Next Generation Dedicated Function Motor Protection Relays

Product Overview/Cat. No. Explanation

MachineAlert Relays

The MachineAlert family of dedicated function motor protection relays offers state-of-the-art supplementary protective functions that are easily added and applied to your motor control circuits. This full range of products allows selective addition of motor protective enhancing functions to meet your specific application requirements for supplemental voltage-, current-, thermistor-, power-, and power factor-based protection. Additionally, MachineAlert relays are your economical choice for protecting equipment investments and minimizing production downtime.

Table of Contents

Standards Compliance

EN 60664, EN 60038
UL 508

Certifications

cULus Listed (File E14840, Guide NKCR, NKCR7)

3

Enhanced Protection

- Voltage monitoring relay
  - Guards against the damaging effects of phase loss, under- and overvoltage, phase imbalance, phase reversal, and voltage quality of incoming power line
- Current monitoring relay
  - Provides under- and overcurrent detection
- Thermistor monitoring relay
  - Protects equipment from overtemperature conditions
- Power (kW) monitoring relay
  - Monitors for under- and over active power, as well as power direction
- Power factor (PF) monitoring relay
  - Monitors for under- and over power factor detection

Typical Applications

- Blowers
- Conveyors
- Compressors
- Cutting and Drilling Machines
- Fans
- Mixers
- Pumps
- VFD-Controlled Motors

Cat. No. Explanation

Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; not all combinations will produce a valid catalog number.

809S – C1 – 10A – 48
a *b* *c* *d*

a

Bulletin Number	
Code	**Description**
809S	Current Monitoring Relay
813S	Voltage Monitoring Relay
814S	Power Monitoring Relay
817S	Thermistor Monitoring Relay

b

Type	
Bulletin 809S	
Code	**Description**
C1	Single-Phase Current Monitoring Relay
Bulletin 813S	
V1	Single-Phase Voltage Monitoring Relay
V3	Three-Phase Voltage Monitoring Relay
Bulletin 814S	
W3	Three-Phase Power (kW) Monitoring Relay
PF3	Three-Phase Power Factor Monitoring Relay
Bulletin 817S	
PTC	Thermistor Monitoring Relay

c

Measurement Rating	
Bulletin 809S	
Code	**Description**
10A	1…10 A AC/DC
Bulletin 813S	
500V	2…500V AC/DC (Type V1)
110V	110…115V AC (Type V3)
230V	208…240V AC (Type V3)
400V	380…415V AC (Type V3)
480V	440…480V AC (Type V3)
690V	600…690V AC (Type V3)
Bulletin 814S	
480V-10A	380…480V AC & 1…10 A AC
690V-10A	600…690V AC & 1…10 A AC
Bulletin 817S	
—	—

d

External Power Code	
Bulletin 809S	
Code	**Description**
48	24/48V AC/DC
230	115/230V AC
Bulletin 813S	
48	24/48V AC/DC (Type V1 only)
230	115/230V AC (Type V1 only)
Bulletin 814S	
—	—
Bulletin 817S	
48	24/48V AC/DC
115	115V AC
230	230V AC

Product Overview

	Bulletin 809S Current Monitoring Relay	Bulletin 813S Voltage Relay		Bulletin 814S Power Factor Relay	Bulletin 814S Power (kw) Relay	Bulletin 817S Thermistor Relay
						
Type	Single-Phase	Single-Phase	Three-Phase	Three-Phase	Three-Phase	—
Operating range	1…10A AC/DC	2…500V AC/DC	110…115V AC 208…240V AC	1…10 A AC	1…10 A AC	24/48V AC/DC
	24/48V AC/DC	24/48V AC/DC	380…415V AC 440…480V AC	380…480V AC	380…480V AC	115V AC
	115/230V AC	115/230V AC	600…690V AC	600…690V AC	600…690V AC	230V AC
Under- and overcurrent protection	✓	—	—	—	—	—
Under- and overvoltage protection	—	✓	✓	—	—	—
Phase loss protection	—	—	✓	—	—	—
Phase imbalance	—	—	✓	—	—	—
Phase reversal	—	—	✓	—	—	—
Minimum and maximum cos (Θ) protection	—	—	—	✓	—	—
Under- and over active power (kW) protection	—	—	—	—	✓	—
Overtemperature protection	—	—	—	—	—	✓
Adjustable time delay settings	✓	✓	✓	✓	✓	—
Programmable latching or inhibit at set level	✓	✓	—	✓	✓	—
Changeover Contacts (SPDT)	1	1	2	1	1	1
Automatic Reset	✓	✓	✓	✓	✓	—
LED status indicator	✓	✓	✓	✓	✓	✓
Dimensions (W x H x D)	22.5 x 80 x 99.5 mm	22.5 x 80 x 99.5 mm	45 x 80 x 99.5 mm	45 x 80 x 99.5 mm	45 x 80 x 99.5 mm	22.5 x 80 x 99.5 mm

Next Generation Dedicated Function Motor Protection Relays

Product Selection/Specifications

Product Selection

Motor Protection Relay Type		Description	Cat. No.
	Bulletin 809S Current Monitoring Relays	1…10 A AC/DC (1-phase); 24/48V AC/DC control power	809S-C1-10A-48
		1…10 A AC/DC (1-phase); 115/230V AC control power	809S-C1-10A-230
	Bulletin 813S Voltage Monitoring Relays	Single-phase voltage monitoring relay, 2…500V AC/DC; 24/48V AC/DC control power	813S-V1-500V-48
		Single-phase voltage monitoring relay, 2…500V AC/DC; 115/230V AC control power	813S-V1-500V-230
		Three-phase voltage monitoring relay, 110…115V AC	813S-V3-110V
		Three-phase voltage monitoring relay, 208…240V AC	813S-V3-230V
		Three-phase voltage monitoring relay, 380…415V AC	813S-V3-400V
		Three-phase voltage monitoring relay, 440…480V AC	813S-V3-480V
		Three-phase voltage monitoring relay, 600…690V AC	813S-V3-690V
	Bulletin 814S Power Monitoring Relays	Three-phase power (kW) monitoring relay, 380…480V AC & 1…10 A AC	814S-W3-480V-10A
		Three-phase power (kW) monitoring relay, 600…690V AC & 1…10 A AC	814S-W3-690V-10A
		Three-phase power factor monitoring relay, 380…480V AC & 1…10 A AC	814S-PF3-480V-10A
		Three-phase power factor monitoring relay, 600…690V AC & 1…10 A AC	814S-PF3-690V-10A
	Bulletin 817 Thermistor Monitoring Relay	Thermistor monitoring relay, 24/48V AC/DC control power	817S-PTC-48
		Thermistor monitoring relay, 115V AC control power	817S-PTC-115
		Thermistor monitoring relay, 230V AC control power	817S-PTC-230

