

Magnetically Coded Non-contact Switch (MC2)

Catalog Numbers 440N-Z21W1PA, 440N-Z21W1PB, 440N-Z21W1PH

IMPORTANT Save these instructions for future reference.

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Summary of Changes

Updated the [Approved Monitoring Relay Units on page 3](#).

Introduction

Installation must be in accordance with the following instructions and specifications and implemented by suitable competent personnel. Adherence to the recommended maintenance instructions forms part of the warranty.

This unit is not to be used as a mechanical stop. Guard stops and guides must be fitted.

This device is intended to be part of the safety-related control system of a machine. Before installation, a risk assessment must be performed to determine whether the specifications of this device are suitable for all foreseeable operational and environmental characteristics. Refer to [Table 1](#) for Certification information and ratings.



ATTENTION: The presence of spare actuators compromise the integrity of the safety systems. Personal injury or death, property damage or economic loss can result. Appropriate management controls, working procedures, and alternative protective measure should be introduced to control their use and availability.



WARNING: Do not defeat, tamper, remove, or bypass this unit. Severe injury to personnel could result.

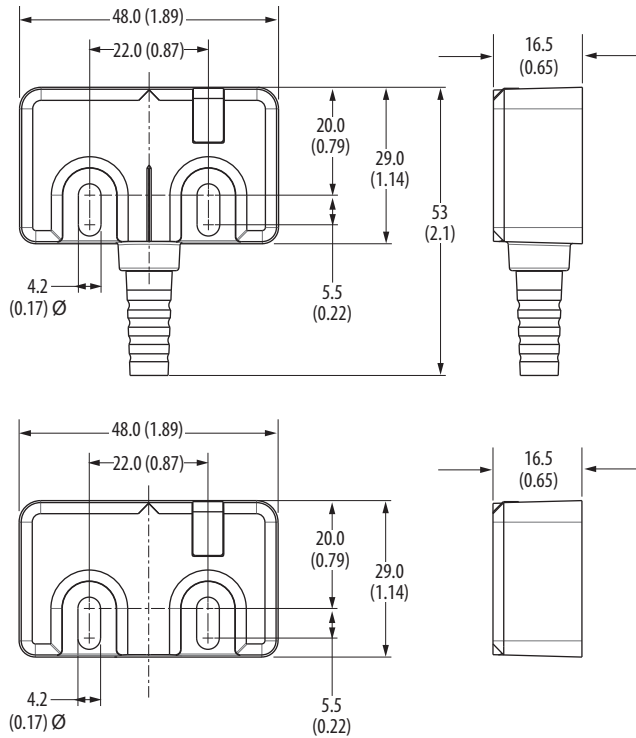
Table 1 - Specifications

Attribute	440N-Z21W1PA, 440N-Z21W1PB, 440N-Z21W1PH
Safety Standards	ISO 14119, IEC 60947-5-3, ISO 13849-1 when used with approved safety relay
Safety Classification	Dual contacts suitable for Cat.3 or 4 systems
Functional Safety Data	B10d: > 2x10 ⁶ operations min. PFHD: < 3x10 ⁻⁷ MTTFd: > 380 years Usable for ISO 13849-1:2006 and IEC 62061. Data other than B10d is based on: Usage rate of 10p/10mins., 24 hrs/day, 360 days/year, representing 51840 operations per year. Dual channel interlock may be suitable for performance levels PLe or PLD (according to ISO 13849-1:2006 and for use in SIL 2 or SIL 3 systems (according to IEC 62061) depending on application characteristics.
Certifications	CE Marked for all applicable directives, c-UL-us, and TÜV
Operating Characteristics (at rated temperature range)	
	Make, Minimum
Sensing distance horizontal plane of operation	10 mm (0.39 in.)
Sensing distance vertical plane of operation	6 mm (0.23 in.)
Typical misalignment	± 4 mm (0.16 in.) (see Figure 3 on page 2 for Misalignment Curve)
Operational Current	≤ 30 mA + 1 Aux
Maximum # of switches, connected in series	Monitoring Relay Unit dependent
Operating Voltage	24V DC +10% / -15%
Physical Characteristics	
Case Material	Molded ABS
Actuator Material	Molded ABS
Color	Red
Outputs	
Safety Output (Solid State Relay)	2 x N.C. 50 mA
Auxiliary	1 x PNP N.O. 200 mA
ResponseTime	
Switch response time	5 ms
Series response time	5 ms
Maximum Frequency of Operation	1 Hz
Environmental	
Operating Temperature	-10...+55 °C (14...131 °F)
Operating Humidity	5...95% relative
Washdown rating / Enclosure type rating	IEC 60529, IP69

