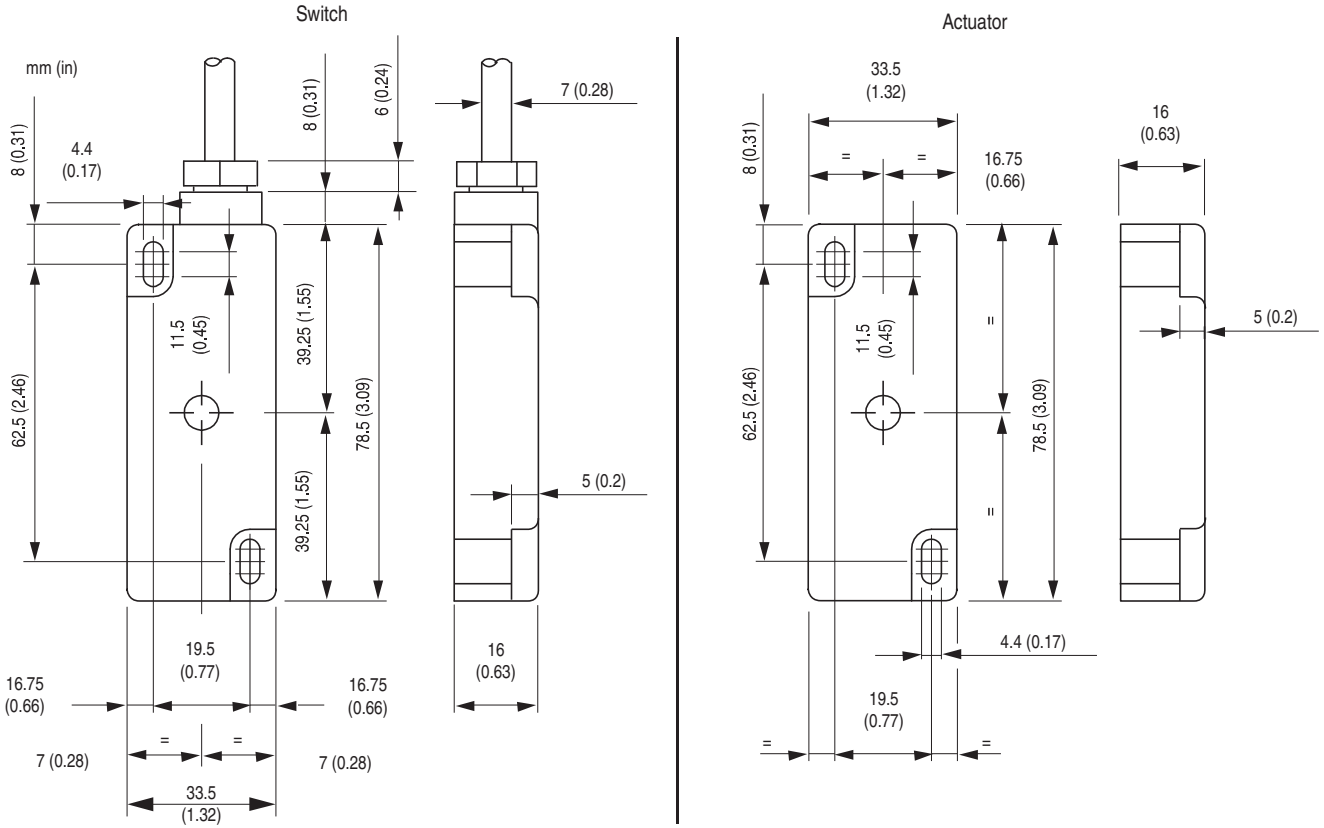
Accessories

| Description | Cat. No. |
|-------------|-------------|
| Actuator | 440N-A02128 |

Safety Switches
Non-Contact Switches
 Ferrogard™ GD2

Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



3-Interlock
Switches

Typical Wiring Diagrams

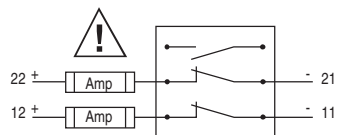
| Description | | FRS21 | FRS2 | FRS20 |
|------------------------|----------------|-----------------|-----------------|--------------|
| | | 2 N.C. + 1 N.O. | 1 N.C. + 1 N.O. | 2 N.C. |
| Cable Versions | Safety A | Black | Blue | Brown |
| | | White | Red | Blue |
| | Safety B | Red | — | Black |
| | | Blue | — | White |
| | Aux A | Yellow | Yellow | — |
| Shield Gnd | Green | Green | — | |
| | | Green/Yellow | Green/Yellow | Green/Yellow |
| 8-Pin Micro (M12) | | | — | — |
| Cordset 889D-F8AB-* | Brown White | Safety A | — | — |
| | Grey Pink | Safety B | — | — |
| | Yellow Red | Safety B | — | — |
| | Green Blue | NA | — | — |

