



Description

The MSR9T has one normally closed and one normally open dual-channel input for use with gate interlocks and emergency stop buttons in higher risk applications. The MSR9T is typically used for gate interlocks incorporating the diversity of one positive opening and one non-positive opening interlock.

The MSR9T has output monitoring that can accommodate an automatic/manual reset. Automatic/manual reset can use a jumper or can be used to check operation of the contacts.

The MSR9T has two normally open safety outputs and one normally closed auxiliary output. The safety outputs have independent and redundant internal contacts to support the safety function. The auxiliary contact is a nonsafety output intended to provide an external signal about the status of the safety outputs.

Features

- Category 3 per EN 954-1
- Stop category 0
- One N.C. and one N.O. dual channel input
- Two N.O. safety outputs
- One N.C. auxiliary output
- Automatic reset
- 45 mm wide housing

LED Indicators

Green	Power On
Green	Output On

Specifications

Safety Ratings			
Standards	EN 954-1, ISO13849-1, IEC/EN 60204-1, IEC 60947-5-1, ANSI B11.19, AS4024.1		
Safety Classification	Cat. 3 per EN 954-1 (ISO 13849-1)		
Certifications	CE Marked for all applicable directives, cULus, and c-Tick		
Power Supply			
Input Power Entry	24V AC/DC, 115/230V AC, 50/60 Hz		
Power Consumption	<4V A		
Inputs			
Safety Inputs	1 N.C. & 1 N.O.		
Input Simultaneity	0.5 seconds		
Input Resistance, Max.	500 Ω		
Reset	Auto./Manual		
Response Time	50 ms		
Outputs			
Safety Contacts	2 N.O.		
Auxiliary Contacts	1 N.C.		
Thermal Current/ I_{th}	4 A (nonswitching)		
Rated Impulse withstand Voltage	2500V		
Switching Current @ Voltage, Min.	10 mA @ 10V		
Fuses, Output	5 A quick acting (external)		
Electrical Life	220V AC/4A/880VA $\cos\phi = 0.35...0.1$ M 220V AC/1.7A/375VA $\cos\phi = 0.6...0.5$ M 30V DC/2A/60W = 1 M 10V DC/0.01A/0.1W = 2 M		
Mechanical Life	2,000,000 operations		
Utilization Category			
A300/AC-15	(Ue)	240V	120V
	(Ie)	3 A	6 A
A300/DC-13	(Ue)	24V	
	(Ie)	3 A	
Environmental and Physical Characteristics			
Enclosure Type Rating/ Terminal Protection	IP40 (NEMA 1), DIN 0470/ IP20, DIN 0470		
Operating Temperature [C (F)]	-10...+55 ° (14...131 °)		
Vibration	0.75 mm (0.30 in.) peak, 10...55 Hz		
Shock	30 g, 11 ms half-sine		
Mounting	35 mm DIN Rail		
Weight [g (lbs)]	210 (0.46)		
Conductor Size, Max.	1 x 2.5 mm ² (14 AWG) stranded, 1 x 4 mm ² (12 AWG) solid		

- * Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
- Mission time/Proof test interval of 20 years
 - Functional test at least once within six-month period

Product Selection

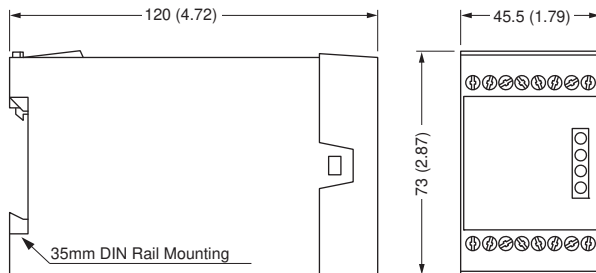
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C. & 1 N.O.	2 N.O.	1 N.C.	Fixed	Auto./Manual	24V AC/DC	440R-F23027
					110/230V AC	440R-F23028

Accessories

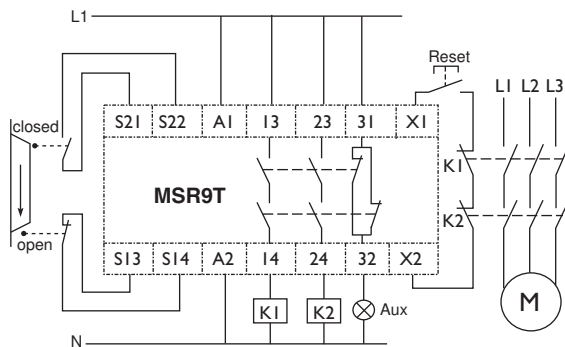
Description	Cat. No.
500 mA Fuse—Bussmann Cat. No. ETF-500 mA	440R-A31562

Approximate Dimensions

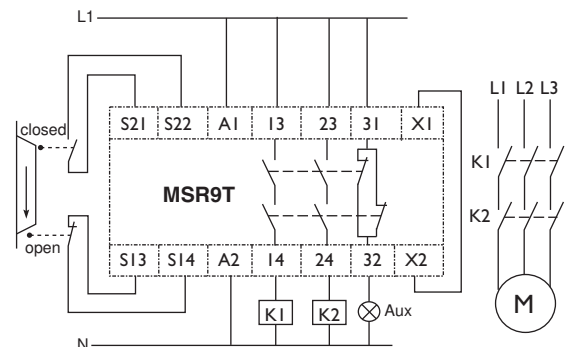
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



Typical Wiring Diagrams

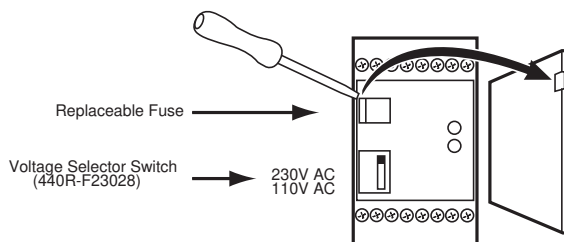


**Dual-Channel Safety Gate, Manual Reset,
Dual-Channel Output, Monitored Output**



**Dual-Channel Safety Gate, Automatic Reset,
Dual-Channel Output, No Monitored Output**

Application Details



Single-Function Safety Relays

MSR30RT/RTP



Housing with removable terminals shown.

Description

The Minotaur MSR30RT/RTP is a microprocessor based, monitoring safety relay, with safety-rated, solid-state outputs.

The versatility of the MSR30RT/RTP inputs allows it to be connected to gate interlocks, e-stop devices and four-wire safety mats. The gate interlocks and e-stops can be either single channel or dual channel normally-closed circuits.

The reset capability of the MSR30RT/RTP allows it to set up for manual or automatic start and restart.

The outputs include two normally-open safety-rated outputs that can be connected to loads up to 2 A at 24V DC. These outputs can be used to send a safety stop signal to a machine or manufacturing system.

The MSR30RT/RTP also has one solid-state normally-closed auxiliary output, which must only be used to indicate the status of the MSR30RT/ RTP.

Features

- Category 4 per EN954-1
- Stop Category 0
- Two solid-state safety outputs
- One solid-state auxiliary output
- One N.C., two N.C or safety mat input
- Monitored manual or automatic/manual reset

LED Indicators

Green	Power (Pwr)
Green	K1 Closed
Green	K2 Closed

Wiring Terminations

S11 & S21	Pulse train output
S12 & S22	Input contacts
A1 – S34	Reset switch
S11 – S34	Automatic reset, start-up test disabled
S21 – S34	Automatic reset, start-up test enabled
A1 – Y2	Monitoring circuit
A1 – Y41	Cross-fault monitoring disabled

Specifications

Safety Ratings	
Standards	EN 954-1, ISO 13849-1, IEC EN 60204-1, ANSI B11.19, AS 4024.5
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PL _e per ISO 13849-1
Functional Safety Data *	PFH _D : < 9.2 x 10 ⁻¹⁰ MTTF _D : > 631 years Note: For up-to-date information, visit http://www.ab.com/Safety/ Suitable for performance levels PL _e (according to ISO 13849-1:2006) and for use in SIL CL3 systems (according to IEC 62061) depending on the architecture and application characteristics
Certifications	CE Marked for all applicable directives, cULus, c-Tick, and TÜV
Power Supply	
Input Power Entry	24V DC SELV
Power Consumption	3 W
Inputs	
Safety Inputs	1 N.C., 2 N.C.
Input Simultaneity	Infinite
Input Resistance, Max.	200 Ω
Reset	Auto./Manual or Monitored Manual
Power On Delay/Recovery Time	3 seconds/20 ms
Response Time	15 ms
Outputs	
Safety Contacts	2 N.O. Solid State
Auxiliary Contacts	1 N.O. Solid State
Fuses, Output	External 6 A slow blow or 10 A fast acting
Power LED Diagnostics	3 s Blink: Initialization Constant: Normal Operation 2 Blinks: Configuration change during operation 3 Blinks: Cross-fault after reset 4 Blinks: Solid-state output switch fault Continuous blinking: Internal fault 5 Blinks: Reset switch closed after reset
Utilization Category	
DC-13	2 A @ 24V DC
Environmental and Physical Characteristics	
Enclosure Type Rating/Terminal Protection	IP40 (NEMA 1) DIN 0470/ IP20, DIN 0470
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms, 100 shocks
Mounting	35 mm DIN Rail
Weight [g (lbs)]	130 (0.287)
Conductor Size, Max.	0.2...2.5 mm ² (24...14 AWG)

- * Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
- Mission time/Proof test interval of 20 years

Product Selection

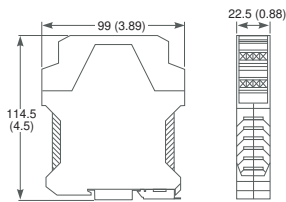
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C., 2 N.C.	2 N.O. Solid State	1 N.O. Solid State	Fixed	Auto./Manual or Monitored Manual	24V DC SELV	440R-N23197
			Removable		24V DC	440R-N23198

Accessories

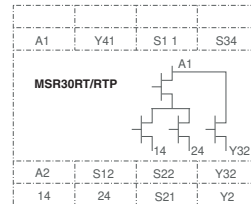
Description	Cat. No.
Bag of 4, 4-Pin Screw Terminal Blocks	440R-A23209
Bag of 4, 4-Pin Spring Clamp Terminal Blocks	440R-A23228

Approximate Dimensions

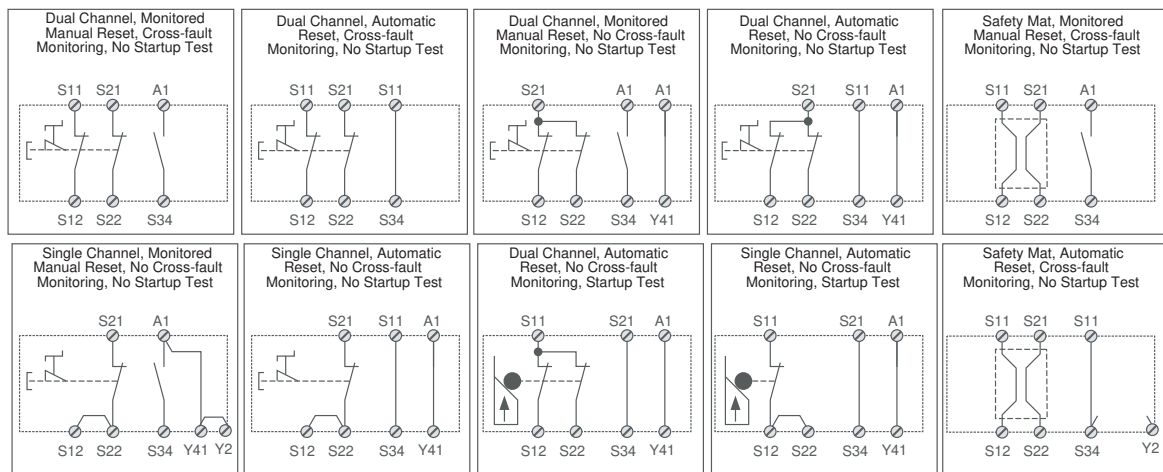
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



Block Diagram



Typical Wiring Diagrams



Dual Channel E-Stop, Dual Channel Outputs, Monitored Manual Reset, Output Monitoring

Single Channel Gate Interlock, Single Channel Output, Automatic Reset, No Output Monitoring

Single-Function Safety Relays

MSR33RT/RTP



Housing with removable terminals shown.

Description

The Minotaur MSR33RT/RTP is a microprocessor-based, monitoring safety relay, with safety-rated, solid-state outputs.

The MSR33RT/RTP is designed to operate with dual channel inputs where one channel is normally closed and the other is normally open. The Sipa sensors can be connected to the MSR33RT/RTP inputs.

Test pulses are used to dynamically check the input circuits. All inputs and outputs are short-circuit protected.

The reset capability of the MSR33RT/RTP allows it to set up for monitored manual or automatic reset. A start-up test can be enabled if automatic reset is used. The start-up test requires the inputs to be cycled before energizing the outputs. The reset and start-up test is determined by the connection wiring.

The outputs include two normally-open safety-rated outputs that can be connected to loads up to 2 A at 24V DC. These outputs can be used to send a safety stop signal to a machine or manufacturing system.

