

Safety Switches

# Non-Contact Switches

## SensaGuard™



### Description

When it comes to machine safety, Rockwell Automation knows that protection of personnel and equipment is your main concern. At the same time, flexibility and productivity are points that must also be considered as you design your safety system. Optimize all of these with the new Allen-Bradley SensaGuard family of non-contact switches.

Featuring the latest generation of RFID technology for coding and inductive technology for sensing, SensaGuard's large sensing range and tolerance to misalignment is a cost-effective solution that is ideally suited for a wide range of industrial safety applications.

The SensaGuard product line is a Category 4/SIL 3 rated switch per EN954-1, TÜV functional safety approved to IEC 61508.

### Features

- Switches can be connect to a standard safety relay, for example, the MSR126, MSR127, MSR200/300 Family, SmartGuard™ and Safety I/O Blocks
- Multiple actuator sizes for large sensing distance
- IP69K environmental rating
- Short-circuit and over-voltage protection
- LED located on the switch for door status and troubleshooting
- Unique coded version
  - Automatic learn process at unit power up
  - During commissioning you have the option to select if the sensor can learn a new actuator up to eight times or lock the unit so it can not learn another actuator
- Integrated latch version
  - Adjustable magnetic latch force 20...60N
  - Designed for easy mounting on aluminum profile

### Benefits

- No dedicated controller required
- Cat 4/SIL 3 rating maintained even with multiple units connected in series
- Switches can be connected in series with other devices (light curtain, E-stops, key interlock switches)
- Extended diagnostics for easy troubleshooting
- Large sensing distances
- Tolerance to misalignment
- Multiple sensing directions
- Stainless steel version suitable for use in harsh environments
- Use standard proximity brackets

### Specifications

Safety Ratings		
Standards	IEC 60947-5-3, IEC 61508, EN 954	
Safety Classification	Cat. 4/SIL3	
Functional Safety Data *	PFH <sub>D</sub> : > 1.12 x 10 <sup>-9</sup> MTTF <sub>D</sub> : > 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, cULus (UL 508), and TÜV	
Outputs (Guard Door Closed, Actuator in Place)		
Safety Outputs	2 x PNP, 0.2 A, max.; Status: ON (+24V DC)	
Auxiliary Outputs	1 x PNP, 0.2 A max.; Status: OFF (0V DC)	
Operating Characteristics		
Sensing Distance (Assure)	18 mm Plastic Barrel/18 mm Target	15 mm (0.59 in.)
	18 mm Plastic Barrel/30 mm Target	25 mm (0.98 in.)
	18 mm Stainless Steel Barrel/Standard Target	10 mm (0.39 in.)
	Large Rectangular Flat Pack with Standard Target	15 mm (0.59 in.)
Misalignment Tolerance, Min	See misalignment curve	
Repeat Accuracy	10% of Sensing Range	
Output Current, Max.	200 mA (all outputs)	
Operating Voltage	24V DC, +10%/-15% Class 2	
Current Consumption	50 mA	
Frequency of Operating Cycle	1 Hz	
Response Time (Off)	54 ms	
Environmental		
Enclosure Type Rating	NEMA 3, 4X, 12, 13, IP69K	
Operating Temperature [C (F)]	-10...+55° (+14...+131°)	
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	VALOX® DR 48	
Actuator Material	VALOX® DR 48	
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 30 years

3-Interlock Switches

**Product Selection**

Type	Assured Sensing Distance	LED Door Indication/Diagnostic	Margin Indication	Magnetic Hold	Actuator Code Type	Cat. No.		
						Cable		Connector 6 inch Pigtail, 8-pin Micro (M12)
						3 m	10 m	
18 mm plastic barrel/18 mm actuator	15 mm (0.59 in.)	Yes	—	—	Standard	440N-Z21S16A	440N-Z21S16B	<b>440N-Z21S16H</b>
					Unique	440N-Z21U16A	440N-Z21U16B	440N-Z21U16H
18 mm plastic barrel/30 mm actuator	25 mm (0.98 in.)	Yes	—	—	Standard	440N-Z21S26A	440N-Z21S26B	<b>440N-Z21S26H</b>
					Unique	440N-Z21U26A	440N-Z21U26B	440N-Z21U26H
18 mm stainless steel barrel/18 mm actuator	10 mm (0.39 in.)	Yes	—	—	Standard	440N-Z21S17A	440N-Z21S17B	<b>440N-Z21S17H</b>
					Unique	440N-Z21U17A	440N-Z21U17B	440N-Z21U17H
Plastic rectangular/rectangular actuator	18 mm (0.71 in.)	Yes	—	—	Standard	440N-Z21SS2A	440N-Z21SS2B	<b>440N-Z21SS2H</b>
					Unique	440N-Z21US2A	440N-Z21US2B	440N-Z21US2H
			Yes	—	Standard	440N-Z21SS2AN	440N-Z21SS2BN	<b>440N-Z21SS2HN</b>
					Unique	440N-Z21US2AN	440N-Z21US2BN	440N-Z21US2HN
			Yes	Yes (9 N)	Standard	440N-Z21SS2AN9	440N-Z21SS2BN9	440N-Z21SS2HN9
					Unique	440N-Z21US2AN9	440N-Z21US2BN9	440N-Z21US2HN9
Plastic housing with integrated latch	Contact/latched	Yes	—	Adjustable 20...60 N	Standard	440N-Z21SS3PA	440N-Z21SS3PB	440N-Z21SS3PH
					Unique	440N-Z21US3PA	440N-Z21US3PB	440N-Z21US3PH

