Conversion Manual

Allen-Bradley

Minotaur Safety Relay (MSR) to Guardmaster Safety Relay (GSR) Conversion

Catalog Numbers 440R Family of Safety Relays

Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Introduction

The Guardmaster® Safety Relay (GSR) next generation family of safety relay series are high-quality replacements for most of the Minotaur™ Safety Relay (MSR) family of safety relays.

In their consistent narrow design of 22.5 mm (0.88 in.) housing and equipped with configurable functions for reset and logic, the GSR relays can consolidate various functions of MSR with fewer models. Therefore reducing stock requirements.

The MSR product line of safety relay modules typically offers one dedicated safety function for one safety circuit and actuator. The MSR solutions have less connectivity to each other than the superior GSR relays. Adding a second or third safety circuit requires more safety relay modules and safety contacts for cascading to maintain PLd or PLe safety ratings according to EN ISO 13849-1, respectively, SIL 2 or SIL 3 according to IEC 62061.

GSR instead offers configurable safety functions and consolidates safety circuits which result in fewer units, less space and fewer costs. Due to the unique SWS cascading capability, logic combinations and zones can be constructed quickly.

A replacement with GSR is meant to be more than a one-by-one swap out.

Machine designs have changed over the past years that are driven by new Machinery directives, changes of harmonized standards and demands of safety solutions contribute to productivity and flexibility.

The following sections offer detailed assistance in converting a legacy MSR solution to a smarter, cost effective machine design. Compliance with the latest requirements of Machinery directive and harmonized standards have also been addressed.

For further assistance in replacing those devices, please contact Technical Support.

GSR Benefits

The GSR family of relays provides the following more benefits

- One or two (dual channel) inputs
- Single wire safety expansion
- Narrow package (smaller panel space)
- Configurable operation
- Cat 4 PLe and SIL3 rating on most models
- RoHS compliance

Conversion Concerns

Manufacturers, distributors, integrators and users recognize that product obsolescence is a fact of the industrial business cycle. This document attempts to provide a most cost effective recommendation for converting the MSR relay family to the state-of-the-art GSR relay family, considering the following major concerns:

Panel Space

Many control panel designers provide space in their panels for future expansion and improvements. If that extra panel space gets used, then panel space can become tight. Recognizing this fact, the recommended conversion is intended to maintain or even reduce panel space.

Wiring Terminal Locations

Moving a wire from the top of the old device to the bottom of the new device in a control panel cannot be taken lightly. Each of the recommended conversions shows the terminal locations of the old and new devices, so the user can plan the conversion appropriately.

Wiring Changes

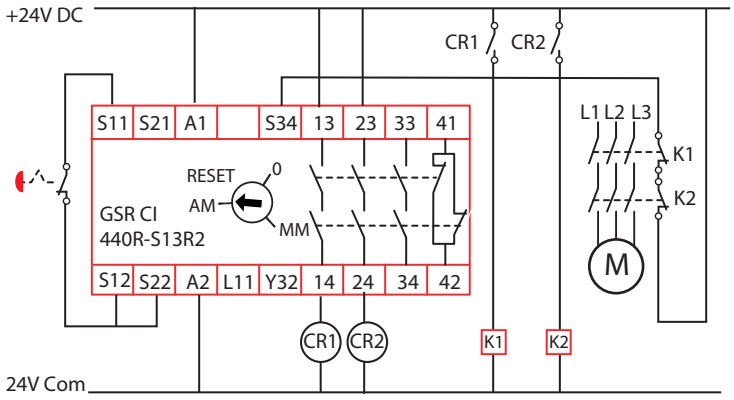
Example schematics, comparing the older and recommended that newer devices are provided for each of the applications that the older device can provide.

Response Time

Response time is the time that is required to perform the safety function. For each conversion, the comparable response time is provided. An increase in the response time may require the user to adjust the safety distance. This adjustment may be a non-issue when a safety gate must be opened manually. There is more likely to be an issue when presence sensing devices like light curtains and safety mats are used.

Interposing Relays

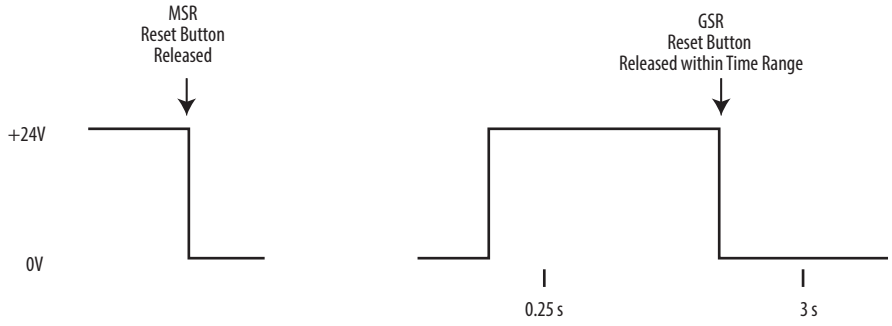
Every safety relay has limitations on the amount of current the relay can switch or carry. When the load exceeds the rating of the safety relay, interposing relays can be used as shown in this example.



CR1 and CR2 consist of: 700-HPSXZ24 (relay)
700-HN123 (base)
700-AD1LR (diode & LED)
700-HN119 (retainer)

Monitored Reset Operation

The reset operation of the GSR relays is slightly different from the operation of the MSR relays. The reset operation of the MSR relays occurs on the trailing edge of the signal; for example, when the reset button is released. The reset on the GSR relays must see the reset signal released within the range of 0.25…3 s.



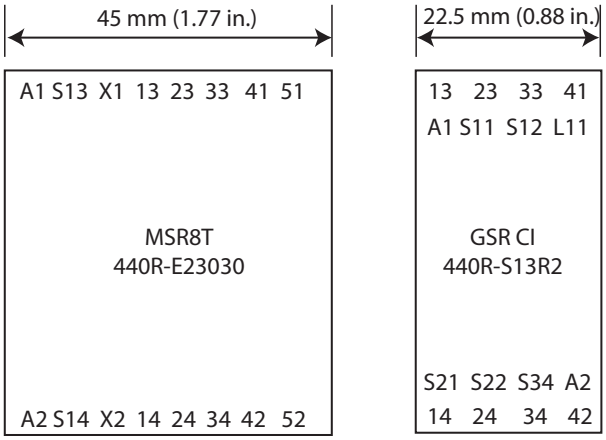
MSR8T

The preferred migration for the MSR8T is to the GSR CI relay.

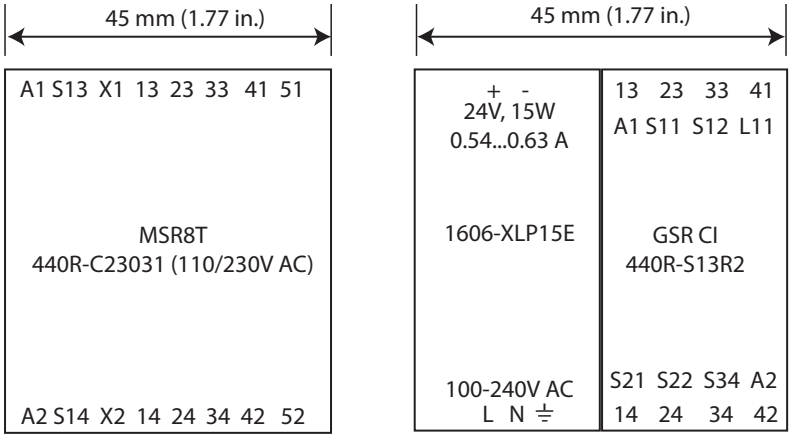
The CI has one switch to configure the reset as automatic or monitored manual. Single or dual channel operation is determined by the wiring.

Terminal Locations and Panel Space

The MSR8T has a row of terminals at the top and bottom. Its width is 45 mm (1.77 in.). The GSR CI has two rows of terminals at the top and bottom, allowing a smaller 22.5 mm (0.88 in.) width.

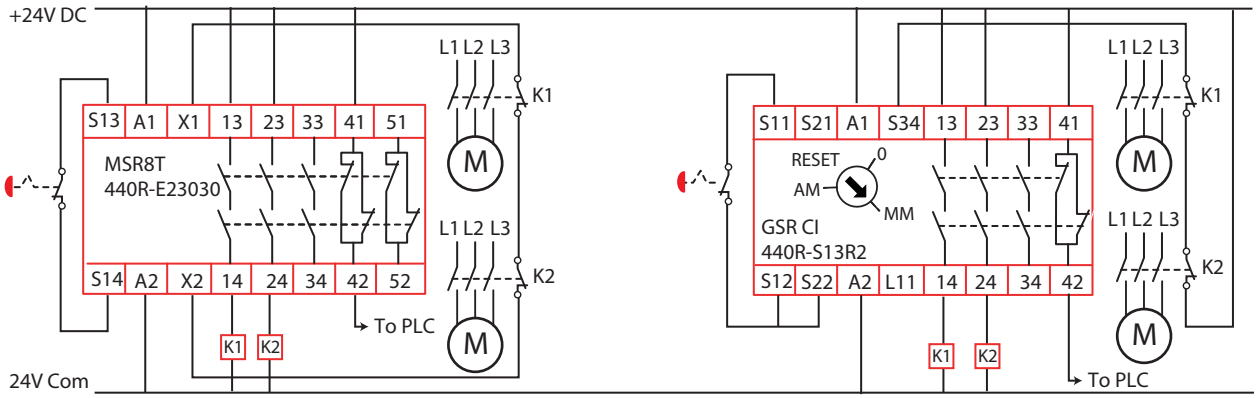


The MSR8T also has option for 115V AC and 230V AC. Since the GSR CI is powered by 24V DC, the 1606-XLP15E can be used to convert the AC supply to 24V DC, while still occupying the same amount of space.



The power, safety inputs and outputs are similar. The reset/monitoring circuit is slightly different. The schematics below show comparisons of the typical ways an MSR8T can be applied and the GSR CI equivalent.

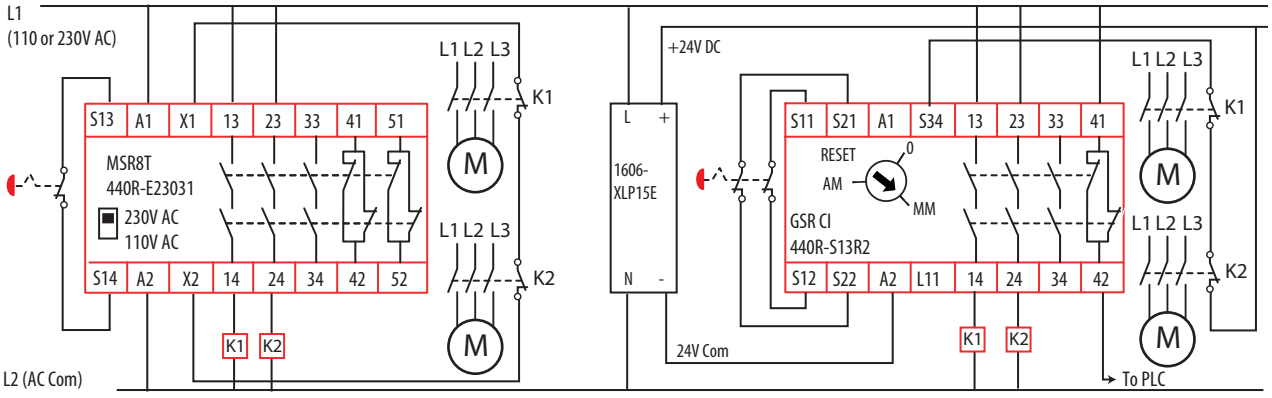
Example Schematic—DC Powered



Example Schematic—AC Powered

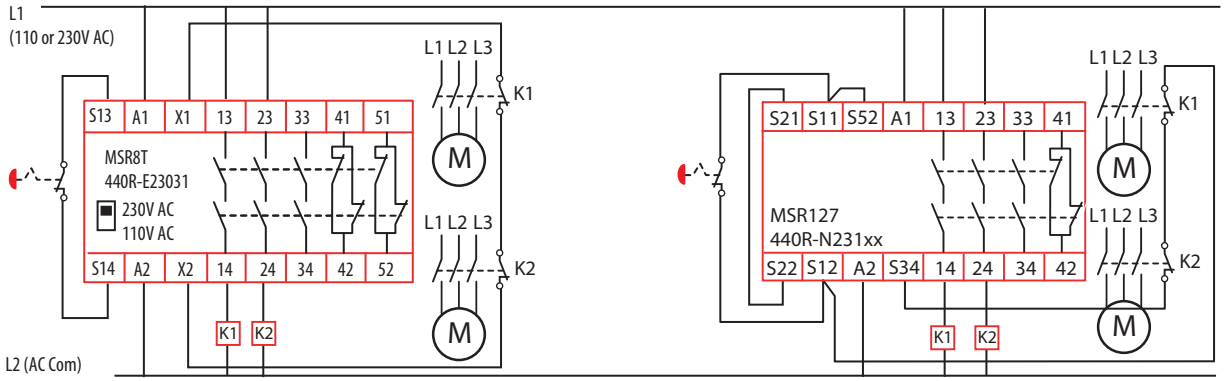
A small 1606 power supply converts 100/240V AC to 24V DC to power the CI relay. The outputs of the CI relay can switch up to 240V AC loads.

The MSR8T has an internal switch that sets the power to either 115V or 230V AC.



Example Schematic—AC Powered Alternative

As an alternative, the AC powered MSR8 can be replaced by an equivalent MSR127. The user must select the appropriate MSR127.



Response Time

MSR8T = 90 ms

CI – 35 ms

Since the CI has a faster response time, the safety distance for the CI is shorter than the MSR8T. No further action is required.