The MSR33 also has one solid-state, normally-open auxiliary output, which must only be used to indicate status of the MSR33RT/RTP.

Features

- Category 4 per EN954-1
- Stop Category 0
- Two solid-state N.O. safety outputs
- One solid-state N.O. auxiliary output
- One N.O. and one N.C. input

LED Indicators

Green	Power (Pwr)
Green	CH1 Energized
Green	CH2 Energized

Wiring Terminations

S11 & S21	Pulse checking dynamic output
S12 & S22	Input contacts
A1 – S34	Reset switch
S11 – S34	Automatic reset, start-up test disabled
S21 – S34	Automatic reset, start-up test enabled
A1 – Y2	Monitoring circuit

Specifications

Safety Ratings	
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, ANSI B11.19, AS 4024.5
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1
Functional Safety Data *	PFH _D : < 9.2 x 10 ⁻¹⁰ MTTF _D : > 631 years Note: For up-to-date information, visit http://www.ab.com/Safety/ Suitable for performance levels PLe (according to ISO 13849-1:2006) and for use in SIL CL3 systems (according to IEC 62061) depending on the architecture and application characteristics
Certifications	CE Marked for all applicable directives, cULus, c-Tick, and TÜV
Power Supply	
Input Power Entry	24V DC SELV
Power Consumption	3 W
Inputs	
Safety Inputs	1 N.C. + 1 N.O.
Input Simultaneity	Infinite
Input Resistance, Max.	200 Ω
Reset	Auto. or Monitored Manual
Power On Delay/Recovery Time	3 seconds/20 ms
Response Time	15 ms
Outputs	
Safety Contacts	2 N.O. Solid State
Auxiliary Contacts	1 N.O. Solid State
Power LED Diagnostics	3 s Blink: Initialization Constant: Normal Operation 2 Blinks: Configuration change during operation 4 Blinks: Solid state output switch fault Continuous blinking: Internal fault
Environmental and Physical Characteristics	
Enclosure Type Rating/Terminal Protection	IP40 (NEMA 1), DIN VDE 0470-1/ IP20
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms, 100 shocks
Mounting	In panel enclosure (IP54); 35 mm DIN Rail
Weight [g (lbs)]	130 (0.287)
Conductor Size, Max.	0.2...2.5 mm ² (24...14 AWG)

* Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
 - Mission time/Proof test interval of 20 years

Product Selection

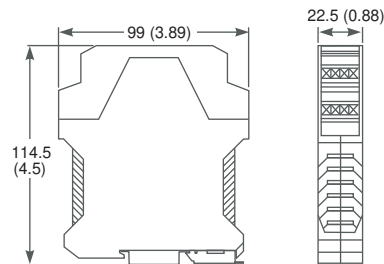
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C. & 1 N.O.	2 N.O. Solid State	1 N.O. Solid State	Fixed	Auto. or Monitored Manual	24V DC SELV	440R-F23199
			Removable			440R-F23200

Accessories

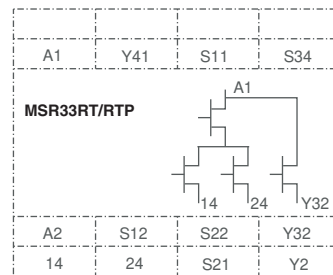
Description	Cat. No.
Bag of 4, 4-Pin Screw Terminal Blocks	440R-A23209
Bag of 4, 4-Pin Spring Clamp Terminal Blocks	440R-A23228

Approximate Dimensions

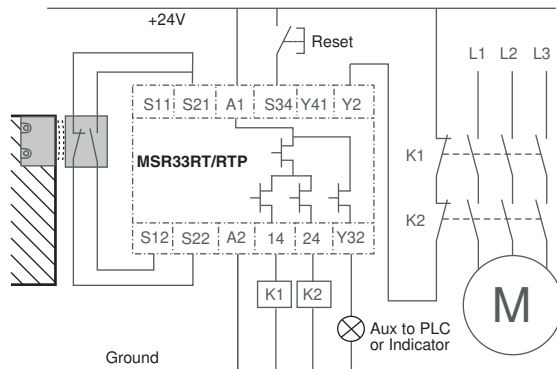
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



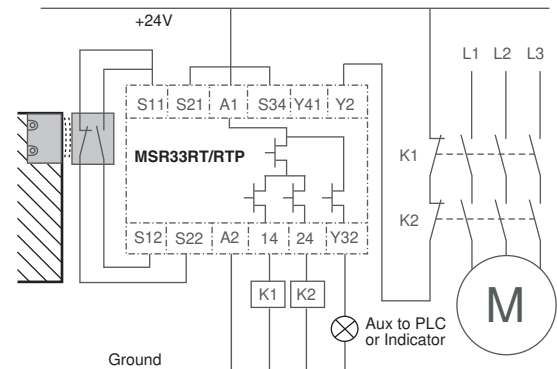
Block Diagram



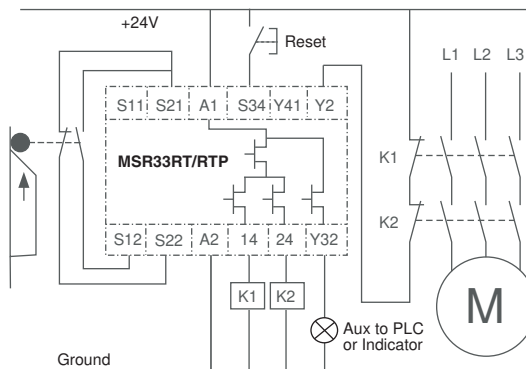
Typical Wiring Diagrams



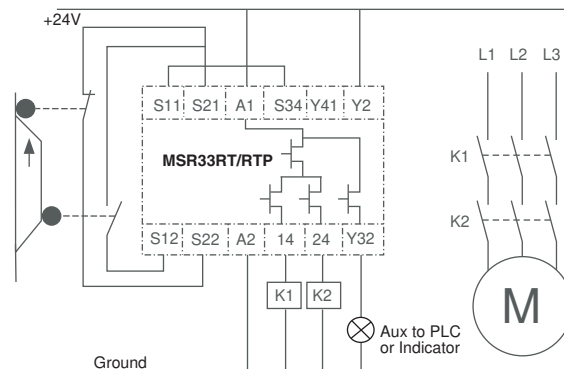
**Sipsa Sensor Inputs, Dual Channel Outputs,
Monitored Manual Reset, Output Monitoring Start-up Test Disabled**



**Sipsa Sensor Inputs, Dual Channel Outputs,
Automatic Reset, No Output Monitoring Start-up Test Enabled**



**Dual Channel Inputs, Dual Channel Outputs,
Monitored Manual Reset, Output Monitoring Start-up Test Disabled**



**Dual Independent Inputs, Dual Channel Outputs,
Automatic Reset, No Output Monitoring Start-up Test Disabled**

Logic

Single-Function Safety Relays

MSR41



Description

The MSR41 safety relay is a simple on/off control module for the GuardShield Micro 400 safety light curtain. This Category 4, SIL CL3 safety device has a pair of PNP solid state, 400 mA OSSDs for direct connection to the final switching device. When safety relay outputs are required, the MSR41 easily accommodates the interconnection of up to three MSR45E safety relay expansion modules, each providing a pair of safety relay outputs. Simply connect ribbon cable connectors from the back of the MSR41 to each of the MSR45E modules for a series of interconnections for two PNP OSSDs, and six N.O. relay outputs.

This 22.5 mm DIN mount safety relay can only be configured through hard-wired configurations. This relay module does not support configuration through the software but can be used for diagnostics only. The removable spring terminal connectors on the MSR41 allow for ease of wiring of the device as well as hard-wired operating mode configuration.

Manual/automatic reset and start/restart can be configured by simply changing the wiring (see examples).

Features

- Category 4 per EN 954-1
- SIL CL3 IEC 61508, IEC 62061
- 22.5 mm housing
- Stop category 0
- 24V DC supply voltage
- Manual or automatic reset
- Eight diagnostic LEDs
- Unique design allows for easy addition of relay expansion modules
- Removable terminal blocks
- Two auxiliary and standard outputs
- RJ45 connections for Micro 400 safety light curtain
- Supports up to three MSR45E expander units

LED Indicators (Default Configuration)

LED	Green	Red
OSSD2	Output active	Output inactive
OSSD1	Output active	Output inactive
Info2 (LED)	System OK	Lockout
Info1 (LED)	Safety Outputs ON	Safety Outputs OFF
IN2	Reset OK	Waiting for reset signal
IN1	—	—
0V	—	—
+24V	Power connected	No power connected

Specifications

Safety Ratings	
Standards	EN 954-1, IEC/EN 60204-1, IEC 61496-1
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 61508, PLe per ISO 13849-1
Functional Safety Data *	PFD: 2.92E-09 (w LC) SFF: 96.40% (w LC) For use in SIL3 systems (according to IEC 61508) depending on the architecture and application characteristics
Note: For up-to-date information, visit http://www.ab.com/Safety/	
Certifications	CE Marked for all applicable directives, cULus, and TÜV
Power Supply	
Input Power Entry	24V DC
Power Consumption	2.4 W (semi-conductor outputs unloaded)
Inputs	
Safety Inputs	GuardShield Micro 400 Light Curtain
Input Resistance, Max.	—
Reset	Auto./manual
Power On Delay Time	Determined by configuration
Response Time	Determined by configuration
Outputs	
Safety Contacts	2 PNP, 400 mA each
Auxiliary Contacts	2 PNP
Environmental and Physical Characteristics	
Enclosure Type Rating/ Terminal Protection	IP20/ IP20
Operating Temperature [C (F)]	0...55 ° (32...131 °)
Vibration	0.35 mm 10...55 Hz
Mounting	35 mm DIN Rail
Weight [g (lbs)]	130 (0.287)
Conductor Size, Max.	1 x 2.5 mm ² (14 AWG) stranded

* Usable for IEC 62061. Data is based on the following assumptions:
- Mission time/Proof test interval of 20 years

Product Selection

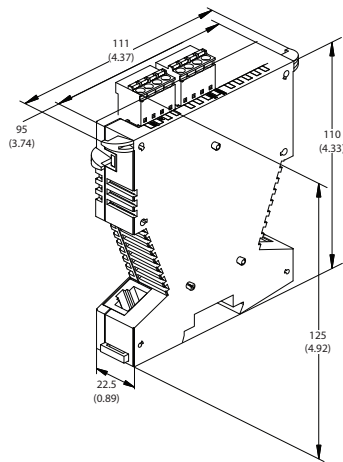
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
GuardShield Micro 400	2 PNP	2 PNP	Removable	Auto./manual	24V DC	440R-P221AGS

Accessories

Description	Cat. No.
MSR45E—expander for MSR41 and MSR42	440R-P4NANS
Ribbon cable—for one MSR45E	440R-ACABL1
Ribbon cable—for two MSR45Es	440R-ACABL2
Ribbon cable—for three MSR45Es	440R-ACABL3
Replacement terminal block kit—MSR41	440R-ATERM1P
Replacement terminal block kit—MSR45E	440R-ATERM2C

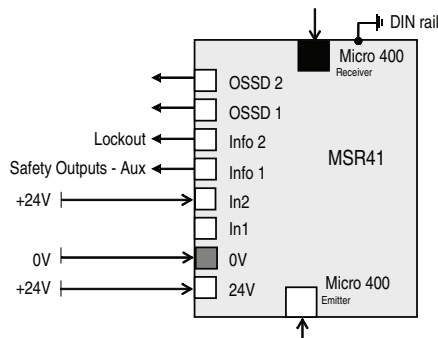
Approximate Dimensions

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

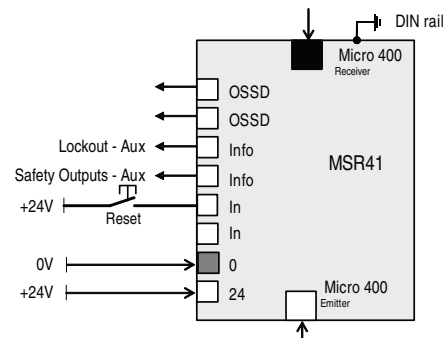


Typical Wiring Diagrams

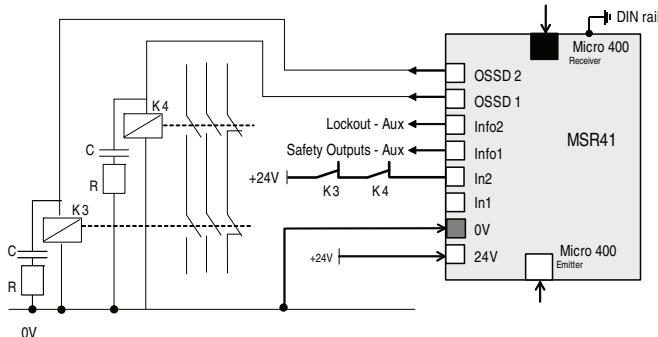
Default Configurations (No Software)



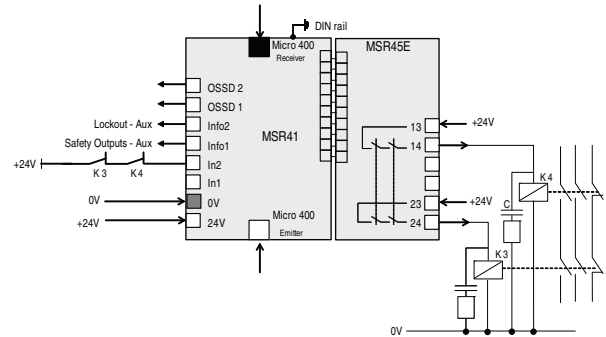
Micro 400 Light Curtain, Automatic Reset, No Output Monitoring



Micro 400 Light Curtain, Manual Reset, No Output Monitoring



Micro 400 Light Curtain, Manual Reset, Output Monitoring



Micro 400 Light Curtain, Automatic Reset, Output Monitoring



Description

The MSR117T has one normally closed single-channel input for use with gate interlocks and emergency stop buttons in lower risk applications. The MSR117T has output monitoring that can accommodate an automatic/manual reset function. Automatic/manual reset can use a jumper or can be used to check operation of the contacts.

