

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 <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
Note:	For up-to-date information, visit <a href="http://www.ab.com/Safety/">http://www.ab.com/Safety/</a>
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

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**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	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§			440N-G02098		
24V DC, 1 A	1 N.C.	1 N.O.	2 m Cable	FRS 2	440N-G02092
			4-Pin Micro QD		<b>440N-G02094</b>
	2 N.C.	—	4 m Cable	FRS 20	440N-G02085
			4-Pin Micro QD		<b>440N-G02090</b>
		1 N.O.	2 m Cable	FRS 21	440N-G02058
			4 m Cable		440N-G02077
			6 m Cable		440N-G02083
			6-Pin Micro QD		<b>440N-G02099</b>

**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.

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Recommended Logic Interfaces

Description	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. Page No.	Cat. No.
<b>Single-Function Safety Relays for 2 N.C. Contact Switch</b>							
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
<b>Single-Function Safety Relays for 1 N.C. &amp; 1 N.O. Contact Switch</b>							
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
<b>Modular Safety Relays</b>							
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)	2 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	—

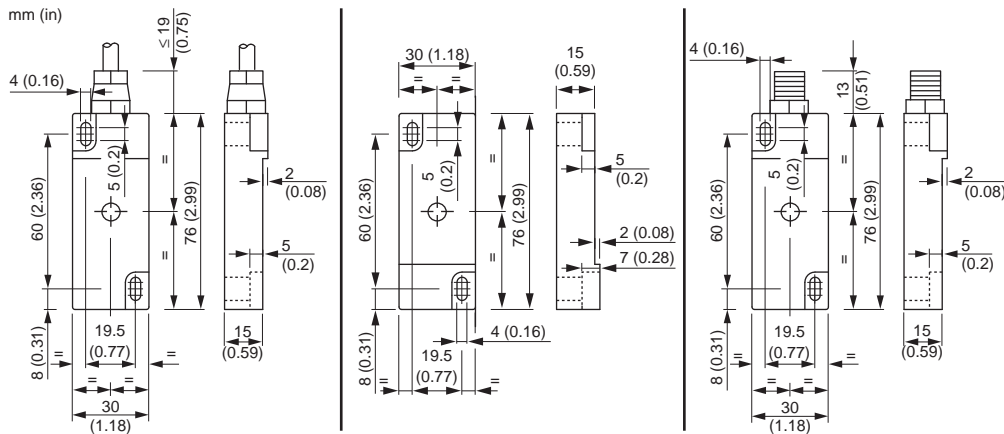
Accessories

Description	Cat. No.
Replacement Actuator	440N-A02005

\* 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.

Approximate Dimensions

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



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**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)		—			—
		—	—	—	
Cordset 889D-F4AC- <i>*</i> or Cable Versions	Brown	—	Safety A	Safety A	—
	Blue	—	—	—	—
	Black	—	Aux A	Safety B	—
	White	—	—	—	—
Cordset 889R-F6ECA- <i>*</i>	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.