

## Interlock 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 (NEMA6P), 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 2A AC, 1A DC)
- Plastic rectangular housing (IP67)
- Cable or Quick Disconnect (QD) connections

### Specifications

|   |   |                             |
|---|---|-----------------------------|
| Standards   | EN954-1, ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, ISO14119, ANSI B11.19, AS4024.1   |                             |
| Category  | Cat. 1 Device per EN954-1<br>Dual channel interlocks suitable for Cat. 3 or 4 systems |                             |
| Approvals   | CE marked for all applicable directives and cULus                                     |                             |
| Reed Contacts                                       | Safety Auxiliary  |                             |
| Operating Distance – Make                           | 12mm (0.47in) 15mm (0.59in)   |                             |
| Operating Distance – Break                          | 23mm (0.91in) 26mm (1.02in)   |                             |
| Closing Time  | 3.0ms 0.5ms   |                             |
| Dropout Time  | 2.1ms 0.3ms   |                             |
| Bounce Time   | 0.7ms 0.7ms   |                             |
| Initial Contact Resistance                          | 15mΩ  | 10mΩ                        |
| Initial Capacitance, Terminal to Terminal           | 0.65pF 0.2pF  |                             |
| Initial Insulation Resistance, Terminal to Terminal | 1 x 10 <sup>6</sup> Ω   | 1 x 10 <sup>6</sup> Ω       |
| Safety Contact Switching Capability                 | AC  | 250VAC 2A max               |
|   | DC  | 24VDC 1A max                |
| Safety Contact External Fusing                      | AC  | ≤1.6A quick blow            |
|   | DC  | ≤0.8A quick blow            |
| Auxiliary Contact Switching Capability              | 300VDC, 250VAC, 0.5A including inrush<br>15VA/10W suitable for AC/DC circuits         |                             |
| Min Initial Breakdown Voltage                       | 600VAC 600VAC   |                             |
| Operating Temperature                               | -10°C to +65°C (14° to 149°F)   |                             |
| Enclosure Protection                                | IP67 (NEMA6P)   |                             |
| <b>Cable</b>  |   |                             |
| FRS 1   | 0.75mm <sup>2</sup> (18 AWG) 2 wire<br>Jacket OD 5.6mm (0.22in)                       |                             |
| FRS 2   | 0.50mm <sup>2</sup> (20 AWG) 4 wire<br>Jacket OD 6.5mm (0.26in)                       |                             |
| FRS 20  | 0.50mm <sup>2</sup> (20 AWG) 4 wire<br>Jacket OD 6.5mm (0.26in)                       |                             |
| FRS 21  | 0.50mm <sup>2</sup> (20 AWG) 6 wire<br>Jacket OD 7.5mm (0.3in)                        |                             |
| Quick Disconnects                                   | M12 x 1, 4 pin or 6 pin   |                             |
| Case Material                                       | Red moulded ABS Plastic   |                             |
| Mounting  | Any position<br>M4 mounting security screws included                                  |                             |
| Weight (not including cable)                        | Sensor Actuator   |                             |
|   | FRS 1   | 35g (0.08lbs) 85g (0.19lbs) |
|   | FRS 2   | 40g (0.09lbs) 85g (0.19lbs) |
|   | FRS 20  | 43g (0.09lbs) 85g (0.19lbs) |
|   | FRS 21  | 43g (0.09lbs) 85g (0.19lbs) |
| Electrical Life                                     | 1 x 10 <sup>6</sup> at the rated load   |                             |
| Mechanical Life                                     | 10 x 10 <sup>6</sup>  |                             |
| Vibration   | 7g, 10 to 200Hz   |                             |
| Shock   | 50g   |                             |

