

## Ferrogard Safety Switches

The Ferrogard™ range of magnetically actuated safety switches offer 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.

### Ferrogard 1, 2, 20, and 21 Non-contact Interlock Switches

The Ferrogard 1, 2, 20, and 21 non-contact interlock switches have the following 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

Attribute	Value
<b>Safety Ratings</b>	
Standards	ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, AS4024.1
Safety classification	Cat. 1 Device per ISO13849-1. Dual channel interlocks suitable for Cat. 3 or 4 systems
Functional safety data <sup>(1)</sup>	B10d: > 2 x 10 <sup>6</sup> operations at min. PFH <sub>D</sub> : > 3 x 10 <sup>-7</sup> MTTFd: > 385 years Dual channel interlock may be suitable for performance levels PL <sub>e</sub> or PL <sub>d</sub> (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on application characteristics
For up-to-date information, visit <a href="https://ab.rockwellautomation.com/safety">https://ab.rockwellautomation.com/safety</a>	
Certifications	CE Marked for all applicable directives <a href="http://www.rockwellautomation.com/certification/overview.page">www.rockwellautomation.com/certification/overview.page</a>
<b>Outputs (Guard Door Closed, Actuator in Place)</b>	
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.
<b>Operating Characteristics</b>	
Operating distance, make	Safety: 12 mm (0.47 in.); Auxiliary: 15 mm (0.59 in.)
Operating distance, break	Safety: 23 mm (0.91 in.); Auxiliary: 26 mm (1.02 in.)
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
<b>Environmental</b>	
Enclosure type rating	IP67 (NEMA 6P)
Operating temperature	-10...+55 °C (+14...+131 °F)
Relative humidity	5...95%
Shock	50 g
Vibration	7 g; 50...200 Hz
Radio frequency	IEC 61000-4-3, IEC 61000-4-6
<b>Physical Characteristics</b>	
Housing material	Molded ABS plastic

Attribute	Value
Actuator material	Molded ABS plastic
Weight	FRS 1-Sensor: 35 g(0.08 lb)/Actuator: 85 g (0.19 lb) FRS 2-Sensor: 40 g (0.09)/Actuator: 85 g (0.19 lb) FRS 20-Sensor: 43 g (0.09)/Actuator: 85 g (0.19 lb) FRS 21-Sensor: 43 g (0.09)/Actuator: 85 g (0.19 lb)
Color	Red

- (1) 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

Switching Capability	Safety Contacts <sup>(1)</sup>	Auxiliary Contacts <sup>(1)</sup>	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	440N-G02043	
			20 m Cable	440N-G02040	
			4-pin Micro QD	440N-G02093	
	2 N.C.	—	4-pin Micro QD	FRS 20	440N-G02097
	2 N.C.	1 N.O.	2 m Cable	FRS 21	440N-G02055
			4 m Cable		440N-G02061
			6 m Cable		440N-G02060
			10 m Cable		440N-G02059
6-pin AC Micro QD <sup>(2)</sup>			440N-G02098		
24V DC, 1 A	1 N.C.	1 N.O.	2 m Cable	FRS 2	440N-G02092
			4-pin Micro QD		440N-G02094
	2 N.C.	—	4 m Cable	FRS 20	440N-G02085
			4-pin Micro QD		440N-G02090
		1 N.O.	2 m Cable	FRS 21	440N-G02058
			4 m Cable		440N-G02077
			6 m Cable		440N-G02083
			6-pin Micro QD		440N-G02099

(1) Contacts are described with the guard door closed, that is, actuator in place. Switch is shipped complete with actuator.

(2) For connector ratings refer to [Table 23](#).

**Table 22 - Connection Systems**

Description	Connection to Distribution Box	
	4-pin Micro (M12) 1 N.C. & 1 N.O.	6-pin Micro (M12) 2 N.C. & 1 N.O.
Cordset	889D-F4AC-x <sup>(1)</sup>	889R-F6ECA-x <sup>(1)</sup>
Patchcord	889D-F4ACDM-y <sup>(2)</sup>	889R-F6ECRM-y <sup>(2)</sup>
Distribution box	898D-P4zKT-DM4 <sup>(3)</sup>	898R-F68MT-A5
Shorting plug	898D-41KU-DM	898R-P61MU-RM
T-port	898D-43KY-D4	—

- (1) Replace x with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
- (2) Replace y with 1 (1 m), 2 (2 m), 3 (3 m), 5 (5 m), or 10 (10 m) for standard cable lengths.
- (3) Replace z with 4 or 8 for number of ports.