**Recommended Logic Interfaces**

Description	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. Page No.	Cat. No.
<b>Single-Function Safety Relays</b>							
MSR127RP	3 N.O.	1 N.C.	Removable (Screw)	Monitored Manual	24V AC/DC	5-26	<b>440R-N23135</b>
MSR127TP				Auto./Manual		5-26	<b>440R-N23132</b>
<b>Modular Safety Relays</b>							
MSR211P Base 2 N.C. only	2 N.O.	1 N.C.	Removable	Auto./Manual or Monitored Manual	24V DC from the base unit	5-84	440R-H23177
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	Cat. No.
Cordset	889D-F8AB-*
Patchcord	889D-F8ABDM-*
Safety Wired T-Port	898D-438Y-D8
Safety Wired Shorting Plug	898D-418U-DM

\* 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 lengths.  
**Note:** For additional information, see page 7-1.









**3-Interlock Switches**

Safety Switches

Non-Contact Switches

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Accessories

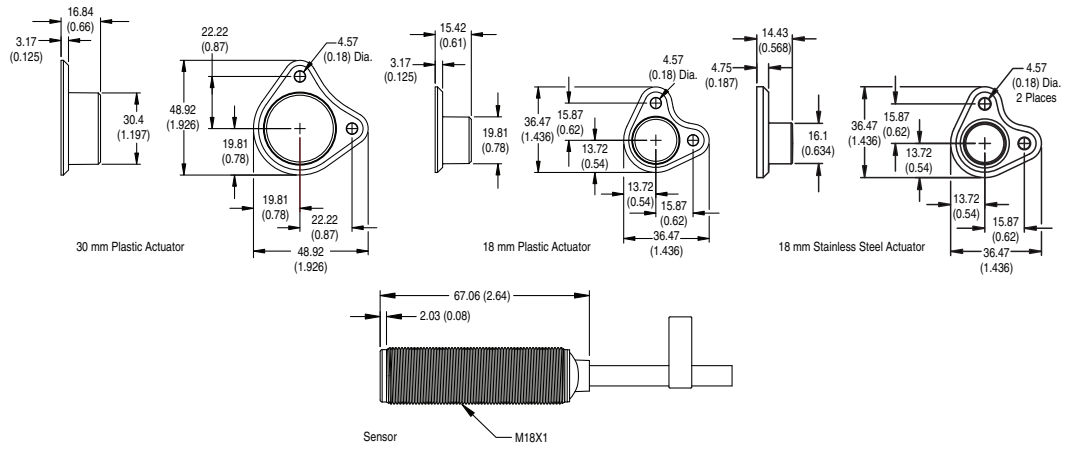
Description		To Be Used With	Cat. No.
	18 mm plastic actuator	Standard coded models only	440N-Z18PT
		Unique coded models only	440N-Z18UPT
	30 mm plastic actuator	Standard coded models only	440N-Z30PT
		Unique coded models only	440N-Z30UPT
	18 mm stainless steel actuator	Standard coded models only	440N-Z18SST
		Unique coded models only	440N-Z18USST
	Rectangular plastic actuator	Standard coded models only	440N-ZPREC
		Unique coded models only	440N-ZUPREC
		Standard coded margin/magnetic hold models only	440N-ZPRECM
		Unique coded margin/magnetic hold models only	440N-ZUPRECM
	Integrated latch actuator	Standard coded models only	440N-ZLPREC
		Unique coded models only	440N-ZULPREC
	Mounting bracket for tubular proximity sensors—right angle style	18 mm barrel models	871A-BRS18
	Mounting bracket for tubular sensors—clamp style		871A-BP18
	Snap clamp mounting bracket		871A-SCBP18
	Swivel/tilt bracket allows ±10° vertical and 360° rotation adjustment		60-2649
	Mounting plate for vertically hinged doors		Integrated latch version only
	Mounting plate for slide and gull wing doors	440N-ASDB	