* Replace symbol with 2 (2 m), 5 (5 m) or 10 (10 m) for standard cable lengths.

External Fuse Safety Contacts



WARNING: All safety contacts fitted with internal non-resettable fuse and must be fused externally as detailed.



| | |
|--------------------------------------|------------------------------|
| FRS 2 GD2 FRS20 GD2 FRS21 GD2 | AC ≤ 1.6 A* (F) IEC 60127-2 |
| FRS 2 GD2 FRS 20 GD2 FRS21 GD2 | DC ≤ 0.4 A** (F) IEC 60127-2 |

Recommended:
 *Bussman BK/GDA-1.6 A
 ** Bussman BK/GDA-400 mA

Non-Contact Switches

Ferrogard™ GS1 & GS2



Description

The Ferrogard range of magnetically actuated safety switches offers non-contact reliability together with tolerance to misalignment. They are designed to be installed so that when a guard door is opened, the action of the magnetic actuator being removed from the switch opens the N.C. safety contacts which are intended for the isolation of control power to a machine primary control element.

The GS1 and GS2 are designed for heavy duty applications. The GS1 is housed in a stainless steel or brass housing. The GS2 offers the same characteristic as the GS1, but in an Ex Range housing for hazardous locations.

Unlike some magnetic switches the Ferrogards have protected safety contacts to help ensure that they do not fail to danger.

All Ferrogards have internal non-resettable overload protection on the safety contact. They should be protected by an external fuse rated as shown in the Specifications table.

See **Other Safety Products** section on page 9-1 for more information on the Ex Range version of the Ferrogard GS2.

Features

- Non-contact actuation
- High tolerance to misalignment
- High switching current (2 A AC)
- Metal housings (IP68)
- Ex Range version available

Specifications

| Safety Ratings | |
|--|---|
| Standards | EN954-1, ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, ISO14119, ANSI B11.19, AS4024.1 |
| Safety Classification | Cat. 1 Device per EN954-1 Dual channel interlocks suitable for Cat. 3 or 4 systems |
| Functional Safety Data * | B10d: > 2 x 10 ⁶ operations at min. PFH _D : > 3 x 10 ⁻⁷ MTTFd: > 385 years Dual channel interlock may be suitable for performance levels PLe or PLd (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on application characteristics |
| Note: | For up-to-date information, visit http://www.ab.com/Safety/ |
| Certifications | GS1 & GS2 - CE Marked for all applicable directives and cULus GS2 Ex - EExd IIC T6 Baseefa |
| Outputs (Guard Door Closed, Actuator in Place) | |
| Safety Outputs | 1 N.C. |
| Auxiliary Outputs | — |
| Operating Characteristics | |
| Operating Distance, Make [mm (in.)] | GS1: 12 (0.47); GS2: 15 (0.59) |
| Operating Distance, Break [mm (in.)] | GS1: 23 (0.91); GS2: 26 (1.02) |
| Environmental | |
| Enclosure Type Rating | IP68 (NEMA 6P) |
| Operating Temperature [C (F)] | GS1: -25...+125° (-13...+257°) GS2: -40...+60° (-40...146°) |
| Relative Humidity | 5...95% |
| Shock | IEC 68-2-27, 30 g, 11 ms |
| Vibration | IEC 68-2-6, 10...55 Hz |
| Radio Frequency | IEC 61000-4-3, IEC 61000-4-6 |
| Physical Characteristics | |
| Housing Material | Stainless Steel or Brass |
| Weight [g (lbs)] | GS1 Brass: 381 (0.84) GS1 Steel: 388 (0.86) Actuator: 116 (0.26) |

* Usable for ISO 13849-1:2006 and IEC 62061. Data other than B10d is based on:
 - Usage rate of 1op/10 mins., 24 hrs/day, 360 days/year, representing 51840 operations per year
 - Mission time/Proof test interval of 38 years

