ProSense® Phase Monitor Relays

PMRU-TL

PMRU-2C

PMRR-TL

PMRRL-TL

Phase Monitor Relays

Phase monitor relays provide protection against premature equipment failure caused by voltage faults on 3-phase systems. All ProSense® phase monitor relays are designed to be compatible with typical Wye or Delta systems. Phase monitor relays protect against single phasing regardless of any regenerative voltages.

PMRU-TL Series

The PMRU-TL Series phase monitor relays utilize a microprocessor based design to provide protection against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage. The PMRU-TL is a universal voltage product that works on any 3-phase system voltage from 190V to 500V. These devices are designed to be compatible with typical Wye or Delta systems. In Wye systems, a connection to a neutral is not required. PMRU-TL Series products protect against unbalanced voltages or single phasing regardless of any regenerative voltages.

The relay is energized when the phase sequence and all voltages are correct. Any one of five fault conditions will de-energize the relay. Re-energization is automatic upon correction of the fault condition. A manual reset option is available if a momentary N.C. switch is wired to the appropriate terminals. A multi-color LED indicates normal condition and also provides specific fault indication to simplify troubleshooting.

The PMRU-TL Series offers a variety of user-adjustable settings. The percent phase unbalance is adjustable from 2% to 10%. The undervoltage drop-out can be set at 80% to 95% of operating voltage (overvoltage setting is fixed at 110% of nominal). The adjustable time delay drop-out on undervoltage (0.3 to 30 seconds) eliminates nuisance tripping caused by momentary voltage fluctuations. There is also an adjustable time delay (1 to 300 seconds) on both power-up and restart after a fault has been cleared.

PMRU-2C Series

The PMRU-2C Series Three-Phase Monitor Relays continuously monitor all voltages to protect motors and equipment from expensive damage due to phase loss, phase reversal, phase unbalance, undervoltage and overvoltage. These products detect single phasing and unbalanced voltages regardless of any regenerative voltages.

Utilizing an advanced microprocessor-based design allows true RMS voltage measurement with full wave monitoring. True RMS voltage measurement ensures accurate sensing in most generator and other applications with non-sinusoidal wave forms excluding V/Hz drives, eliminating nuisance tripping. Full wave monitoring provides a more accurate method to measure the voltages, regardless of load type or wave shape, resulting in improved protection across more applications.

The PMRU-2C Series is a true universal product, with two units that work on a wide variety of adjustable line-line voltages to cover more global applications.

PMRR-TL Series

The PMRR-TL Series phase monitor relays provide protection against phase reversal in a compact low-cost design. One relay will work on any 3-phase system from 190V to 500V. This relay is designed to be compatible with typical Wye or Delta systems. In Wye systems, a connection to a neutral is not required.

The relay is energized and the Green LED is ON when the sequence is correct. Any fault will de-energize the relay and turn ON the Red LED. Re-energization is automatic upon correction of the fault condition.

PMRRL-TL Series

The PMRRL-TL Series phase monitor relays provide protection against phase loss, phase reversal and undervoltage. These relays are designed to be compatible with typical Wye or Delta systems. In Wye systems, a connection to a neutral is not required. Phase monitor relays protect against single phasing regardless of any regenerative voltages.

The relay is energized and the Green LED is ON when all three phases are present in the correct sequence at a voltage level above the undervoltage setting. The undervoltage drop-out can be set at 75 to 95% of operating voltage. Any fault will instantaneously de-energize the relay and turn ON the Red LED. Re-energization is automatic upon correction of the fault condition.

Reference Guide

The reference guide below provides general information on the different versions of Phase Monitor Relays offered by AutomationDirect.com
(see Product Selection on the following pages for further details).