3-Interlock  
Switches

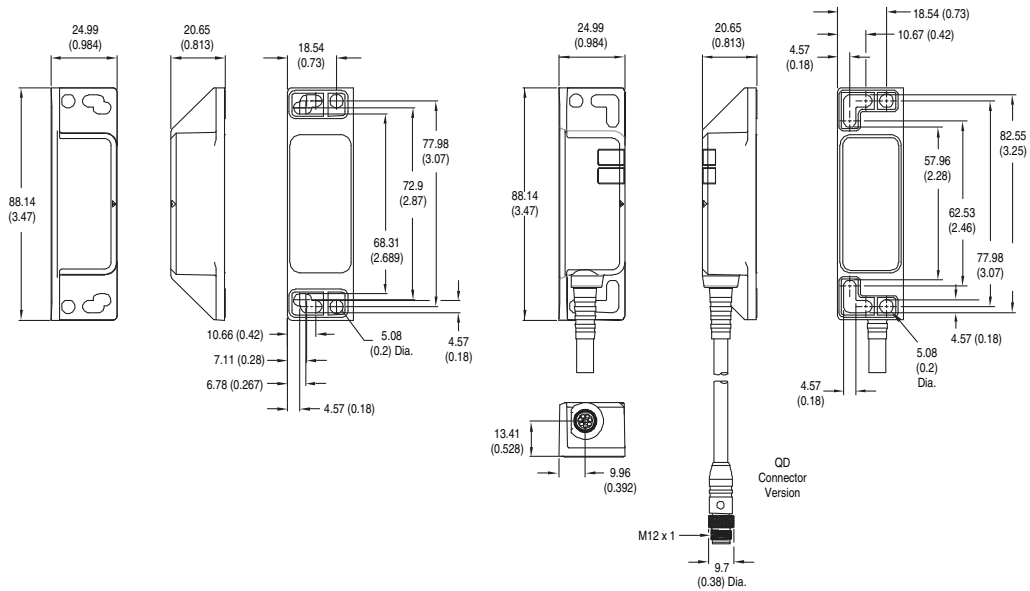
**Approximate Dimensions**

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

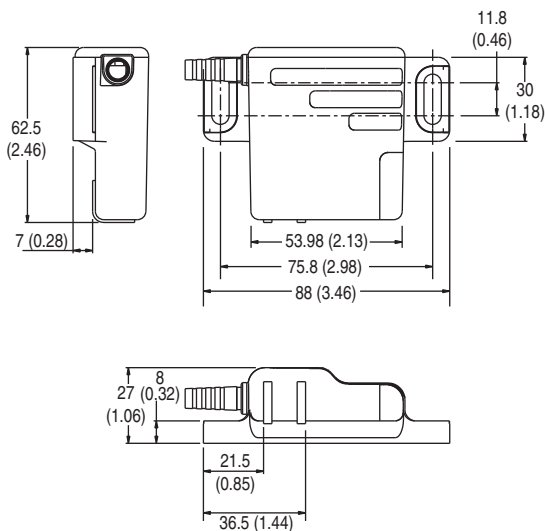
**18 mm Barrel**



**Large Rectangular Flat Pack**



**Integrated Latch**



**3-Interlock Switches**

Safety Switches

Non-Contact Switches

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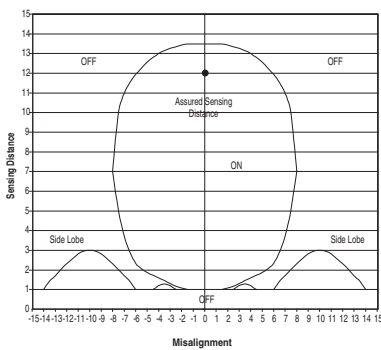
Typical Wiring Diagrams

Description		Plastic	Stainless Steel
8-Pin Micro (M12)			
8-Pin Cordset 889D-F8AB-★ or cable version	Grey	Safety A	Safety A
	Red	Safety A+	Safety A+
	Pink	Safety B	Safety B
	Yellow	Safety B+	Safety B+
	White	Aux A	Aux A
	Brown	24V DC +	24V DC +
	Blue	Gnd	Gnd
	Green	NA	Shield

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

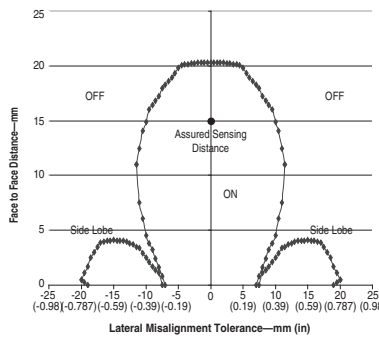
Misalignment Curves

18 mm Stainless Steel Barrel



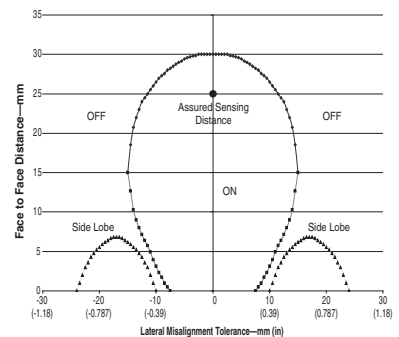
**Note:** There must be a minimum spacing of 4 mm (0.157 in.) if actuator and sensor face approaches laterally. This will prevent false triggering due to the side lobe areas.