Current Transformers

Use only with **Cat No. 809S-C1.**

Trip Current Range Continuous AC Amperes (5 A Secondary Winding)	Maximum Current [A]		Cat. No.
	Continuous	Inrush	
4.2…50	75	350	809S-CT1
17…200	300	1400	809S-CT2
42…500	750	3500	809S-CT3
100…1200	1800	8400	809S-CT4

Specifications

Bulletin 809S Current Monitoring Relay, Single-Phase

Cat. No.	809S-C1-10A-48	809S-C1-10A-230
Input Specifications		
Measuring Range	1…10 A AC/DC	1…10 A AC/DC
Internal Resistance	3 mΩ	3 mΩ
Maximum for 1 Second	50 A	50 A
Contact Input	Terminals Z1, Y1	Terminals Z1, Y1
Disabled	>10 kΩ	>10 kΩ
Enabled	<500 Ω	<500 Ω
Latch Disable	>500 ms	>500 ms
Output Specifications		
Type of Contact	(1) Form C	(1) Form C
Rated Insulation Voltage	250V AC	250V AC
Supply Specifications	Terminals A1, A2 or A3, A2	Terminals A1, A2 or A3, A2
Rated Operational Voltage	24…48V AC/DC +/- 15%	115/230V AC +/- 15%
	45 to 65 Hz, Insulated	45 to 65 Hz, Insulated
Rated Operational Power	4 VA, 3 W	4 VA, 3 W
General Specifications		
Power ON Delay	1 s +/- 0.5 s or 6 s +/- 0.5 s	1 s +/- 0.5 s or 6 s +/- 0.5 s
Environment		
Degree of Protection	IP 20	IP 20
Pollution Degree	3	3
Dimensions (W x H x D)	22.5 x 80 x 99.5 mm	22.5 x 80 x 99.5 mm
Screw Terminals	Max. 0.5 N•m	Max. 0.5 N•m

Bulletin 813S Voltage Relay, Single-Phase

Cat. No.	813S-V1-500V-48	813S-V1-500V-230
Input Specifications		
Measuring Range	2…500 V AC/DC	2…500 V AC/DC
Internal Resistance	500 kΩ	500 kΩ
Maximum for 1 Second	1000 V	1000 V
Contact Input	Terminals Z1, Y1	Terminals Z1, Y1
Disabled	>10 kΩ	>10 kΩ
Enabled	<500 Ω	<500 Ω
Latch Disable	>500 ms	>500 ms
Output Specifications		
Type of Contact	(1) Form C	(1) Form C
Rated Insulation Voltage	250V AC	250V AC
Supply Specifications	Terminals A1, A2 or A3, A2	Terminals A1, A2 or A3, A2
Rated Operational Voltage	24 to 48 V AC/DC +/- 15%	115/230V AC +/- 15%
	45 to 65 Hz, Insulated	45 to 65 Hz, Insulated
Rated Operational Power	4VA, 3 W	4VA, 3 W
General Specifications		
Power ON Delay	1 s +/- 0.5 s or 6 s +/- 0.5 s	1 s +/- 0.5 s or 6 s +/- 0.5 s
Environment		
Degree of Protection	IP 20	IP 20
Pollution Degree	3	3
Dimensions (W x H x D)	22.5 x 80 x 99.5 mm	22.5 x 80 x 99.5 mm
Screw Terminals	Max. 0.5 N•m	Max. 0.5 N•m

Bulletin 813S Voltage Relay, Three-Phase

Cat. No.	813S-V3-110V	813S-V3-230V	813S-V3-400V	813S-V3-480V	813S-V3-690V
Input Specifications					
Input	Terminals L1, L2, L3, N	Terminals L1, L2, L3, N	Terminals L1, L2, L3, N	Terminals L1, L2, L3, N	Terminals L1, L2, L3, N
Supply	110…115V AC	208…240V AC	380…415V AC	440…480V AC	600…690V AC
	Self-powered	Self-powered	Self-powered	Self-powered	Self-powered
Frequency	50…400 Hz	50…400 Hz	50…400 Hz	50…400 Hz	50…400 Hz
Ranges					
Upper Level	+2…+22% of the nominal voltage	+2…+22% of the nominal voltage	+2…+22% of the nominal voltage	+2…+22% of the nominal voltage	+2…+22% of the nominal voltage
Lower Level	-22…-2% of the nominal voltage	-22…-2% of the nominal voltage	-22…-2% of the nominal voltage	-22…-2% of the nominal voltage	-22…-2% of the nominal voltage
Asymmetry	2…22% of the nominal voltage	2…22% of the nominal voltage	2…22% of the nominal voltage	2…22% of the nominal voltage	2…22% of the nominal voltage
Tolerance	2…22% of the nominal voltage	2…22% of the nominal voltage	2…22% of the nominal voltage	2…22% of the nominal voltage	2…22% of the nominal voltage
Hysteresis					
Set Points from 2…5%	1%	1%	1%	1%	1%
Set Points from 5…22%	2%	2%	2%	2%	2%
Output Specifications					
Type of Contact	(2) Form C, Normally Energized	(2) Form C, Normally Energized	(2) Form C, Normally Energized	(2) Form C, Normally Energized	(2) Form C, Normally Energized
Rated Insulation Voltage	250V AC	250V AC	250V AC	250V AC	250V AC
Supply Specifications					
Rated Operational Power	13 VA @ Δ 400V AC, 50 Hz	13 VA @ Δ 400V AC, 50 Hz	13 VA @ Δ 400V AC, 50 Hz	13 VA @ Δ 400V AC, 50 Hz	21 VA @ Δ 600V AC, 50 Hz
General Specifications					
Power ON Delay	1 s +/- 0.5 s or 6 s +/- 0.5 s	1 s +/- 0.5 s or 6 s +/- 0.5 s	1 s +/- 0.5 s or 6 s +/- 0.5 s	1 s +/- 0.5 s or 6 s +/- 0.5 s	1 s +/- 0.5 s or 6 s +/- 0.5 s
Environment					
Degree of Protection	IP 20	IP 20	IP 20	IP 20	IP 20
Pollution Degree	3	3	3	3	3
Dimensions (W x H x D)	45 x 80 x 99.5 mm	45 x 80 x 99.5 mm	45 x 80 x 99.5 mm	45 x 80 x 99.5 mm	45 x 80 x 99.5 mm
Screw Terminals	Max. 0.5 N•m	Max. 0.5 N•m	Max. 0.5 N•m	Max. 0.5 N•m	Max. 0.5 N•m