**Table 23 - Connector Ratings**

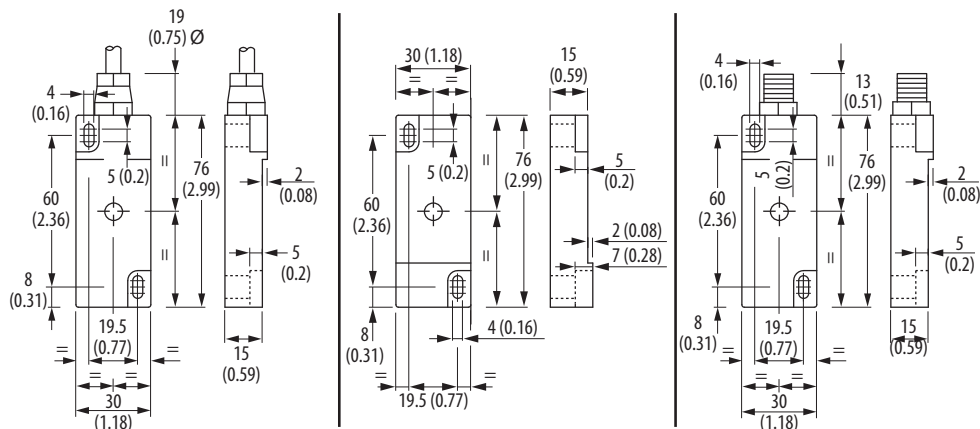
Description	Max Ratings		Applicable Standards
	AC	DC	
4-pin Micro (M12)	250V, 4 A	250V, 4 A	IEC 61076-2-101:2003
5-pin Micro (M12)	60V, 4 A	60V, 4 A	IEC 61076-2-101:2003
6-pin Micro (M12)	30V, 2 A	30V, 2 A	IEC 61076-2-101:2003
8-pin Micro (M12)	30V, 2 A	30V, 2 A	IEC 61076-2-101:2003
12-pin M23	63V, 6 A	63V, 6 A	IEC 61984:2001

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

(1) Replace x with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

## Ferrogard 3, 4, and 5 Non-contact Interlock Switches

The Ferrogard 3, 4, and 5 non-contact interlock switches have the following features:

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



### Specifications

Attribute	Value
<b>Safety Ratings</b>	
Standards	ISO13849-1, IEC/EN 60204-1, NFPA79, EN 1088, AS4024.1
Safety classification	Cat. 1 Device per ISO13849-1. Dual channel interlocks suitable for Cat. 3 or 4 systems
Functional safety data <sup>(1)</sup>	B10d: > 2 x 10 <sup>6</sup> operations at min. PFH <sub>D</sub> : > 3 x 10 <sup>-7</sup> MTTFd: > 385 years Dual channel interlock may be suitable for performance levels PL <sub>e</sub> or PL <sub>d</sub> (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on application characteristics
For up-to-date information, visit <a href="https://ab.rockwellautomation.com/safety">https://ab.rockwellautomation.com/safety</a>	
Certifications	CE Marked for all applicable directives <a href="http://www.rockwellautomation.com/certification/overview.page">www.rockwellautomation.com/certification/overview.page</a>
<b>Outputs (Guard Door Closed, Actuator in Place)</b>	
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
<b>Operating Characteristics</b>	
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	300V DC, 250V AC 0.5 A including inrush, min
Safety contact external fusing	≤1.6 A quick blow
<b>Environmental</b>	
Enclosure type rating	IP65 (NEMA 13)
Operating temperature	-10...+65 °C (+14...+149 °F)
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
<b>Physical Characteristics</b>	
Housing material	Molded ABS plastic
Actuator material	Molded ABS plastic
Color	Red

- (1) 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 <sup>(1)</sup>	Auxiliary Contacts <sup>(1)</sup>	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

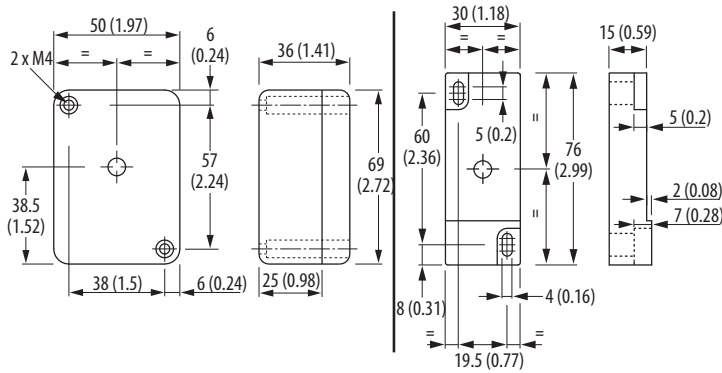
(1) Contacts are described with the guard door closed, that is, actuator in place.