18 mm Plastic Barrel



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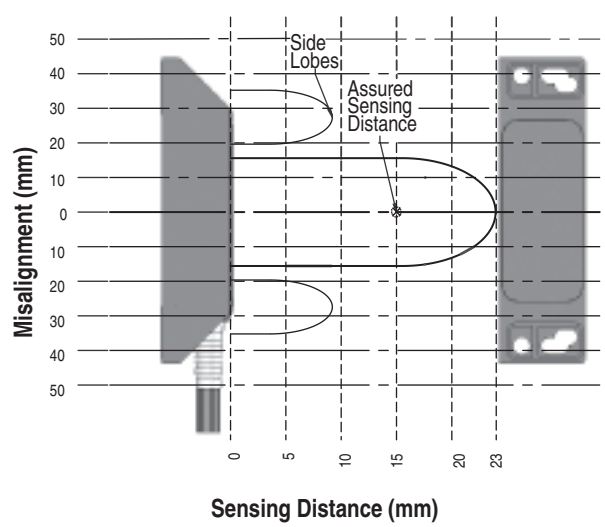
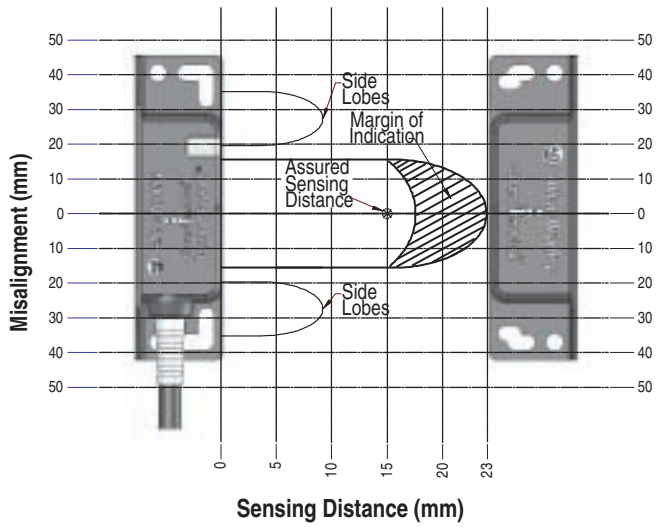
30 mm Plastic Barrel



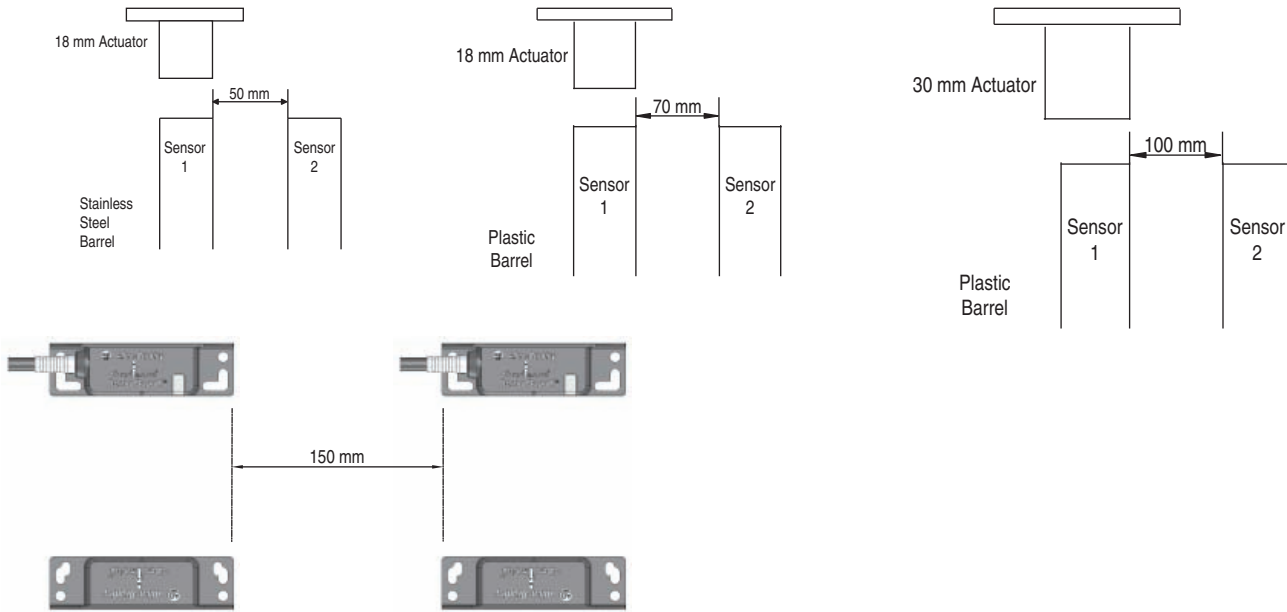
**Note:** There must be a minimum spacing of 7 mm (0.275 in.) if actuator and sensor face approaches laterally. This will prevent false triggering due to the side lobe areas.

