

# INSTALLATION INSTRUCTIONS FOR THE MAGNETICALLY ACTUATED SAFETY INTERLOCK SWITCHES FFS SERIES

50026830

Issue 2



## ⚠ WARNING

### IMPROPER INSTALLATION

- Consult with local safety agencies and their requirements when designing a machine-control link, interface, and all control elements that affect safety.
- Strictly adhere to all installation instructions.

**Failure to comply with these instructions could result in death or serious injury**

## GENERAL INFORMATION

When installed on a machine guard, and the switch and actuator are within the specified operating range, the safety contacts will be closed and the auxiliary contacts will be open. (See table for switching distances).

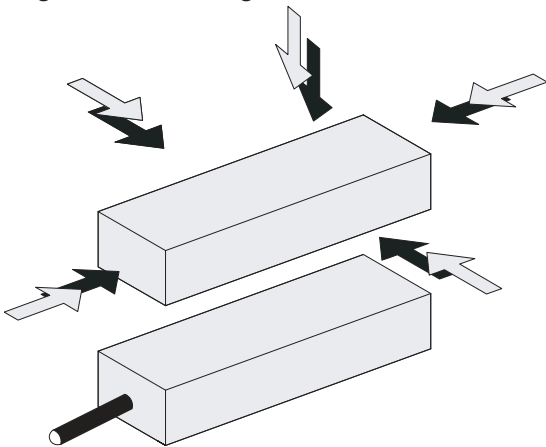
When the actuator moves out of the operating range, the safety contacts will open. The auxiliary contacts will close for indication.

The FF series safety switches and actuators are designed to approach each other from most angles. When the switch is closed, the targets on the printed face of the switch must align.

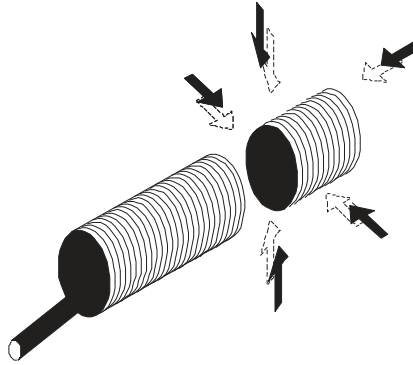
## MOUNTING INFORMATION

The FF safety switches can approach each other from most angles. When the switch is closed, targets on the printed face must align. See Figure 1.

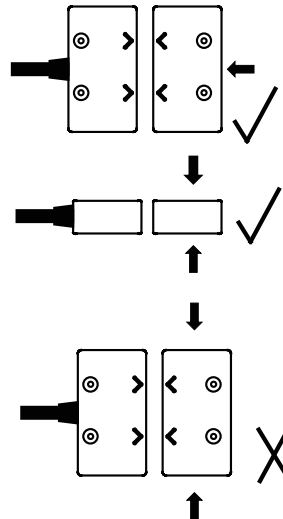
**Figure 1. Switch Alignment (FFS and FF6)**



**Figure 2. Switch Alignment (FF2 and FF3)**

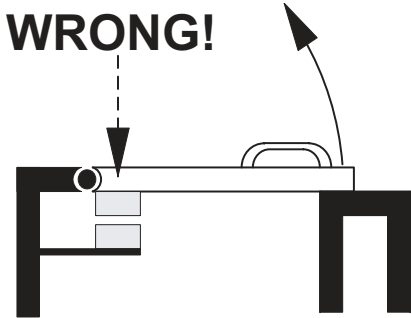


**Figure 3. Switch Alignment (FF5)**

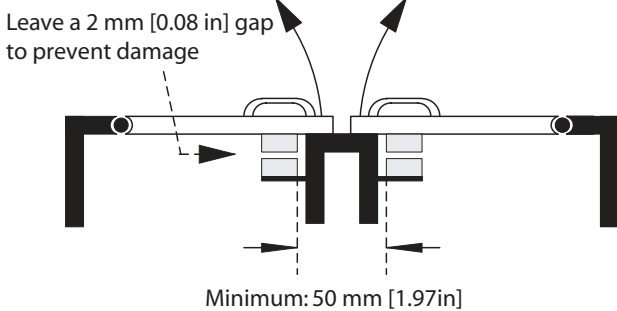


Mount the switch on the machine frame and the actuator on the opening edge of the door. Always try to mount the switch on non-ferrous material. **Ferrous material may reduce the switching distance.** Be sure to use tamper-proof screws. Do not use the safety switch as a door stop. Leave a minimum of 50 mm [1.97 in] between any adjacent switches. See Figures 4 and 5.