The MSR117T has three normally open safety outputs and one normally closed auxiliary output. The safety outputs have independent and redundant internal contacts to help ensure the safety function. The auxiliary contact is a nonsafety output intended to provide an external signal about the status of the safety outputs.

The MSR117T can be activated via the terminals A1-A2 and the feedback/reset loop X1-X2. Then the safety outputs 13-14, 23-24 and 33-34 close and enable operation.

Features

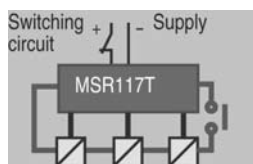
- Category 4 per EN 954-1
- Stop category 0
- Single channel input
- Three N.O. safety outputs
- One N.C. auxiliary output
- 22.5 mm wide housing

Specifications

Safety Ratings	
Standards	IEC/EN 60204-1, ISO 12100, ISO 13849-1 (EN 954-1)
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1
Functional Safety Data *	PFH _D : < 2.53 x 10 ⁻⁹ MTTF _D : > 425 years Suitable for performance levels PLe (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics
Certifications	CE Marked for all applicable directives, cULus, and TÜV
Power Supply	
Input Power Entry	24V AC/DC
Power Consumption	2 W
Inputs	
Safety Inputs	1 N.C.
Input Resistance, Max.	25 ohms
Reset	Auto./Manual or Monitored Manual
Power On Delay/Recovery Time	1 sec/110 ms
Response Time	30 ms
Outputs	
Safety Contacts	3 N.O.
Auxiliary Contacts	1 N.C.
Thermal Current/I _{th}	2 x 5 A or 3 x 4 A
Rated Impulse withstand Voltage	2500V
Switching Current @ Voltage, Min.	10 mA @ 10V
Fuses, Output	6 A slow blow or 10 A quick blow (external)
Electrical Life	230V AC/4 A/880V A cosφ=0.35...0.1 M 230V AC/1.7 A/375V A cosφ=0.6...0.5 M 30V DC/2 A/60 = 1 M 10V DC/0.01 A/0.1 W = 2 M
Mechanical Life	2,000,000 cycles
Environmental and Physical Characteristics	
Enclosure Type Rating/Terminal Protection	IP40 (NEMA 1), DIN 0470/ IP20, DIN 0470
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms 100 shocks
Mounting	35 mm DIN Rail
Weight [g (lbs)]	180 (0.37)
Conductor Size, Max.	0.2...4 mm ² (24...12 AWG) wire size only

* Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
 - Mission time/Proof test interval of 20 years
 - Functional test at least once within six-month period

Applications



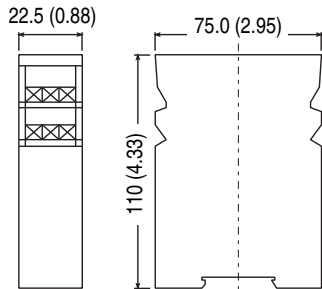
- Contactor monitoring circuit
- Contactor switching circuit
- Supply inclusive of switching circuit
- ☐ Contactor
- Monitored by Minotaur

Product Selection

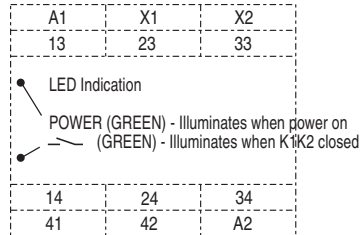
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C.	3 N.O.	1 N.C.	Fixed	Auto./Manual or Monitored Manual	24V AC/DC	440R-B23211

Approximate Dimensions

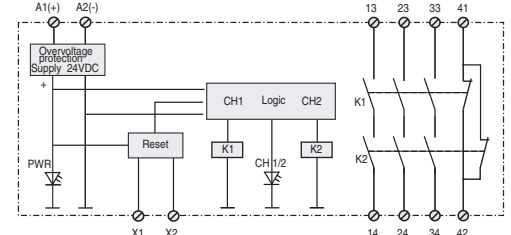
Dimensions are shown in mm (in.).
 Dimensions are not intended to be used
 for installation purposes.



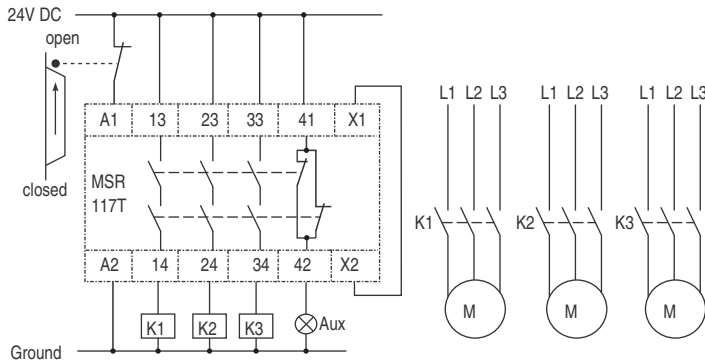
Connections



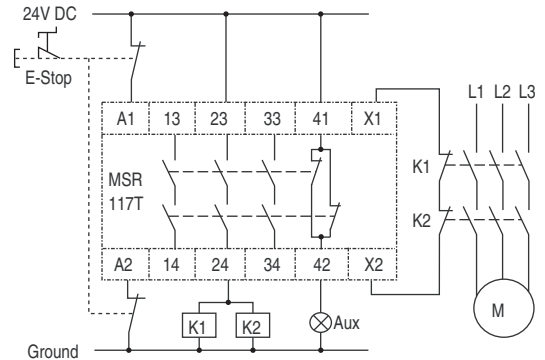
Block Diagram



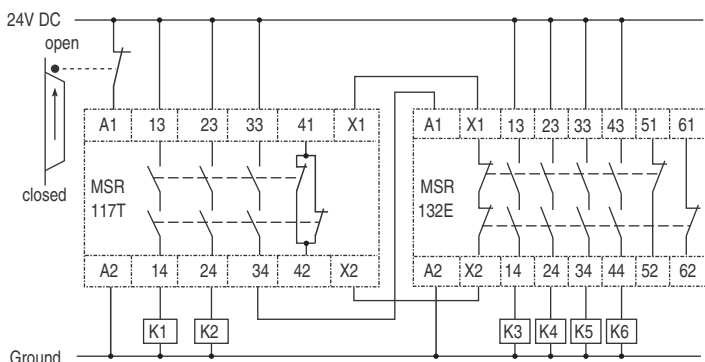
Typical Wiring Diagrams



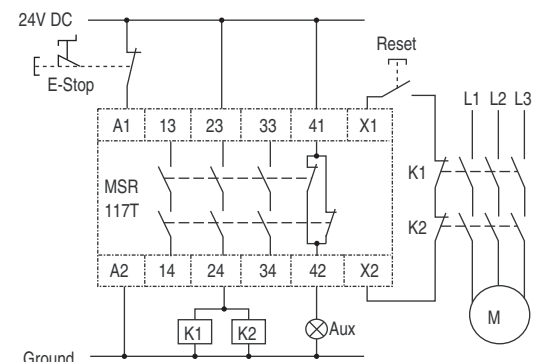
**Single Channel Gate Interlock, Automatic Reset,
 Single Channel Output, No Monitored Output**



**Dual Channel E-Stop, Automatic Reset,
 Single Channel Output, Monitored Output**



**Single Channel Gate Interlock, Automatic Reset,
 Single Channel Output Expansion**



**Single Channel E-Stop, Manual Reset,
 Single Channel Output, Monitored Output**

Logic

Single-Function Safety Relays

MSR126RT



Description

The Allen-Bradley Guardmaster Minotaur MSR126R/T is a safety monitoring relay that provides the very basics for safety control systems in a 22.5 mm package.

The MSR126R/T is designed for connection to a single channel safety gate, a single channel e-stop or a light curtain that provides cross fault detection. The MSR126.1R/T is designed for connection to a dual channel safety gate or e-stop, as it performs cross fault detection across the inputs.

The MSR126R and MSR126.1R are designed for applications where a monitored manual reset is required. Monitored manual reset requires the use of a momentary normally open switch to activate the outputs.

The MSR126T and MSR126.1T are designed for applications where automatic/manual reset is required.

The outputs are only two normally open safety-rated outputs. The safety outputs have independent and redundant internal contacts to support the safety function.

Features

- Category 4 per EN 954-1
- Stop category 0
- Two safety contacts N.O.
- Single/dual channel operation
- Cross fault monitoring
- Monitored or automatic reset
- E-stop, safety gate or light curtain applications

LED Indicators

Green	Power On
Green	K1 Closed
Green	K2 Closed

Specifications

Safety Ratings	
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, IEC 60947-4-1, IEC 60947-5-1, ANSI B11.19, AS 4024.1
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1
Functional Safety Data *	PFH _D : < 1.45 x 10 ⁻⁹ MTTF _d : > 398 years Suitable for performance levels Ple (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics
Note: For up-to-date information, visit http://www.ab.com/Safety/	
Certifications	CE Marked for all applicable directives, cULus, c-Tick, and BG
Power Supply	
Input Power Entry	24V AC/DC, 115/230V AC
Power Consumption	4 W
Inputs	
Safety Inputs	1 N.C., 2 N.C., or LC
Input Simultaneity	Infinite
Input Resistance, Max.	90 Ω
Reset	Auto./Manual or Monitored Manual
Power On Delay/Recovery Time	300 ms/100 ms
Response Time	15 ms
Outputs	
Safety Contacts	2 N.O.
Thermal Current/ <i>I_{th}</i>	Max 6 A in one current path (nonswitching)
Rated Impulse withstand Voltage	2500V
Switching Current @ Voltage, Min.	10 mA @ 10V
Fuses, Output	External 6 A slow blow or 10 A fast acting
Electrical Life (Operations)	(With surge suppression) 250V AC/6 A/1500VA cosφ = 1...0.1 M 250V AC/2.5 A/625VA cosφ = 1...0.5 M 250V AC/1.5 A/375VA cosφ = 0.35...0.3 M 250V AC/5 A/1250VA cosφ = 0.6...0.1 M 24V DC/2 A/48 W = 1 M 10V DC/0.01 A/0.1 W = 2 M
Mechanical Life	2,000,000 operations
Utilization Category	
Resistive: AC-1	6 A/250V AC
Resistive: DC-1	6 A/24V DC
Inductive: AC-15	6 A/250V AC
Inductive: DC-13	3 A/24V DC
	6 A/125V AC
	6 A/24V DC @ 6 ops/min
Environmental and Physical Characteristics	
Enclosure Type Rating/Terminal Protection	IP40 (NEMA 1), DIN 0470/ IP20, DIN 0470
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms 100 shocks
Mounting	35 mm DIN Rail
Weight [g (lbs)]	24V DC: 160 (0.35); 115/230V AC: 215 (0.47)
Conductor Size, Max.	0.2...4 mm ² (24...12 AWG)

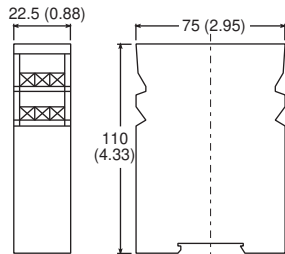
* Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
 - Mission time/Proof test interval of 20 years
 - Functional test at least once within six-month period

Product Selection

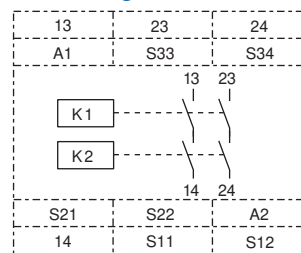
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
Light Curtain or Single Channel (MSR126T)	2 N.O.	None	Fixed	Auto./Manual	24V AC/DC	440R-N23117
Dual Channel 2 N.C. (MSR126.IT)					115V AC	440R-N23116
					230V AC	440R-N23115
					24V AC/DC	440R-N23114
					115V AC	440R-N23113
					230V AC	440R-N23112
Light Curtain or Single Channel (MSR126R)				Monitored Manual	24V AC/DC	440R-N23123
Dual Channel 2 N.C. (MSR126.IR)					115V AC	440R-N23122
					230V AC	440R-N23121
					24V AC/DC	440R-N23120
					115V AC	440R-N23119
					230V AC	440R-N23118