Output Load Capability

The MSR8T has a higher current capability than the CI, as shown in the table. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	MSR8T	CI
AC Inductive	B300, AC-15 4 A	C300, AC-15 1.5 A
DC	P300, DC-13 3 A at 24V DC	2 A at 24V DC
Thermal (non-switching)	4 A	2 A

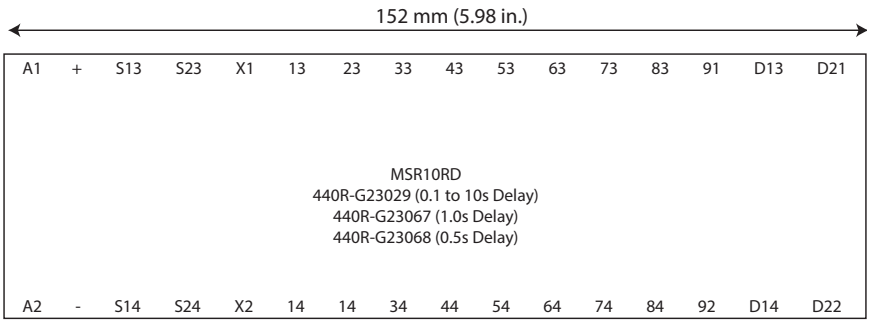
MSR10RD

The MSR10RD has eight immediate safety outputs and one delayed safety output, plus an immediate auxiliary output and a delayed auxiliary output. The preferred migration for the MSR10RDT is to the GSR CI relay with two EM expansion relays and one EMD expansion relay.

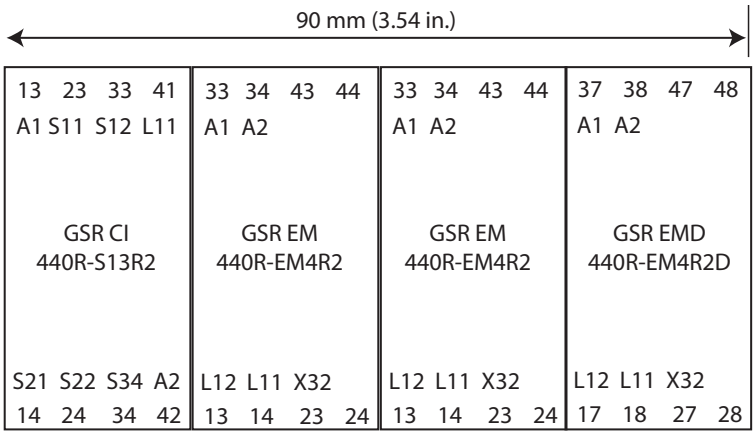
The MSR10RD comes complete with an option for 24V DC, 115V AC, and 230V AC. For AC powered applications, a 1606 power supply can be used to provide 14V to the GSR relays.

Terminal Locations and Panel Space

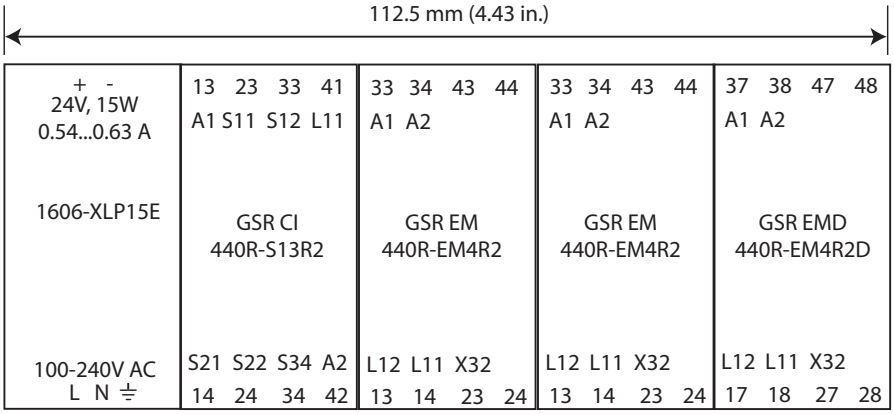
The MSR10RD has a row of terminals at the top and bottom. Its width is 152 mm (5.98 in.).



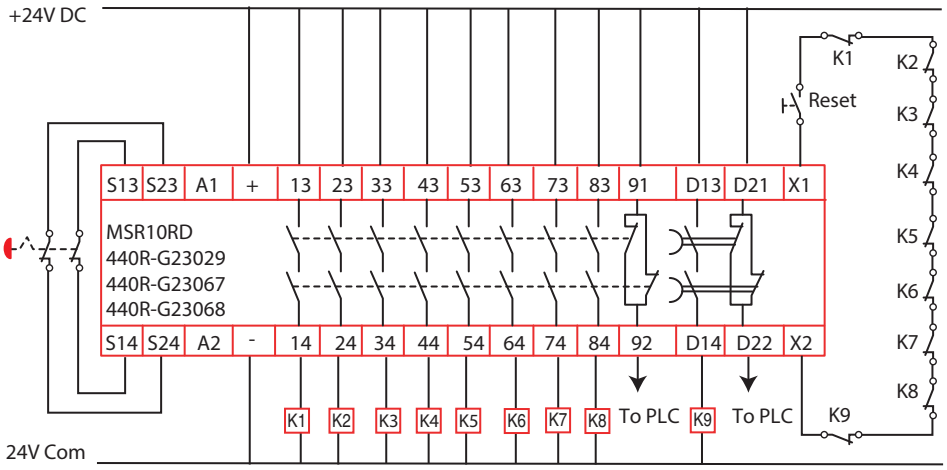
For 24V DC powered applications, a GSR CI, two EM, and one EMD relay are needed; these occupy only 90 mm (3.54 in.) of panel space.



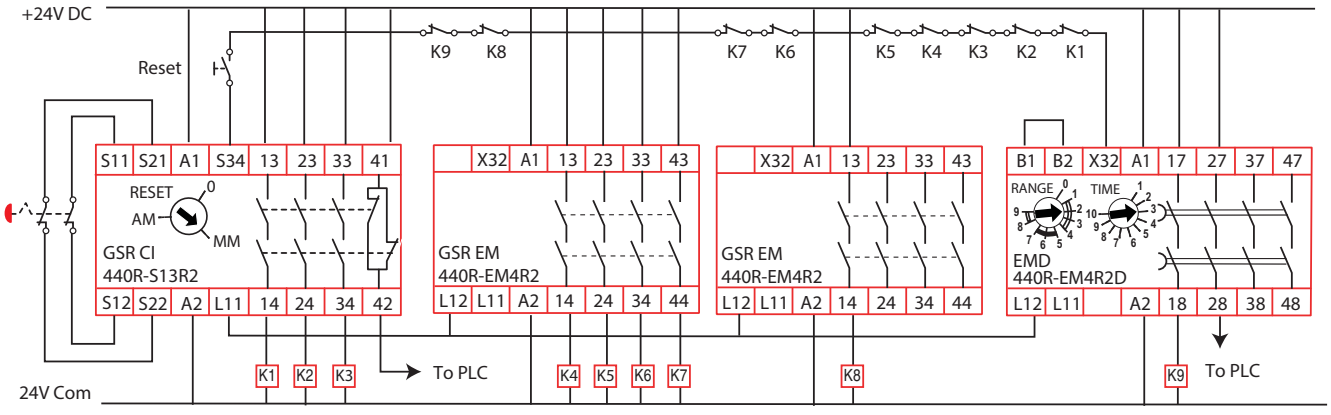
For applications powered by 115V AC or 230V AC, the 1606-XLP15E can be used to convert the AC supply to 24V DC, while still occupying less than the amount of panel space required by the MSR10RD.



Example Schematic—DC Powered

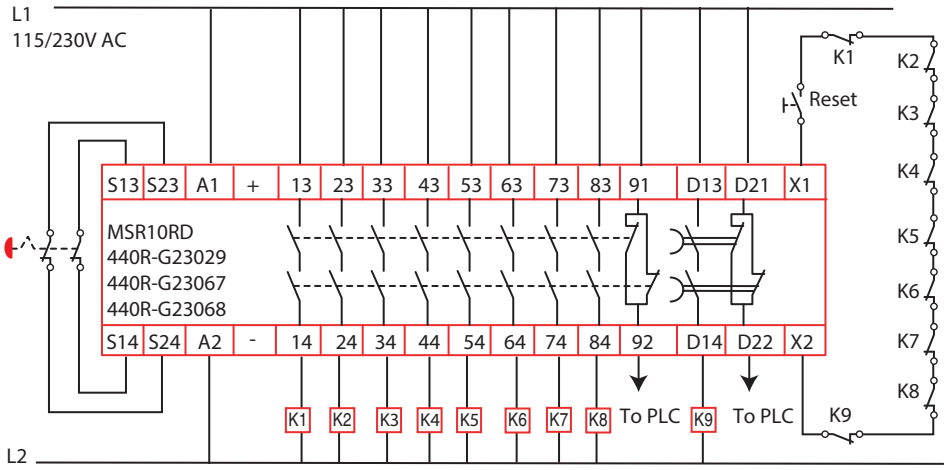


The GSR equivalent circuit is as follows:

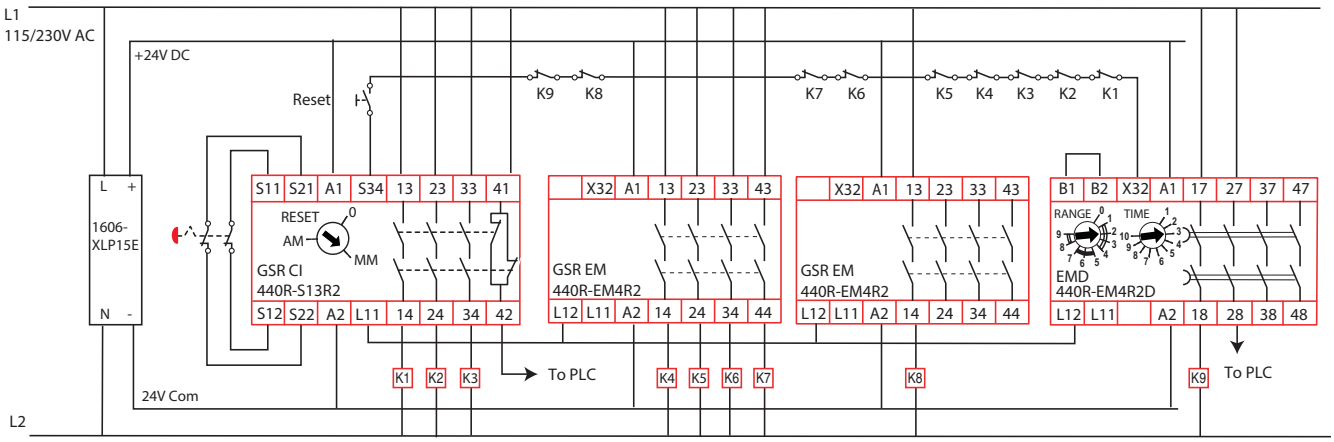


Example Schematic—AC Powered

The MSR10RD has an internal switch that sets the power to either 115V or 230V AC.



The GSR solution requires a power supply. The 1606-XLP15E provides 15 W, enough to power the four GSR relays. Each GSR relay consumes a maximum 3.5 W.



Response Time

MSR10RD = 50 ms

CI – 35 ms

EM – 70 ms (35 ms from the CI + 35 ms from the safety wire input)

EMD – 70 ms (35 ms from the CI + 35 ms from the safety wire input)

Since the CI has a faster response time, the safety distance for the CI is shorter than the MSR10RD. The response time of the loads that are connected to the EM and EMD are longer and must be evaluated for adequate safety distance.

ATTENTION

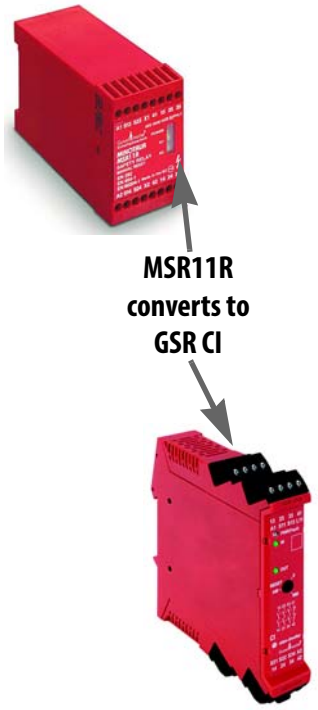
Since the MSR10RD is faster than the EM and EMD relays, the safety distance must be examined closely and adjusted if necessary.

Output Load Capability

The MSR10RD has a higher current capability than the CI, EM, and EMD as shown in the table. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the GSR capability.

Load Type	MSR10RD	CI	EM	EMD
AC Inductive	B300, AC-15 4 A	C300, AC-15 1.5 A	B300, AC-15 1.5 A/250V AC	B300, AC-15 1.5 A/250V AC
DC	P300, DC-13 3 A at 24V DC	DC-13 2 A at 24V DC	DC-13 2 A at 24V DC	DC-13 2 A at 24V DC
Thermal (non-switching)	4 A	2 A	6 A on 1 circuit	6 A on 1 circuit

MSR11R



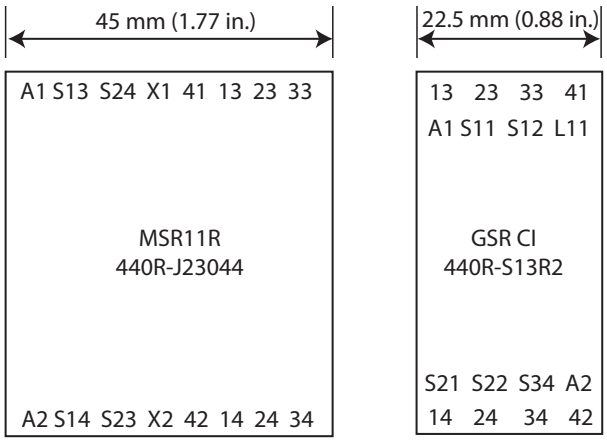
The preferred migration for the MSR11R is to the GSR CI relay. The MSR11R is only available with one dual channel and monitored manual reset.