Bulletin 814S Power Factor Relay, Three-Phase

Cat. No.	814S-PF3-480V-10A	814S-PF3-690V-10A
Input Specifications		
Input	Terminals L1, L2, L3	Terminals L1, L2, L3
Voltage	380…480V AC	600…690V AC
	Self-powered	Self-powered
Current	1…10 A	1…10 A
Measuring Ranges		
Power Factor (cos ϑ)		
Upper Level	0.1…0.99	0.1…0.99
Lower Level	0.1…0.99	0.1…0.99
Direct Input		
Upper Level	1…10 A	1…10 A
Lower Level	50 A	50 A
Contact Input	Terminals Z1, Y1	Terminals Z1, Y1
Disabled	>10 kΩ	>10 kΩ
Enabled	<500 Ω	<500 Ω
Pulse Width	>500 ms	>500 ms
Hysteresis	PF Approx. 0.1	PF Approx. 0.1
Output Specifications		
Type of Contact	(1) Form C	(1) Form C
Rated Insulation Voltage	250V AC	250V AC
Supply Specifications		
Rated Operational Power	13 VA @ Δ 400V AC, 50 Hz	21 VA @ Δ 600V AC, 50 Hz
General Specifications		
Power ON Delay	1 to 30 s +/- 0.5 s	1 to 30 s +/- 0.5 s
Environment		
Degree of Protection	IP 20	IP 20
Pollution Degree	3	3
Dimensions (W x H x D)	45 x 80 x 99.5 mm	45 x 80 x 99.5 mm
Screw Terminals	Max. 0.5 N•m	Max. 0.5 N•m

Bulletin 814S Power (kW) Relay, Three-Phase

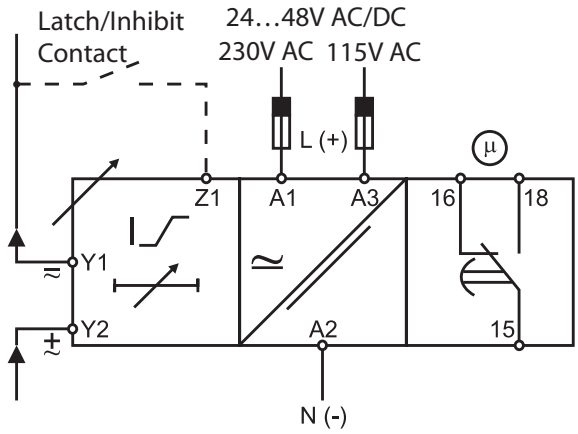
Cat. No.	814S-W3-480V-10A	814S-W3-690V-10A
Input Specifications		
Input	Terminals L1, L2, L3	Terminals L1, L2, L3
Voltage	380…480V AC	600…690V AC
	Self-powered	Self-powered
Current	1…10 A	1…10 A
Measuring Ranges		
Active Power		
Upper Level	-100…+100%	-100…+100%
Lower Level	-100…+100%	-100…+100%
Direct Input		
Upper Level	1…10 A	1…10 A
Lower Level	50 A	50 A
Contact Input	Terminals Z1, U2	Terminals Z1, U2
Disabled	>10 kΩ	>10 kΩ
Enabled	<500 Ω	<500 Ω
Pulse Width	>500 ms	>500 ms
Hysteresis	~2% of Set Value - Fixed	~2% of Set Value - Fixed
Output Specifications		
Type of Contact	(1) Form C	(1) Form C
Rated Insulation Voltage	250V AC	250V AC
Supply Specifications		
Rated Operational Power	13 VA @ Δ 400V AC, 50 Hz	21 VA @ Δ 600V AC, 50 Hz
General Specifications		
Power ON Delay	1 to 30 s +/- 0.5 s	1 to 30 s +/- 0.5 s
Environment		
Degree of Protection	IP 20	IP 20
Pollution Degree	3	3
Dimensions (W x H x D)	45 x 80 x 99.5 mm	45 x 80 x 99.5 mm
Screw Terminals	Max. 0.5 N•m	Max. 0.5 N•m

Bulletin 817S Thermistor Relay

Cat. No.	817S-PTC-48	817S-PTC-115	817S-PTC-230
Input Specifications			
Input	Terminals T1, T2	Terminals T1, T2	Terminals T1, T2
Supply	24…48 V AC/DC	115V AC	230V AC
Measuring Ranges			
Max Cold PTC Resistance	1500 Ω	1500 Ω	1500 Ω
Alarm Setpoint	3100 Ω+/- 10%	3100 Ω +/- 10%	3100 Ω +/- 10%
Return Setpoint	1650 Ω +/- 10%	1650 Ω +/- 10%	1650 Ω +/- 10%
Short-circuit Detection	0…10 Ω	0…10 Ω	0…10 Ω
Measurement Voltage	<2.5 V	<2.5 V	<2.5 V
Contact Input	Terminals Z1, Z2	Terminals Z1, Z2	Terminals Z1, Z2
Disabled	>10 kΩ	>10 kΩ	>10 kΩ
Enabled	<500 Ω	<500 Ω	<500 Ω
Alarm Reset	>500 ms	>500 ms	>500 ms
Output Specifications			
Type of Contact	(1) Form C	(1) Form C	(1) Form C
Rated Insulation Voltage	250V AC	250V AC	250V AC
Supply Specifications			
Rated Operational Power			
AC	2.5VA	2.5VA	2.5VA
DC	1.5 W	1.5 W	1.5 W
General Specifications			
Alarm ON Delay	<150 ms	<150 ms	<150 ms
Reset Delay	<500 ms	<500 ms	<500 ms
Environment			
Degree of Protection	IP 20	IP 20	IP 20
Pollution Degree	3	3	3
Dimensions (W x H x D)	22.5 x 80 x 99.5 mm	22.5 x 80 x 99.5 mm	22.5 x 80 x 99.5 mm
Screw Terminals	Max. 0.5 N•m	Max. 0.5 N•m	Max. 0.5 N•m