**Figure 4. Do Not Use the Safety Switch as a Door Stop**

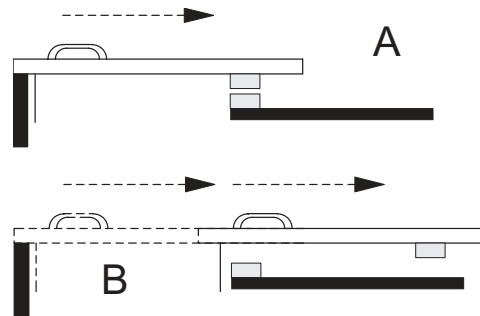


**Figure 5. Minimum Distance Between Switches**



When fixing the safety switch to a sliding door (A), ensure that when the door is opened (B) it is not easily accessible, helping prevent the system being overridden. See Figure 6.

**Figure 6. Placement for Sliding Doors**



**TABLE 1. SPECIFICATIONS**

| Type  | FF2-10-AC<br>FF2-11-AC                     | FF2-10-DC<br>FF2-11-DC                     | FF3-20-AC<br>FF3-21-AC                     | FF3-20-DC<br>FF3-21-DC                     | FF5  | FF5-SS                                     |
|---|--|--|--|--|--|--|
| <b>Contact arrangement</b>                  | 1NC (FF2-10-AC)<br>1NC/1NO (FF2-11-AC)     | 1NC (FF2-10-DC);<br>1NC/1NO (FF2-11-DC)    | 2NC (FF3-20-AC)<br>2NC/1NO (FF3-21-AC)     | 2NC (FF3-20-DC);<br>2NC/1NO (FF3-21-DC)    | Max: 2NC safety and 1NO auxiliary          | Max: 2NC safety and 1NO auxiliary          |
| <b>Safety contact rating</b>                | 230 Vac/2 A                                | 30 Vdc/1 A inductive/resistive             | 230 Vac/2 A                                | 30 Vdc/1 A inductive/resistive             | 24 Vdc/0.3 A inductive/resistive           | 24 Vdc/0.3 A inductive/resistive           |
| <b>Safety contact operating distance</b>    | 10 mm [0.4 in] ON;<br>30 mm [ 1.18 in] OFF | 10 mm [0.4 in] ON;<br>30 mm [ 1.18 in] OFF | 10 mm [0.4 in] ON;<br>30 mm [ 1.18 in] OFF | 10 mm [0.4 in] ON;<br>30 mm [ 1.18 in] OFF | 6 mm [0.24 in] ON;<br>17 mm [ 0.67 in] OFF | 6 mm [0.24 in] ON;<br>17 mm [ 0.67 in] OFF |
| <b>Safety contact close/drop/bounce</b>     | 3 ms/2.1 ms/<br>0.7 ms                     | 3 ms/2.1 ms/<br>0.7 ms                     | 3 ms/2.1 ms/<br>0.7 ms                     | 3 ms/2.1 ms/<br>0.7 ms                     | 3 ms/2.1 ms/<br>0.7 ms                     | 3 ms/2.1 ms/<br>0.7 ms                     |
| <b>Auxiliary contact rating</b>             | 15 W/10 VA                                 | 15 W/10 VA                                 | 15 W/10 VA                                 | 15 W/10 VA                                 | 24 Vdc/0.3 A inductive/resistive           | 24 Vdc/0.3 A inductive/resistive           |
| <b>Auxiliary contact operating distance</b> | 7 mm [0.28 in] OFF;<br>14 mm [0.55 in] ON  | 7 mm [0.28 in] OFF;<br>14 mm [0.55 in] ON  | 7 mm [0.28 in] OFF;<br>14 mm [0.55 in] ON  | 7 mm [0.28 in] OFF;<br>14 mm [0.55 in] ON  | 6 mm [0.24 in] OFF;<br>17 mm [0.67 in] ON  | 6 mm [0.24 in] OFF;<br>17 mm [0.67 in] ON  |
| <b>Auxiliary contact close/drop/bounce</b>  | 0.5 ms/0.3 ms/<br>0.7 ms                   | 0.5 ms/0.3 ms/<br>0.7 ms                   | 0.5 ms/0.3 ms/<br>0.7 ms                   | 0.5 ms/0.3 ms/<br>0.7 ms                   | 0.5 ms/0.3 ms/<br>0.7 ms                   | 0.5 ms/0.3 ms/<br>0.7 ms                   |
| <b>Internal fuse</b>                        | ac: 2 A fast acting                        | dc: 1 A fast acting                        | ac: 2 A fast acting                        | dc: 1 A fast acting                        | not applicable                             | not applicable                             |
| <b>External fuse (cust. supplied)</b>       | ac: 1.6 A fast acting                      | dc: 0.8 A fast acting                      | ac: 1.6 A fast acting                      | dc: 0.8 A fast acting                      | dc: 0.2 A fast acting                      | dc: 0.2 A fast acting                      |
| <b>IP rating</b>                            | IP67                                       | IP67                                       | IP67                                       | IP67                                       | IP67                                       | IP67                                       |
| <b>Vibration/shock</b>                      | 50 Hz to 100 Hz/<br>10 g                   | 50 Hz to 100 Hz/<br>10 g                   | 50 Hz to 100 Hz/<br>10 g                   | 50 Hz to 100 Hz/<br>10 g                   | 50 Hz to 100 Hz/<br>10 g                   | 50 Hz to 100 Hz/<br>10 g                   |
| <b>Operating temperature</b>                | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           |
| <b>Mounting and fixture</b>                 | Target to target                           | Target to target                           | Target to target                           | Target to target                           | Target to target                           | Target to target                           |
| <b>Construction</b>                         | Red ABS resin filled                       | Red ABS resin filled                       | Red ABS resin filled                       | Red ABS resin filled                       | Red ABS resin filled                       | 316 stainless steel, resin filled          |