Currently, only the 24V version is available. The 110V AC and 230V AC versions were obsoleted earlier.

The CI has one switch to configure the reset as automatic or monitored manual. Dual channel operation is determined by the wiring.

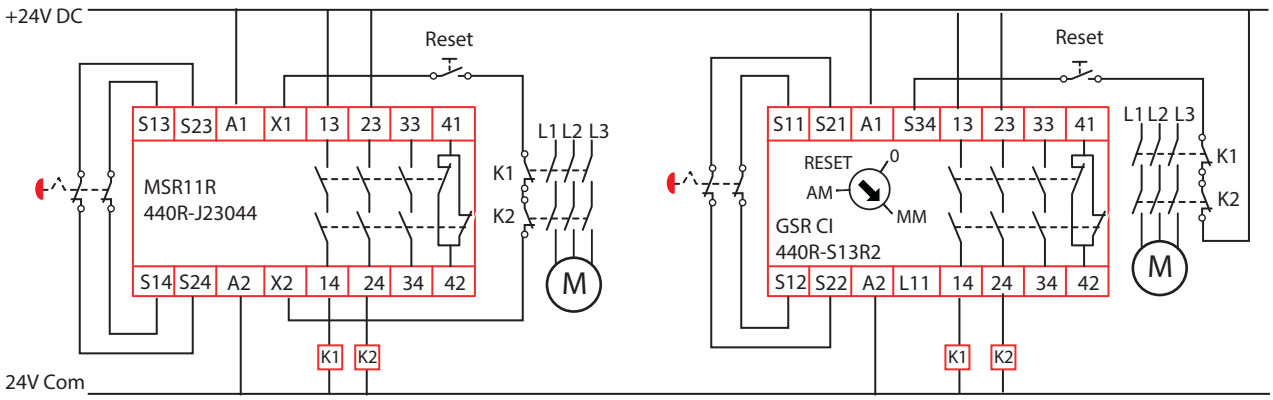
Terminal Locations and Panel Space

The MSR11R has a row of terminals at the top and bottom. Its width is 45 mm (1.77 in.). The GSR CI has two rows of terminals at the top and bottom, allowing a smaller 22.5 mm (0.88 in.) width.



The power, safety inputs and outputs are similar. The reset/monitoring circuit is slightly different. The schematics below show comparisons of the four different ways an MSR11R can be applied and the GSR CI equivalent.

Example Schematic



Response Time

MSR11R = 50 ms

CI = 35 ms

Since the CI has a faster response time, the safety distance for the CI is shorter than the MR11R. No further action is required.

Output Load Capability

The MSR11R has a higher current capability than the CI, as shown in the table. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	MSR11R	CI
AC Inductive	B300, AC-15 4 A	C300, AC-15 1.5 A
DC	P300, DC-13 3 A at 24V DC	2 A at 24V DC
Thermal (non-switching)	4 A	2 A

MSR12T

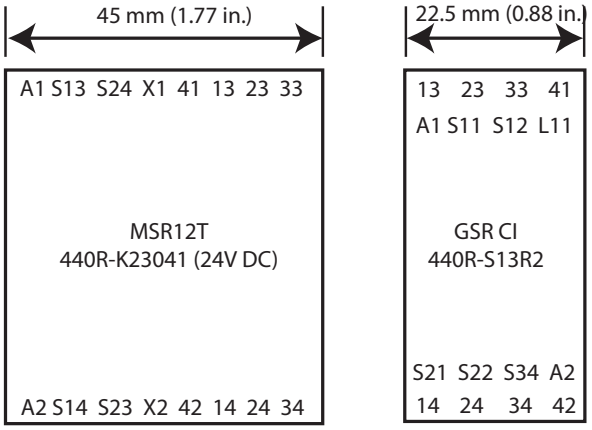
The preferred migration for the MSR12T is to the GSR CI relay. The MSR12T is only available with one dual channel and automatic reset.

Currently, only the 24V DC and 110V AC versions are available. The 230V AC version was obsoleted earlier.

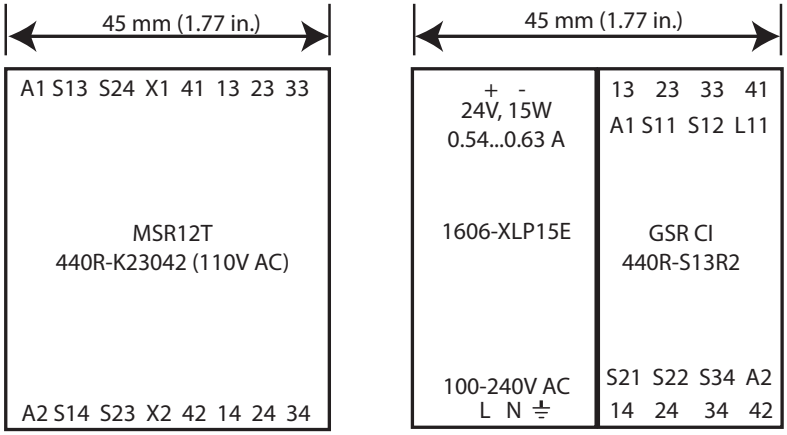
The CI has one switch to configure the reset as automatic or monitored manual. Dual channel operation is determined by the wiring.

Terminal Locations and Panel Space

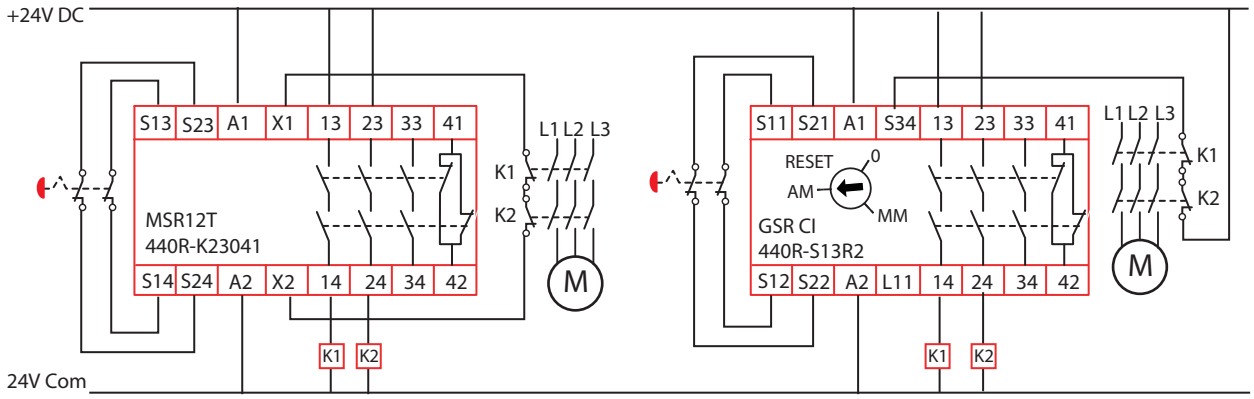
The MSR12T has a row of terminals at the top and bottom. Its width is 45 mm (1.77 in.). The GSR CI has two rows of terminals at the top and bottom, allowing a smaller 22.5 mm (0.88 in.) width.



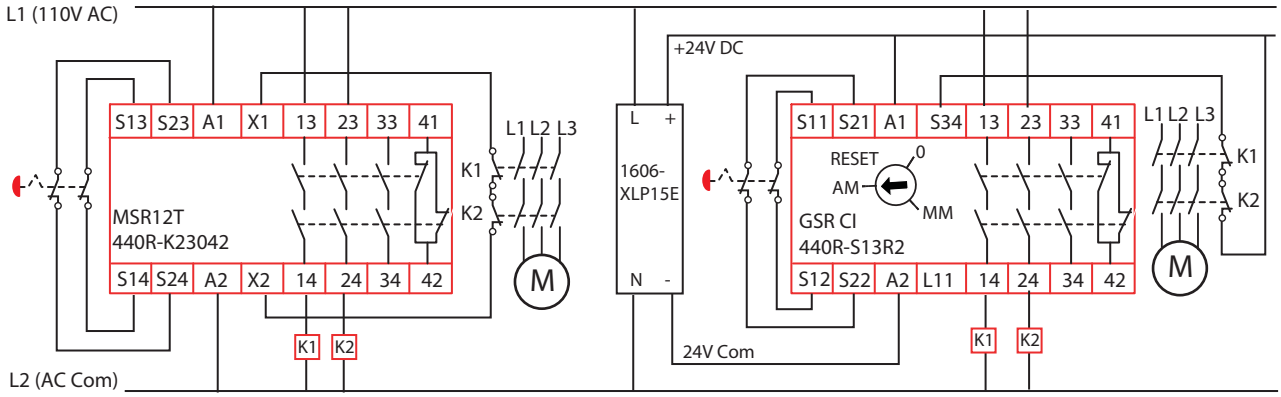
The MSR12T also has option for 110V AC. Since the GSR CI is powered by 24V DC, the 1606-XLP15E can be used to convert the AC supply to 24V DC, while still occupying the same amount of space.



Example Schematic—DC Powered

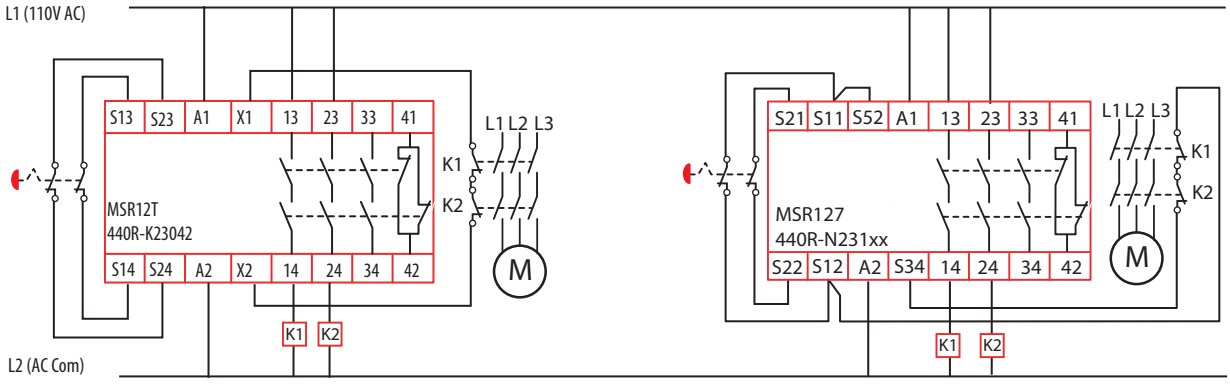


Example Schematic—AC Powered



Example Schematic—AC Powered Alternative

As an alternative, the AC powered MSR12 can be replaced by an equivalent MSR127. The user must select the appropriate MSR127.



Response Time

MSR12T = 50 ms

CI = 35 ms

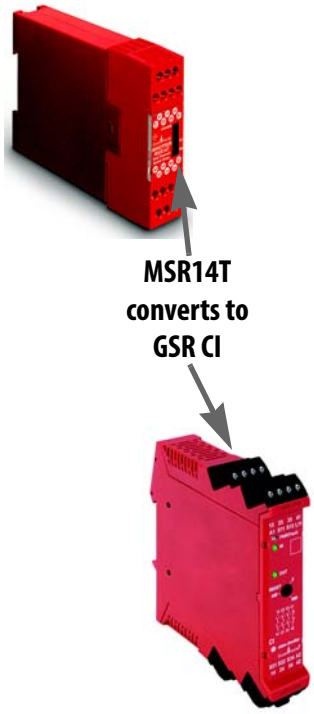
Since the CI has a faster response time, the safety distance for the CI is shorter than the MR12T. No further action required by the user.

Output Load Capability

The MSR12T has a higher current capability than the CI, as shown in the table. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	MSR12T	CI
AC Inductive	B300, AC-15 4 A @ 250V AC	C300, AC-15 1.5 A
DC	N300, DC-13 3 A at 30V DC	2 A at 24V DC
Thermal (non-switching)	4 A	2 A

MSR14T

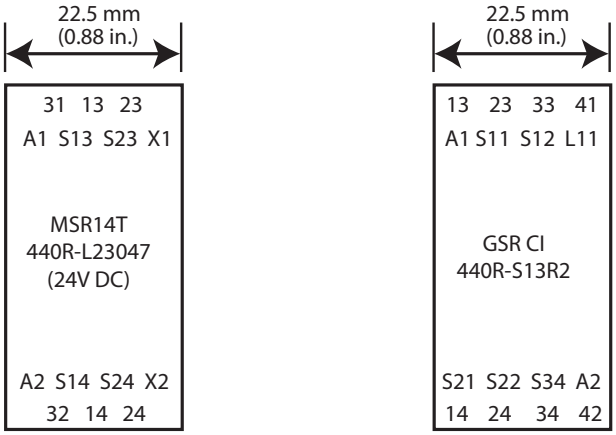


The preferred migration for the MSR14T is to the GSR CI relay. The MSR14T is only available with 24V DC power, one dual channel input and automatic reset. It has two normally open outputs and one normally closed output.