Series	Mounting Style	Phase Loss	Phase Reversal	Phase Unbalance	Under Voltage	Over Voltage	Time Delay on Undervoltage	Approvals*
PMRR-TL	Plug-in*		ø					cURus, CE
PMRRL-TL		ø	ø		ø (adj.)		4 secs fixed	
PMRU-TL		ø	ø	ø (adj.)	ø (adj.)	ø(fixed)	0.3–30 seconds	
PMRU-2C	DIN-rail	100ms fixed	100ms fixed	0.3–30 seconds	0.3–30 seconds	0.3–30 seconds	0.3–30 seconds	cULus, CE

*** In addition to the above approvals, all plug-in products are also UL Listed when used with the appropriate (70169-D) socket.**

ProSense® Phase Monitor Relays

Features

PMRR-TL
- Protects against phase reversal
- Works with 190 to 500V 3-phase systems
- LED indicates both normal and fault conditions
- Compact plug-in case utilizing industry standard 8-pin octal socket
- 10A SPDT output contacts

PMRU-TL
- Universal voltage range of 190 to 500VAC, 3-phase systems
- Protects against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage
- Variety of user-selectable and adjustable settings for flexibility in 3-phase protection
- Automatic or Manual Reset
- Multi-Color LED indicates normal condition and provides fault indication to simplify troubleshooting
- Compact plug-in case utilizing industry standard 8-pin octal socket
- 10A SPDT output contacts

PMRRL-TL
- Protects against phase loss, phase reversal and undervoltage
- Undervoltage setting is adjustable from 75-95% of nominal
- LED indicates normal and fault conditions
- Compact plug-in case utilizing industry
- Standard 8-pin octal socket
- 10A SPDT output contacts

PMRU-2C
- Protects against phase loss, phase reversal, phase unbalance, undervoltage, overvoltage and rapid cycling
- True RMS voltage measurement ensures accurate sensing across more applications
- Retains fault indication and continues monitoring all voltages even with a lost phase
- Full fault indication on top of unit for easy troubleshooting
- Manual reset option works with external switch to reset the relay from outside the enclosure
- Compact 52.5 mm wide enclosure for both DIN-rail or panel-mount
- 10A DPDT output contacts

Agency Approvals
- cURus, File number E191059
- UL Listed, File number E191059
- CE

(with socket 70169-D)

Phase Monitor Relays				
Part Number	***Price***	***Description***	***Use With:***	***Drawing Link***
PMRR-1C-480A-TL	$49.50	ProSense phase monitor relay, 3-phase, socket mount, 190-500 VAC input voltage, SPDT, 10A contact rating, 8-pin, LED indicator(s), phase reversal protection.	70169-D or 750-2C-SKT	PDF
PMRRL-1C-208A-TL	$57.00	ProSense phase monitor relay, 3-phase, socket mount, 208 VAC input voltage, SPDT, 10A contact rating, 8-pin, LED indicator(s), phase reversal, phase loss and undervoltage protection.		PDF
PMRRL-1C-240A-TL	$57.00	ProSense phase monitor relay, 3-phase, socket mount, 240 VAC input voltage, SPDT, 10A contact rating, 8-pin, LED indicator(s), phase reversal, phase loss and undervoltage protection.		PDF
PMRRL-1C-480A-TL	$57.00	ProSense phase monitor relay, 3-phase, socket mount, 480 VAC input voltage, SPDT, 10A contact rating, 8-pin, LED indicator(s), phase reversal, phase loss and undervoltage protection.		PDF
PMRU-1C-480A-TL	$83.00	ProSense phase monitor relay, 3-phase, socket mount, 190-500 VAC input voltage, SPDT, 10A contact rating, 8-pin, LED indicator(s), phase reversal, phase loss, phase unbalance, overvoltage and undervoltage protection.		PDF
PMRU-2C-500A	$91.00	ProSense phase monitor relay, 3-phase, 35mm DIN rail mount, 190-500 VAC input voltage, DPDT, 10A contact rating, screw terminal(s), LED indicator(s), phase reversal, phase loss, phase unbalance, overvoltage and undervoltage protection.	NA	PDF
PMRU-2C-600A	$97.00	ProSense phase monitor relay, 3-phase, 35mm DIN rail mount, 460-600 VAC input voltage, DPDT, 10A contact rating, screw terminal(s), LED indicator(s), phase reversal, phase loss, phase unbalance, overvoltage and undervoltage protection.	NA	PDF
70169-D	$5.50	Relay socket, 10A at 600V, 8-pin octal configuration. Can be mounted on 35mm DIN-rail or directly mounted to the panel.	------	PDF
750-2C-SKT	$4.75	Relay socket, 5A at 600V, 8-pin octal configuration. Can be mounted on 35mm DIN-rail or directly mounted to the panel	------	PDF