Approximate Dimensions

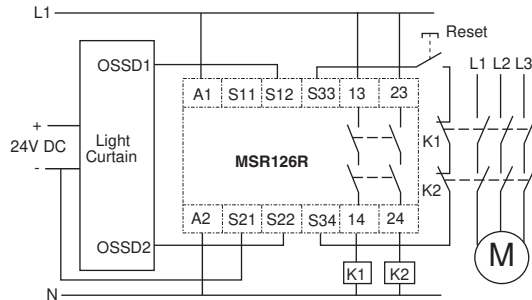
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



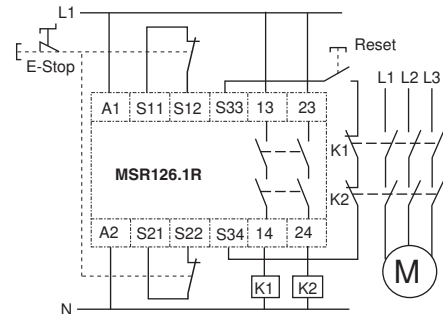
Block Diagram



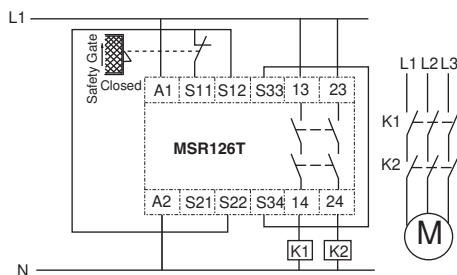
Typical Wiring Diagrams



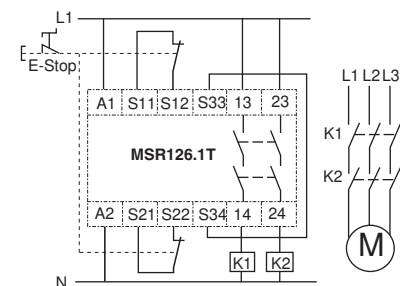
**115/230V Supply, 24V DC Light Curtain,
Monitored Manual Reset, Monitored Output**



**Dual Channel E-Stop Input,
Monitored Manual Reset, Monitored Output**



**Single Channel Safety Gate,
Automatic Reset, No Output Monitoring**



**Dual Channel E-Stop, Automatic Reset,
No Output Monitoring**

Logic

Single-Function Safety Relays

MSR127RTP



Description

The MSR127RTP can be connected in three different input wiring configurations: one normally closed, two normally closed, or with two PNP connections from a light curtain. When connected in the two normally closed fashion, the MSR127RTP checks for cross faults across the two inputs. When connected to light curtains, the light curtain must perform the cross fault detection.

The MSR127RP has a monitored manual reset. The MSR127TP has an automatic/manual reset. Models with automatic/manual reset can have the reset jumpered or can be converted to an unmonitored manual reset by adding a normally open switch in the monitoring loop. Models with monitored manual reset provide checking of the output monitoring circuit.

The outputs include three normally open safety-rated outputs as well as one normally closed auxiliary output. The safety outputs have independent and redundant internal contacts to support the safety function. The auxiliary output is a nonsafety output intended to provide an external signal about the status of the safety outputs.

Features

- Category 4 per EN 954-1
- Stop category 0
- Three safety contacts
- One auxiliary contact
- Cross fault monitoring
- Monitored or automatic reset
- Removable terminals
- Light curtain, E-stop or safety gate applications

LED Indicators

Green	Power On
Green	CH1 Closed
Green	CH2 Closed

Specifications

Safety Ratings		
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, IEC 60947-4-1, IEC 60947-5-1, ANSI B11.19, AS4024.1	
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1	
Functional Safety Data ★ Note: For up-to-date information, visit http://www.ab.com/Safety/	PFH _D : < 1.45 x 10 ⁻⁹ MTTF _d : > 398 years Suitable for performance levels PLe (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics	
Certifications	CE Marked for all applicable directives, cULus and BG	
Power Supply		
Input Power Entry	24V AC/DC, 115V AC or 230V AC 50/60 Hz	
Power Consumption	2 W	
Inputs		
Safety Inputs	1 N.C. or 2 N.C. or LC	
Input Simultaneity	Infinite (ch2 before ch1) with Auto Reset	
Input Resistance, Max.	110 Ω	
Reset	Auto./Manual or Monitored Manual	
Power On Delay/ Recovery Time	1 second/100 ms	
Response Time	15 ms	
Outputs		
Safety Contacts	3 N.O.	
Auxiliary Contacts	1 N.C.	
Thermal Current/I _{th}	Units with 24V AC/DC supply: 3 x 4 A or 2 x 5 A nonswitching Units with 115/230V AC supplies: 3 x 3 A or 2 x 4 A or 1 x 5 A nonswitching	
Rated Impulse withstand Voltage	2500V	
Switching Current @ Voltage, Min.	10 mA/10V	
Fuses, Output	External 6 A slow blow or 10 A fast acting	
Electrical Life (Operations)	(With surge suppression) 250V AC/6 A/1500VA cosφ = 1...0.1 M 250V AC/2.5 A/625VA cosφ = 1...0.5 M 250V AC/1.5 A/375VA cosφ = 0.35...0.3 M 250V AC/5 A/1250VA cosφ = 0.6...0.1 M 24V DC/2 A/48 W = 1 M 10V DC/0.01 A/0.1 W = 2 M	
Mechanical Life	2,000,000 operations	
Utilization Category		
Resistive: AC-1	5 A/250V AC	
Resistive: DC-1	5 A/24V DC	
Inductive: AC-15	5 A/250V AC	
Inductive: DC-13	3 A/24V DC	5 A/24V DC @ 6 ops/min
Environmental and Physical Characteristics		
Enclosure Type Rating/ Terminal Protection	IP40 (NEMA 1)/ IP20	
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)	
Vibration	10...55 Hz, 0.35 mm	
Shock	10 g, 16 ms 100 shocks	
Mounting	35 mm DIN Rail	
Weight [g (lbs)]	24V DC: 210 (0.46), 115/230V AC: 260 (0.57)	
Conductor Size, Max.	0.2...4 mm² (24...12 AWG)	

- * Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
- Mission time/Proof test interval of 20 years
 - Functional test at least once within six-month period

Product Selection

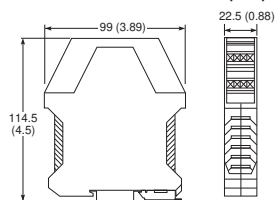
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C., 2 N.C., Light Curtain	3 N.O.	1 N.C.	Fixed	Auto./Manual	24V AC/DC	440R-N23126
				Monitored Manual		440R-N23129
				Auto./Manual	115V AC	440R-N23125
				Monitored Manual		440R-N23128
				Auto./Manual	230V AC	440R-N23124
				Monitored Manual		440R-N23127
			Removable (Screw)	Auto./Manual	24V AC/DC	440R-N23132
				Monitored Manual		440R-N23135
			Removable (Spring Clamp)	Auto./Manual	24V AC/DC	440R-N23132S
				Monitored Manual		440R-N23135S
			Removable (Screw)	Auto./Manual	115V AC	440R-N23131
				Monitored Manual		440R-N23134
				Auto./Manual	230V AC	440R-N23130
				Monitored Manual		440R-N23133

Accessories

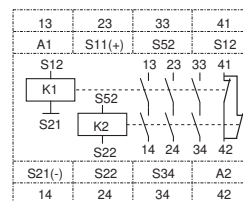
Description	Cat. No.
4 Replacement 4-pin Terminals (screw)	440R-A23209
4 Replacement 4-pin Terminals (spring clamp)	440R-A23228

Approximate Dimensions

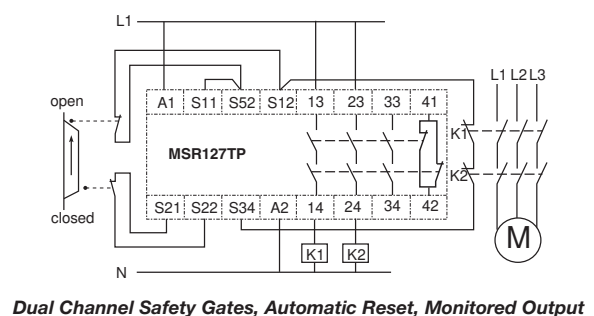
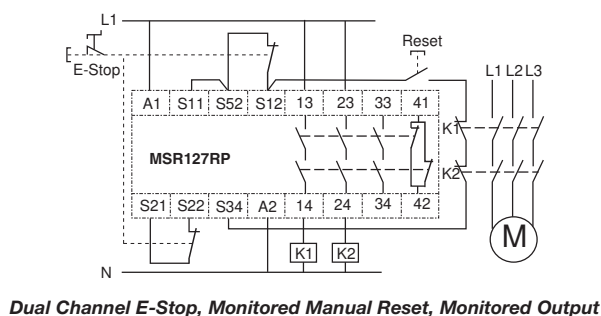
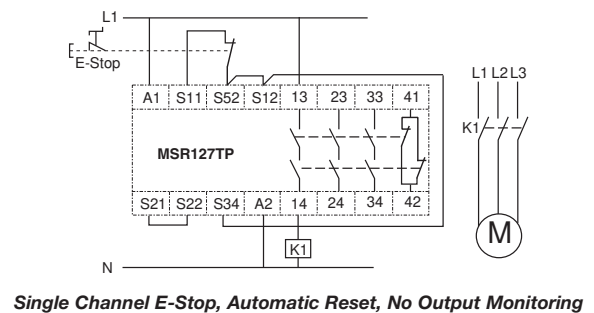
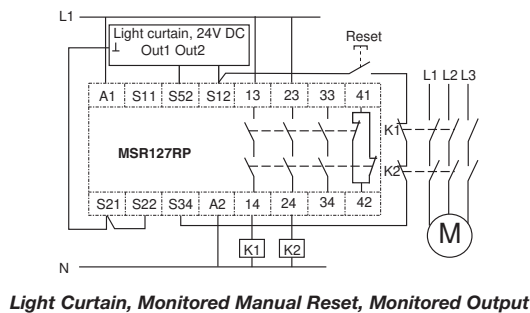
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



Block Diagram



Typical Wiring Diagrams





Green	Power
Green	Start
Green	CH1 Input Closed
Green	CH2 Input Closed
Green	CH1 Output Active
Green	CH2 Output Active

Safety Ratings		
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, IEC 60947-4-1, IEC 60947-5-1, ANSI B11.19, AS4024.1	
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1	
Functional Safety Data * Note: For up-to-date information, visit http://www.ab.com/Safety/	PFH _p : < 1.67 x 10 ⁻⁹ MTTF _d : > 389 years Suitable for performance levels PLe (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics.	
Certifications	CE Marked for all applicable directives, cULus, BG, and c-Tick	
Power Supply		
Input Power Entry	24V AC/DC, 115V AC or 230V AC	
Power Consumption	4 W	
Inputs		
Safety Inputs	1 N.C., 2 N.C., LC or SM	
Input Simultaneity	Infinite	
Input Resistance, Max.	45 Ω	
Reset	Auto./Manual or Monitored Manual	
Power On Delay/ Recovery Time	1 second/100 ms	
Response Time	15 ms	
Outputs		
Safety Contacts	3 N.O.	
Auxiliary Contacts	2 N.C.; 1 SS PNP inputs closed; 1 SS PNP outputs active; 30V DC/20 mA solid state	
Thermal Current/ <i>I_{th}</i>	1 x 6 A or 3 x 5 A nonswitching	
Rated Impulse withstand Voltage	2500V	
Switching Current @ Voltage, Min.	10 mA @ 10V	
Fuses, Output	External 6 A slow blow or 10 A fast acting	
Electrical Life (Operations)	(With surge suppression) 250V AC/6 A/1500VA cosφ = 1...0.1 M 250V AC/2.5 A/625VA cosφ = 1...0.5 M 250V AC/1.5 A/375VA cosφ = 0.35...0.3 M 250V AC/5 A/1250VA cosφ = 0.6...0.1 M 24V DC/2 A/48 W = 1 M 10V DC/0.01 A/0.1 W = 2 M	
Mechanical Life	2,000,000 operations	
Utilization Category		
Resistive: AC-1	6 A/250V AC	
Resistive: DC-1	6 A/24V DC	
Inductive: AC-15	6 A/250V AC	6 A/125V AC
Inductive: DC-13	3 A/24V DC	6 A/24V DC @ 6 ops/min
UL	B300, R300, 1 x 6 A or 2 x 5 A resistive/250V AC, 24V DC	
Environmental and Physical Characteristics		
Enclosure Type Rating/ Terminal Protection	IP40 (NEMA 1)/ IP20	
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)	
Vibration	10...55 Hz, 0.35 mm	
Shock	10 g, 16 ms 100 shocks	
Mounting	45 mm housing, 35 mm DIN Rail	
Weight [g (lbs)]	24V DC: 320 (0.71) 115/230V AC: 450 (0.99)	
Conductor Size, Max.	0.2...4 mm ² (24...12 AWG)	

Product Selection

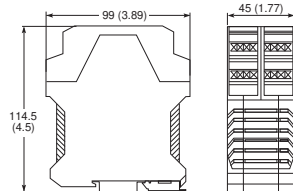
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.	
1 N.C., 2 N.C., Light Curtain, Safety Mat	3 N.O.	2 N.C., 2 PNP Solid State	Removable (Screw)	Auto./Manual or Monitored Manual	24V AC/DC	440R-C23139	
			Removable (Spring Clamp)			440R-C23139S	
			Removable (Screw)		115V AC	440R-C23137	
					230V AC	440R-C23136	