**TABLE 2. SPECIFICATIONS**

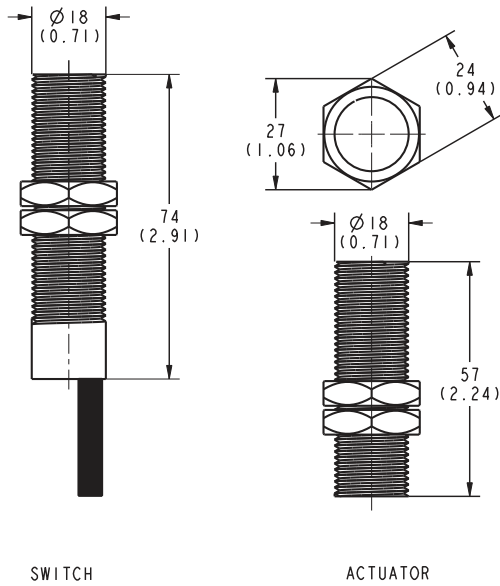
| Type  | FF6 ac                                     | FF6 dc                                     | FF6-SS ac                                  | FF6-SS dc                                  |
|---|--|--|--|--|
| <b>Contact arrangement</b>                  | Max: 2NC safety and 1NO auxiliary          | Max: 2NC safety and 1NO auxiliary          | 1NC safety                                 | Max: 2NC safety and 1NO auxiliary          |
| <b>Safety contact rating</b>                | 230 Vac/2 A                                | 30 Vdc/1 A inductive/resistive             | 230 Vac/2 A                                | 30 Vdc/1 A inductive/resistive             |
| <b>Safety contact operating distance</b>    | 10 mm [0.4 in] ON;<br>30 mm [ 1.18 in] OFF | 10 mm [0.4 in] ON;<br>30 mm [ 1.18 in] OFF | 10 mm [0.4 in] ON;<br>30 mm [ 1.18 in] OFF | 10 mm [0.4 in] ON;<br>30 mm [ 1.18 in] OFF |
| <b>Safety contact close/drop/bounce</b>     | 3 ms/2.1 ms/0.7 ms                         | 3 ms/2.1 ms/0.7 ms                         | 3 ms/2.1 ms/0.7 ms                         | 3 ms/2.1 ms/0.7 ms                         |
| <b>Auxiliary contact rating</b>             | 15 W/10 VA                                 | 15 W/10 VA                                 |  | 15 W/10 VA                                 |
| <b>Auxiliary contact operating distance</b> | 7 mm [0.28 in] OFF;<br>20 mm [0.79 in] ON  | 7 mm [0.28 in] OFF;<br>20 mm [0.79 in] ON  |  | 7 mm [0.28 in] OFF;<br>20 mm [0.79 in] ON  |
| <b>Auxiliary contact close/drop/bounce</b>  | 0.5 ms/0.3 ms/0.7 ms                       | 0.5 ms/0.3 ms/0.7 ms                       |  | 0.5 ms/0.3 ms/0.7 ms                       |
| <b>Internal fuse</b>                        | ac: 2 A fast acting                        | dc: 1 A fast acting                        | ac: 2 A fast acting                        | dc: 1 A fast acting                        |
| <b>External fuse (cust. supplied)</b>       | ac: 1.6 A fast acting                      | dc: 0.8 A fast acting                      | ac: 1.6 A fast acting                      | dc: 0.8 A fast acting                      |
| <b>IP rating</b>                            | IP67                                       | IP67                                       | IP67                                       | IP67                                       |
| <b>Vibration/shock</b>                      | 50 Hz to 100 Hz/ 10 g                      | 50 Hz to 100 Hz/ 10 g                      | 50 Hz to 100 Hz/ 10 g                      | 50 Hz to 100 Hz/ 10 g                      |
| <b>Operating temperature</b>                | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           |
| <b>Mounting and fixture</b>                 | Target to target                           | Target to target                           | Target to target                           | Target to target                           |
| <b>Construction</b>                         | Red ABS resin filled                       | Red ABS resin filled                       | 316 stainless steel, resin filled          | 316 stainless steel, resin filled          |