Note: Requires a 600V rated socket when used on system voltages greater than 300 volts, such as the 70169-D or 750-2C-SKT.

ProSense® Phase Monitor Relays

Technical Specifications

Part Number	PMRU-1C-480A-TL	PMRU-2C-500A	PMRU-2C-600A	PMRR-1C-480A-TL	PMRRL-1C-208A-TL	PMRRL-1C-240A-TL	PMRRL-1C-480A-TL
Input Voltage Range**	190–500 VAC, 50/60Hz (±20%)	190-500 VAC, 50/60Hz (±5%)	460-600 VAC 50/60Hz (±5%)	190–500 VAC, 50/60Hz (+10/-25%)	208VAC, 50/60Hz (+10/-25%)	240VAC, 50/60Hz (+10/-25%)	480VAC, 50/60Hz (+10/-25%)
Phase Loss	Unit trips on total loss of one or more of the three phases (A,B,C)	Unit trips on loss of any phase A,B,C, regardless of any regenerative voltages.		N/A	Unit trips on total loss of one or more of the three phases (A,B,C)		
Phase Reversal	Unit trips if sequence of the three phases is anything other than A-B-C	Unit trips if sequence (rotation) of the three phases is anything other than A-B-C. It will not work on C-B-A.		Unit trips if rotation (sequence) of the three phases is anything other than A-B-C.	Unit trips if sequence of the three phases is anything other than A-B-C		
Phase Unbalance	Adjustable from 2-10%			N/A			
Undervoltage	Adjustable from 80-95% of nominal voltage	Adjustable from 80-95% of the line voltage setting.		N/A	Unit trips when the average of all three line phases is less than the adjusted set point		
Overvoltage	Fixed at 110% of nominal	Fixed at 110% of the line voltage setting.		N/A	N/A	N/A	N/A
Output Contacts	SPDT 10A @ 277VAC 7A @ 30VDC; 1HP @ 250VAC, 1/2HP @ 125VAC, C300 Pilot Duty	DPDT 10A @ 277VAC / 10A @ 30 VDC; 1/2 HP @ 120/240 VAC (N.O.), 1/3HP @ 120/240 VAC (N.C.), B300 Pilot Duty, R300 (N.O.)		SPDT 10A @ 277VAC / 7A @ 30VDC; 1HP @ 250VAC, 1/2HP @ 125VAC, C300 Pilot Duty			
Life*	Mechanical: 10,000,000 operations; Full Load: 100,000 operations						
Response Times	See table 2 on following page			Power Up & Restart After Fault: 1 second fixed Drop-out Due to Phase Reversal: 100ms fixed	Restart: 1 second fixed; Drop-out Due to Fault: Phase Loss and Reversal: 100ms fixed, Undervoltage: 4 seconds fixed		
Power Consumption	< 40VA						
Temperature	Operating: -28 to 65°C [-18 to 149°F] Storage: -40 to 85°C [-40 to 185°F]						
Mounting	8-pin octal socket requires a 600V rated socket when used on system voltages greater than 300V	35mm Din-rail or panel mount		8-pin octal socket requires a 600V rated socket when used on system voltages greater than 300V			
Indicator LED	See Table 1 on following page			Green LED is ON: when all conditions are normal; Red LED: Reversal	See Table 3 on following page		
Reset	Standard reset is automatic upon correction of fault or when a momentary-contact N.C. switch is wired across the Manual Reset terminals (6 & 7), the unit switches to manual reset mode and remote manual reset is available	Standard reset is automatic upon correction of fault or when a momentary-contact N.C. switch is wired across the Manual Reset terminals (4 & 5)		Standard reset is automatic upon correction of fault.			
Weight (lb)	0.3	0.3	0.3	0.4	0.3	0.3	0.3
Wire Size	12-22 AWG	12-30 AWG		12-22 AWG			
Tightening Torque	12 in•lbs	7 in•lbs		12 in•lbs			
Approvals	cURus, CE (cULus when used with socket 70169-D)	cULus		cURus, CE (cULus when used with socket 70169-D)			