Table 1 - Specifications (Continued)

Shock & Vibration	IEC 680068-2-27 30 g, 11 ms IEC 680068-2-6 10...55 Hz
E.M.C.	EN 61000-6-2, EN 60947-5-3
Protection	
Safety Output Short-Circuit Protection	Provided by the approved safety relays
Auxiliary Overload Protection	Internal resettable fuse
24V Supply Reverse Polarity Protection	Incorporated
Electrical Life	1 x 10 ⁶ cycles

Figure 1 - Approximate Dimensions [mm (in.)]



Mounting Information

Use non-removable screws, bolts, or nuts to mount the switch and actuator. Do not over torque the mounting hardware. It is recommended to use M3 screws and washers throughout.

Maximum torque is 1 N•m (8.86 in•lb). Use nonmagnetic mounting hardware.

Position the switch and actuator so they are aligned with each other.

Mounting for Maximum Misalignment

Mount the Sensor to the fixed part of the guard and the Actuator to the movable section. Keep the Sensor and Actuator within the sensing range detailed as shown in [Figure 3](#).

Minimum distance between sensors is 50 mm (1.97 in.).

IMPORTANT To obtain maximum switching distance, center the switches ± 4 mm (0.24 in.).

Figure 2 - Sensor Alignment

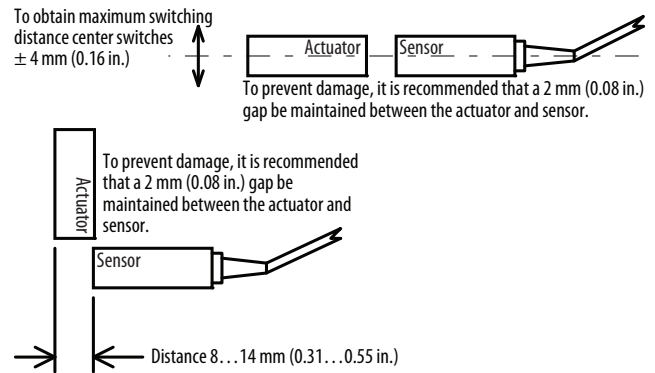
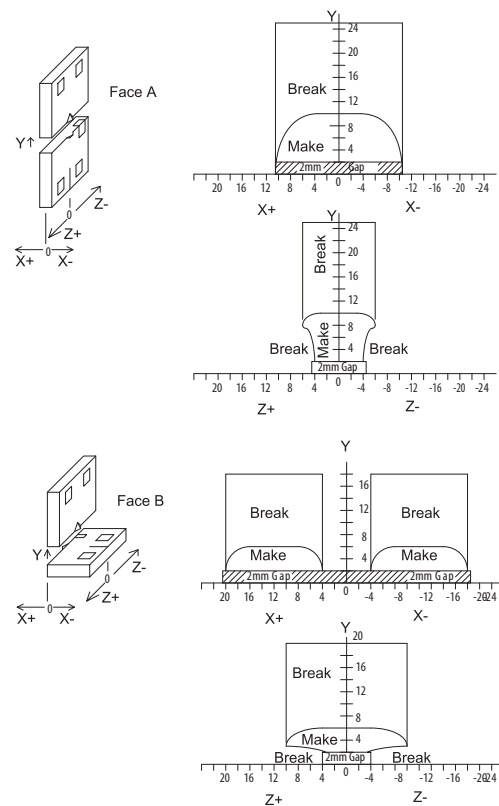