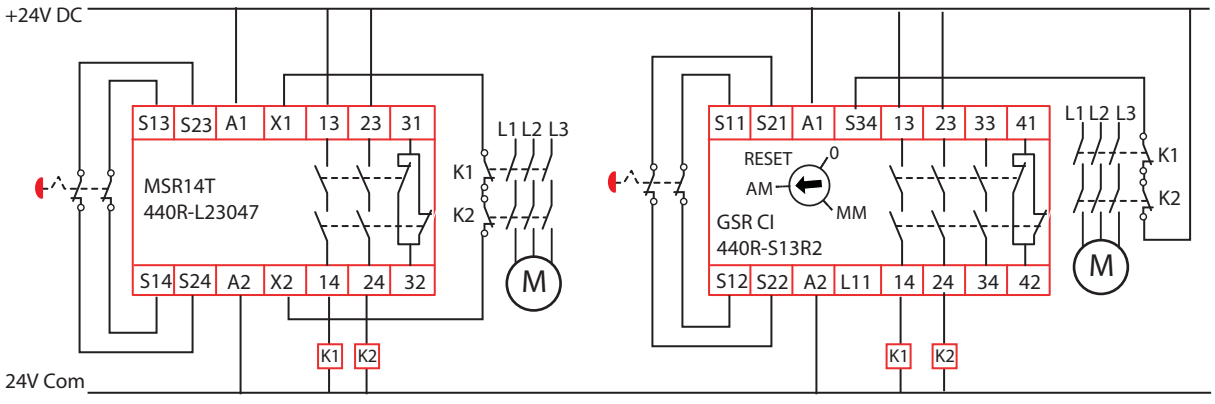
The CI has one switch to configure the reset as automatic or monitored manual. Dual channel operation is determined by the wiring.

Terminal Locations and Panel Space

The MSR14T has a 22.5 mm (0.88 in.) wide body, with two rows of terminals at the top and bottom. The GSR CI has is similar in that it also two rows of terminals at the top and bottom in a 22.5 mm (0.88 in.) width.



Example Schematic



Response Time

MSR14T = 90 ms

CI = 35 ms

Since the CI has a faster response time, the safety distance for the CI is shorter than the MR12T. No further action is required.

Output Load Capability

The MSR14T has a higher current capability than the CI, as shown in the table. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	MSR14T	CI
AC Inductive	B300, AC-15 4 A @ 250V AC	C300, AC-15 1.5 A
DC	N300, DC-13 2 A at 30V DC	2 A at 24V DC
Thermal (non-switching)	4 A	2 A

MSR15D

MSR15D converts to GSR CI

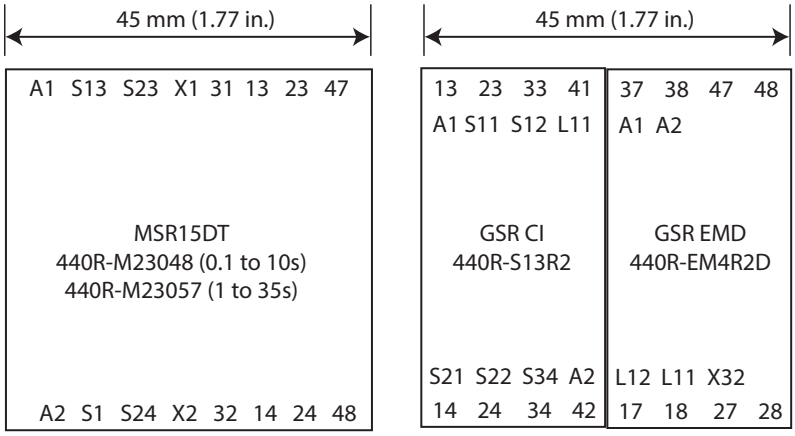
plus the EMD expansion relay

The MSR15D is a safety relay with two immediate safety outputs and one off-delayed safety output. There are two models, which have different delay time ranges. The preferred migration for the MSR15D is to the GSR CI with the EMD expansion relay. The MSR15D is only available with 24V DC power, one dual channel input and automatic reset.

The CI has one switch to configure the reset as automatic or monitored manual. The EMD has two rotary switches that can accommodate the delay ranges of both MSR15D models.

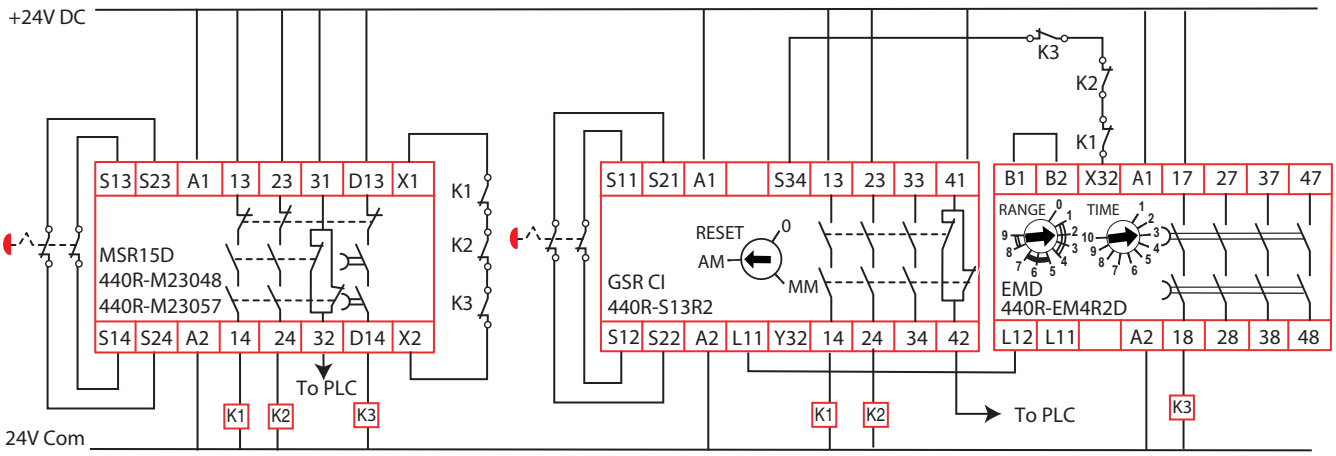
Terminal Locations and Panel Space

The MSR15D has a 45 mm (1.77 in.) wide body, with a row of terminals at the top and bottom. The combination the GSR CI and EMD also occupy 45 mm (1.77 in.) of panel space. They each have two rows of terminals at the top and bottom.



Example Schematic

For off-delay operation, the Range switch on the EMD should be set to values 1, 2, 3 or 4. A jumper between B1 and B2 is used if retriggerable operation is desired.



Response Time

MSR15D = 90 ms (immediate outputs), 0.1 to 35 s (delayed output)

CI = 35 ms (immediate outputs), 0.1 to 35 s (delayed output)

Since the CI has a faster response time, the safety distance for the CI is shorter than the MR15D. No further action is required.

Output Load Capability

The MSR15D has a higher current capability than the CI, as shown in the table. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	MSR15D	CI	EMD
AC Inductive	B300, AC-15 4 A @ 250V AC	C300, AC-15 1.5 A	B300, AC-15 1.5 A, 250V AC
DC	N300, DC-13 2 A at 30V DC	2 A at 24V DC	DC-13 2 A at 24V DC
Thermal (non-switching)	4 A	2 A	6 A on 1 circuit

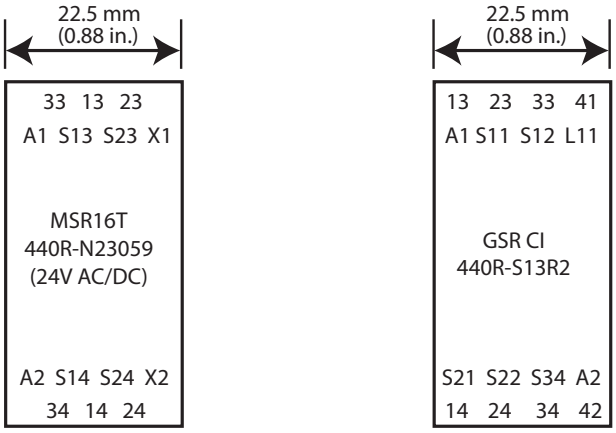
MSR16R/T

The preferred migration for the MSR16R/T is to the GSR CI relay. The MSR16T is only available with 24V AC/DC power, one dual channel input. By setting an internal switch, the MSR16R/T can be set for monitored manual or automatic reset. It has three normally open outputs.

The CI has one switch to configure the reset as automatic or monitored manual. Dual channel operation is determined by the wiring.

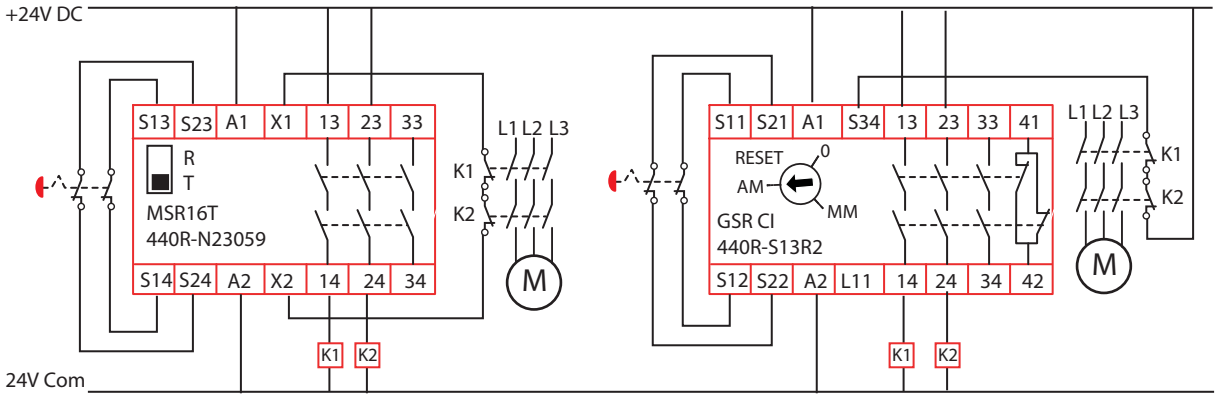
Terminal Locations and Panel Space

The MSR16R/T has a 22.5 mm (0.88 in.) wide body, with two rows of terminals at the top and bottom. The GSR CI has is similar in that it also two rows of terminals at the top and bottom in a 22.5 mm (0.88 in.) width.



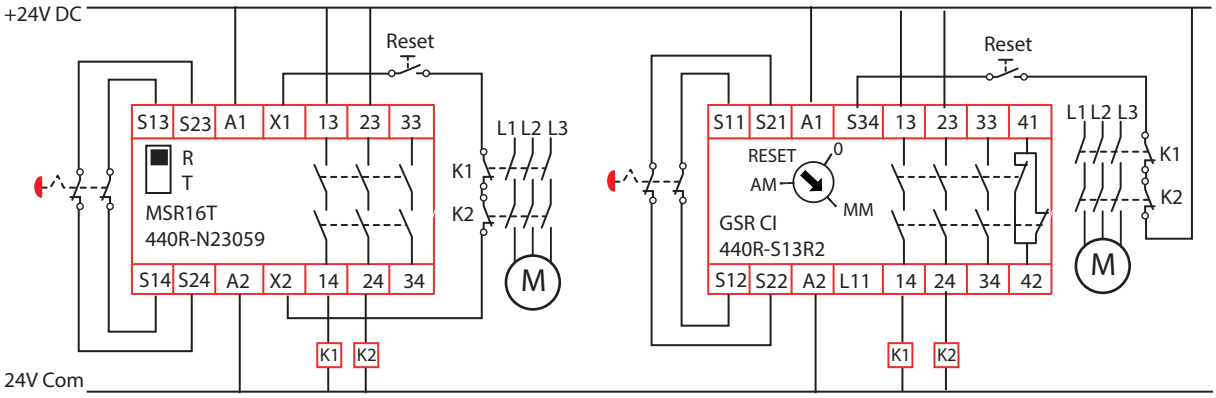
Example Schematic—Automatic Reset

Inside the MSR16R/T cover, set the internal switch to "T." On the CI, configure the rotary switch on its front face to AM.



Example Schematic—Monitored Reset

Inside the MSR16R/T cover, set the internal switch to “R.” On the CI, configure the rotary switch on its front face to MM.



Response Time

MSR16R/T = 90 ms

CI = 35 ms

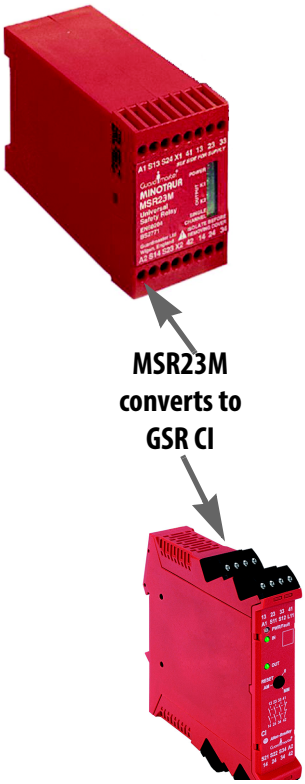
Since the CI has a faster response time, the safety distance for the CI is shorter than the MR16T. No further action is required.