Accessories

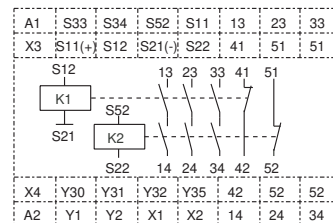
Description	Cat. No.
Bag of 4, 4-Pin Screw Terminal Blocks	440R-A23209
Bag of 4, 4-Pin Spring Clamp Terminal Blocks	440R-A23228

Approximate Dimensions

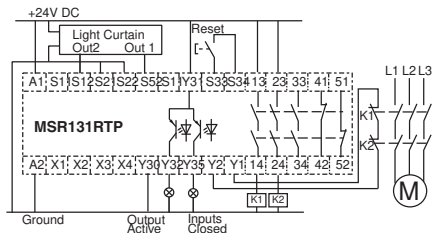
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



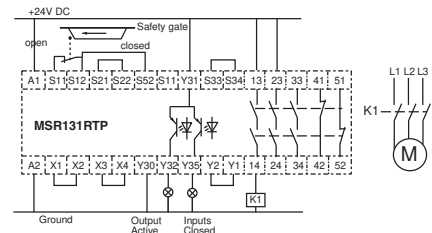
Block Diagram



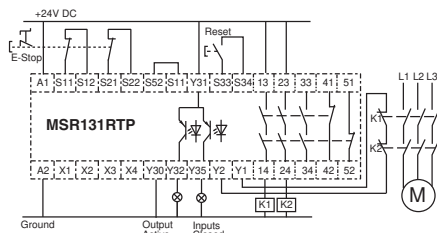
Typical Wiring Diagrams



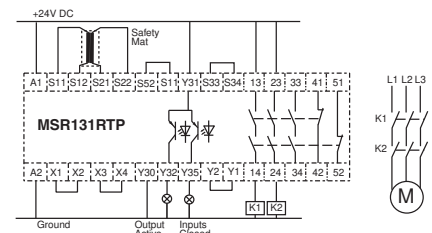
Light Curtain, Monitored Manual Reset, Monitored Output



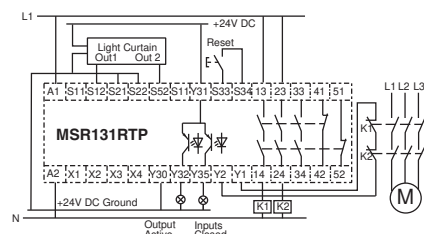
Single Channel Safety Gate, Automatic Reset, No Output Monitoring



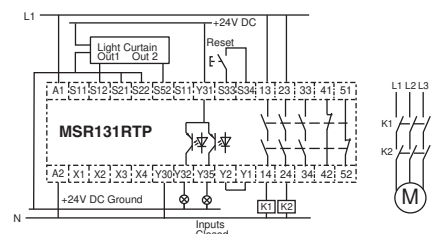
Dual Channel E-Stop, Monitored Manual Reset, Monitored Output



Safety Mat, Automatic Reset, No Output Monitoring



115/230V AC Supply, 24V DC, Light Curtain, Monitored Manual Reset, Monitored Output



115/230V AC Supply, 24V DC, Light Curtain, Monitored Manual Reset, No Output Monitoring

Logic

Single-Function Safety Relays

MSR142RTP



Description

The MSR142RTP is a versatile monitoring safety relay. It can be connected in four different input wiring configurations: one normally closed, two normally closed, two PNP connections from a light curtain, or a four-wire safety mat. When connected in the two normally closed fashion, the MSR142RTP checks for cross faults across the two inputs. When connected to light curtains, the light curtain must perform the cross-fault detection.

The MSR142RTP has output monitoring that can accommodate either automatic/manual reset or a monitored manual reset. When configured with automatic/manual reset (jumpers on X1-X2 and X3-X4), the MSR142RTP can have the reset terminals S33-S34 jumpered or can be converted to an unmonitored manual reset by adding a normally open switch in the monitoring loop (S33-S34). When configured to monitored manual reset, the MSR142RTP checks the output monitoring circuit through the manual application of the reset switch.

The outputs include seven normally open safety-rated outputs, four normally closed auxiliary outputs, and two solid-state outputs. One solid-state output indicates that the inputs are closed. The second solid-state output indicates that the safety outputs are active. The safety outputs have independent and redundant internal contacts to support the safety function. The auxiliary outputs are nonsafety outputs intended to provide an external signal about the status of the safety outputs.

Features

- Category 4 per EN 954-1
- Stop category 0
- Light curtain, safety mat, E-stop inputs
- Seven electromechanical N.O. state safety outputs
- Four electromechanical N.C. auxiliary outputs
- Two solid-state auxiliary outputs
- Cross-fault monitoring
- Monitored or automatic reset
- Removable terminals

LED Indicators

Green	Power
Green	Start
Green	CH1 IN
Green	CH2 IN
Green	CH1 output energized
Green	CH2 output energized

Specifications

Safety Ratings	
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, IEC 60947-5-1, AS 4042.1, ISOTR 12100, B11.19
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1
Functional Safety Data *	PFH _D : < 1.92 x 10 ⁻⁹ MTTF _d : > 210 years Suitable for performance levels PLe (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics
Certifications	CE Marked for all applicable directives, cULus, TÜV, and c-Tick
Power Supply	
Input Power Entry	24V AC/DC, 115V AC or 230V AC 50/60 Hz
Power Consumption	5 W
Inputs	
Safety Inputs	1 N.C., 2 N.C., Light Curtain or 4-Wire Safety Mat
Input Simultaneity	Infinite
Input Resistance, Max.	45 ohms
Reset	Auto./Manual or Monitored Manual
Power On Delay/Recovery Time	1 s/100 ms
Response Time	15 ms
Outputs	
Safety Contacts	7 N.O.
Auxiliary Contacts	4 N.C., 2 PNP
Rated Impulse withstand Voltage	2500V
Switching Current @ Voltage, Min.	10 mA @ 10V DC
Fuses, Output	6 A slow blow or 10 A quick blow (external)
Electrical Life (Operations)	220V AC/4 A/880VA cosφ = 0.35...0.1 M 220V AC/1.7 A/375VA cosφ = 0.6...0.5 M 30V DC/2 A/60 W = 1 M 10V DC/0.01 A/0.1 W = 2 M
Mechanical Life	2,000,000 operations
Utilization Category	
Inductive: Safety & Aux.: AC-15	6 A/250V AC
Inductive: AC-13	3 A/24V DC
Resistive: DC-13	20 mA/30V DC short-circuit protected
UL	4 x B300 or 7 x 4 A Resistive
Environmental and Physical Characteristics	
Enclosure Type Rating/Terminal Protection	IP40 (NEMA 1), DIN VDE 0470-1/ IP20
Operating Temperature [C (F)]	-5...+55 ° (14...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms, 100 shocks
Mounting	35 mm DIN Rail
Weight [g (lbs)]	24V: 470 (1.04); 115/230V AC: 607 (1.34)
Conductor Size, Max.	0.2...4 mm ² (24...12 AWG)

- * Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
- Mission time/Proof test interval of 20 years
 - Functional test at least once within six-month period

Product Selection

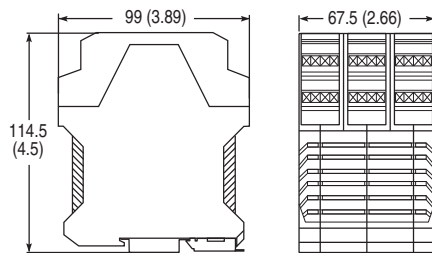
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C., 2 N.C., Light Curtain, Safety Mat	7 N.O.	4 N.C., 2 PNP, Solid-state	Removable	Monitored Manual or Auto/Manual	24V AC/DC	440R-G23216
					115V AC	440R-G23215
					230V AC	440R-G23214

Accessories

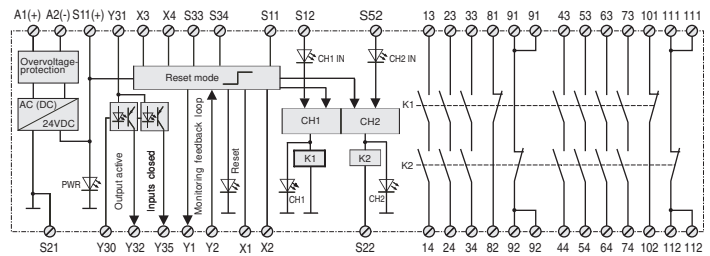
Description	Cat. No.
Bag of 4, 4-Pin Screw Terminal Blocks	440R-A23209
Bag of 4, 4-Pin Spring Clamp Terminal Blocks	440R-A23228

Approximate Dimensions

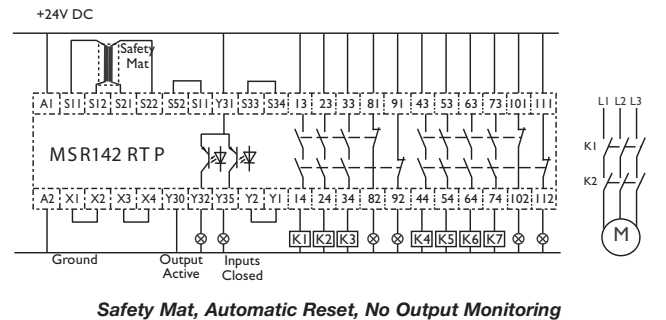
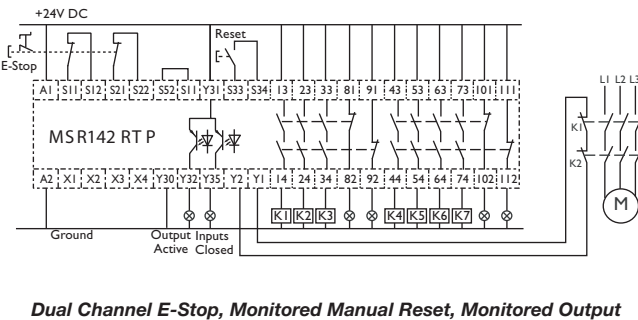
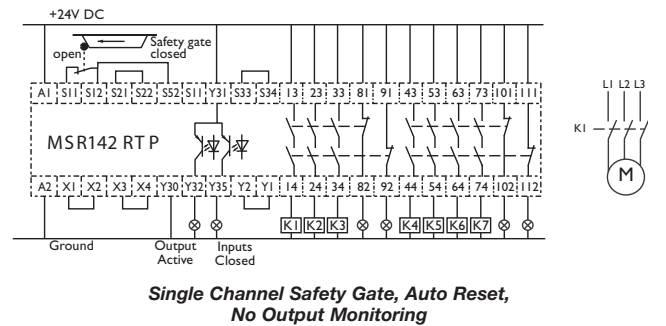
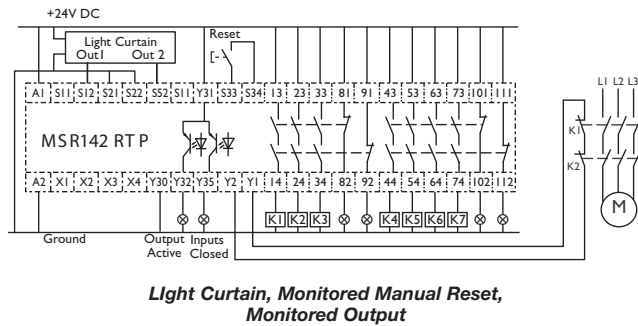
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



Block Diagram



Typical Wiring Diagrams





Description

The MSR144RTP is a versatile monitoring safety relay. It can be connected in four different input wiring configurations: one normally closed, two normally closed, two PNP connections from a light curtain, or a four-wire safety mat. When connected in the two normally closed fashion, the MSR144RTP checks for cross faults across the two inputs. When connected to light curtains, the light curtain must perform the cross-fault detection.

Any combination of up to five MSR230 and MSR238 output modules can be easily connected to the MSR144RTP by removing the terminator, inserting a ribbon cable from the expander and then placing the terminator into the last expansion module.

The MSR144RTP has output monitoring that can accommodate either automatic/manual reset or a monitored manual reset. When configured with automatic/manual reset (jumpers on X1-X2 and X3-X4), the MSR144RTP can have the reset terminals S33-S34 jumpered or can be converted to an unmonitored manual reset by adding a normally open switch in the monitoring loop (S33-S34). When configured to monitored manual reset, the MSR144RTP checks the output monitoring circuit through the manual application of the reset switch.

The outputs include two normally open safety rated outputs, two normally closed auxiliary outputs, and two solid-state auxiliary outputs. One solid-state output indicates the inputs are closed. The second solid-state output indicates the safety outputs are active.

The safety outputs have independent and redundant internal contacts to help ensure the safety function. The auxiliary outputs are nonsafety outputs intended to provide an external signal about the status of the safety outputs.