## Accessory

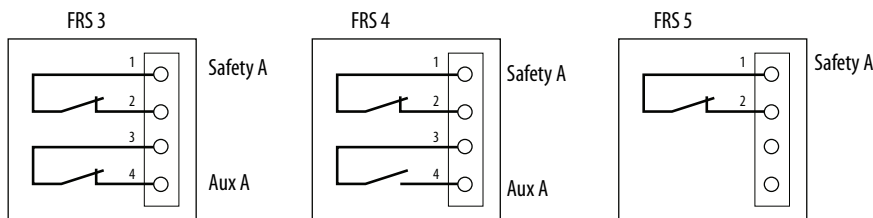
Description	Cat. No.
Replacement Actuator	440N-A02005

## Approximate Dimensions

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



## Typical Wiring Diagrams



## Ferrogard 6, 9, 10, 13, and 14 Non-contact Interlock Switches

The Ferrogard 6, 9, 10, 13, and 14 non-contact interlock switches have the following features:

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



### Specifications

Attribute	Value	
<b>Safety Ratings</b>		
Standards	ISO13849-1, IEC/EN60204-1, NFPA79, EN1088, AS4024.1	
Safety classification	Cat. 1 Device per ISO13849-1. Dual channel interlocks suitable for Cat. 3 or 4 systems	
Functional safety data <sup>(1)</sup>	B10d: > 2 x 10 <sup>6</sup> operations at min. PFH <sub>D</sub> : > 3 x 10 <sup>-7</sup> 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	
For up-to-date information, visit <a href="https://ab.rockwellautomation.com/safety">https://ab.rockwellautomation.com/safety</a>		
<b>Certifications</b>		
FRS6, FRS9, FRS10	CE Marked for all applicable directives <a href="http://www.rockwellautomation.com/certification/overview.page">www.rockwellautomation.com/certification/overview.page</a>	
FRS13, FRS14	CE Marked for all applicable directives and c-UL-us <a href="http://www.rockwellautomation.com/certification/overview.page">www.rockwellautomation.com/certification/overview.page</a>	
<b>Outputs (Guard Door Closed, Actuator in Place)</b>		
Safety outputs	1 N.C.	1 N.C.
Auxiliary outputs	—	1 N.C.
<b>Operating Characteristics</b>		
Operating distance, make	12 mm (0.47 in.)	
Operating distance, break	23 mm (0.91 in.)	
<b>Environmental</b>		
Enclosure type rating	IP67 (NEMA 6P)	
Operating temperature	-10...+65 °C (+14...+149 °F)	
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	
<b>Physical Characteristics</b>		
Housing material	Molded ABS plastic	
Actuator material	Molded ABS plastic	
Weight of Sensor	28 g (0.06 lb)	
Weight of Actuator	70 g (0.15 lb)	
Color	Red	

(1) 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 <sup>(1)</sup>	Auxiliary Contacts <sup>(1)</sup>	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
					4-pin Micro QD	440N-G02095
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	
				8-pin Micro QD	440N-G02160	
24V DC, 1 A			FRS 14	2 m Cable	440N-G02156	
				4 m Cable	440N-G02157	
				8-pin Micro QD	440N-G02161	

(1) Contacts are described with the guard door closed, that is, actuator in place.

**Table 24 - Connection Systems**

Description	4-pin Micro (M12)	8-pin Micro (M12)
Cordset	889D-F4AC-x <sup>(1)</sup>	889D-F8AB-x <sup>(1)</sup>
Patchcord	889D-F4ACDM-y <sup>(2)</sup>	889D-F8ABDM-y <sup>(2)</sup>