Output Load Capability

The MSR16R/T has a higher current capability than the CI, as shown in the table. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	MSR16R/T	CI
AC Inductive	A300, AC-15 6 A @ 250V AC	C300, AC-15 1.5 A
DC	N300, DC-13 6 A at 30V DC	2 A at 24V DC
Thermal (non-switching)	6 A	2 A

MSR23M



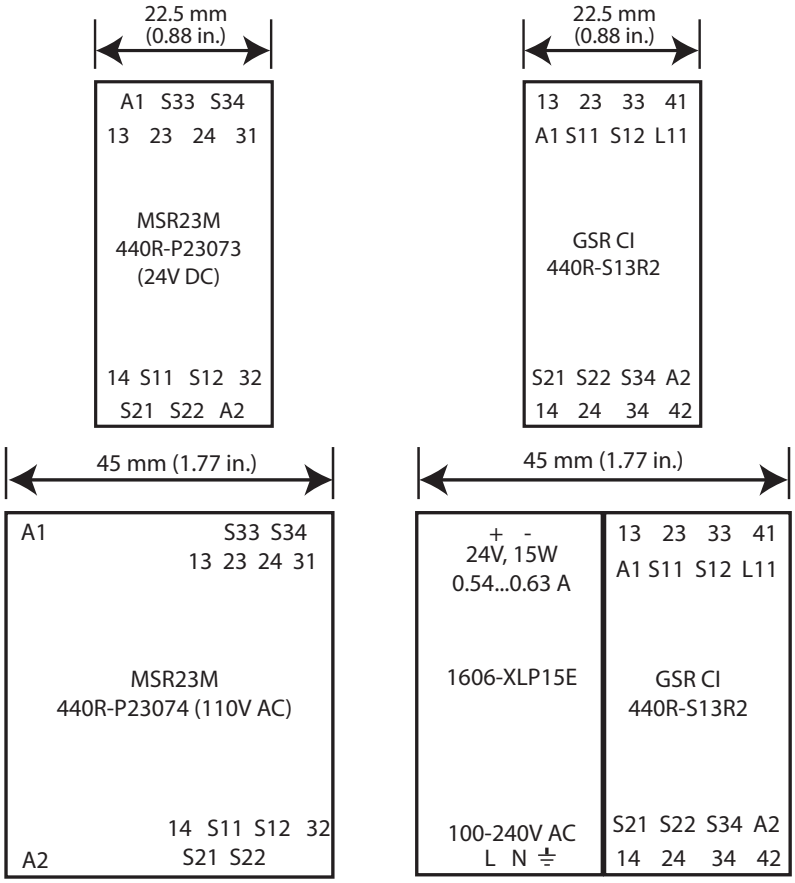
The MSR23M is a safety relay that is designed to interface with safety mats. The MSR23M is available in narrow housing for 24V DC applications and wider housing for applications requiring 110V AC.

Each unit has an internal switch that sets the relay for automatic reset or monitored manual reset.

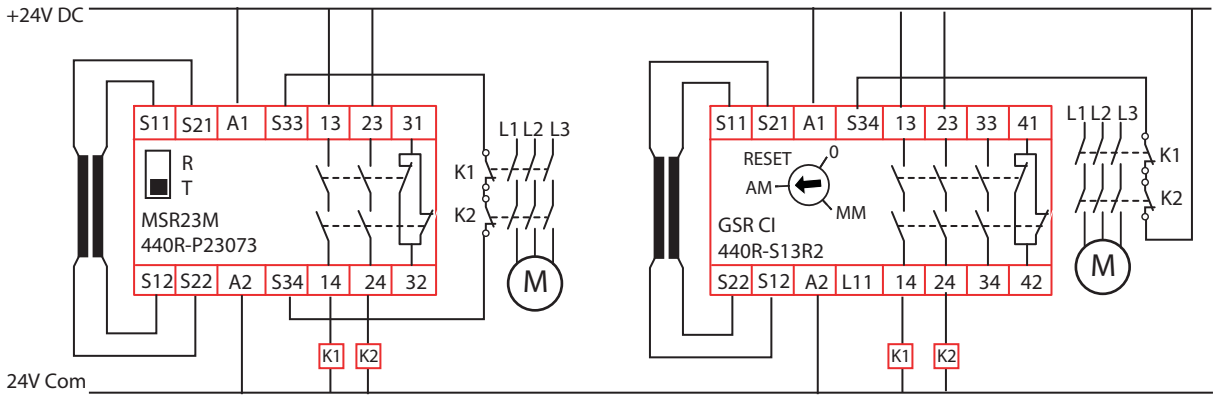
The recommended conversion is to a GSR CI for the DC powered unit and a GSR CI with a 1606 power supply for the MSR23M powered at 110V AC.

Terminal Locations and Panel Space

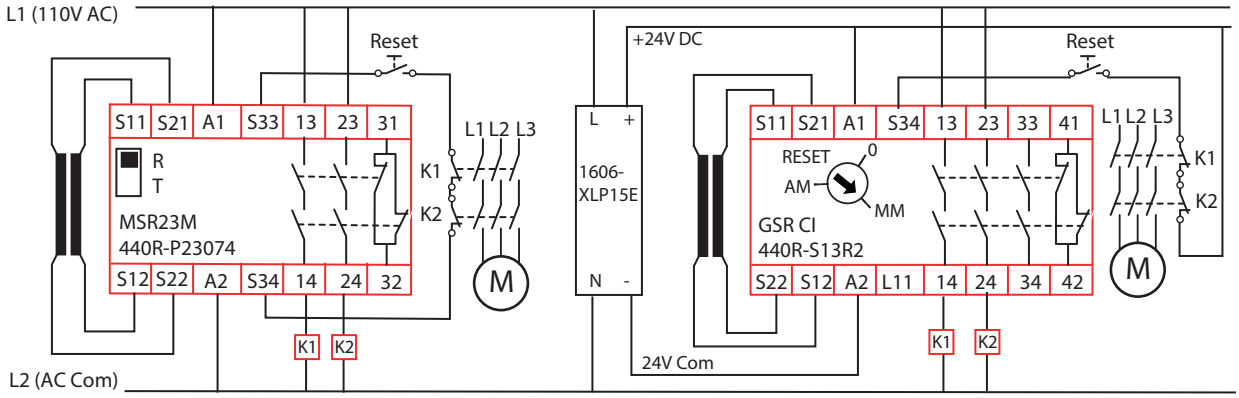
For those applications where the MSR23M is powered by 110V AC, a 1606-XLP15E power supply can be used. With the additional power supply, the panel space by the replacement design occupies a smaller space than the MSR18RT by itself.



Example Schematic—24V DC with Automatic Reset



Example Schematic—110V AC with Monitored Reset



Response Time

MSR23M = 15 ms

CI = 35 ms

ATTENTION

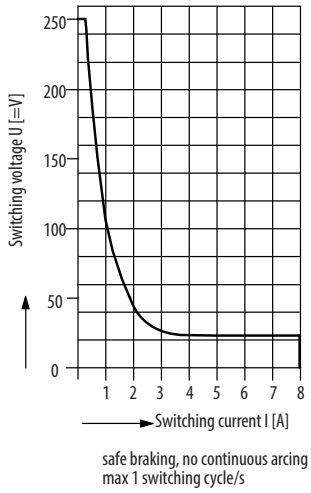
Since the MSR23M is faster than the CI, the safety distance must be examined closely and adjusted if necessary.

Output Load Capability

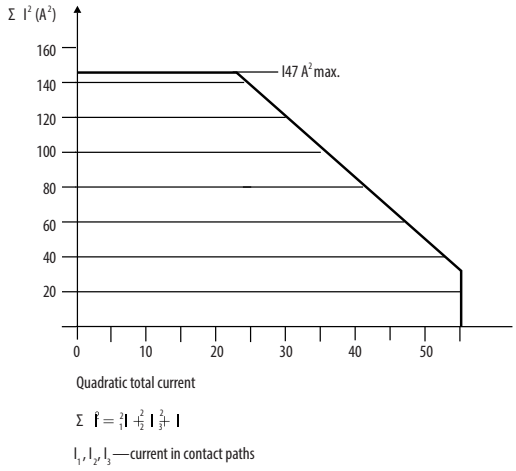
The outputs of the CI may require interposing relays, depending on the load being switched by the MSR23M. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	MSR23M	CI
AC Inductive	B300, AC-15 3 A	C300, AC-15 1.5 A
DC	P300, DC-13 2.5 A at 24V DC	2 A at 24V DC
Thermal (non-switching)	1 circuit at 8 A 2 circuits at 7 A See current limit curve	2 A

The current through the contacts in the MSR23M must be adjusted to its current limit curves:



Arc Limit Curve Under Resistive Load



Quadratic Total Current Limit Curve

MSR123RT

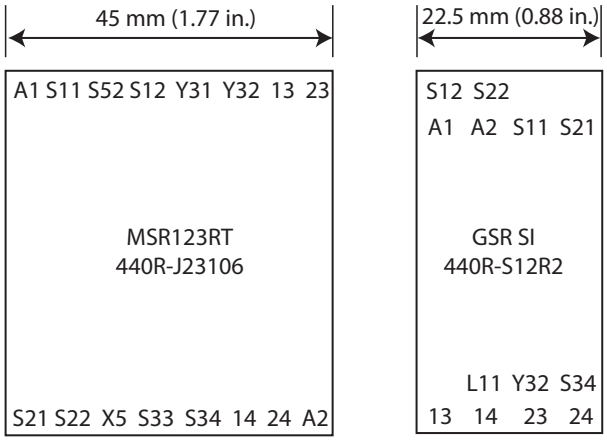
MSR123RT converts to GSR SI

The MSR123RT has the following key design characteristics:

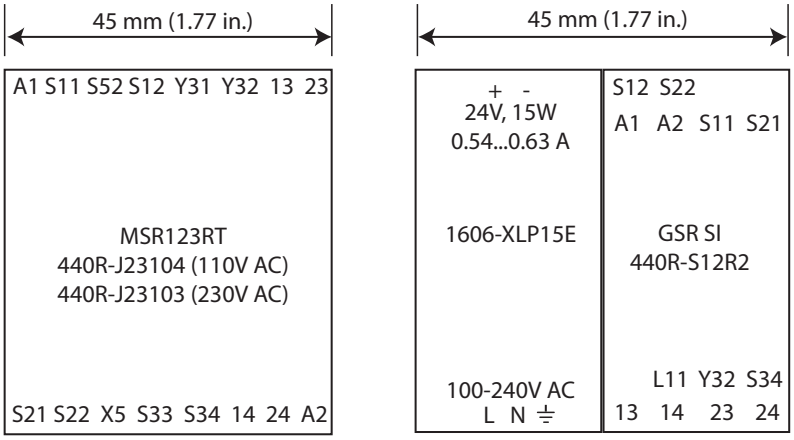
- Single or dual channel inputs
- Can accommodate mechanical and OSSD (light curtain) inputs
- Two electromechanical safety outputs
- One solid-state auxiliary output.
- Reset can operate automatically or monitored manual.

The recommended conversion is to a GSR SI.

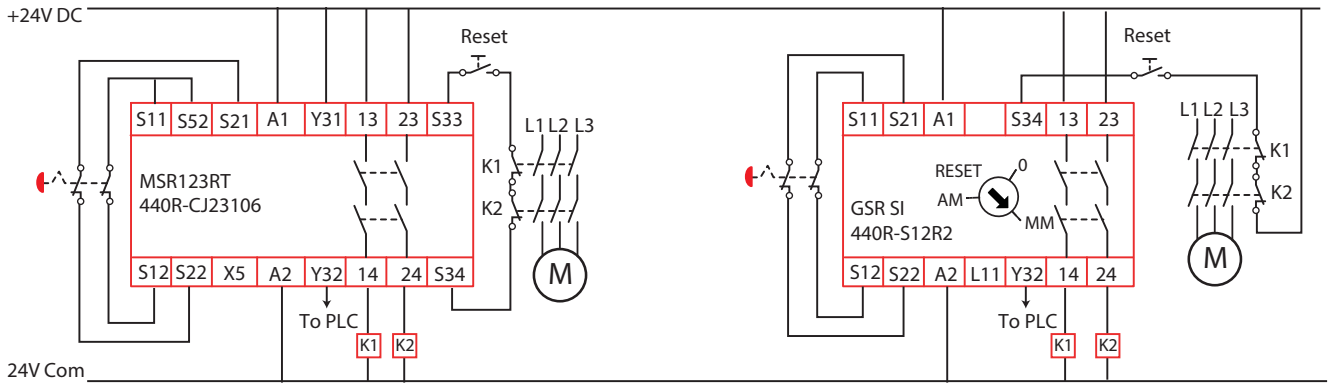
Terminal Locations and Panel Space



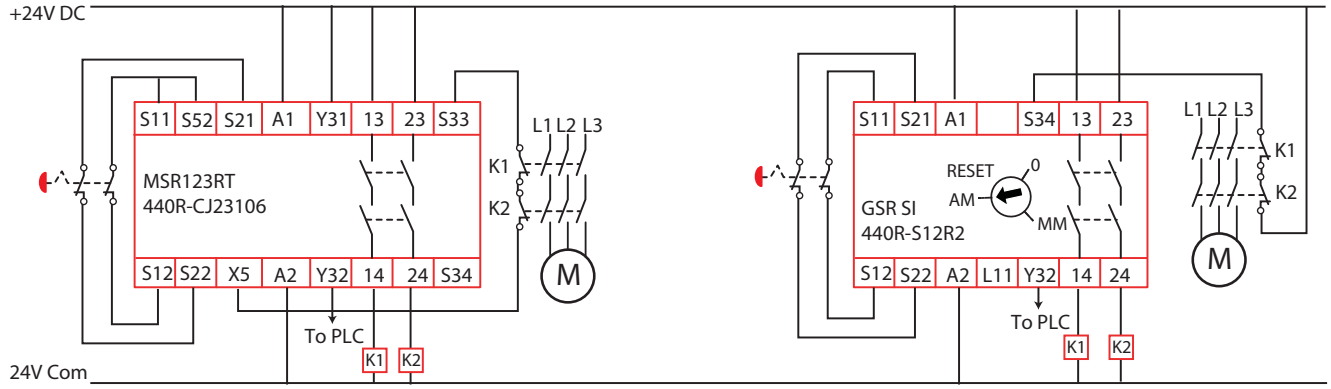
For those applications where the MSR123RT is powered by 115V AC or 230V AC, a 1606-XLP15E power supply can be used. With the additional power supply, the panel space by the replacement design occupies a smaller space than the MSR123RT by itself.