Features

- Category 4 per EN 954-1
- Stop category 0 or 1 (with MSR238)
- Light curtain, safety mat, E-stop inputs
- Two N.O. safety outputs
- Two N.C. auxiliary outputs
- Two solid-state auxiliary outputs
- Cross-fault monitoring
- Monitored manual or automatic/manual
- Removable terminals
- Expansion for up to five modules

LED Indicators

Green	Power
Green	Start
Green	CH1 IN
Green	CH2 IN
Green	CH1 output energized
Green	CH2 output energized

Specifications

Safety Ratings	
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, AS 4024.1, ISOTR 12100
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1
Functional Safety Data *	PFH _D : < 1.67 x 10 ⁻⁹ MTTF _D : > 389 years Suitable for performance levels Pl _e (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics
Certifications	CE Marked for all applicable directives, cULus, TÜV, and c-Tick
Power Supply	
Input Power Entry	24V DC
Power Consumption	4 W + expanders
Inputs	
Safety Inputs	1 N.C., 2 N.C., LC or 4-wire safety mat
Input Simultaneity	Infinite
Input Resistance, Max.	45 ohms
Reset	Auto./Manual or Monitored Manual
Power On Delay/Recovery Time	1 s/100 ms
Response Time	15 ms
Outputs	
Safety Contacts	2 N.O.
Auxiliary Contacts	2 N.C., 2 PNP
Rated Impulse withstand Voltage	2500V
Switching Current @ Voltage, Min.	10 mA @ 10V DC
Fuses, Output	6 A slow blow or 10 A quick blow (external)
Electrical Life (Operations)	220V AC/4 A/880VA cosφ = 0.35...0.1 M 220V AC/1.7 A/375VA cosφ = 0.6...0.5 M 30V DC/2 A/60 W = 1 M 10V DC/0.01 A/0.1 W = 2 M
Mechanical Life	2,000,000 operations
Utilization Category	
Inductive: Safety & Aux.: AC-15	5 A/250V AC
Inductive: Safety & Aux.: DC-13	3 A/24V DC
UL	B300, R300, 1 x 6 A or 2 x 5 A resistive/250V AC, 24V DC
Solid State:	20 mA/30V DC short circuit protection
Environmental and Physical Characteristics	
Enclosure Type Rating/Terminal Protection	IP40 (NEMA 1), DIN VDE 0470-1/ IP20
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms, 100 shocks
Mounting	35 mm DIN Rail
Weight [g (lbs)]	315 (0.71)
Conductor Size, Max.	0.2...4 mm ² (24...12 AWG)

- * Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
- Mission time/Proof test interval of 20 years
 - Functional test at least once within six-month period

Product Selection

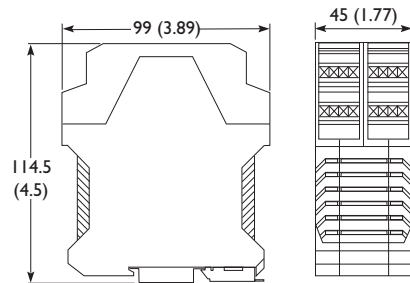
Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C., 2 N.C., Light Curtain, Safety Mat	2 N.O.	2 N.C., 2 PNP solid-state	Removable	Monitored Manual or Auto/Manual	24V DC	440R-C23205

Accessories

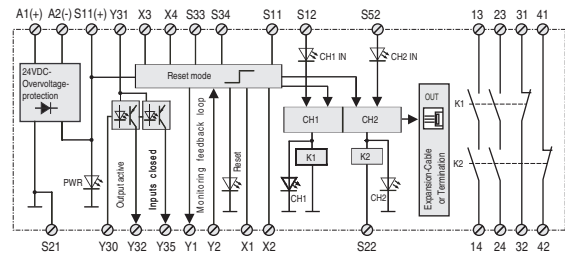
Description	Cat. No.
Bag of 4, 4-Pin Screw Terminal Blocks	440R-A23209
Bag of 4, 4-Pin Spring Clamp Terminal Blocks	440R-A23228

Approximate Dimensions

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



Block Diagram





Description

The CU4 is an off-delay timing unit which can be operated standalone or as an extension of a host relay. The timed outputs are used in applications where power must be maintained for a fixed duration after an input signal is received. For example, driving a power to lock TLS2-GD2 to maintain a guard door in the locked position for a fixed duration after a stop button is pressed. Another example would be maintaining the connection of a drive to a motor until the braking function is achieved, and then dropping out a contactor to remove power to the motor.

The inputs can be connected in either a single channel or dual channel configuration. The inputs must remain open during the complete timing cycle. Closing the contacts before the timing cycle completes causes the timer to be reset to zero.

The CU4 has a redundant structure with two independent safe timer circuits. The outputs include two normally open safety delayed outputs as well as one normally closed auxiliary output. The safety outputs have independent and redundant internal contacts to support the safety function. When used as an extension of a host relay, the normally closed contacts should be used in the feedback loop of the host relay. If used in standalone application, the normally closed contacts can be used to signal an auxiliary device or PLC.

A typical operation starts with power applied to A1/A2 and the input circuits open.

1. Close the B11/B12 and B21/B22 circuits.
 - a. The safety outputs (17/18 & 27/28) close immediately.
2. Open the B11/B12 or B21/B22 circuits.
 - a. The timing process starts.
 - b. The safety outputs (17/18 & 27/28) open after the time expires.
3. Go to Step 1.

Features

- Category 3 per EN 954-1
- Stop category 1
- Timed off-delay 0.15...30 s
- Two safety contacts
- One auxiliary contact

LED Indicators

Green	Power
Green	CH1 t1 Active
Green	CH2 t2 Active

Specifications

Safety Ratings		
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, IEC 60947-5-1, ANSI B11.19, AS4024.1	
Safety Classification	Cat. 3 per EN 954-1 (ISO 13849-1), SIL CL2 per EN IEC 62061, PLe per ISO 13849-1	
Functional Safety Data  Note: For up-to-date information, visit http://www.ab.com/Safety/	PFH _D : < 2.16 x 10 ⁻⁹ MTTF _D : > 345 years Suitable for performance levels Ple (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics	
Certifications	CE Marked for all applicable directives, cULus, c-Tick, and BG	
Power Supply		
Input Power Entry	24V AC/DC, 50/60 Hz; 0.85...1.1 x rated voltage	
Power Consumption	2.5 W	
Inputs		
Safety Inputs	1 N.C. or 2 N.C.	
Input Simultaneity	Infinite	
Reset	Automatic	
Response Time	30 ms	
Outputs		
Safety Contacts	2 N.O.	
Auxiliary Contacts	1 N.C.	
Rated Impulse withstand Voltage	2500V	
Switching Current @ Voltage, Min.	10 mA/10V	
Fuses, Output	External 6 A slow blow or 10 A fast acting	
Electrical Life (Operations)	220V AC/4 A/880VA cosφ = 0.35...0.1 M 220V AC/1.7 A/375VA cosφ = 0.6...0.5 M 30V DC/2 A/60 W = 1 M 10V DC/0.01 A/0.1 W = 2 M	
Mechanical Life	2,000,000 operations	
Utilization Category		
AC-15	5 A @ 250V AC	5 A @ 125V AC
DC-13	3 A/24V DC	
UL:	B300, 5 A/250V AC, 24V DC	
Environmental and Physical Characteristics		
Enclosure Type Rating/ Terminal Protection	IP40, DIN 0470/ IP20	
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)	
Vibration	10...55 Hz, 0.35 mm	
Shock	10 g, 16 ms, 100 shocks	
Mounting	35 mm DIN Rail	
Weight [g (lbs)]	165 (0.36)	
Conductor Size, Max.	0.2...4 mm ² (24...12 AWG)	

* Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:

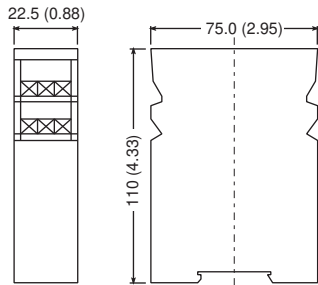
- Mission time/Proof test interval of 20 years
- Functional test at least once within six-month period

Product Selection

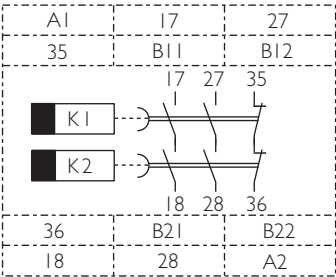
Inputs	Safety Outputs	Auxiliary Outputs	Time Range	Reset Type	Power Supply	Cat. No.
1 N.C. or 2 N.C.	2 N.O.	1 N.C.	0.15...3s	Automatic	24V AC/DC, 50/60 Hz 0.85...1.1 x rated voltage	440R-S23173
			0.5...10s			440R-S23174
			1.5...30s			440R-S23175

Approximate Dimensions

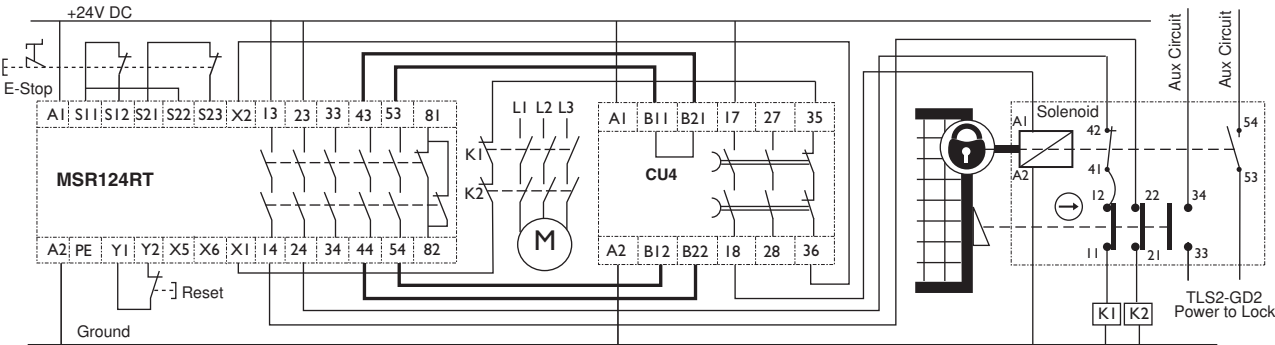
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



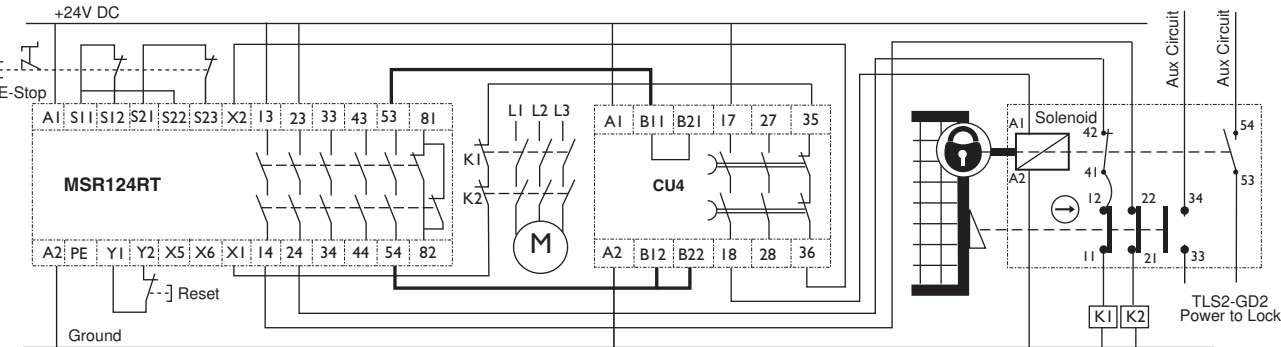
Block Diagram



Typical Wiring Diagrams



Dual Channel Wiring to CU4 Inputs



Single Channel Wiring to CU4 Inputs

Single-Function Safety Relays with Delayed Outputs

MSR38D/DP



Housing with removable terminals shown.

Description

The Minotaur MSR38D/DP is a microprocessor-based, monitoring safety relay, with delayed, safety-rated, solid-state outputs.

The inputs of the MSR38D/DP are the same as the MSR30. They can be connected to gate interlocks, e-stop devices or four-wire safety mats. The gate interlocks and e-stops can be either single channel or dual channel normally-closed circuits.

The reset capability of the MSR38D/DP allows it to set up for monitored manual or automatic/manual reset.

The outputs include two delayed normally-open safety rated outputs that can be connected to loads up to 2 A at 24V DC. These outputs can be used to send a safety stop signal to a machine or manufacturing system. The delay is accomplished by the configuration of jumpers on the terminals. The delay can be easily adjusted by reconfiguring the jumpers.

The MSR38D/DP also has one solid-state normally-closed auxiliary output, which must only be used to indicate the status of the MSR38D/DP. The auxiliary output responds immediately to the change in input status; it is not delayed.