**Product Selection**

| Safety Contact Switching Capability  | Safety Contacts  | Auxiliary Contacts  | Connection     | Housing Material | Type         | Catalogue Number |             |
|--|--|---|----------------|------------------|--------------|------------------|-------------|
| 250V AC 2A   | 1 N.C.   | None  | 2m Cable       | ABS Plastic      | FRS 1        | 440N-G02001      |             |
|  |  |   | 4m Cable       |                  |              | 440N-G02004      |             |
|  |  |   | 6m Cable       |                  |              | 440N-G02022      |             |
|  |  |   | 8m Cable       |                  |              | 440N-G02041      |             |
|  |  |   | 10m Cable      |                  |              | 440N-G02015      |             |
|  |  | 1 N.O.  | 2m Cable       |                  | 440N-G02002  |                  |             |
|  |  |   | 4m Cable       |                  | 440N-G02014  |                  |             |
|  |  |   | 6m Cable       |                  | 440N-G02038  |                  |             |
|  |  |   | 8m Cable       |                  | 440N-G02033  |                  |             |
|  |  |   | 10m Cable      |                  | 440N-G02019  |                  |             |
|  | 2 N.C.   | None  | 15m Cable      |                  | 440N-G02043  |                  |             |
|  |  |   | 20m Cable      |                  | 440N-G02040  |                  |             |
|  |  |   | 4 Pin Micro QD |                  | 440N-G02093  |                  |             |
|  |  |   | 4m Cable       |                  | 440N-G02085  |                  |             |
|  |  |   | 4 Pin Micro QD |                  | 440N-G02097  |                  |             |
|  | 1 N.O.   | 1 N.O.  | 2m Cable       |                  | FRS 21       | 440N-G02055      |             |
|  |  |   | 4m Cable       |                  |              | 440N-G02061      |             |
|  |  |   | 6m Cable       |                  |              | 440N-G02060      |             |
|  |  |   | 10m Cable      |                  |              | 440N-G02059      |             |
|  |  |   | 6 Pin Micro QD |                  |              | 440N-G02098      |             |
| 6 Pin Micro QD   |  |   | 440N-G02092    |                  |              |                  |             |
| 24V DC 1A  | 1 N.C.   | 1 N.O.  | 2m Cable       | FRS 2            | 440N-G02094  |                  |             |
|  |  |   | 4 Pin Micro QD |                  | 440N-G02090  |                  |             |
|  | 2 N.C.   | None  | 1 N.O.         | 4 Pin Micro QD   | FRS 21       | 440N-G02058      |             |
|  |  |   |                | 2m Cable         |              | 440N-G02077      |             |
|  |  |   |                | 4m Cable         |              | 440N-G02083      |             |
|  |  |   |                | 6m Cable         |              | 440N-G02099      |             |
|  |  |   |                | 6 Pin Micro QD   |              | 440N-G02099      |             |
|  |  |   |                | 6 Pin Micro QD   |              | 440N-G02099      |             |
|  |   | Mating cable, 4-pin straight 2m. See page 15-10 for details and additional lengths. |                |                  |              |                  | 889D-F4AC-2 |
|  |  | Mating cable, 4-pin straight 5m. See page 15-10 for details and additional lengths. |                |                  |              |                  | 889D-F4AC-5 |
| Mating cable, 4-pin straight 10m. See page 15-10 for details and additional lengths. |  |   |                |                  | 889D-F4AC-10 |                  |             |
|   | Mating cable, 6-pin straight 2m. See page 15-11 for details and additional lengths.  |   |                |                  |              | 889R-F6ACA-2     |             |
|  | Mating cable, 6-pin straight 5m. See page 15-11 for details and additional lengths.  |   |                |                  |              | 889R-F6ACA-5     |             |
|  | Mating cable, 6-pin straight 10m. See page 15-11 for details and additional lengths. |   |                |                  |              | 889R-F6ACA-10    |             |

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

**Accessories**

| Description          | Page Number | Catalogue Number |
|----------------------|-------------|------------------|
| Replacement Actuator | —           | 440N-A02005      |