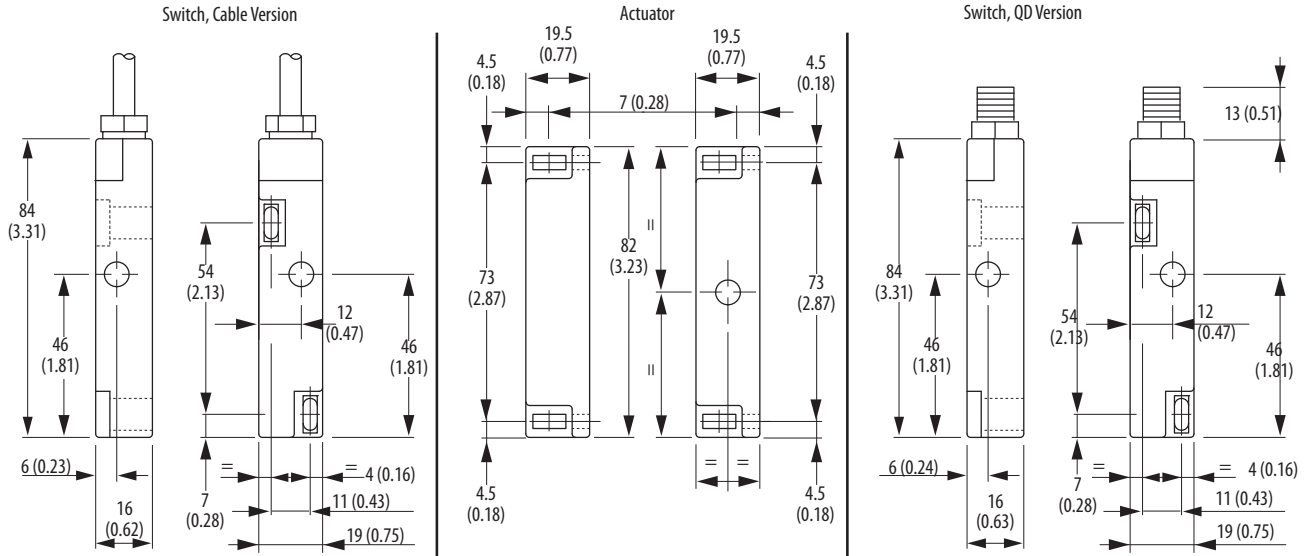
(1) Replace x with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

(2) Replace y with 1 (1 m), 2 (2 m), 3 (3 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

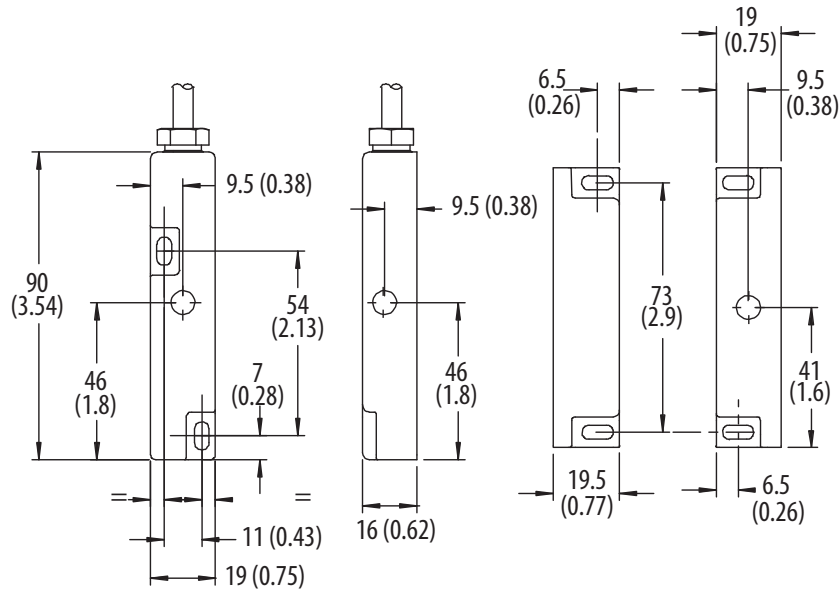
## Approximate Dimensions

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

**Figure 14 - FRS 6, 9, and 10**



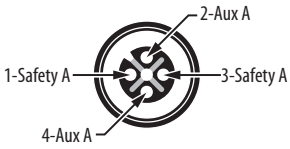
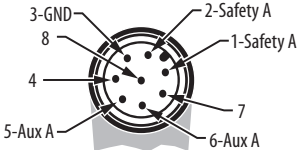
**Figure 15 - FRS 13 and 14**



## Accessories

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

## Typical Wiring Diagrams

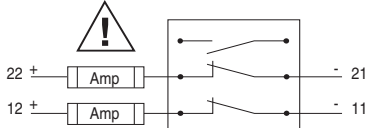
Description		FRS 6, 9 and 10 1 N.C.	FRS 13 and 14 1 N.C. and 1 N.C.
4-pin Micro (M12)			—
8-pin Micro (M12)		—	
Cordset 889D-F4AC-x <sup>(1)</sup>	Brown	Safety A	Safety A
	Blue		
	White	—	Aux A
	Black	—	Aux A
Cordset 889D-F8AB-x <sup>(1)</sup>	White	—	Safety A
	Brown		Aux A
	Gray		
	Pink		
	Green		
Cable Version	Safety A	Brown	Brown
		Blue	Blue
	Aux A	—	Black
		—	Gray

(1) Replace x with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.