Function and Wiring Diagrams

Bulletin 809S Wiring Diagram



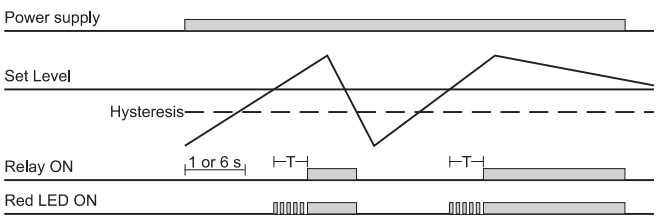
Terminals	Power Supply
A1, A2	24/48V AC/DC
	230V AC
A3, A2	115V AC

Single-Phase Current Monitoring Relays

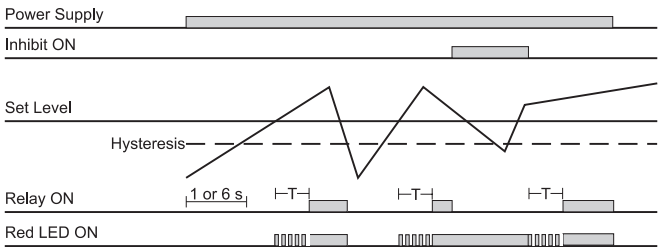
These devices are TRMS AC/DC over- or undercurrent monitoring relays. Through the built-in shunt, it is possible to monitor loads up to 10 A AC/DC by direct measuring or through a current transformer. When monitoring current through a current transformer and the latch function is disabled, the relay operates when the measured value exceeds (or drops below) the set level for more than the set delay time. It releases when the current drops below (or exceeds) the set level or when the power supply is interrupted. With the built-in latch function, the ON position of the relay output can be maintained. The inhibit function can be used to avoid relay operation when not desired. The LEDs indicate the state of the alarm and the output relay.

Bulletin 809S Function Diagrams

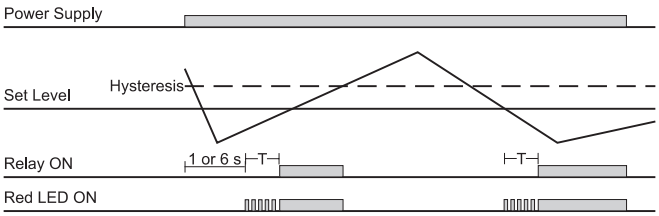
Overcurrent - Normally De-energized relay



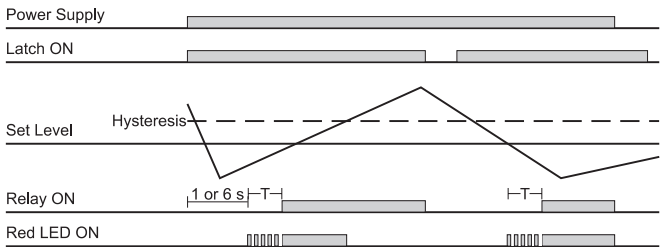
Overcurrent - Inhibit function - Normally De-energized relay



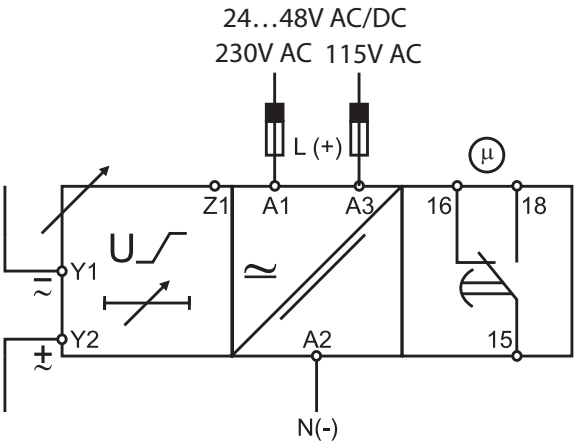
Undercurrent - Normally De-energized relay



Undercurrent - Latch function - Normally De-energized relay



Bulletin 813S Wiring Diagram — Single-Phase



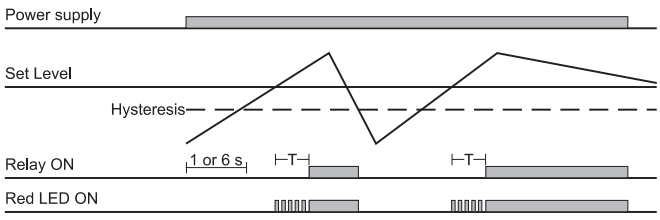
Terminals	Power Supply
A1, A2	24/48V AC/DC
	230V AC
A3, A2	115V AC

Single-Phase Voltage Monitoring Relays

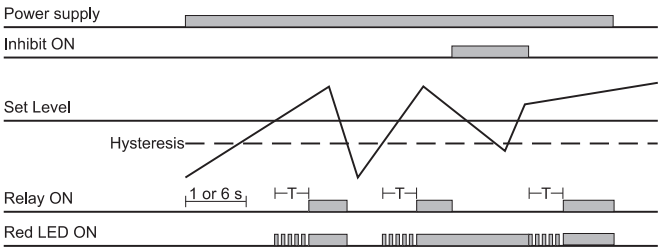
These devices are TRMS AC/DC over- or undervoltage monitoring relays. When the latch function is disabled, the relay operates when the measured value exceeds (or drops below) the set level for more than the set delay time. It releases when the voltage drops below (or exceeds) the set level or when the power supply is interrupted. With the built-in latch function, the ON position of the relay output can be maintained. The inhibit function can be used to avoid relay operation when not desired. The LEDs indicate the state of the alarm and the output relay.