**TABLE 3. SPECIFICATIONS**

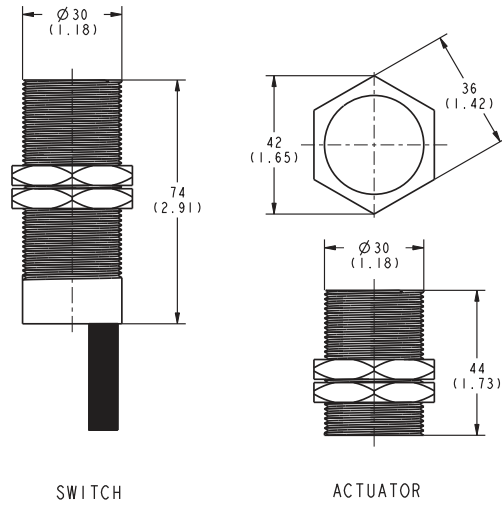
| Type  | FFS-11-03                                  | FFS-20-03                                  | FFS-11-QD                                  | FFS-20-QD                                  |
|---|--|--|--|--|
| <b>Contact arrangement</b>                  | Max: 1NC safety and 1NO auxiliary          | Max: 2NC safety                            | Max: 1NC safety and 1NO auxiliary          | Max: 2NC safety                            |
| <b>Safety contact rating</b>                | 230 Vac/2 A<br>30 Vdc/2 A                  | 230 Vac/2 A<br>30 Vdc/2 A                  | 230 Vac/2 A<br>30 Vdc/2 A                  | 230 Vac/2 A<br>30 Vdc/2 A                  |
| <b>Safety contact operating distance</b>    | 7 mm [0.28 in] ON;<br>12 mm [ 0.47 in] OFF | 7 mm [0.28 in] ON;<br>12 mm [ 0.47 in] OFF | 7 mm [0.28 in] ON;<br>12 mm [ 0.47 in] OFF | 7 mm [0.28 in] ON;<br>12 mm [ 0.47 in] OFF |
| <b>Safety contact close/drop/bounce</b>     | 3 ms/2.1 ms/0.7 ms                         | 3 ms/2.1 ms/0.7 ms                         | 3 ms/2.1 ms/0.7 ms                         | 3 ms/2.1 ms/0.7 ms                         |
| <b>Auxiliary contact rating</b>             | 15 W/10 VA                                 | –  | 15 W/10 VA                                 | –  |
| <b>Auxiliary contact operating distance</b> | 7 mm [0.28 in] OFF;<br>12 mm [0.47 in] ON  | –  | 7 mm [0.28 in] OFF;<br>12 mm [0.47 in] ON  | –  |
| <b>Auxiliary contact close/drop/bounce</b>  | 0.5 ms/0.3 ms/0.7 ms                       | –  | 0.5 ms/0.3 ms/0.7 ms                       | –  |
| <b>Internal fuse</b>                        | Not applicable                             | Not applicable                             | Not applicable                             | Not applicable                             |
| <b>External fuse (cust. supplied)</b>       | 3 A/230 Vac, 1 A/30 Vdc                    | 3 A/230 Vac, 1 A/30 Vdc                    | 3 A/230 Vac, 1 A/30 Vdc                    | 3 A/230 Vac, 1 A/30 Vdc                    |
| <b>IP rating</b>                            | IP67                                       | IP67                                       | IP67                                       | IP67                                       |
| <b>Supply voltage</b>                       | 24 Vdc                                     | 24 Vdc                                     | 24 Vdc                                     | 24 Vdc                                     |
| <b>Vibration/shock</b>                      | 50 Hz to 100 Hz/ 10 g                      | 50 Hz to 100 Hz/ 10 g                      | 50 Hz to 100 Hz/ 10 g                      | 50 Hz to 100 Hz/ 10 g                      |
| <b>Operating temperature</b>                | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           | -10°C to 55°C<br>[14°F to 131°F]           |
| <b>Mounting and fixture</b>                 | Target to target                           | Target to target                           | Target to target                           | Target to target                           |
| <b>Construction</b>                         | Blue ABS resin filled                      | Blue ABS resin filled                      | Blue ABS resin filled                      | Blue ABS resin filled                      |