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

**Table 25 - External Fuse Safety Contacts**

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

(1) Recommended: Bussman BK/GDA-1.6 A

(2) Recommended: Bussman BK/GDA-400 mA

(3) Recommended: Bussman BK/GDA-2.5 A

## Ferrogard GD2 Non-contact Interlock Switches

The Ferrogard GD2 non-contact interlock switches have the following features:

### 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

Attribute	Value		
<b>Safety Ratings</b>			
Standards	ISO13849-1, IEC/EN 60204-1, NFPA79, EN1088, ISO14119, ANSI B11.19, AS4024.1		
Safety classification	Dual channel interlocks suitable for Cat. 3 or 4 systems		
Functional safety data <sup>(1)</sup>	B10d: > 2 x 10 <sup>6</sup> operations at min. PFH <sub>D</sub> : > 3 x 10 <sup>-7</sup> MTTFd: > 385 years Dual channel interlock may be suitable for performance levels PL <sub>e</sub> or PL <sub>d</sub> (according to ISO 13849-1:2006) and for use in SIL2 or SIL3 systems (according to IEC 62061) depending on application characteristics		
For up-to-date information, visit <a href="https://ab.rockwellautomation.com/safety">https://ab.rockwellautomation.com/safety</a>			
Certifications	CE Marked for all applicable directives and c-UL-us <a href="http://www.rockwellautomation.com/certification/overview.page">www.rockwellautomation.com/certification/overview.page</a>		
<b>Outputs (Guard Door Closed, Actuator in Place)</b>			
Safety outputs	1 N.C.	2 N.C.	2 N.C.
Auxiliary outputs	1 N.O.	—	1 N.O.
<b>Operating Characteristics</b>			
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)		
<b>Environmental</b>			
Enclosure type rating	IP68 (NEMA 6P)		
Operating temperature	-25...+125 °C (-13...+257 °F)		
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		
<b>Physical Characteristics</b>			
Housing material	Stainless Steel; BS3146 ANC4B (316L)		
Actuator material	Stainless Steel; BS3146 ANC4B (316L)		
Weight, sensor [g (lb)]	156 (0.34)		
Weight, actuator [g (lb)]	168 (0.37)		

- (1) 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 <sup>(1)</sup>	Auxiliary Contacts <sup>(1)</sup>	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

(1) Contacts are described with the guard door closed, that is, actuator in place. Switch is shipped with complete actuator.

**Table 26 - Connection Systems**

Description	8-pin Micro (M12)
Cordset	889D-F8AB-x <sup>(1)</sup>
Patchcord	889D-F8ABDM-y <sup>(2)</sup>

(1) Replace x with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

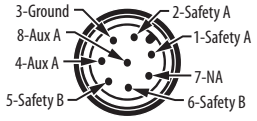
(2) Replace y with 1 (1 m), 2 (2 m), 3 (3 m), 5 (5 m), or 10 (10 m) for standard cable lengths.

## Accessory

Description	Cat. No.
Actuator	440N-A02128



## Typical Wiring Diagrams

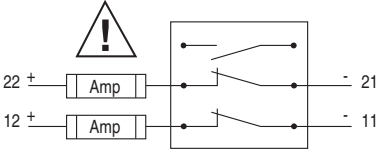
Description		FRS21 2 N.C. and 1 N.O.	FRS2 1 N.C. and 1 N.O.	FRS20 2 N.C.
Cable Versions	Safety A	Black	Blue	Brown
		White	Red	Blue
	Safety B	Red	—	Black
		Blue		White
	Aux A	Yellow	Yellow	
		Green	Green	
Shield Gnd	—	Green/Yellow	Green/Yellow	
8-pin Micro (M12)		—	—	
Cordset 889D-F8AB-x <sup>(1)</sup>	Brown White	Safety A	—	—
	Gray Pink	Safety B	—	—
	Yellow Red	Safety B	—	—
	Green Blue	NA	—	—

(1) Replace x with 2 (2 m), 5 (5 m), or 10 (10 m) for standard cable lengths.



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

**Table 27 - External Fuse Safety Contacts**

	
FRS 2 GD2 FRS20 GD2 FRS21 GD2	AC 1.6 A <sup>(1)</sup> ≤ (F) IEC 60127-2
FRS 2 GD2 FRS 20 GD2 FRS21 GD2	DC 0.4 A <sup>(2)</sup> ≤ (F) IEC 60127-2

(1) Recommended: Bussman BK/GDA-1.6 A

(2) Recommended: Bussman BK/GDA-400 mA