Bulletin 813S Function Diagrams — Single-Phase

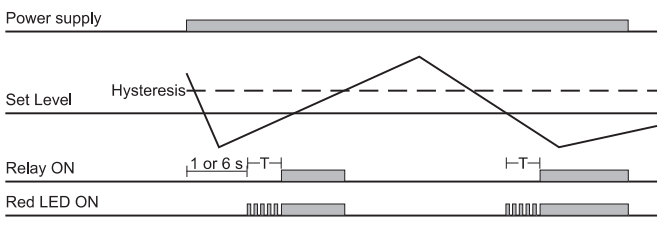
Overvoltage - Normally De-energized relay



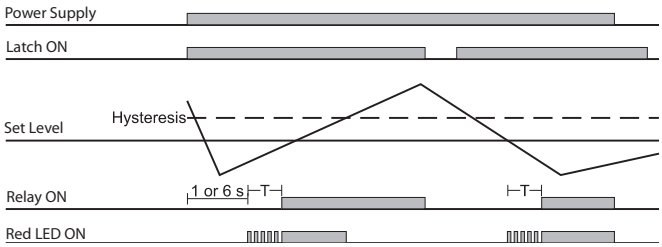
Overvoltage - Inhibit function - Normally De-energized relay



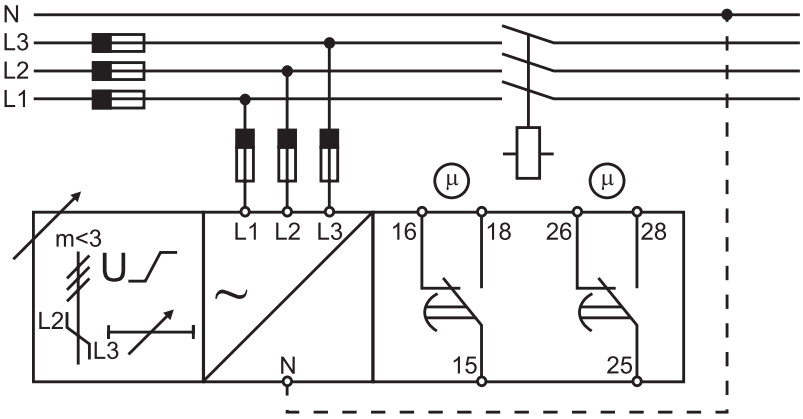
Undervoltage - Normally De-energized relay



Under voltage - Latch function - Normally De-energized relay



Bulletin 813S Wiring Diagram — Three-Phase

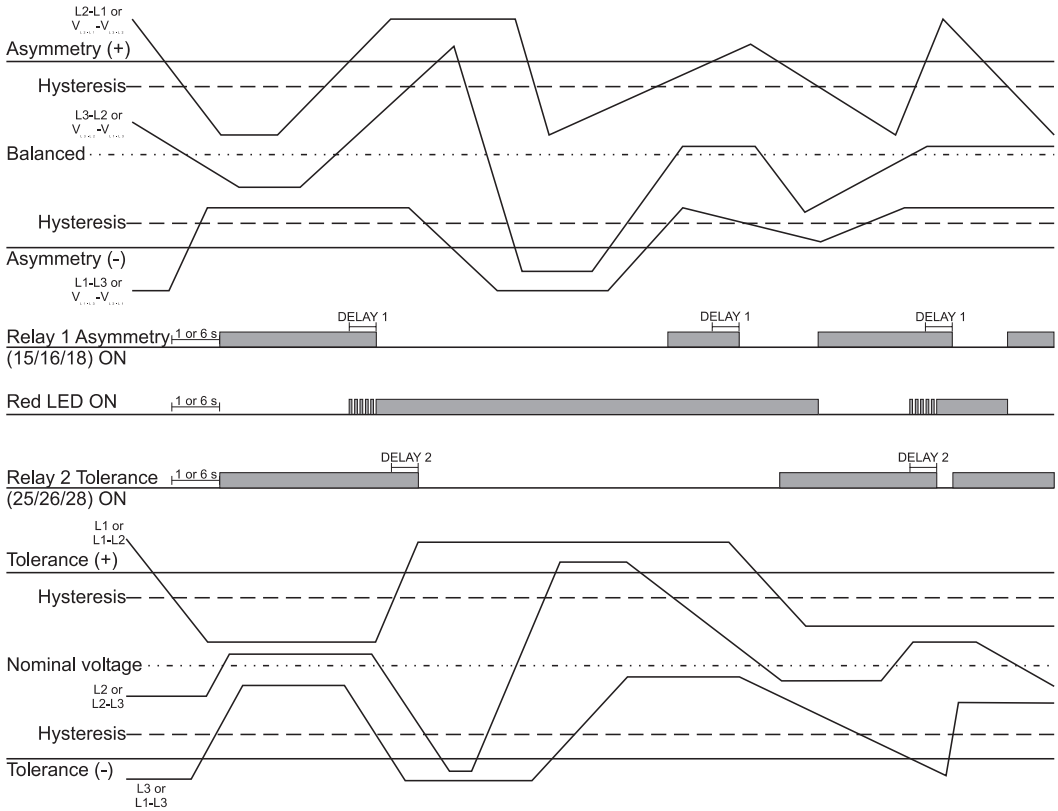


Three-Phase Voltage Monitoring Relays

These self-powered devices are TRMS three-phase over- and undervoltage, phase sequence, phase loss, and asymmetry and tolerance monitoring relays. For voltage level monitoring, if one or more phase-phase or phase-neutral voltage exceeds the upper set level or drops below the lower set level, the red LED starts flashing and the respective output relay releases after the set time period. For asymmetry and tolerance monitoring, if one or more phase-phase or phase-neutral voltage exceeds the set levels, the red LED starts flashing and the respective output relay releases after the set time period. For both functions, if the phase sequence is wrong or one phase is lost, both output relays release immediately.