**DIMENSIONS mm [in]**

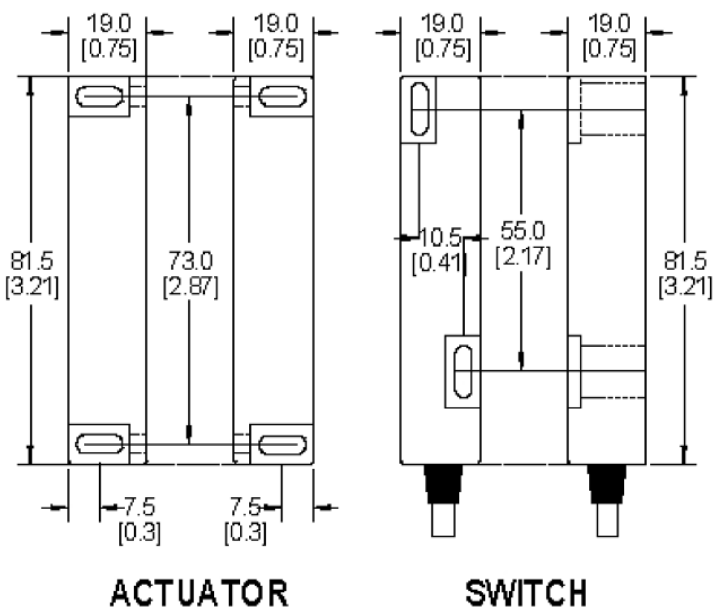
**Figure 7. FF2 Series**



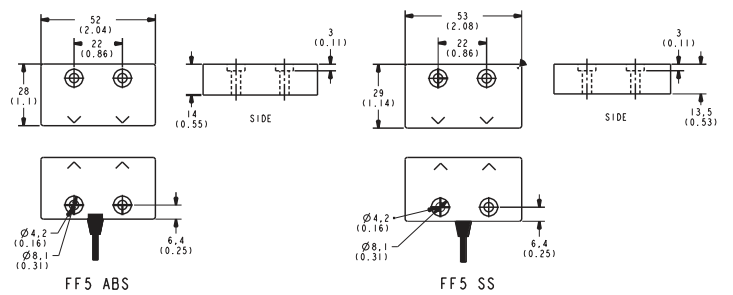
**Figure 8. FF3 Series**



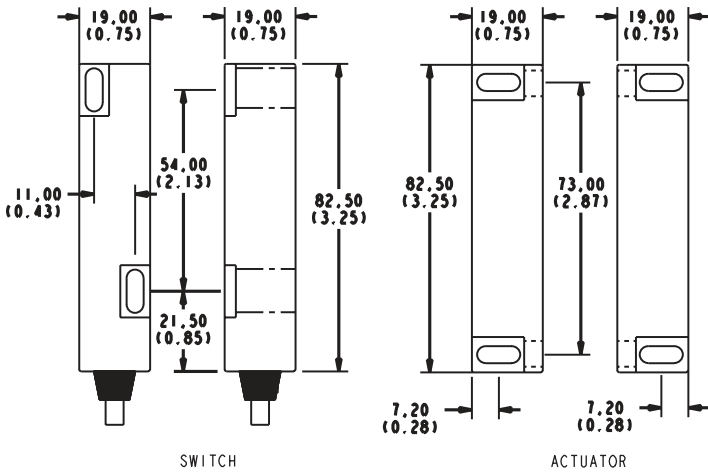
**Figure 9. FF6 Stainless Steel, Pre-Wired**