Figure 3 - Misalignment Curve



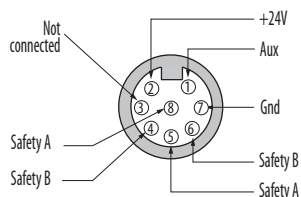
LED Operation and Diagnostics

Table 2 - Unit Indicators (per IEC 60073)

	State	Status	Troubleshooting
Device Output LED	Off	Not powered	Check supply, check wiring to controller A
	Off	Overload	Check AUX connections
	Red	Actuator not present	If actuator present check misalignment.
	Green	Actuator present	—
	Green flashing	Actuator present Actuation not present on other switches or wiring fault	Check wiring to controller. Check actuators on other switches

Connection Information

Table 3 - Wiring Diagram



Pin	Wire Color	Signal
1	White	PNP Aux
2	Brown	+24V
3	Green	Not connected
4	Yellow	Safety B
5	Gray	Safety A
6	Pink	Safety B
7	Blue	0V
8	Red	Safety A

Recommended Mating Cable

The standard cable lengths are 2 m, 5 m, and 10 m. Use catalog number 889D-F8AB-2 [2 m (6.5 ft)] for the standard length or replace the 2 with 5 [5 m (16.4 ft)] or 10 [10 m (32.8 ft)] for remaining options.

IMPORTANT When the MC2 is used with any MSR100 series relay, for the diagnostic function to operate correctly the red and gray wires (Safety A) must be connected to S11 and S12.

Power Supply Requirements

24V DC + 10%/-15% has to be supplied by a power supply that complies with IEC/EN 60204 and IEC/EN 61558-1. Such a power supply meets the electrical safety requirements and maintains the minimum power of 20.4V DC during 20 ms even in the event of voltage dips.

When using an approved relay with a MC2 and the same power supply is utilized for all devices, the relay will provide surge protection for the MC2. If a separate power supply is used for the MC2, then extra protection will be required.

Safety Ratings

An MC2 can achieve up to Cat 4/PLe, SIL CL3 when individually monitored by an approved Monitoring Relay Unit (see 9.1) that itself achieves Cat 4/PLe SIL CL3.

Two or more MC2 sensors connected in series with an approved relay, achieves up to CAT3/PLd/SIL CL2.

Maintenance

Every six months check the correct operation of the switching circuit. Also check for signs of abuse or tampering. Inspect the switch casing for damage.

Repair

If there is any malfunction or damage, no attempts at repair should be made. The unit should be replaced before machine operation is allowed.

Declaration of Conformity

This is to declare that the products shown in this document conform with the Essential Health and Safety Requirements (EHSRs) of the European Machinery Directive (98/37/ED Machinery Directive, 2004/108/EC EMC Directive). These products also conform to EN 60947-5-3, EN 1088, EN ISO 12100 parts 1 & 2, EN 60204-1 and have Third Party Approval.

For a comprehensive certificate, visit: <https://www.rockwellautomation.com/global/certification/overview.page>

Approved Monitoring Relay Units

MC2 can only be used with the approved relays. Use of other devices not listed is at your own risk.

Only 24V DC MSR Relays or MSR Relays configured for 24V DC operation are compatible with MC2.