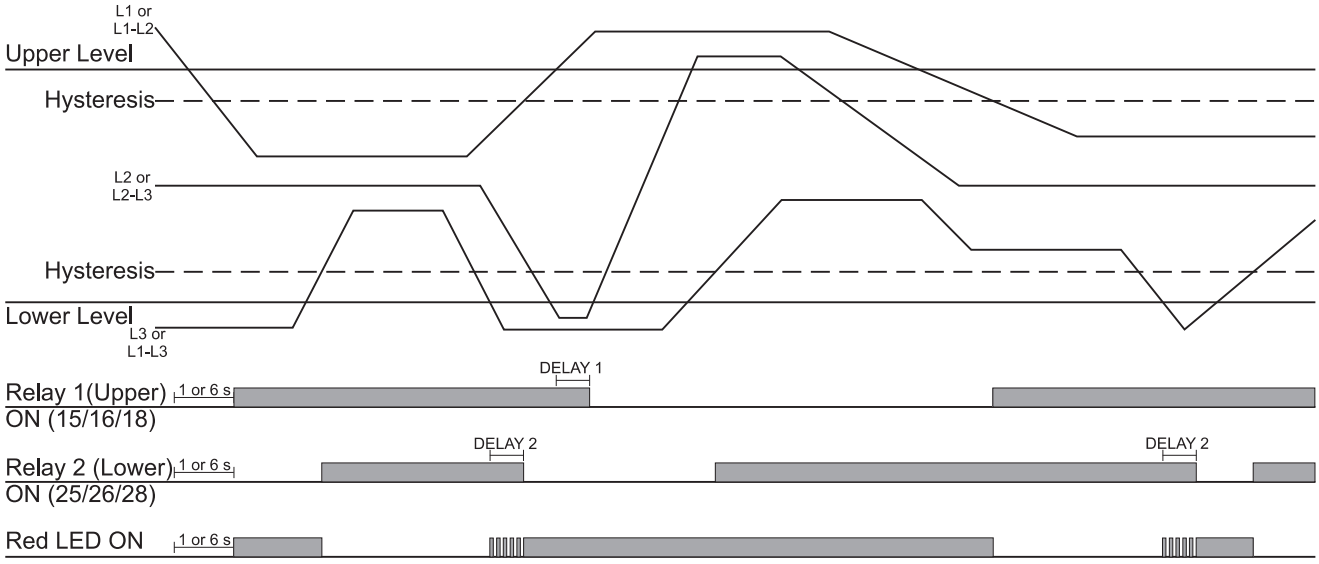
Bulletin 813S Function Diagrams — Three-Phase

Asymmetry and tolerance monitoring (2 x SPDT relays)

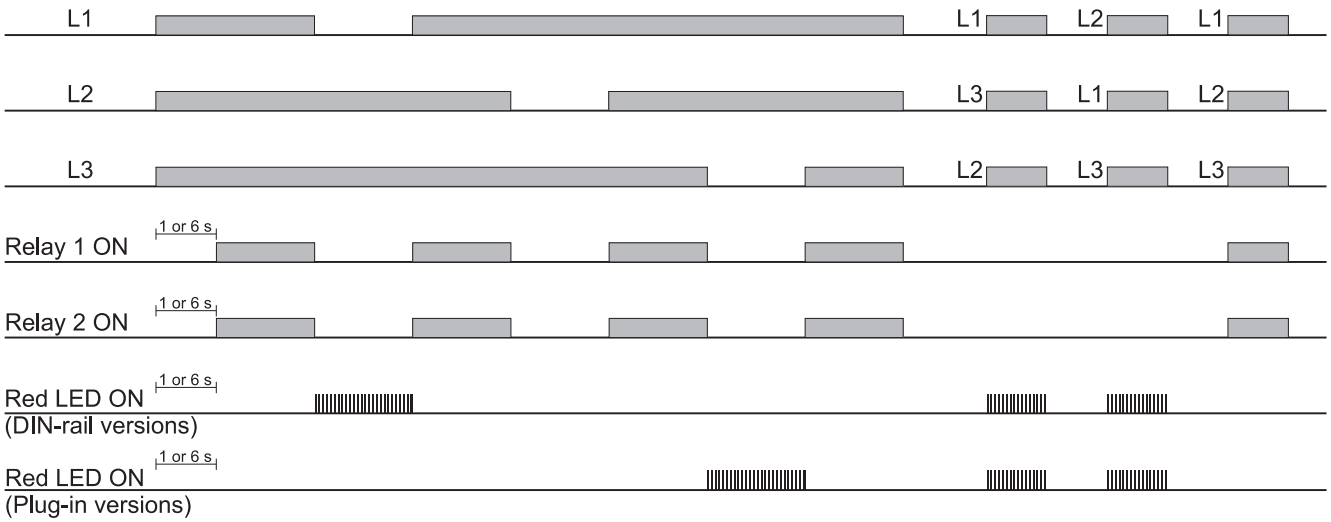


Bulletin 813S Function Diagrams — Three-Phase, Continued

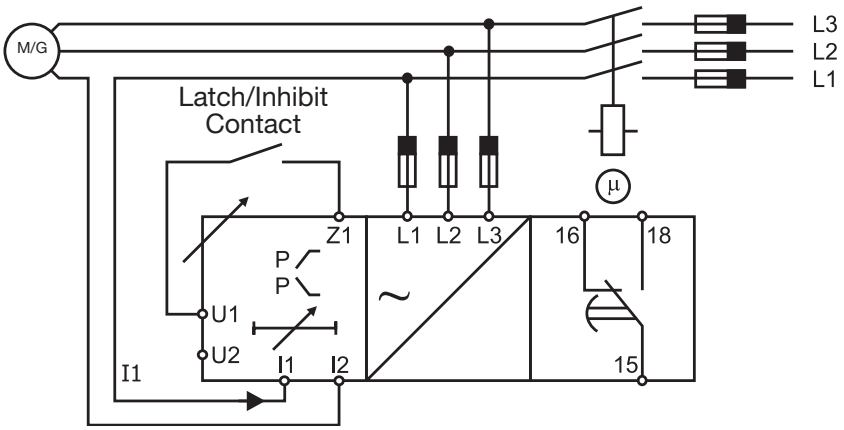
Over and undervoltage monitoring (2 x SPDT relays)