3-Interlock Switches

**Large Rectangular Flat Pack**



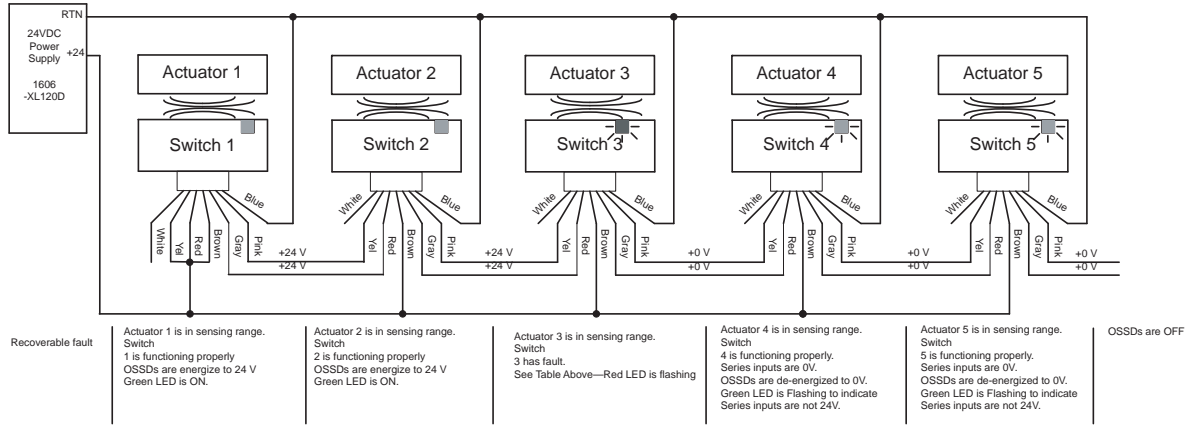
**Minimum Distance Between Sensors**



**3-Interlock Switches**

**Safety Switches**  
**Non-Contact Switches**  
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**Diagnostic**

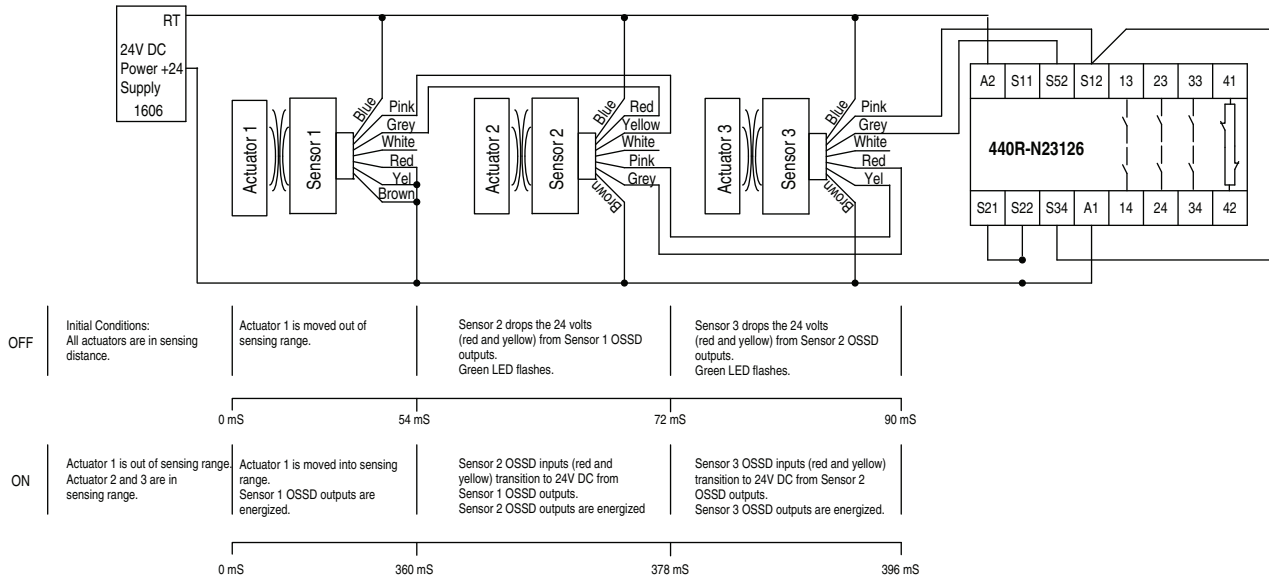


**Unit Indicators (per IEC 60073)**

	State	Status	Troubleshooting
<b>Device Output LED</b>	Off	Not Powered	NA
	Red	Not Safe, Output Off	NA
	Green	Safe, Output On	NA
	Green Flash	Power Up Test	Check 24V DC on Safety + Outputs (yellow and red wire)
	Red Flash	1 Hz Flash Recoverable Fault 4 Hz Flash Nonrecoverable Fault	Recoverable Fault: Check Safety Outputs Are Not Shorted to GND, 24V DC or Each Other. Cycle Power.
	Amber Flash	Safe, Output On, Sensor Is Reaching Max. Sensing Distance	Re-adjust Distance Between Actuator and Sensor until Output LED Is Green