Product Selection

| Safety Contact Switching Capability | Safety Contacts | Auxiliary Contacts | Connection | Housing Material | Type | Cat. No. |
|-------------------------------------|-----------------|--------------------|------------|------------------|--------------------------|-------------|
| 250V AC, 2 A | 1 N.C. | None | 2 m Cable | Brass | GS 1 | 440N-G02048 |
| | | | | Stainless Steel | | 440N-G02049 |
| | | | 3 m Cable | Brass | GS2-Ex (brass) | 440N-H02046 |
| | | | | Stainless Steel | GS2-Ex (stainless steel) | 440N-H02047 |

Note: Contacts are described with the guard door closed, that is, actuator in place. Switch is shipped with complete actuator.

Recommended Logic Interfaces

| Description | Safety Outputs | Auxiliary Outputs | Terminals | Reset Type | Power Supply | Cat. Page No. | Cat. No. |
|--------------------------------------|------------------------------|------------------------------|-------------------|----------------------------------|---------------------------|---------------|-------------|
| Single-Function Safety Relays | | | | | | | |
| MSR127RP | 3 N.O. | 1 N.C. | Removable (Screw) | Monitored Manual | 24V AC/DC | 5-26 | 440R-N23135 |
| MSR127TP | 3 N.O. | 1 N.C. | Removable (Screw) | Auto./Manual | 24V AC/DC | 5-26 | 440R-N23132 |
| MSR126T | 2 N.O. | None | Fixed | Auto./Manual | 24V AC/DC | 5-24 | 440R-N23117 |
| MSR30T | 2 N.O. Solid State | 1 N.O. Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC | 5-16 | 440R-N23198 |
| Modular Safety Relays | | | | | | | |
| MSR210P Base 2 N.C. only | 2 N.O. | 1 N.C. and 2 PNP Solid State | Removable | Auto./Manual or Monitored Manual | 24V DC from the base unit | 5-82 | 440R-H23176 |
| MSR220P Input Module | — | — | Removable | — | 24V DC | 5-86 | 440R-H23178 |
| MSR310P Base | MSR300 Series Output Modules | 3 PNP Solid State | Removable | Auto./Manual Monitored Manual | 24V DC | 5-102 | 440R-W23219 |
| MSR320P Input Module | — | 2 PNP Solid State | Removable | — | 24V DC from the base unit | 5-106 | 440R-W23218 |

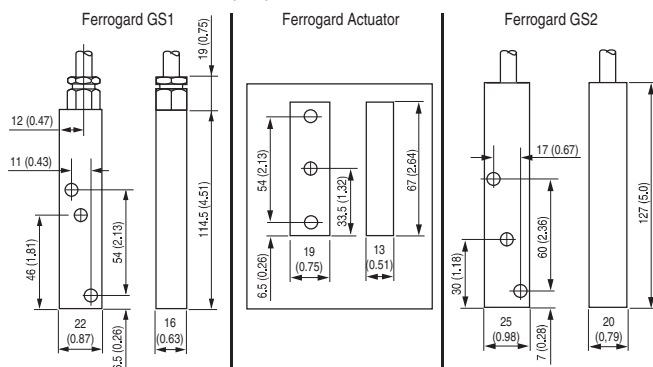
Note: For additional Safety Relays connectivity, see page 5-12.
 For additional Safety I/O and Safety PLC connectivity, see page 5-116.
 For application and wiring diagrams, see page 10-1.

Accessories

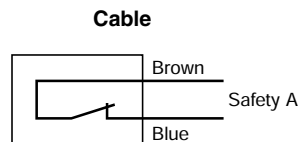
| Description | Used with | Cat. No. |
|-------------------------|-----------------|-------------|
| Actuator, Alnico | Brass Switch | 440N-A02056 |
| Actuator, Epoxy-painted | Stainless Steel | 440N-A02057 |

Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



Typical Wiring Diagrams



External Fuse Safety Contacts



WARNING: All safety contacts fitted with internal non-resettable fuse and must be fused externally as detailed.

| | |
|-----|-----------------------------|
| GS1 | AC ≤ 1.6 A* (F) IEC 60127-2 |
| GS2 | |

Recommended:
 *Bussman BK/GDA-1.6 A