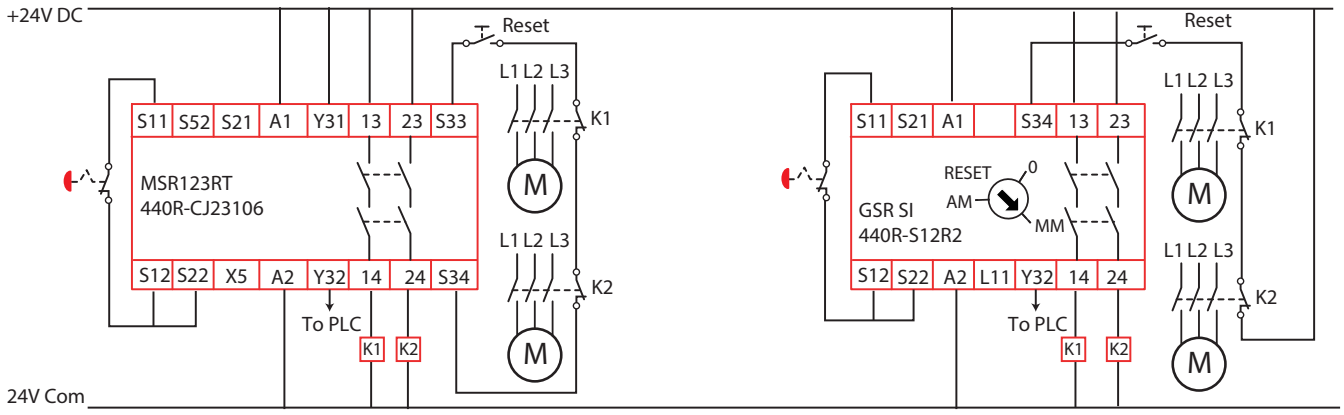
Example Schematic—24V DC, Mechanical Contacts, Monitored Reset



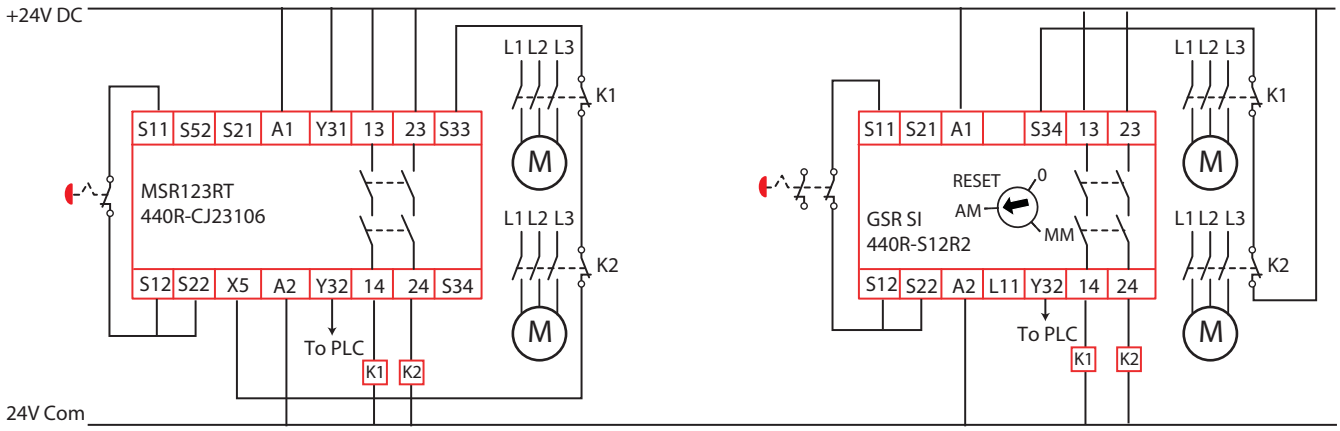
Example Schematic—DC Powered, Dual Channel, Automatic Reset



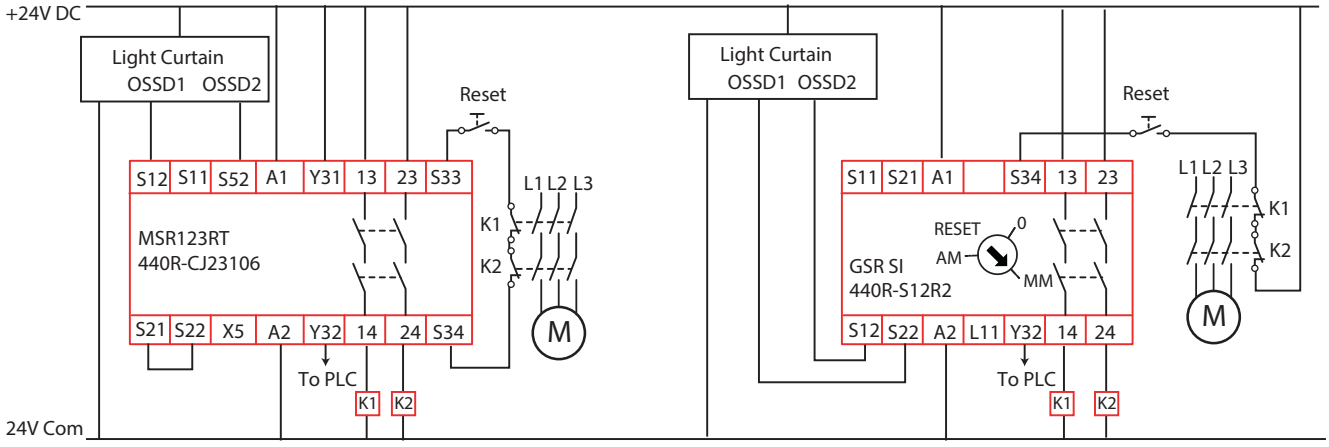
Example Schematic—Single Channel, Monitored Reset



Example Schematic—Single Channel, Automatic Reset

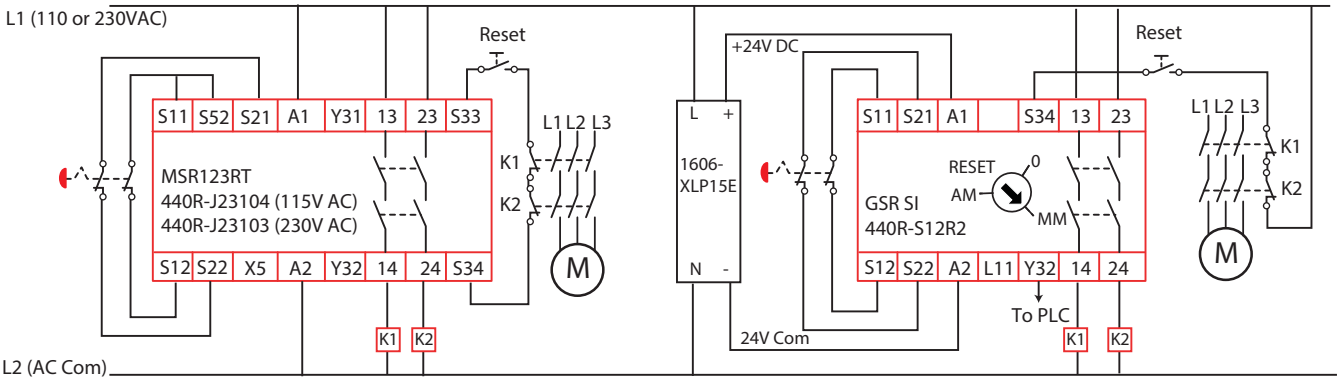


Example Schematic—Light Curtain, Monitored Reset



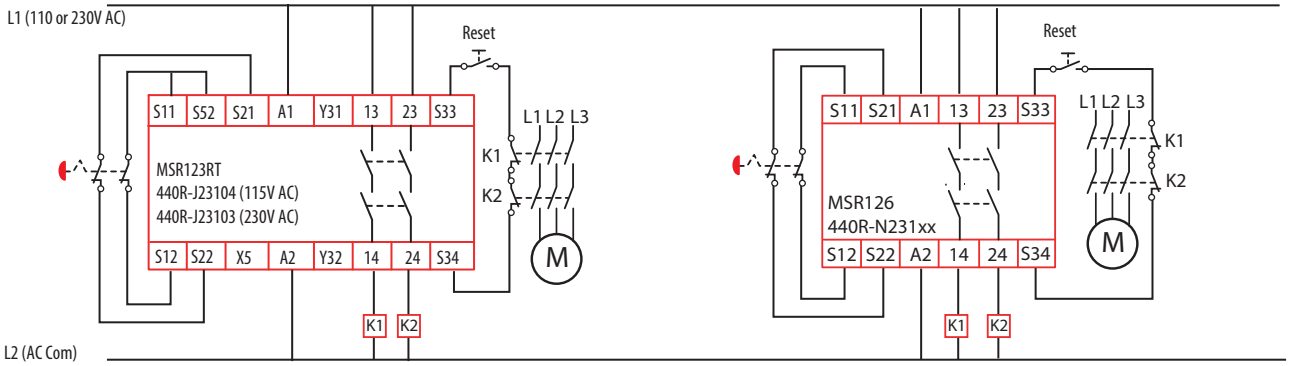
Example Schematic—AC Powered, Monitored Reset

A Bulletin 1606-XLP15E can be used to provide the 24V DC to power the GSR SI relay.



Example Schematic—AC Powered Alternative

As an alternative, the AC powered MSR123 can be replaced by an equivalent MSR126. The user must select the appropriate MSR126. Note that the MSR126 does not have an auxiliary output.



Response Time

MSR123RT = 15 ms

SI = 35 ms

The safety outputs of the CI has a 35 ms response time, whereas the single wire safety output of the CI is 25 ms.

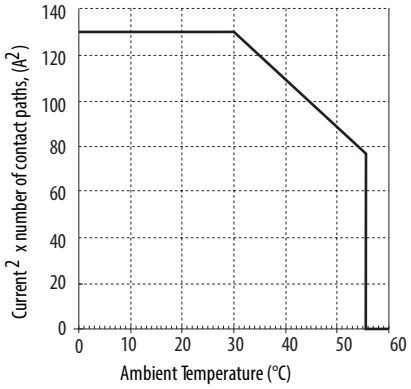
ATTENTION	Since the MSR123RT is faster than the SI, the safety distance must be examined closely and adjusted if necessary.

Output Load Capability

The outputs of the SI may require interposing relays, depending on the load being switched by the MSR123RT. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the SI capability.

Load Type	MSR123RT	SI
AC Inductive	A300, AC-15 6 A	C300, AC-15 1.5 A
DC	N300, DC-13 3 A at 24V DC	2 A at 24V DC
Thermal (non-switching)	10 A (maximum in one circuit) See current limit curve	2 A

The current through the contacts in the MSR123RT must be adjusted to its current limit curve:



MSR178DP

The preferred migration for the MSR178DP is to the GSR SI and EMD relay combination. This migration will cover most of the applications.

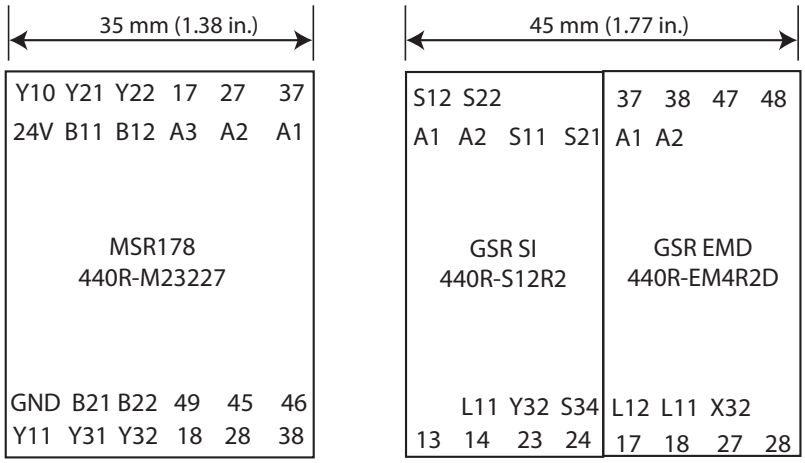
The MSR178DP is available with 24V DC, 115V AC and 230V AC all included in the same catalog number. A 1606 power supply is needed in order to convert the AC supply to DC.

The MSR178DP function can also be initiated with a two-hand control requirement. An MSR125HP provides the replacement two-hand operation.

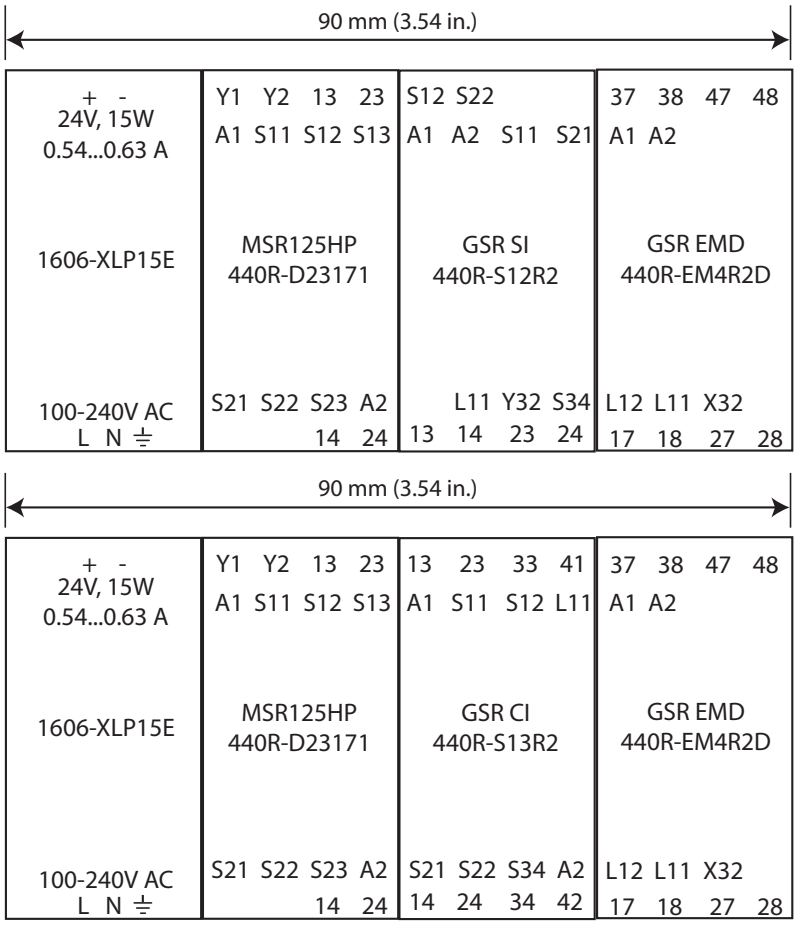
The MSR178 timing range can be set anywhere from 0.1 seconds to 30 minutes using a combination of jumpers and an analog potentiometer. The EMD can also be set between 0.1 seconds and 30 minutes, by setting two multi-position switches.