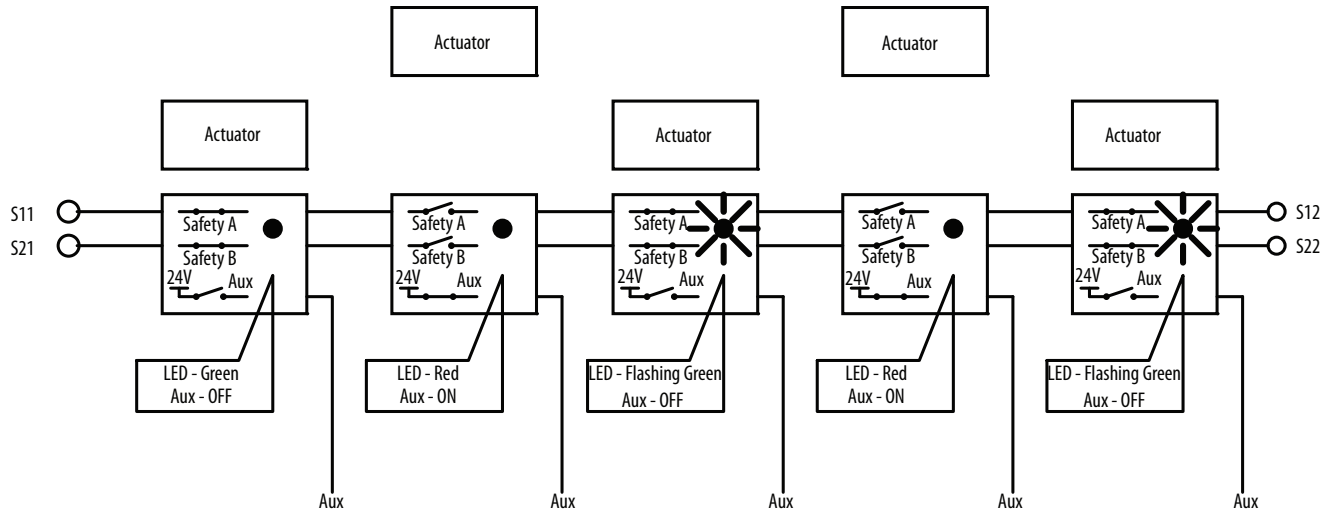
Table 4 - Approved Monitoring Relay Unit List and Max Number of Series MC2s

Monitoring Relay Series	Catalog Number	Max Number of MC2 Units in Series 24V DC Supply Voltage		
		-5%	-10%	-15%
GSR Series				
GSR CI	440R-S13R2	8	10	10
GSR DI	440R-D22R2	8	10	10
GSR SI	440R-S12R2	8	10	10
GSR DIS	440R-D22S2	8	10	10
CR30	440C-CR30	8	10	10
MSR Series				
MSR30RT/RTP	440R-N23197/440R-N23198	10	10	10
MSR 100 Series				
MSR124RT	440R-G23110/440R-G23108/ 440R-G23107	10	10	10
MSR126T/R	440R-N23117/440R-N23123	10	10	10
MSR126.1T/.1R	440R-N23114/440R-N23120	10	10	10
MSR127T/TP	440R-N23126/440R-N23132	10	10	10
MSR127R/RP	440R-N23129/440R-N23135	10	10	10
MSR131RTP	440R-C23139	10	10	10
MSR138DP	440R-M23151	10	10	10
MSR138.1DP	440R-M23084	10	10	10
MSR142RTP	440R-G23216	10	8	-
MSR178DP	440R-M23227	10	10	10

IMPORTANT For up-to-date information, visit <http://ab.rockwellautomation.com/sensors-Switches/safety-interlock-switches/magnetically-coded-non-contact-interlock-switches>