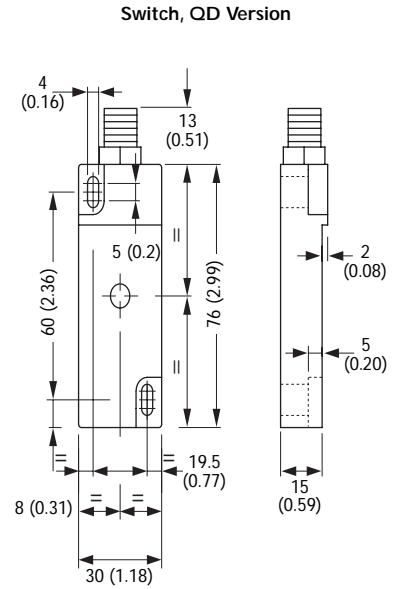
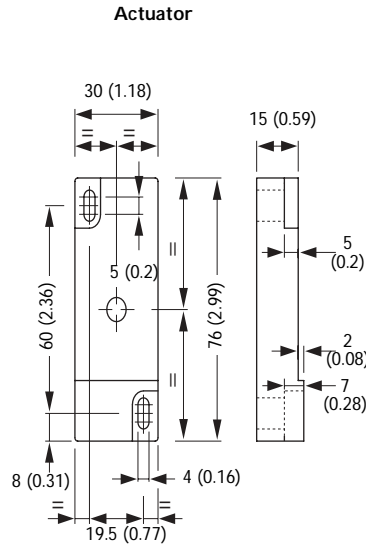
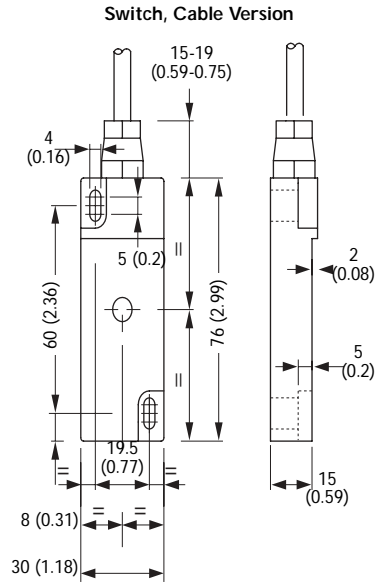
Interlock Switches

**Non contact Switches**

**Ferrogard 1, 2, 20 & 21**

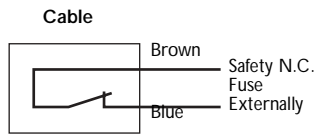
**Approximate Dimensions—mm (inches)**

*Dimensions are not intended to be used for installation purposes.*

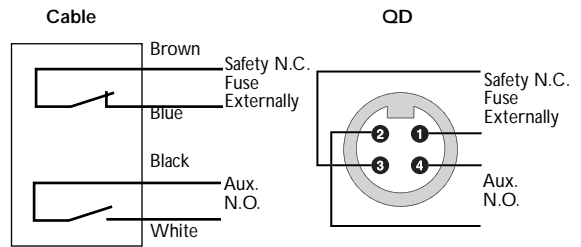


**Typical Wiring Diagrams**

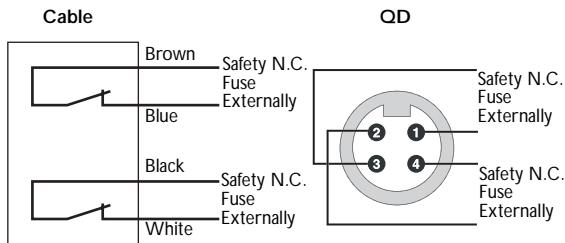
**FRS 1**



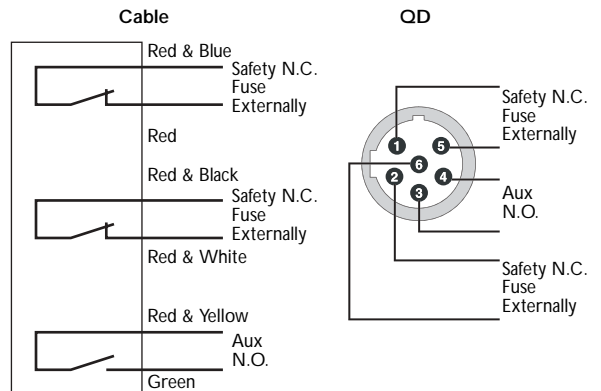
**FRS 2**



**FRS 20**



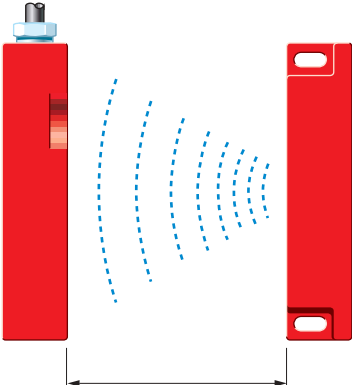
**FRS 21**



**Application Details**

**Operating Principle**

Encapsulated in the Ferrogard is a unique high power industrial reed, capable of switching up to 15A. The reed switch is de-rated by a non resettable overload protection fuse. On presenting the actuator to the switch, the high intensity magnetic field from the actuator causes the contacts to close. On removing the actuator (opening the door), the safety contacts open.



**Typical Operating Curve**

When the actuator is aligned with the switch, the sensing distance is 10mm (0.39). As the amount of misalignment increases, the sensing distance decreases. Beyond 4mm (0.16), the switch will not actuate in the presence of the actuator.