Phase sequence, total phase loss



Bulletin 814S Wiring Diagram — Power (kW) Type

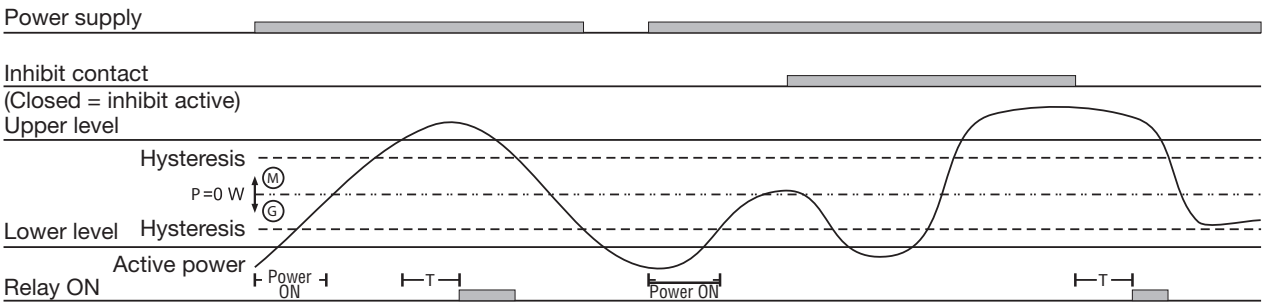


Three-Phase Active Power (kW) Monitoring Relays

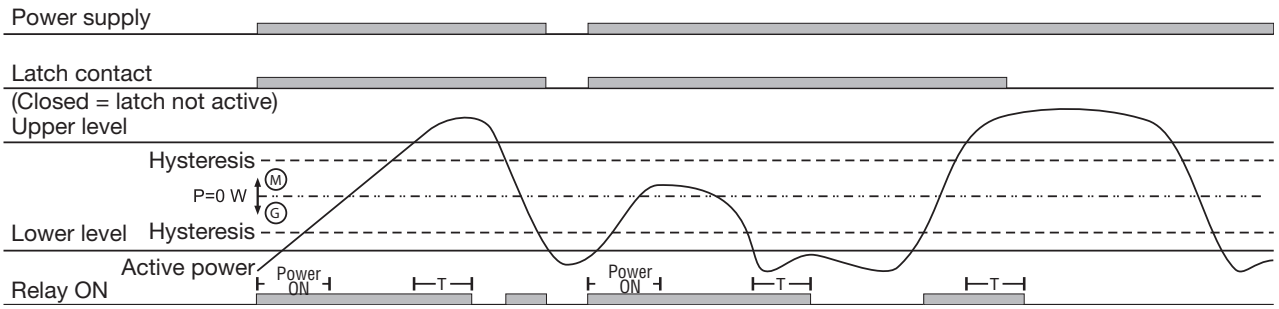
These self-powered devices are TRMS active power monitoring relays for three-phase balanced systems. They can be used for monitoring the actual load of asynchronous motors and other symmetrical loads, as well as to see if the power flows in the correct direction. The monitoring relay measures the active power of a three-phase balanced system. The relay has an adjustable power ON delay in order to avoid undesired overload detection during motor start. With the built-in latch function, the ON-position of the relay output can be maintained. The inhibit function can be used to avoid relay operation when not desired. The LEDs indicate the state of the alarm and the output relay.

Bulletin 814S Function Diagrams — Power (kW) Type

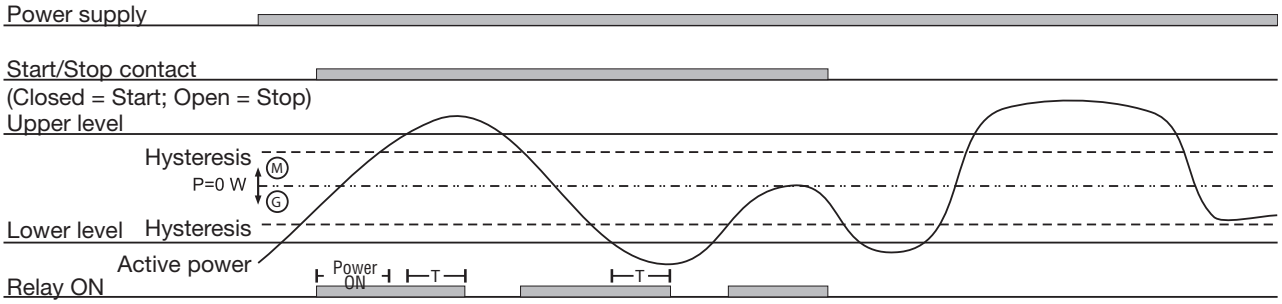
Inhibit function - Normally De-energized relay



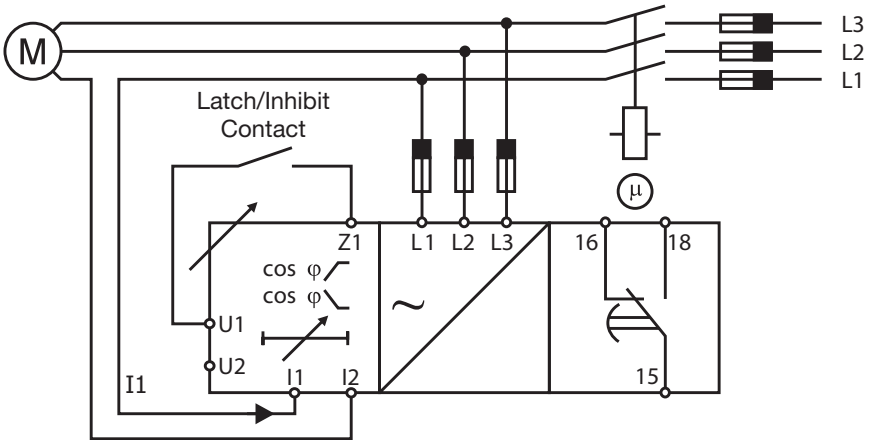
Latch function - Normally Energized relay