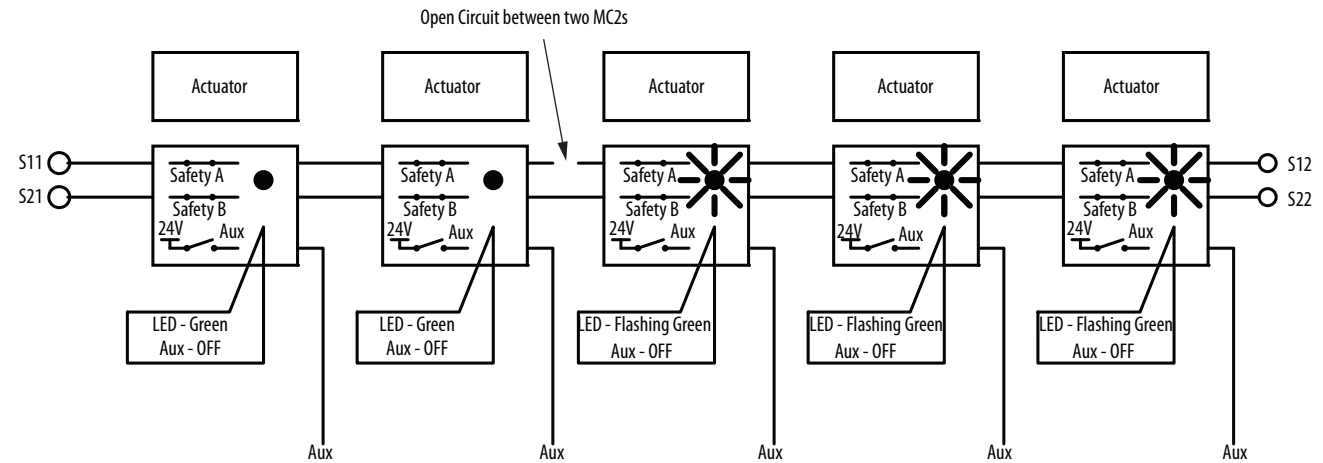
Troubleshooting

Figure 4 - Series Circuit — Two Guards Open



The auxiliary contacts close at the same time as the first safety contact opens

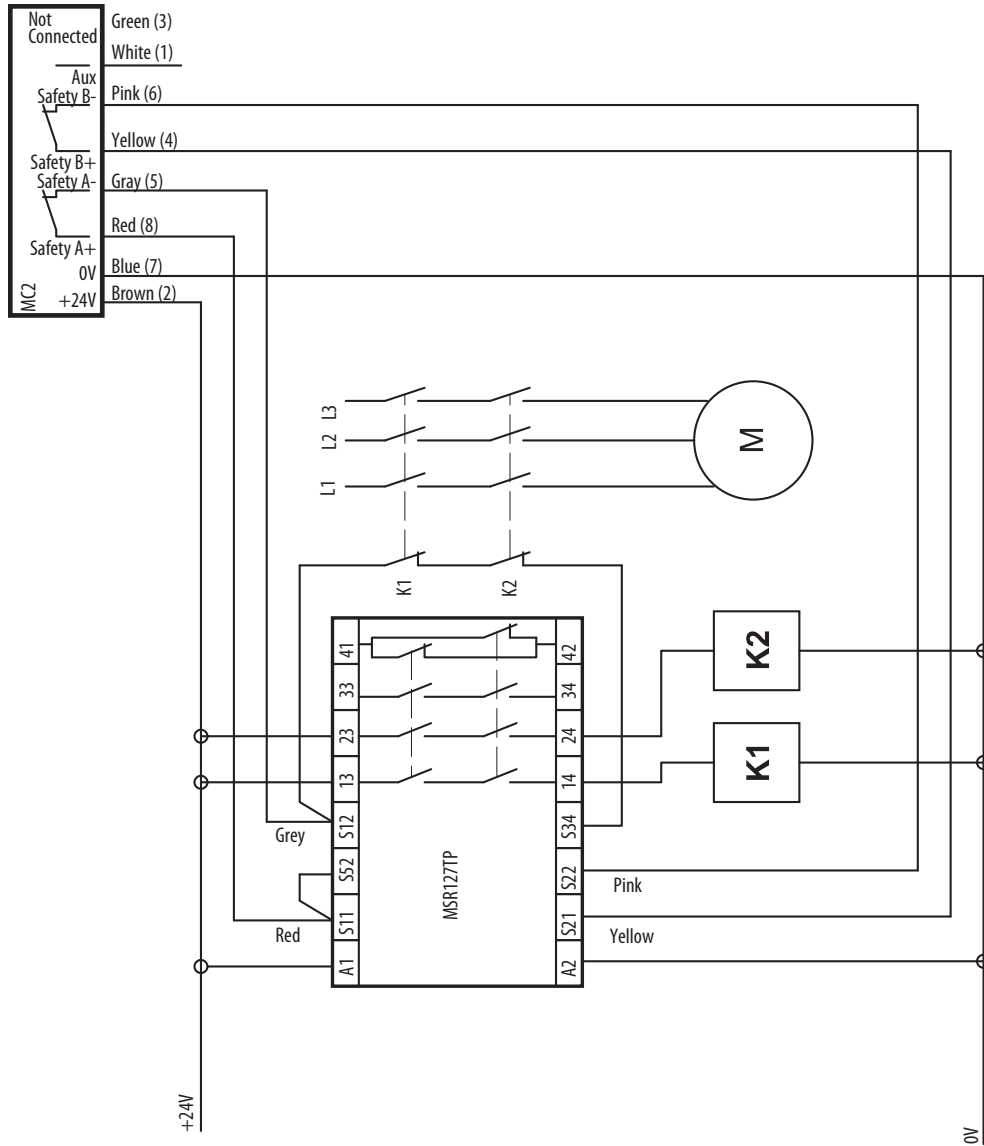
Figure 5 - Series Circuit — Open Circuit on Channel A