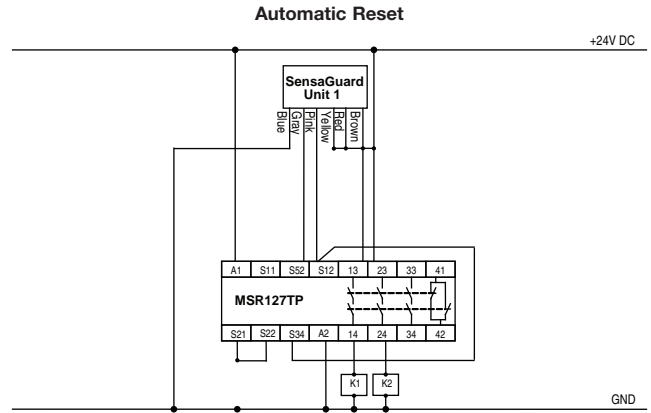
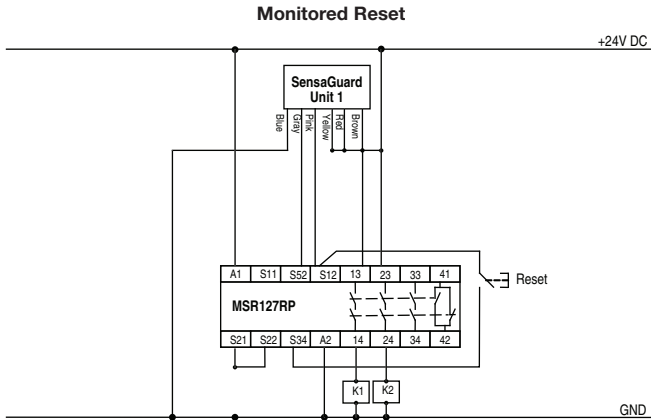
**3-Interlock Switches**

**Unit Response Time**

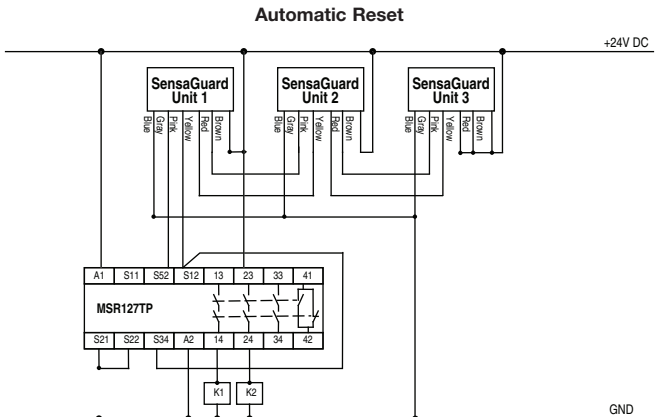
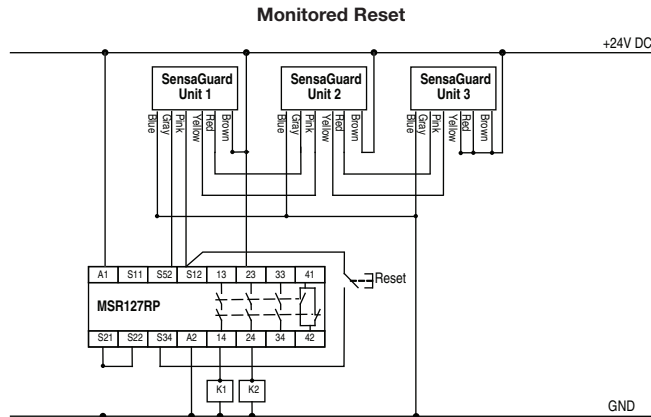