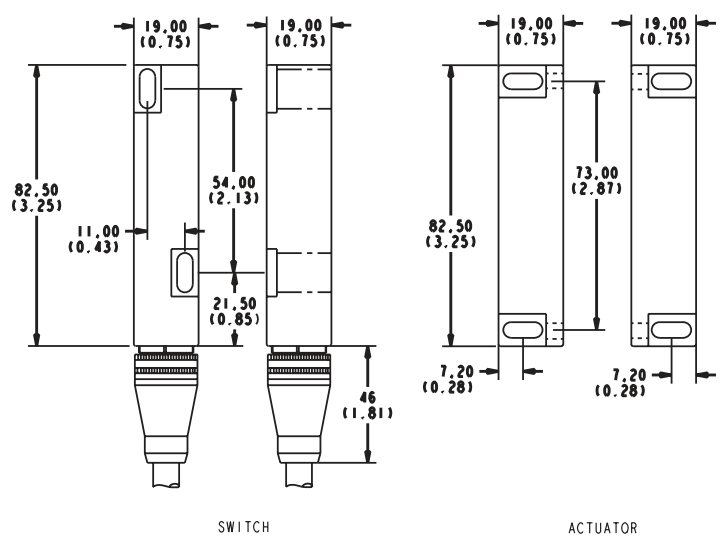
**Figure 10. FF5 Series**



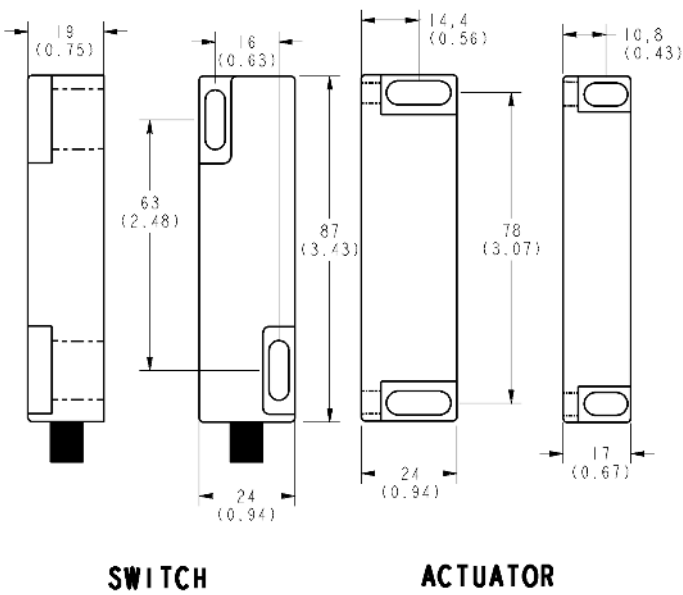
**Figure 11. FF6 Pre-Wired**



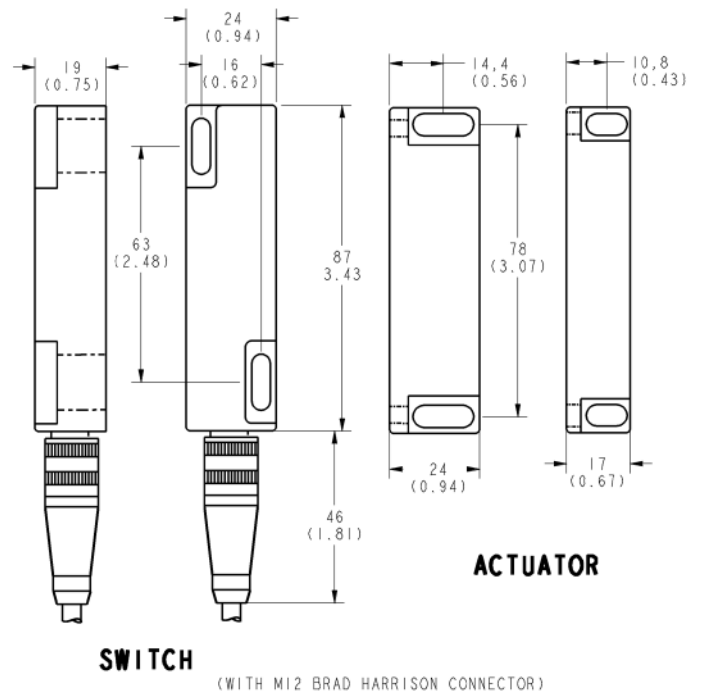
**Figure 12. FF6 Series Quick Connect**



**Figure 13. FFS Pre-Wired**



**Figure 14. FFS Quick Connect**



## CONTACTS AND CONNECTIONS

Figure 15. FF2-10

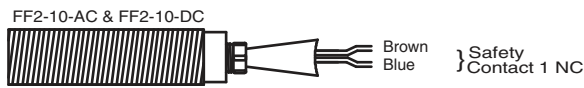


Figure 16. FF3-20