Features

- Category 4 per EN 954-1
- Stop Category 0 or 1
- Two delayed solid-state safety outputs
- One solid-state auxiliary output
- One N.C., two N.C. or safety mat input
- Monitored manual or automatic/manual reset

LED Indicators

Green	Power (Pwr)
Green	K1 Closed
Green	K2 Closed

Wiring Terminations

S11 & S21	Pulse train output
S12 & S22	Input contacts
A1 – S34	Reset switch
S11 – S34	Automatic reset, start-up test disabled
S21 – S34	Automatic reset, start-up test enabled
A1 – Y2	Monitoring circuit
A1 – Y41	Cross-fault monitoring disabled

Specifications

Safety Ratings	
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, ANSI B11.19, AS4024.1
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1
Functional Safety Data *	PFH _D : < 9.2 x 10 ⁻¹⁰ MTTF _D : > 631 years Note: For up-to-date information, visit http://www.ab.com/Safety/ Suitable for performance levels PLe (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics
Certifications	CE Marked for all applicable directives, cULus, c-Tick, and TÜV
Power Supply	
Input Power Entry	24V DC SELV
Power Consumption	3 W
Inputs	
Safety Inputs	1 N.C. or 2 N.C. or SM
Input Resistance, Max.	200 Ω
Reset	Auto./Manual or Monitored Manual
Power On Delay/Recovery Time	3 seconds/20 ms
Response Time	15 ms
Outputs	
Safety Contacts	2 N.O. SS, 2 A @ 24V DC
Auxiliary Contacts	1 N.O. SS, 50 mA @ 24V DC
Fuses, Output	External 6 A slow blow or 10 A fast acting
Power LED Diagnostics	3 s Blink: Initialization Constant: Normal Operation 2 Blinks: Configuration change during operation 4 Blinks: Solid state output switch fault 5 Blinks: Reset switch closed after reset Continuous blinking: Internal fault
Environmental and Physical Characteristics	
Enclosure Type Rating/Terminal Protection	IP40 (NEMA 1), DIN 0470/ IP20, DIN 0470
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms, 100 shocks
Mounting	35 mm DIN Rail
Weight [g (lbs)]	130 (0.287)
Conductor Size, Max.	0.2...2.5 mm ² (24...14 AWG)

* Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
 - Mission time/Proof test interval of 20 years

Single-Function Safety Relays with Delayed Outputs

Logic
MSR38D/DP

Product Selection

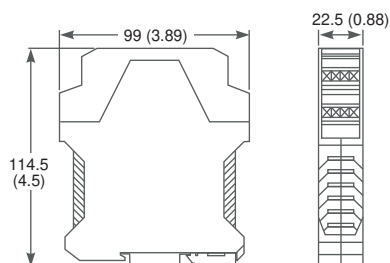
Inputs	Delayed Safety Outputs	Instantaneous Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C., 2 N.C., Safety Mat	2 N.O. Solid State	1 N.O. Solid State	Fixed	Auto./Manual or Monitored Manual	24V DC SELV	440R-M23203
			Removable			440R-M23204

Accessories

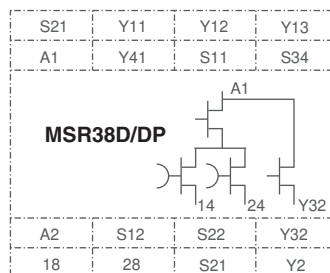
Description	Cat. No.
Bag of 4, 4-Pin Screw Terminal Blocks	440R-A23209
Bag of 4, 4-Pin Spring Clamp Terminal Blocks	440R-A23228

Approximate Dimensions

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

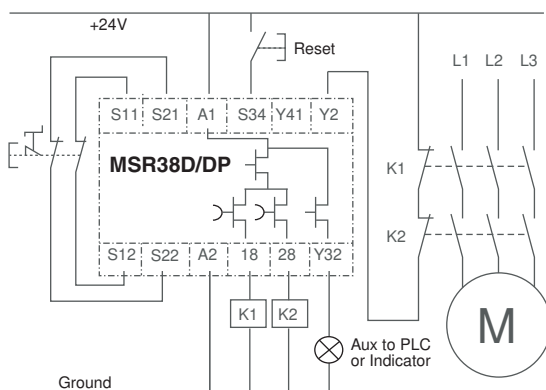


Block Diagram

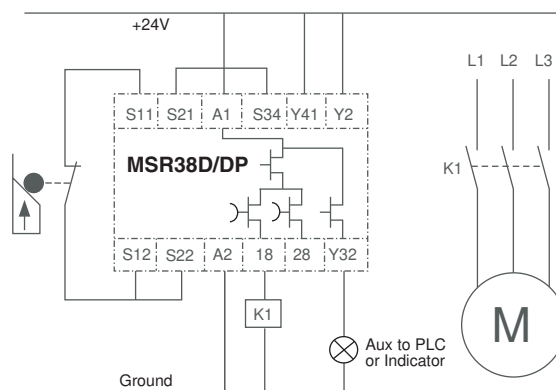


Typical Wiring Diagrams

See MSR30 on 5-16 for additional input wiring configurations.



Dual Channel E-Stop, Dual Channel Delayed Outputs, Monitored Manual Reset, Output Monitoring



Single Channel Gate Interlock, Single Channel Delayed Output, Automatic Reset, No Output Monitoring

Apply jumpers (links) on the terminals identified to achieve the desired off delay.

Delay(s)	Y11	Y12	Y13	Delay(s)	Y11	Y12	Y13	Delay(s)	Y11	Y12	Y13
0	—	—	—	8	S21	S11	—	50	—	S21	S21
0.5	S11	—	—	10	—	S11	S21	60	S11	S11	S11
1	—	S11	—	12	S21	—	S11	80	S11	S11	S21
1.5	—	—	S11	15	—	S21	S11	100	S11	S21	S11
2	S21	—	—	18	S11	S11	—	120	S11	S21	S21
3	—	S21	—	21	S11	—	S11	160	S21	S11	S11
4	—	—	S21	26	—	S11	S11	200	S21	S11	S21
5	S11	S21	—	30	S21	S21	—	250	S21	S21	S11
6	S11	—	S21	40	S21	—	S21	300	S21	S21	S21

Single-Function Safety Relays with Delayed Outputs

MSR138DP



Description

The MSR138DP can be connected in 3 different input wiring configurations: 1 normally closed, 2 normally closed, or 2 OSSD. When connected in the two normally closed fashion, the MSR138DP checks for cross faults across the two inputs. When connected to light curtains, the light curtain must perform the cross-fault detection.

The MSR138DP has output monitoring that can accommodate either automatic/manual reset or a monitored manual reset. When configured with automatic/manual reset (jumpers on X1-X2 and X3-X4), the MSR138DP can have the reset terminals S33-S34 jumpered or can be converted to an unmonitored manual reset by adding a normally open switch in the monitoring loop (S33-S34). When configured to monitored manual reset, the MSR138DP checks the output monitoring circuit through the manual application of the reset switch. The unit cannot be reset until the timing function has completed.

The outputs of the MSR138DP include two normally open immediate safety outputs and three normally open delayed safety outputs. The outputs of the MSR138.1DP include two normally open immediate safety rated outputs, two normally open delayed safety outputs and one normally closed delayed safety output. The safety outputs have independent and redundant internal contacts to support the safety function. If a reset request is made during the time cycle, it will cause a lockout condition. Cycle inputs after timing has completed and reset after the delay time has expired to clear lockout. Connecting contacts 55-56 of the MSR138.1DP in series to Y1-Y2 can avoid this lockout.

A normally closed timer reset switch can be added to force the delayed contacts open prior to the completion of the timing cycle.

Features

- Category 4/3 per EN 954-1
- Stop category 0 and 1
- Light curtain, E-stop, safety gate inputs
- Two immediate safety outputs
- Delayed outputs: 3 N.O. safety or 2 N.C. safety and 1 N.C. aux.
- Cross fault monitoring
- Monitored or automatic reset
- Removable terminals

LED Indicators

Green	Power—Illuminates when power on
Green	Start—Illuminates when S33-S34 is closed
Green	CH1 IN—Illuminates when channel 1 input is closed
Green	CH2 IN—Illuminates when channel 2 input is closed
Green	CH1—Illuminates when K1 is closed
Green	CH2—Illuminates when K2 is closed
Green	CHT1—Illuminates during timing period
Green	CHT2—Illuminates during timing period

Specifications

Safety Ratings		
Standards	EN 954-1, ISO 13849-1, IEC/EN 60204-1, IEC 60947-4-1, IEC 60947-5-1, ANSI B11.19, AS4024.1	
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1	
Functional Safety Data ★ Note: For up-to-date information, visit http://www.ab.com/Safety/	PFH _D : < 2.38 x 10 ⁻⁹ MTTF _d : > 195 years Suitable for performance levels PLe (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics	
Certifications	CE Marked for all applicable directives, cULus, c-Tick, and TÜV	
Power Supply		
Input Power Entry	24V AC/DC, 115V AC or 230V AC	
Power Consumption	4 W	
Inputs		
Safety Inputs	1 N.C., 2 N.C. or LC	
Input Simultaneity	Infinite	
Input Resistance, Max.	135 Ω	
Reset	Auto./Manual or Monitored Manual	
Power On Delay/ Recovery Time	1 second/100 ms	
Response Time	15 ms	
Outputs		
Safety Contacts	2 N.O.	
Auxiliary Contacts	Delayed 3/2 N.O.	
Thermal Current/I _{th}	5 x 2.5 A or 3 x 3.5 A nonswitching	
Rated Impulse withstand Voltage	2500V	
Switching Current @ Voltage, Min.	10 mA @ 10V	
Fuses, Output	External 6 A slow blow or 10 A fast acting	
Electrical Life (Operations)	(With surge suppression) 250V AC/6 A/1500VA cosφ = 1...0.1 M 250V AC/2.5 A/625VA cosφ = 1...0.5 M 250V AC/1.5 A/375VA cosφ = 0.35...0.3 M 250V AC/5 A/1250VA cosφ = 0.6...0.1 M 24V DC/2 A/48 W = 1 M 10V DC/0.01 A/0.1 W = 2 M	
Mechanical Life	2,000,000 cycles	
Utilization Category		
Resistive: AC-1	7 A@ 250V AC	
Resistive: DC-1	7 A/24V DC	
Inductive: AC-15	6 A@ 250V AC	6 A @ 125V AC
Inductive: DC-13	3 A/24V DC	6 A/24V DC @ 6 ops/min
UL	B300, 5 A/250V AC, 24V DC	
Environmental and Physical Characteristics		
Enclosure Type Rating/ Terminal Protection	IP40 (NEMA 1)/ IP20	
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)	
Vibration	10...55 Hz, 0.35 mm	
Shock	10 g, 16 ms, 100 shocks	
Mounting	35 mm DIN Rail	
Weight [g (lbs)]	24V DC: 350 (0.77); 115/230V AC: 490 (1.08)	
Conductor Size, Max.	0.2...4 mm ² (24...12 AWG)	

- * Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
- Mission time/Proof test interval of 20 years
 - Functional test at least once within six-month period

Single-Function Safety Relays with Delayed Outputs

MSR138DP

Logic

Product Selection

Inputs	Safety Outputs	Delayed Safety Outputs	Delayed Auxiliary Outputs	Time Delay	Terminals	Reset Type	Power Supply	Cat. No.
1 N.C., 2 N.C., Light Curtain	2 N.O.*	3 N.O.* (MSR138DP)	—	1.0 seconds, fixed	Removable	Auto./Manual or Monitored Manual	115V AC	440R-M23080
				0.15...3 s	Spring Clamp		24V AC/DC	440R-M23143 440R-M23143S
				0.15...3 seconds	Removable		115V AC	440R-M23141
				0.5...10 s			230V AC	440R-M23140
				0.5...10 seconds	Spring Clamp		24V AC/DC	440R-M23147 440R-M23147S
				1.5...30 seconds	Removable		115V AC	440R-M23145
		2 N.O.* (MSR138.1DP)	1 N.C.	230V AC			440R-M23144	
				0.15...3 seconds			24V AC/DC	440R-M23151
				0.5...10 seconds			115V AC	440R-M23149
				1.5...30 seconds	230V AC		440R-M23148	
				0.15...3 seconds	Removable		24V AC/DC	440R-M23084
				0.5...10 seconds			115V AC	440R-M23082
				1.5...30 seconds			230V AC	440R-M23081
				24V AC/DC			440R-M23088	
	115V AC	440R-M23086						
	230V AC	440R-M23085						
	24V AC/DC	440R-M23092						
	115V AC	440R-M23090						
	230V AC	440R-M23089						

* Instantaneous safety outputs Cat. 4

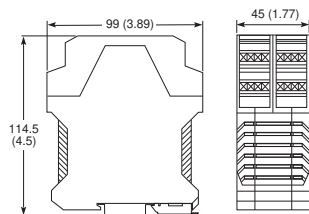
* Delayed safety outputs are Cat. 3

Accessories

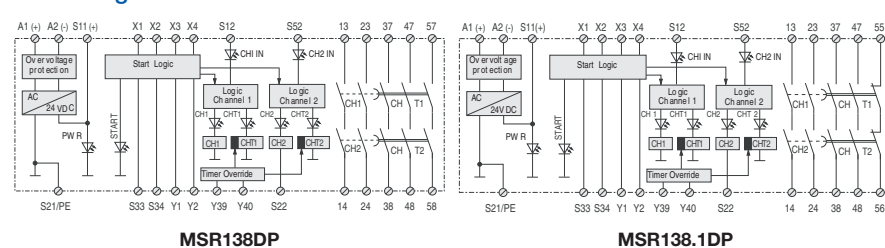
Description	Cat. No.
Bag of 4, 4-Pin Screw Terminal Blocks	440R-A23209
Bag of 4, 4-Pin Spring Clamp Terminal Blocks	440R-A23228

Approximate Dimensions

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



Block Diagram

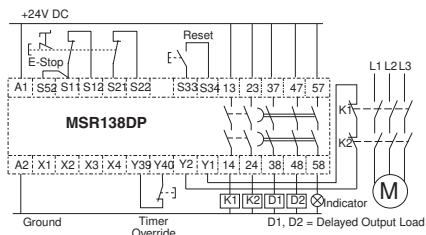


MSR138DP

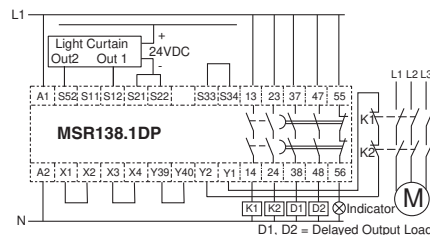
MSR138.1DP

In applications with 24V AC supply: terminal S21 must not be connected to PE.