Terminal Locations and Panel Space

The MSR178DP has a 35 mm (1.38 in.) wide body, with two rows of terminals at the top and bottom. The GSR CI and EMD are similar in that they also two rows of terminals at the top and bottom in a 22.5 mm (0.88 in.) width.



For AC operation, the 1606-XLP15E can be used to supply 24V to the SI and EMD and MSR125. The MSR125HP is also available in 115V AC or 230V AC. In the worst case scenario, the panel space that is required to replace the MSR178DP is 90 mm (3.54 in.).



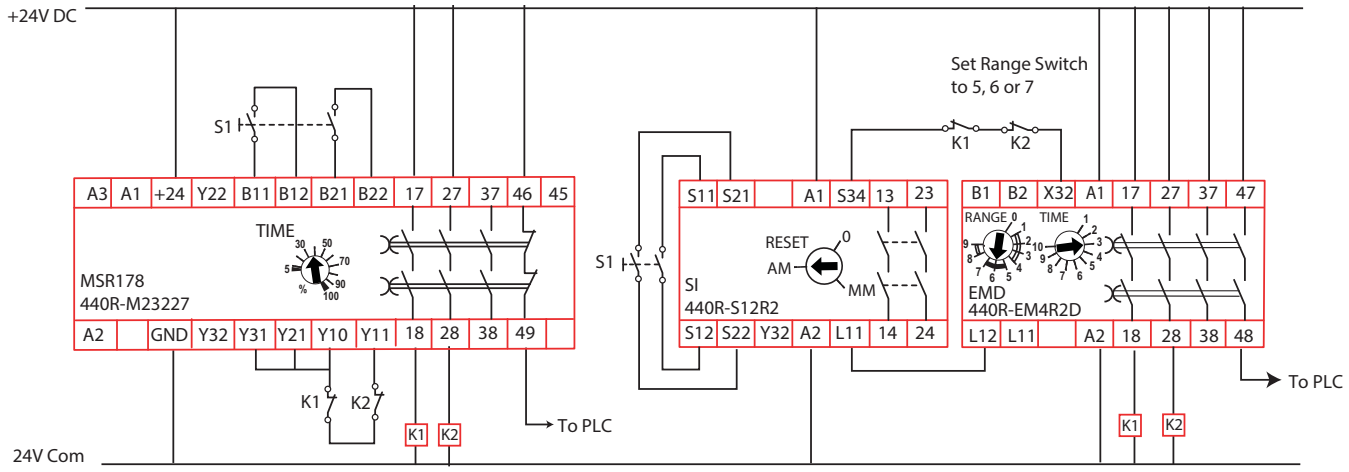
Example Schematic—On Delay

When you press and hold S1, the LEDs on both examples start flashing to indicate that the timing has started. On the MSR178, the CH1 IN and CH2 IN LEDs flash. On the EMD, the Logic IN LED flashes.

After the time expires, the outputs turn ON.

When you release switch S1, the outputs turn OFF immediately.

If you release S1 in the middle of the timing cycle, and then reapply S1, the timer starts from zero.



Example Schematic—Off Delay, Retriggerable

The MSR178 off delay is retriggerable. To achieve similar result, the EMD requires a jumper from B1 to B2.

When you press S1, K1 and K2 turn ON immediately. You can release S1 immediately; it does not have to be held closed.

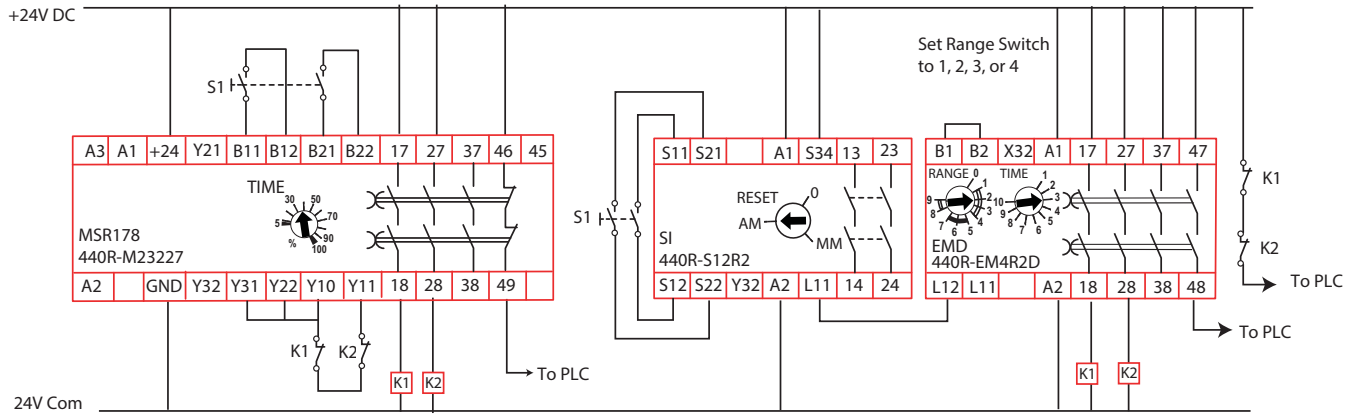
Both systems have an LED that flashes to indicate the timing cycle is in process. On the MSR178, it's the CH1 IN and CH2 IN LEDs. On the EMD, it's the Logic IN LED.

After the time expires the outputs turn OFF (and all four LEDs turn OFF).

If you repress S1 during the timing cycle, K1 and K2 remain ON, the timing cycle is retriggered and starts again from zero.

If you have use the auxiliary signal to the PLC, you can use one of the normally open contacts of the EMD and reverse the logic in the PLC.

Monitoring of the normally closed contacts of K1 and K2 will be performed by the PLC to achieve the same retriggerable performance as the MSR178.

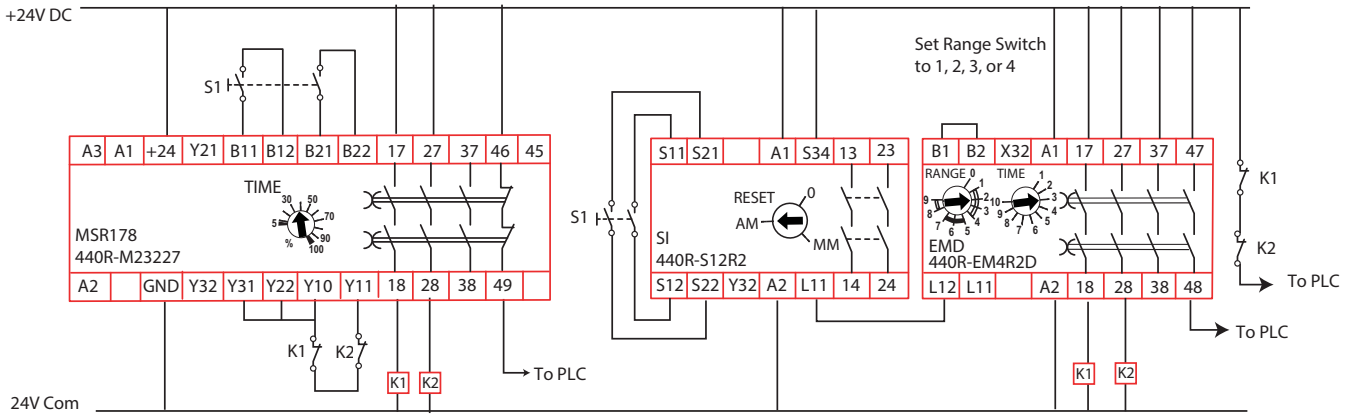


Example Schematic—Off Delay, Non-Retriggerable

Although the MSR178 does not have a specific setting for non-retriggerable off delay, the control system may be prevent a retriggerable input. In this case, the contactors K1 and K2 can be monitored by the SI relay.

When you press the S1 switch, the K1 and K2 contactors turn ON immediately.

When you release S1, the timing cycle starts. The EMD timing cycle will run to its conclusion and turn off K1 and K2. If S1 is repressed and held during the timing cycle, K1 and K2 will turn back ON immediately after the completion of the timing cycle (they turn OFF momentarily and then turn back ON).

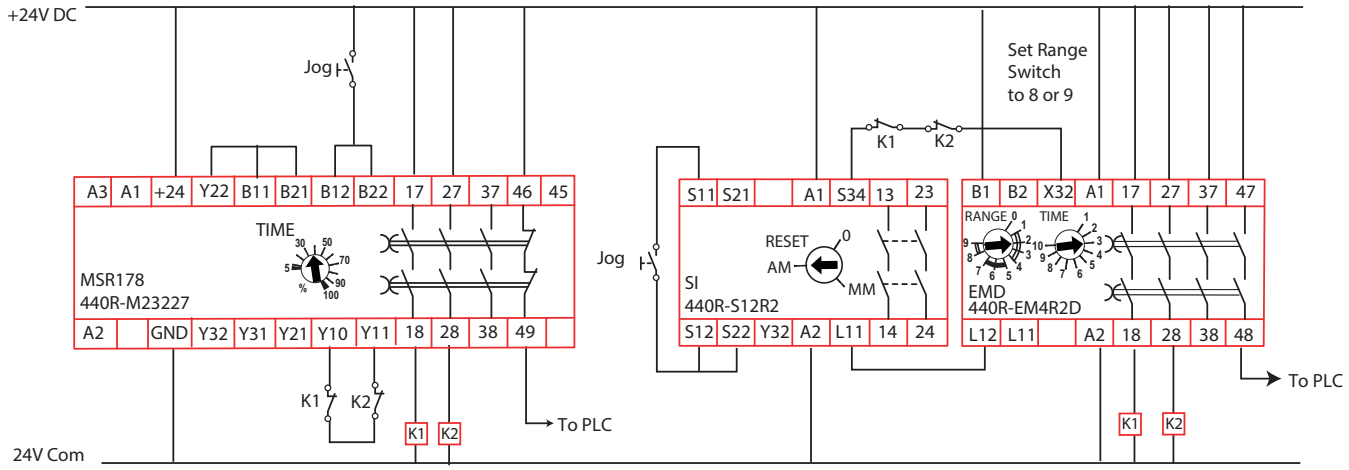


Example Schematic—Single Shot Jog

When the jog switch is pressed and held, the K1 and K2 contactors turn ON during the timing cycle.

If the jog switch is released before the end to the timing cycle, the K1 and K2 contactors turn OFF immediately. The jog function cannot be restarted until after completion of the timing cycle.

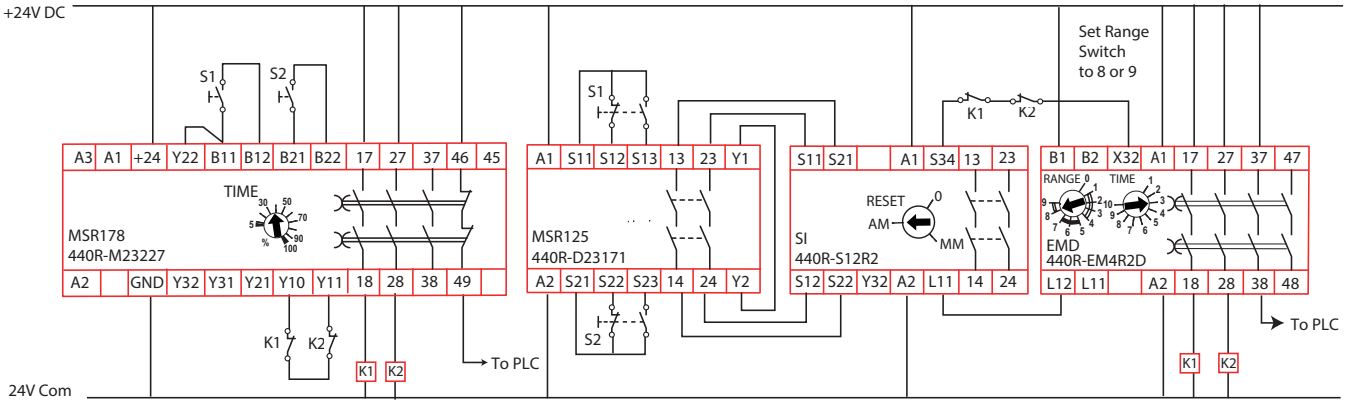
If you have use of the MSR178 auxiliary signal to the PLC, you can use one of the normally open contacts of the EMD and reverse the logic in the PLC.