Start and stop function - Normally Energized relay



Bulletin 814S Wiring Diagram — Power Factor Type

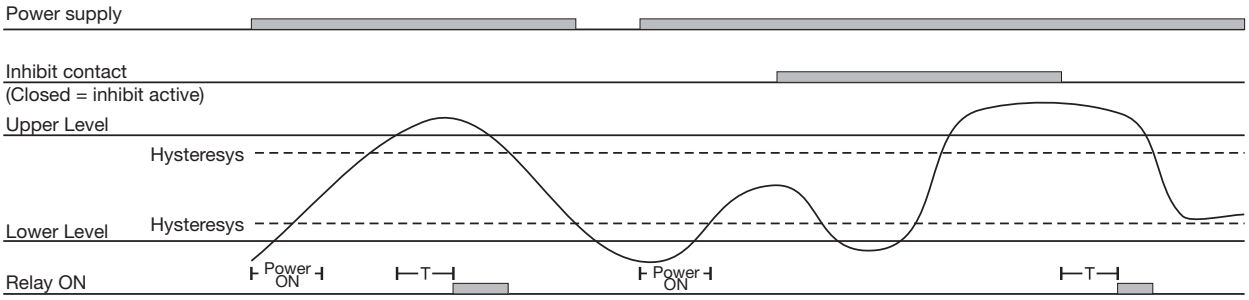


Three-Phase Power Factor Monitoring Relays

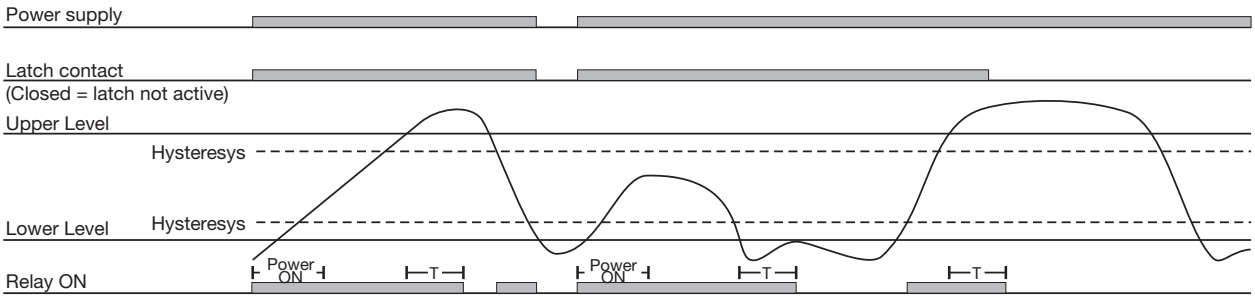
These self-powered devices are TRMS power factor monitoring relays for three-phase balanced systems. They can be used for monitoring the actual load of asynchronous motors and other symmetrical loads, where the power factor is almost proportional to the load. The relay measures the absolute value for the power factor of the system PF = Active Power / Apparent Power that is for balanced system with sinus waveforms the cosine of the angle between motor current and motor voltage (cos ϑ). As cos ϑ varies with the load of the motor, underload and overload can be indirectly detected by the monitoring relay. With the built-in latch function, the ON-position of the relay output can be maintained. The inhibit function can be used to avoid relay operation when not desired. The LEDs indicate the state of the alarm and the output relay.

Bulletin 814S Function Diagrams — Power Factor Type

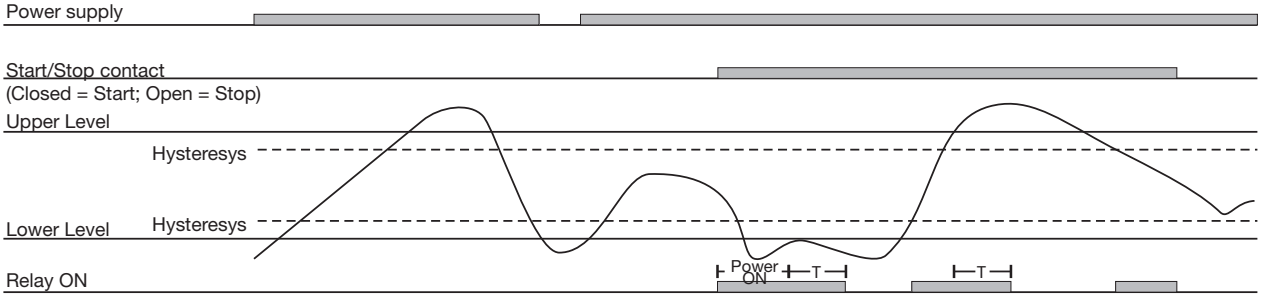
Inhibit function - Normally De-energized relay



Latch function - Normally Energized relay



Start and stop function - Normally Energized relay

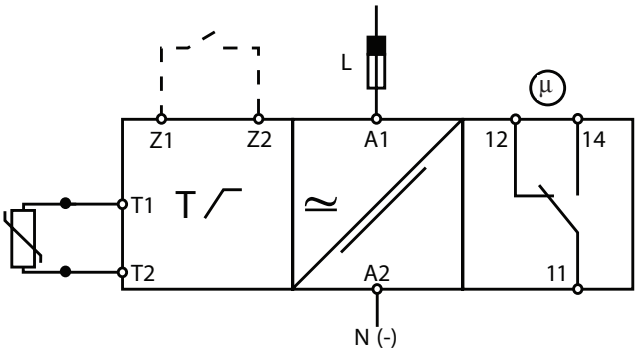


3

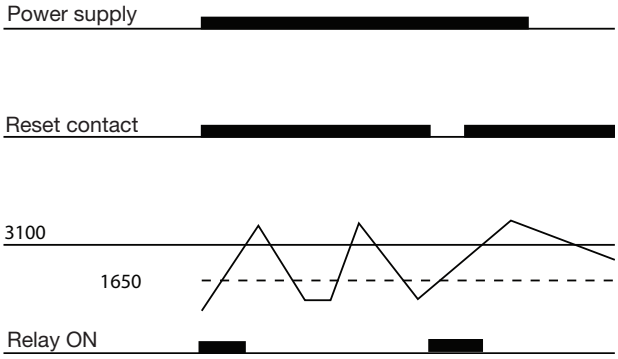
Thermistor Monitoring Relays

These devices are motor temperature monitoring relays, used to monitor the temperature of the coils of a motor with built-in PTCs. The alarm status of the relay can be reset by either an external contact or an internal button. The test button allows the simulation of the fault condition. The LEDs indicate the alarm status.

Bulletin 817S Wiring Diagram



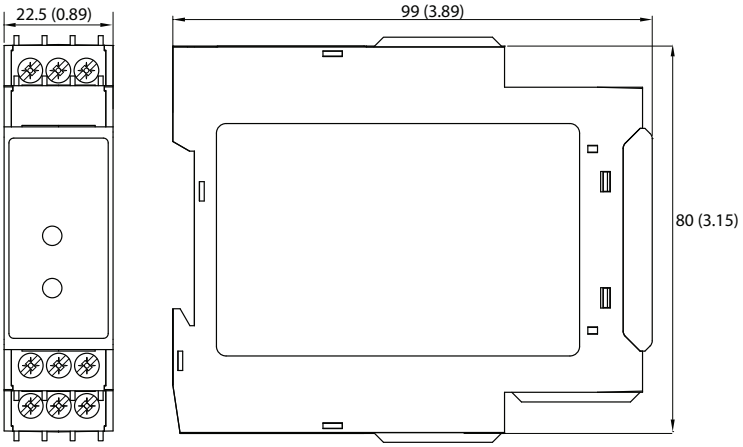
Bulletin 817S Function Diagram



Approximate Dimensions

Dimensions shown are in millimeters (inches) Dimensions are not intended for manufacturing purposes.

Bulletin 809S, 813S Single-Phase Relays/Bulletin 817S Thermistor Relays



Bulletin 813S, 814S Three-Phase Relays