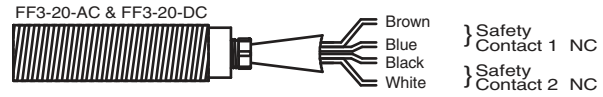


Figure 17. FF2-11

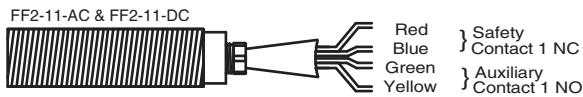


Figure 18. FF3-21

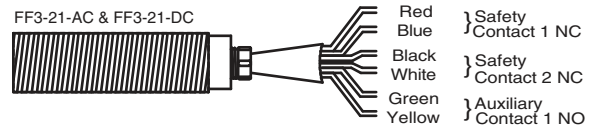


Figure 19. FF5

The safety contact must be fused externally. dc switch – external fuse = 0.2 A fast acting

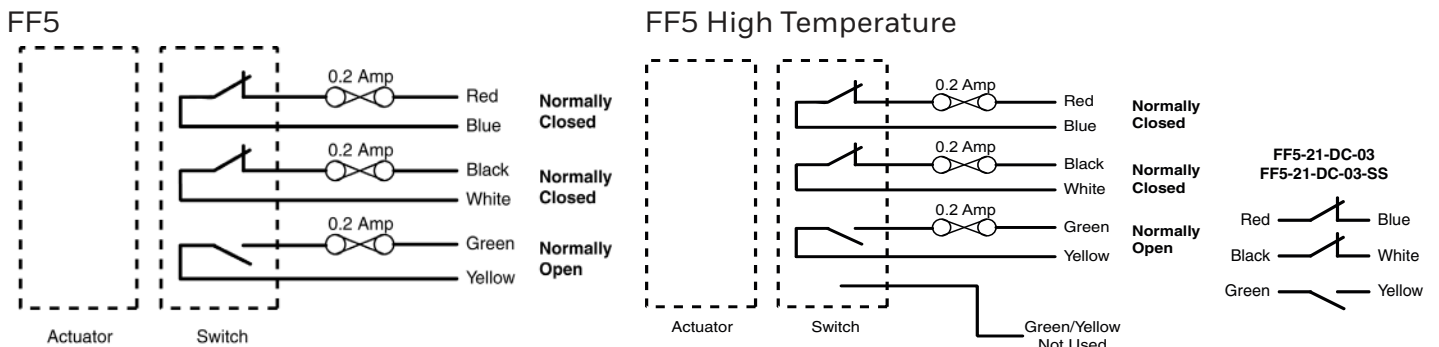
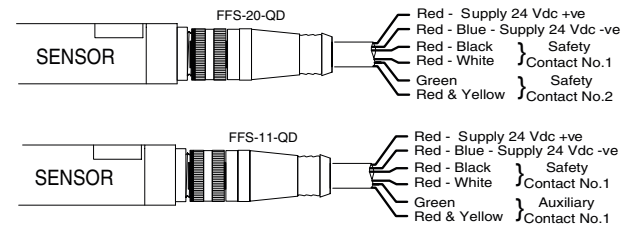
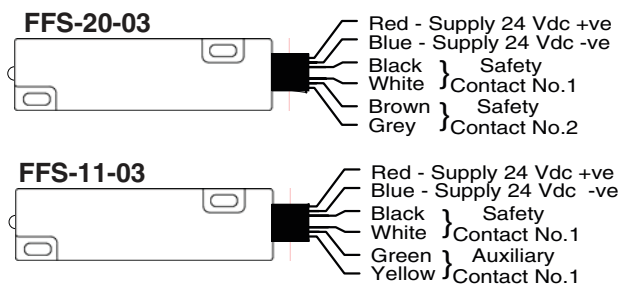
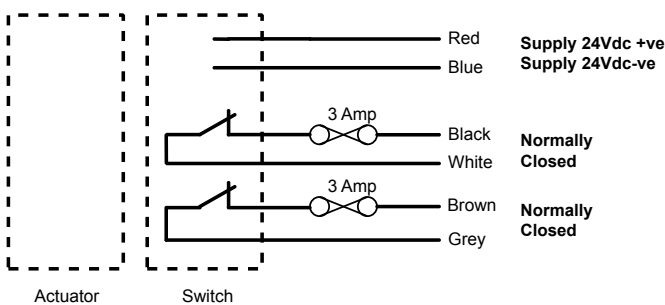