Typical Wiring Diagrams



24V DC Supply Dual Channel E-Stop,
Monitored Manual Reset, Monitored Output



115/230V AC Supply, 24V DC Light Curtain,
Automatic Reset, Monitored Output

5-Safety Relays

Single-Function Safety Relays with Delayed Outputs

MSR178DP



Description

The MSR178DP is a multi-function time-delay relay for use in safety circuits. It can be configured by the user to perform on-delay, off-delay or single-pulse modes. It is used for applications such as delayed unlocking of safety gates, delayed de-energizing of variable speed controlled motors, or jogging (single pulse) in teaching or setup mode.

The MSR178DP can be used e.g. in conjunction with a power to release or power to lock guard locking switch to time out high inertia machines with significant run down in potentially dangerous equipment. The single-pulse mode enables implementation of two-hand control by use of two normally open contacts. It also can be used as a preset time limited mute dependent bypass in order to clear a blockage in the muting sensor area.

The operating function is selected by external jumpers to Y21 and Y22. The delay time is selected by a combination of external jumpers to Y31 and Y32 and the potentiometer located on the front face.

The input to the MSR178DP can be connected in five different configurations: one normally closed, two normally closed, one normally open, two normally open, or two PNP connections from a light curtain. The normally closed connections are used for off-delay timing. The normally open inputs are used for on-delay timing and the single-pulse function. To generate the single pulse both inputs must be closed within 0.5 seconds. Thus a two-hand control arrangement in accordance with EN 574 Cat. IIIA can be used to trigger the single pulse.

The MSR178DP has three normally open redundant safety outputs. The two normally closed outputs can be connected in series to achieve redundant safety or connected in parallel for auxiliary signaling. External devices can be monitored by the Y11 terminal. Power to the MSR178DP can be either 24V AC/DC (24V/GND terminals) or 115V AC (A3/A2 terminals), or 230V AC (A1/A2 terminals).

The MSR178DP can be used as a standalone control module or in combination with an MSR safety relay to combine instant and delayed safety outputs, as needed.

Features

- Category 4 per EN 954-1
- SIL3 per IEC 61508
- Stop category 1
- On-/off-delayed, or single-pulse (one shot) operation
- Four time ranges up to 30 mins.
- Pulsed or static input monitoring
- Three N.O. safety outputs
- One N.C. safety or two N.C. auxiliary outputs
- Eight diagnostic LEDs
- Automatic reset
- Removable terminals

Specifications

Safety Ratings	
Standards	EN 954-1, IEC 61508, EN IEC 62061, ISO 13849-1, IEC/EN 60204-1, IEC 60947-5-1, EN 61812-1, AS 4024.1, ISOTR 12100, B11.19
Safety Classification	Cat. 4 per EN 954-1 (ISO 13849-1), SIL CL3 per EN IEC 62061, PLe per ISO 13849-1
Functional Safety Data *	PFH _D : < 2.74 x 10 ⁻⁹ MTTF _d : > 285 years Suitable for performance levels Ple (according to ISO 13849-1:2006) and for use in SIL3 systems (according to IEC 62061) depending on the architecture and application characteristics
Certifications	CE Marked for all applicable directives, cULus, c-Tick, and TÜV
Power Supply	
Input Power Entry	24V AC/DC, 115/230V AC 50/60 Hz
Power Consumption	4 W
Inputs	
Safety Inputs	1 or 2 N.O., 1 or 2 N.C., Light Curtain
Input Simultaneity	Infinite for On-/Off-delay, 0.5 s for single pulse function
Input Resistance, Max.	900 Ω
Reset	Automatic
Power On Delay/Recovery Time	500 ms/300 ms single pulse only
Response Time	<±0.5% (at constant temp)
Outputs	
Safety Contacts	3 N.O.
Auxiliary Contacts	2 N.C.
Thermal Current/ <i>I_{th}</i>	6 A
Rated Impulse withstand Voltage	2500V
Switching Current @ Voltage, Min.	10 mA @ 10V DC
Fuses, Output	External 6 A slow blow or 10 A quick blow
Electrical Life (Operations)	230V AC/4 A/880VA cosφ = 0.35...0.1 M 230V AC/1.7 A/375VA cosφ = 0.6...0.5 M 30V DC/2 A/60 W = 1 M 10V DC/0.01 A/0.1 W = 2 M
Mechanical Life	2,000,000 operations
Utilization Category	
Inductive: AC-15	6 A/250V AC
Inductive: DC-13	3 A/24V DC
UL:	B300, 6 A/250V AC, 3 A/24V DC
Environmental and Physical Characteristics	
Enclosure Type Rating/Terminal Protection	IP40 (NEMA 1), DIN VDE 0470-1/ IP20
Operating Temperature [C (F)]	-5...+55 ° (14...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms, 100 shocks
Mounting	35 mm DIN Rail
Weight [g (lbs)]	325 (0.72)
Conductor Size, Max.	0.2...4 mm ² (24... 12 AWG)

- * Usable for ISO 13849-1:2006 and IEC 62061. Data is based on the following assumptions:
- Mission time/Proof test interval of 20 years
 - Functional test at least once within six-month period

Single-Function Safety Relays with Delayed Outputs

MSR178DP

Logic

Product Selection

Inputs	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. No.
1 or 2 N.O., 1 or 2 N.C., Light Curtain, Two-Hand Control, Enabling Switch	3 N.O.	2 N.C.	Removable	Automatic	24V AC/DC, 115V AC or 230V AC	440R-M23227

Accessories

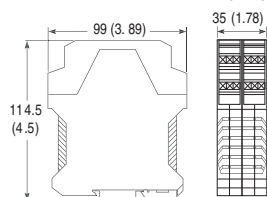
Description	Cat. No.
Bag of 4, 3-Pin Screw Terminal Blocks	440R-A23210
Bag of 4, 3-Pin Spring Clamp Terminal Blocks	440R-A23229

LED Indicators

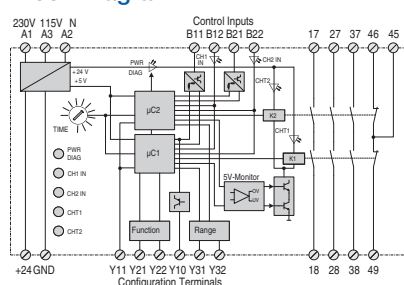
PWR: Green	Power on
Flashing Green/Red	Failure
CH1/2 IN: Static Green	Input closed
Flashing Green	Time lapse
CHT1: Green	Output CH1 Active
CHT2: Green	Output CH2 Active

Approximate Dimensions

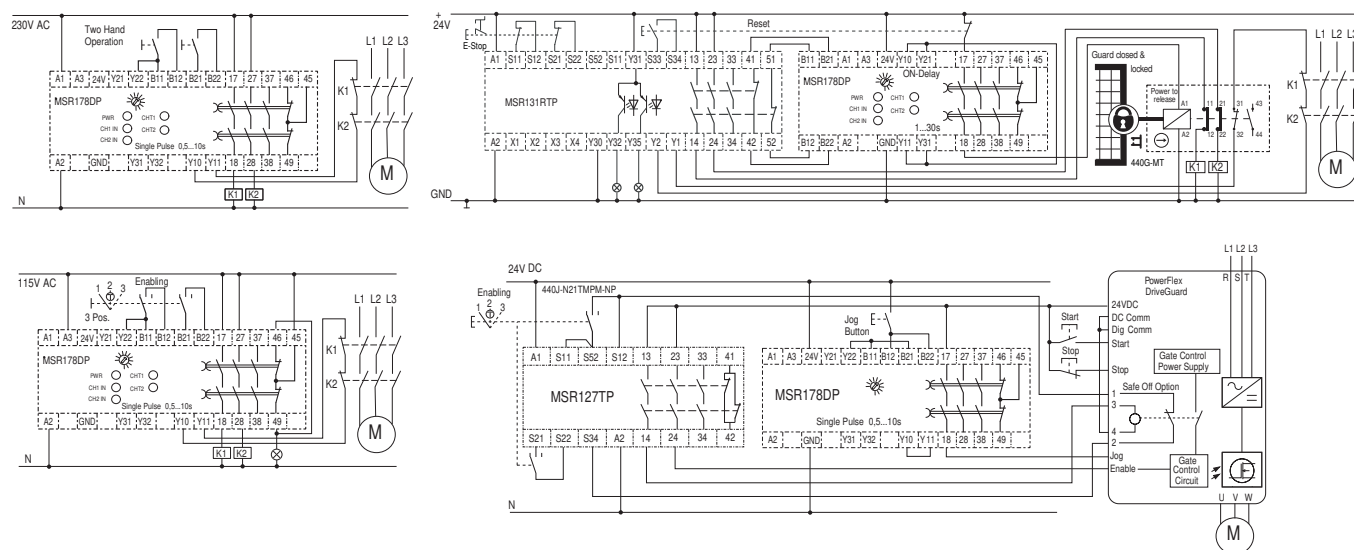
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



Block Diagram



Typical Wiring Diagrams

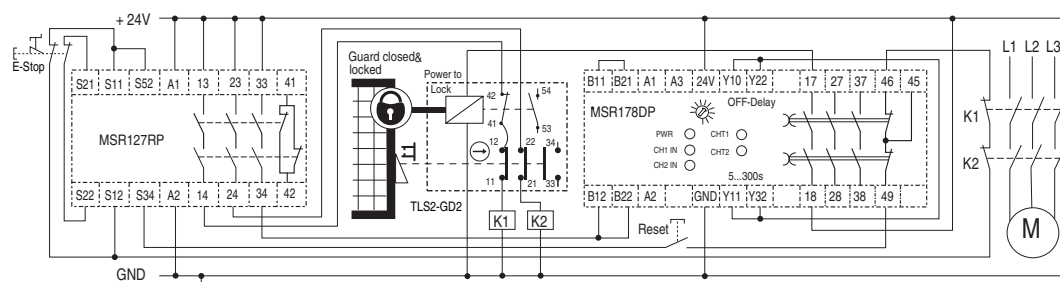


5-Safety Relays

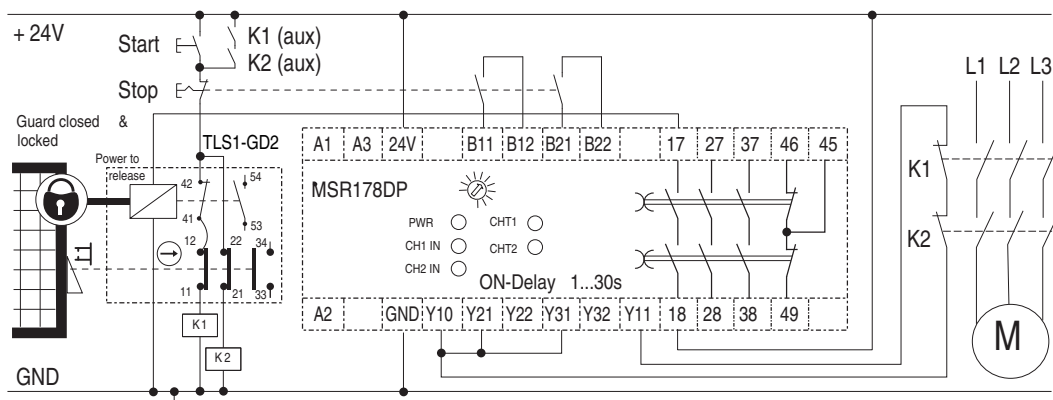
Single-Function Safety Relays with Delayed Outputs

MSR178DP

Typical Wiring Diagrams (continued)



MSR178DP generates OFF-delayed solenoid release after E-Stop on MSR127



MSR178DP ON-delayed unlocking the Gate after maintained stop switch pressed

Jumper Configuration

Operating Function		
Y10...Y21		ON Delay
Y10...Y22		OFF Delay
B11...Y22		Single Pulse
Time Range		
—		0.5...10 s
Y10...Y31		1...30 s
Y10...Y32		5...300 s
Y10...Y31...Y32		1...30 min
Cross Fault Detection on Inputs		
—		Enabled
B11...B21		Disabled
Feedback Loop		
Y10...Y11		Close before reset

Time Function Diagrams