The auxiliary contacts close at the same time as the first safety contact opens

Application Wiring Examples

Figure 6 - Single Switch, Automatic Reset, Monitored Outputs MSR127TP



IMPORTANT To maintain the correct diagnostic operation, the red wire (QD pin 8) must be connected to S11.

Figure 7 - Multiple Switches, Automatic Reset, Monitored Output MSR127TP

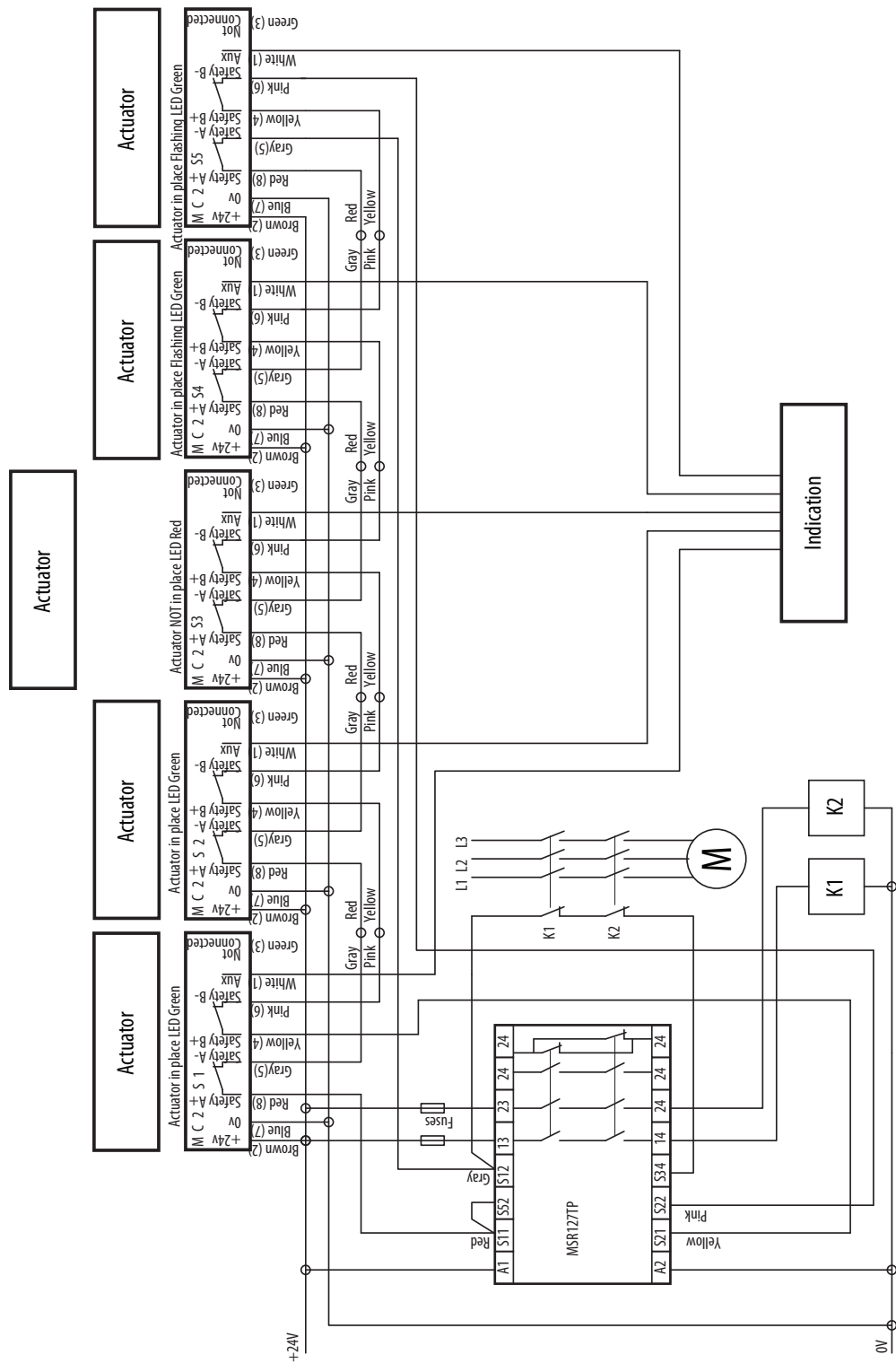
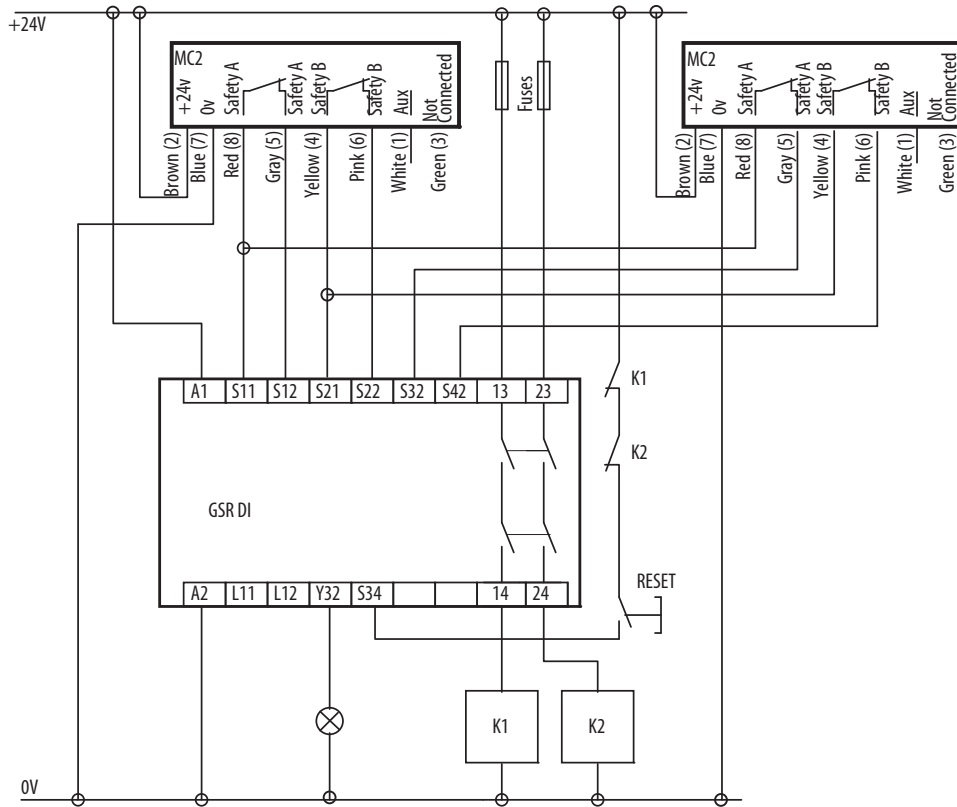


Figure 8 - Multiple Switches, Manual Reset, Monitored Output MSR210P



Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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Waste Electrical and Electronic Equipment (WEEE)



At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental information on its website at <http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page>.

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