**Application Wiring Examples**

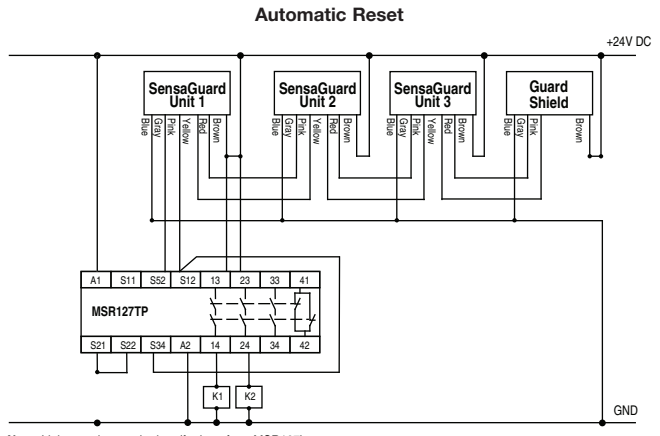
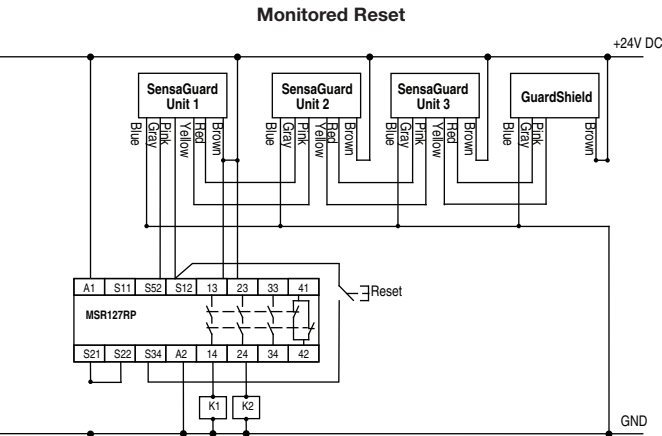
**MSR127RP with One Sensor**



**MSR127RP with Three Sensors**



**MSR127RP with Two Sensors and One Light Curtain**



Note: Light curtain must be last (farthest from MSR127).

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**3-Interlock Switches**



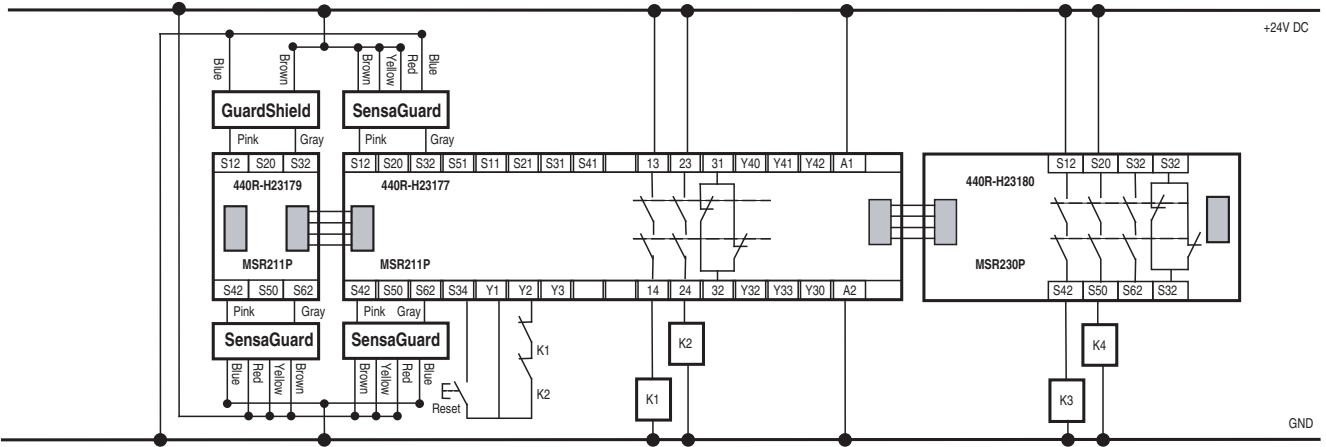
Safety Switches

Non-Contact Switches

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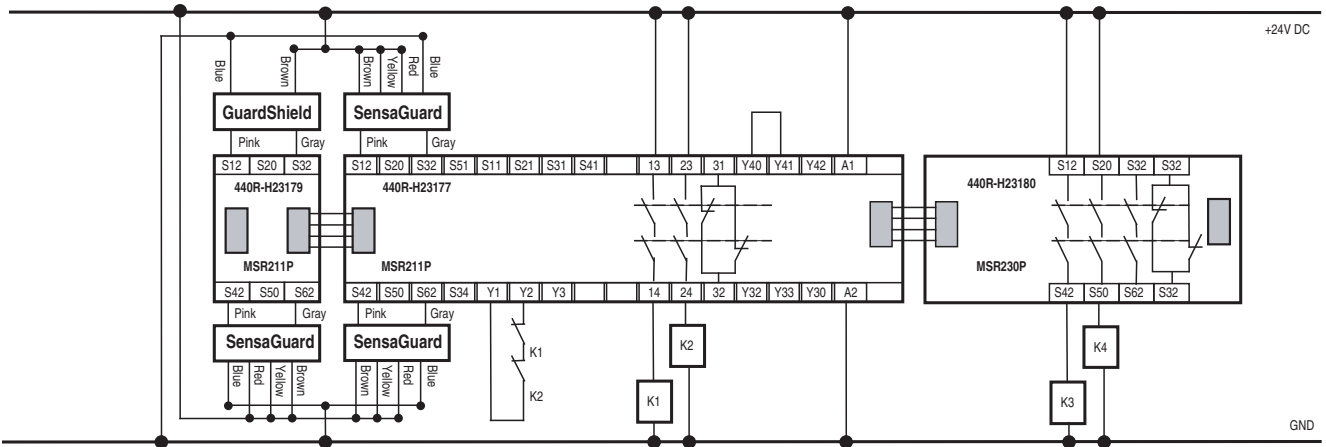
MSR200 Series with Three Sensors and One Light Curtain