Example Schematic—Single Shot Two-hand Control

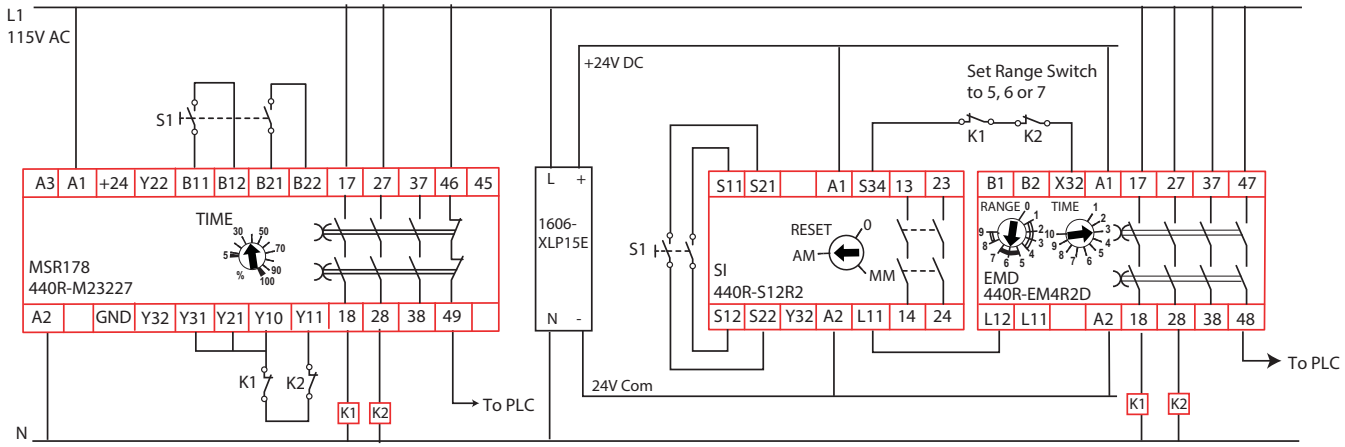
The MSR178 can generate a shot output with a two hand control operation. Switches S1 and S2 must be actuated within 0.5s of each other and the K1 and K2 outputs will turn ON for the specified duration.

To accomplish the combination of features, a two-hand control must be used and the SI and EMD. The MSR125 is recommended for this, but it requires that S1 and S2 to be converted to normally open, normally closed switches.



Example Schematic—On Delay, AC Powered

A 1606-XLP15E power supply can be used in applications where the MSR178 is powered by either 115V AC or 230V AC.



Response Time

MSR178DP = 20 ms

SI = 25 ms (Single wire safety output)

EMD = 35 ms

MSR125 = 20 ms

ATTENTION	Since the MSR178DP has a faster response time than all combinations of SI, EMD, and MSR125, the safety distance must be examined closely and adjusted if necessary.

Output Load Capability

The MSR178DP has a higher current capability than the CI, as shown in the table. See Interposing Relays on page 3 for a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	MSR178DP	EMD
AC Inductive	B300, AC-15 6 A @ 250V AC	B300, AC-15 1.5 A
DC	DC-13 3 A at 30V DC	DC-13 2 A at 24V DC
Thermal (non-switching)	4 A	6 A on 1 circuit

CU1

The preferred migration for the CU1 is to the GSR SI and EMD relay combination.

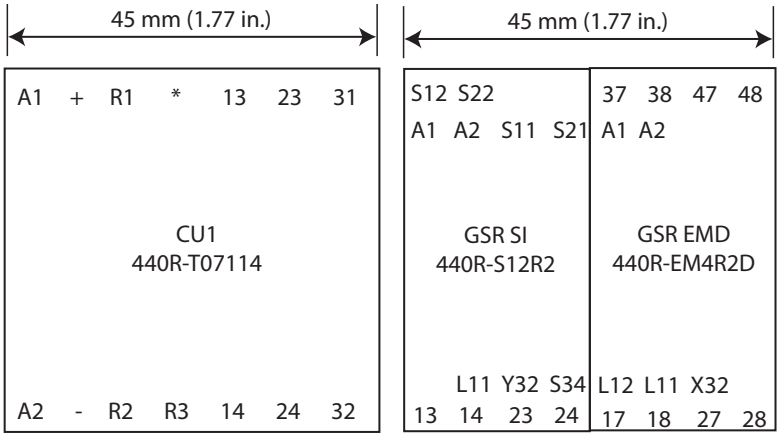
The CU1 is available with 24V DC, 115V AC and 230V AC all included in the same catalog number. A 1606 power supply is required to convert the AC supply to DC.

The CU1 on-delay may be adjusted from 0.1 seconds to 40 minutes. The EMD can be adjusted from 0.1 seconds to 30 minutes. For applications that require longer than 30 minutes, two EMD relays can be cascaded using the Single Wire Safety signal.

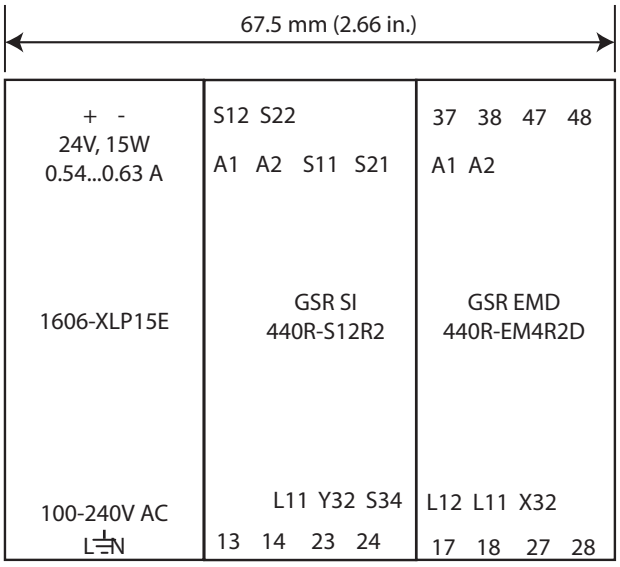
The CU1 has a Remote Indication accessory. This device contains two LEDs—red to indicate the timing cycle is in process and green to indicate that the output is ON (the timing cycle is completed).

Terminal Locations and Panel Space

The CU1 has a 45 mm (1.77 in.) wide body, with one row of terminals at the top and bottom. The combination of the GSR SI and EMD also occupy 45 mm (1.77 in.) of panel space.



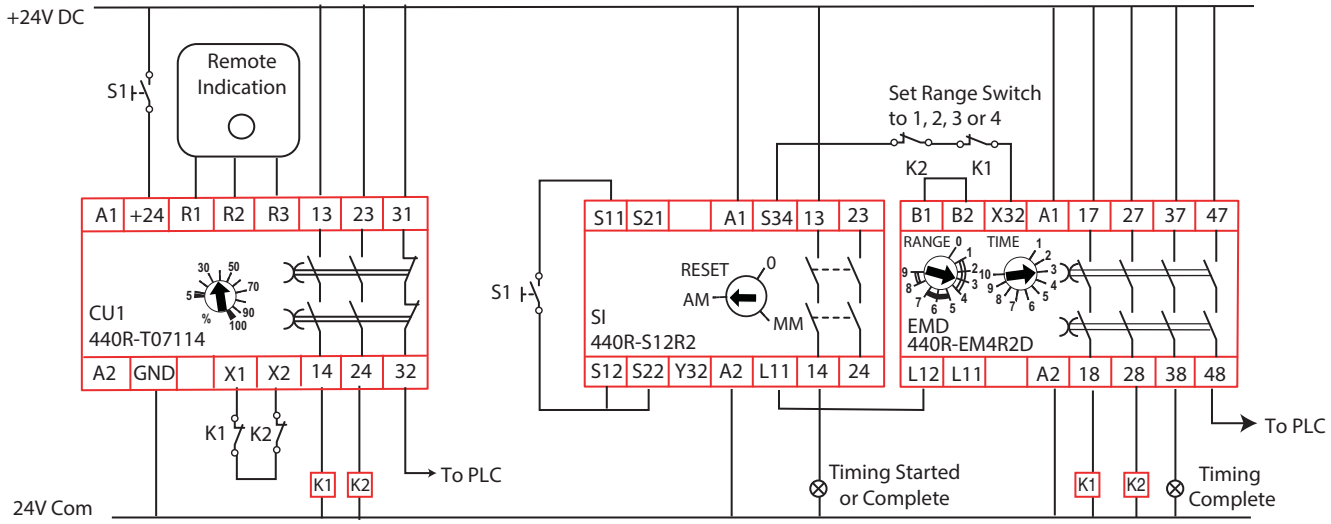
For those applications powered by AC, a 1606-XPL15E can be used to provide the 24V DC for the CI and EMD. This increases the panel space by 22.5 mm (0.88 in.) to a total of 67.5 mm (2.66 in.).



Example Schematic—ON Delay up to 30 minutes

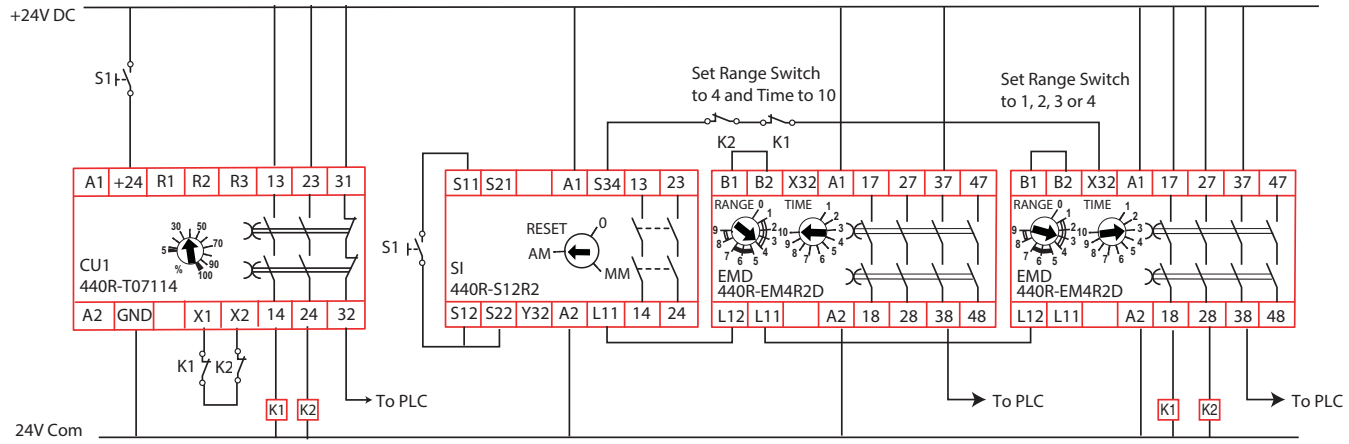
Timing begins when switch S1 is pressed, provided the reset loop X1-X2 on the CU1 is made. Switch S1 must be maintained closed for the full duration of the timing cycle.

The Remote Indication unit can be replaced with two LED indicators



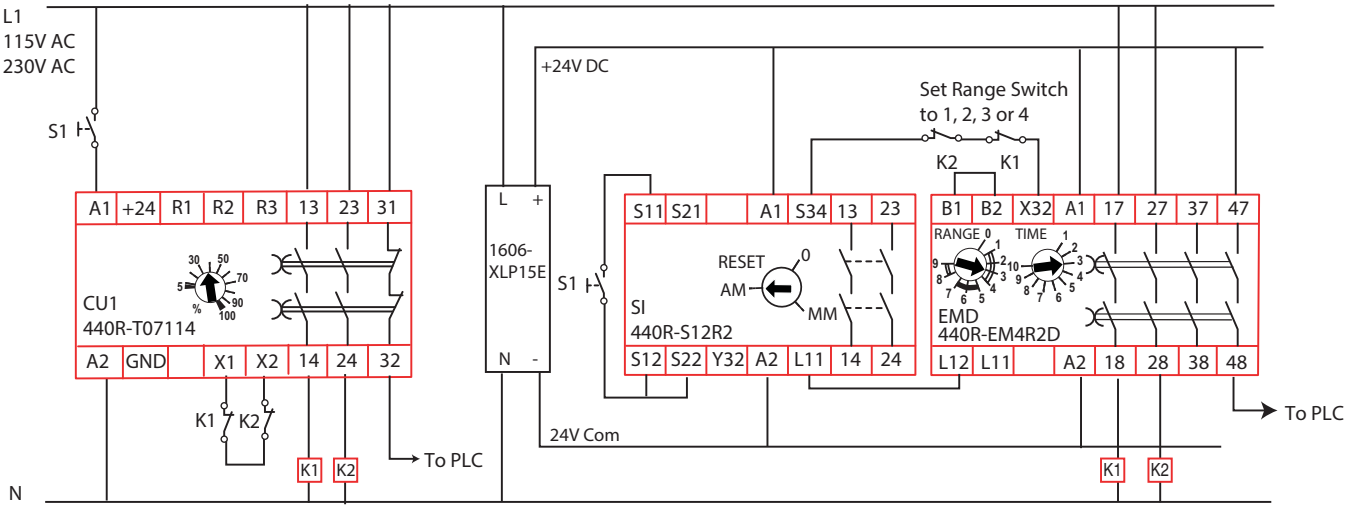
Example Schematic—ON Delay up to 60 minutes

For applications where the timing cycle is greater than 30 minutes and less than 60 minutes, two EMD relays must be used. The Single Wire Safety signal is cascaded (L11 to L12 and then again from L11 to L12). Set the Range switch to 4 and Time switch to 10, on the first EMD to achieve a 30 minute delay. At the end of its cycle, it will signal the second EMD to start its timing cycle. Set the Range and Time of the second EMD to achieve the desired extra time (up to a total of 60 minutes).



Example Schematic—AC Powered

For AC powered applications, a 1606-XLP15E power supply is recommended to provide the 24V DC supply to the CI and EMD relays.



Response Time

CU1 =set by the timer selection

EMD = set by the timer selection

For most applications, there should be no further action is required by the user, as the timings can be made equivalent.

Output Load Capability

The CU1 has a higher current capability than the CI, as shown in the table. See Interposing Relays on page 3 or a wiring example of using interposing relays for applications where the load exceeds the CI capability.

Load Type	CU1	CI
AC Inductive	B300, AC-15 4 A @ 250V AC	C300, AC-15 1.5 A
DC	N300, DC-13 2 A at 30V DC	2 A at 24V DC
Thermal (non-switching)	4 A	2 A

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In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
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Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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