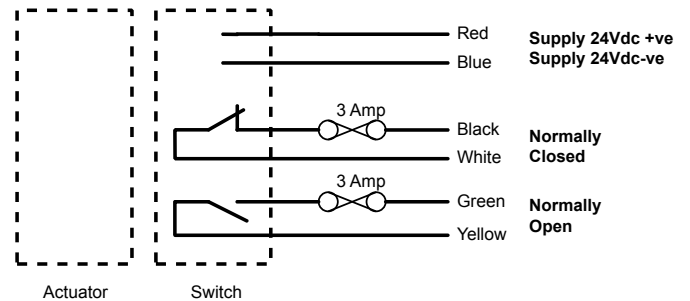
Figure 20. FFS



FFS-20-03 Connections



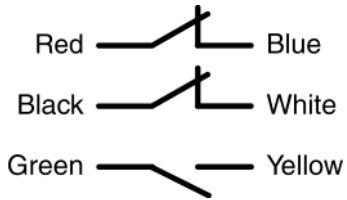
FFS-11-03 Connections



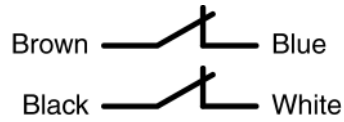
NOTE: Contact configurations show under closed condition for guard device.

### CONTACTS AND CONNECTIONS

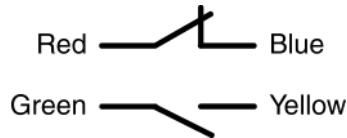
**FF6-21-ABS (ac & dc)**  
**FF6-21-SS (dc only)**



**FF6-20 ABS (ac & dc)**  
**FF6-20 SS (dc only)**



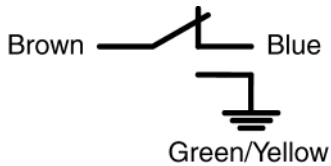
**FF6-11 ABS (ac & dc)**  
**FF6-11 (dc only)**



**FF6-10 ABS (ac & dc)**  
**FF6-10 SS (ac & dc)**



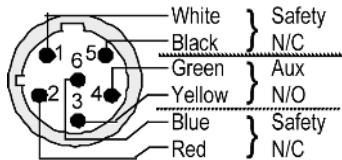
**FF6-10-03-SS**



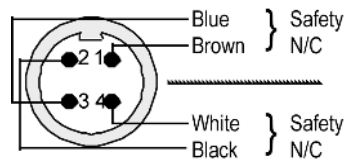
NOTE: Contact configurations show under closed condition for guard device.

### QUICK DISCONNECT CONNECTIONS

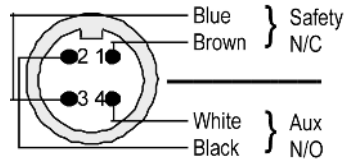
**FF6-21-AC-QD05**  
**FF6-21-DC-QD05**



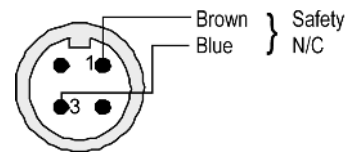
**FF6-20-AC-QD05**  
**FF6-20-DC-QD05**



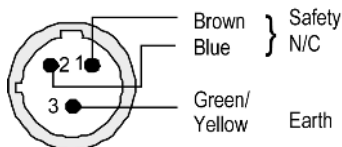
**FF6-11-AC-QD05**  
**FF6-11-DC-QD05**



**FF6-10-AC-QD05**  
**FF6-10-DC-QD05**



**FF6-10-AC-SS-QD05**



## WARRANTY/REMEDY

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|---------------|---------------------|
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| Latin America | +1 305 805 8188     |
| Europe        | +44 1344 238258     |
| Japan         | +81 (0) 3-6730-7152 |
| Singapore     | +65 6355 2828       |
| Greater China | +86 4006396841      |

### Honeywell Sensing and Safety Technologies

830 East Arapaho Road  
Richardson, TX 75081  
[sps.honeywell.com/ast](https://sps.honeywell.com/ast)