Manual Reset



Note: Light curtain can be attached to any input.

Automatic Reset

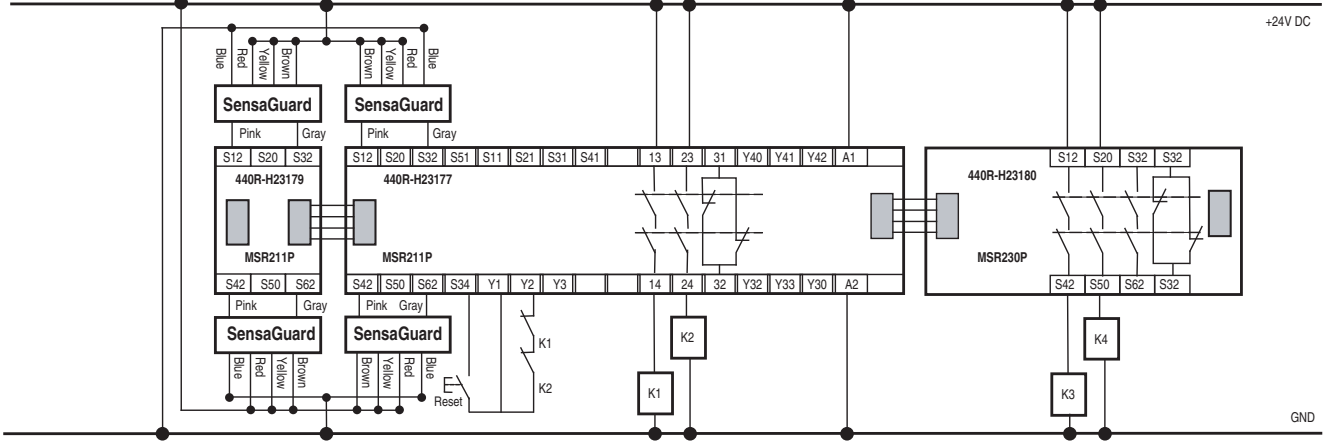


Note: Light curtain can be attached to any input

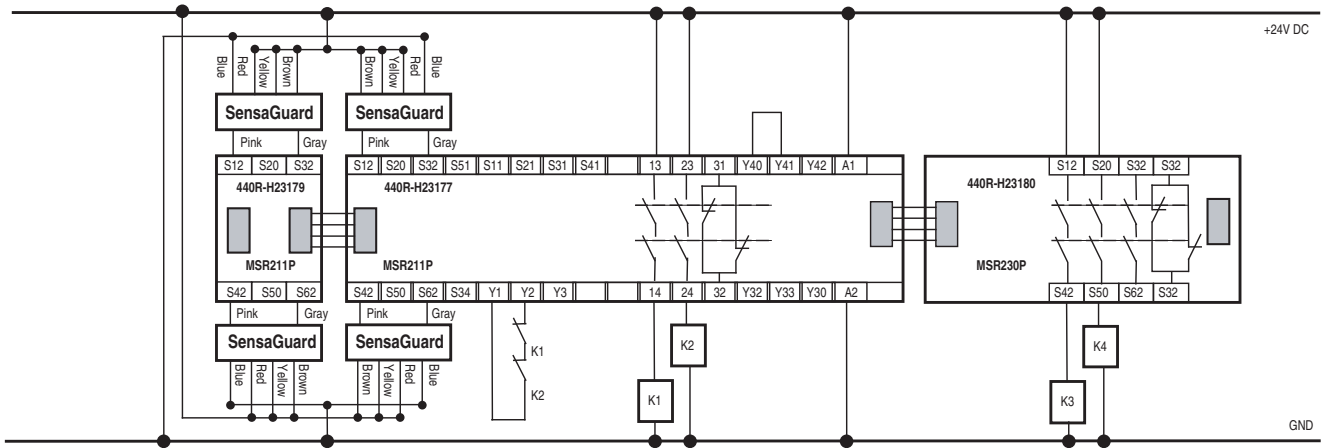
3-Interlock Switches

**MSR200 Series with Four Sensors**

**Manual Reset**



**Automatic Reset**



**3-Interlock Switches**