*** Resistive load**

**** Fusing is not required by code but if fusing is used we recommend 2 Ampere MCL2 fuse between the phase monitor relay and the three phases.**

ProSense® Phase Monitor Relays

PMRU-TL, PMRU-2C LED Indication

Table 1 - LED Indication		
LED Status*	***Indicator***	
Green Steady		Normal (Relay ON)
Green Flashing		Restart (Delay)
Red Steady		Reversal
Red Flashing		Loss/UB (Unbalance)
		Low Volt (Undervoltage)
		High Volt (Overvoltage)

PMRU-TL, PMRU-2C Response Time

Table 2 - Response Times	
Power-up and restart after fault	1-300 seconds adjustable
Drop-out Due to Fault	
Phase Loss Reversal	100ms fixed
Phase Unbalance	Normal: 0.3–30 seconds adjustable Severe (Twice Knob Setting): 0.3–2 seconds
Undervoltage/Overvoltage	0.3–30 seconds adjustable

PMRRL-TL LED Indication

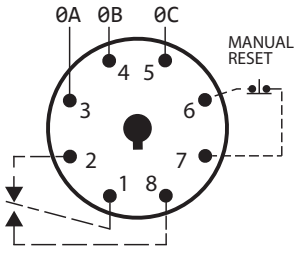
Table 3 - LED Indication		
LED Status*	***Indicator***	
Green Steady		Normal (Relay ON)
Green Flashing		Restart (Delay)
Red Steady		Reversal
Red Flashing		Loss
		Low Volt (Undervoltage)

PMRRL-TL Undervoltage

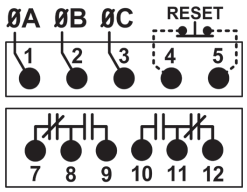
Table 4 - Undervoltage Rating	
PMRRL-1C-208A-TL	156–198 V
PMRRL-1C-240A-TL	180–230 V
PMRRL-1C-480A-TL	360–460 V

Wiring Diagrams

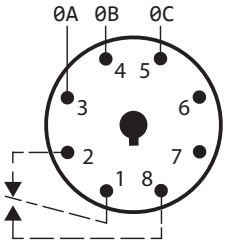
PMRU-1C-480A-TL



PMRU-2C-500A, PMRU-2C-600A



PMRRL-1C-208A-TL, PMRRL-1C-240A-TL PMRRL-1C-480A-TL, PMRR-1C-480A-TL



ProSense® Phase Monitor Relays

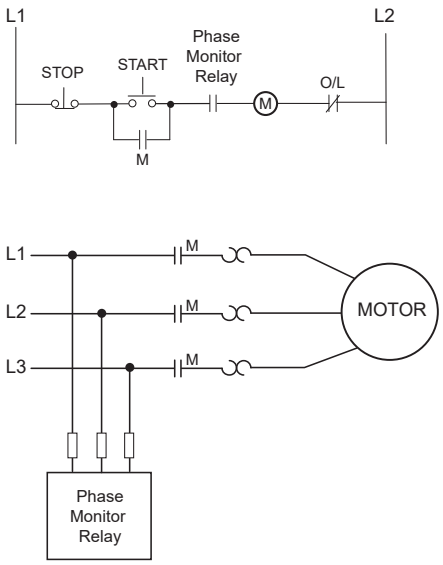
Protection

Depending on the unit selected, it will protect 3-phase equipment against:

- Phase Loss - total loss of one or more of the three phases. Also known as "single phasing." Typically caused by a blown fuse, broken wire, or worn contacts. This condition would result in a motor drawing locked rotor current during start-up. In addition, a 3-phase motor will continue to run after losing a phase, resulting in possible motor burn-out.
- Phase Reversal - reversing any two of the three phases will cause a 3-phase motor to run in the opposite direction. This may cause damage to driven machinery or injury to personnel. The condition usually occurs as a result of mistakes made during routine maintenance or when modifications are made to the circuit.
- Phase Unbalance - unbalance of a 3-phase system occurs when single phase loads are connected such that one or two of the lines (phases) carry more or less of the load. This could cause motors to run at temperatures above published ratings.
- Undervoltage - when voltage in all three lines of a 3-phase system drop simultaneously.
- Overvoltage - when voltage in all three lines of a 3-phase system increase simultaneously.

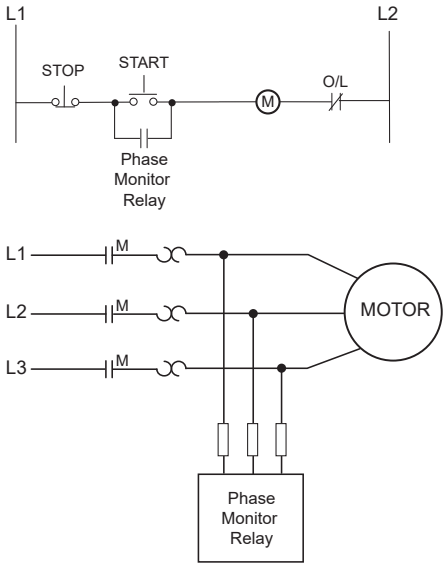
Typical Connections

Line Side Monitoring (recommended)



Line Side Monitoring
With the relay connected before the motor starter, the motor can be started in the reverse direction. However, the motor is unprotected against phase failures between the relay and the motor.

Load Side Monitoring



Load Side Monitoring
With the relay connected directly to the motor, the total feed lines are monitored. This connection should not be used with reversing motors.

ProSense® Octal Sockets

Features

- Mounts on 35mm DIN rail
- Screw clamp wire termination

70169-D

70170-D

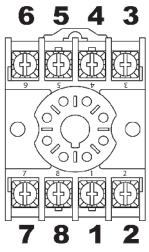
750-2C-SKT

Octal Sockets for Relays					
Part Number	*Price*	*Description*	*Qty*	*Wt (lb)*	*Drawing Links*
70169-D	$5.50	Macromatic relay socket, 8-pin, 35mm DIN rail or panel mount. For use with ProSense octal relays.	1	0.1	PDF
70170-D	$6.50	Macromatic relay socket, 11-pin, 35mm DIN rail or panel mount. For use with ProSense octal relays.	1	0.1	PDF
750-2C-SKT	$4.75	AutomationDirect relay socket, 8-pin, 35mm DIN rail or panel mount. For use with 750-2C and H750-2C series octal relays.	1	0.1	PDF

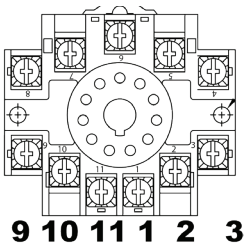
Octal Sockets Specifications								
Part Number	*Number of Pins*	*Voltage*	*Current*	*Screw Size*	*Wire Size (capacity)*	*Screw Torque*	*Screw Chassis Mounting Torque*	*Agency Approval **
70169-D	8	600V	10A	6-32	1 or 2, 12-20 AWG	12 in-lb	7 in-lb	UL Recognized E169693, CSA, CE
70170-D	11	300V	10A	6-32	1 or 2, 12-20 AWG	12 in-lb	12 in-lb	
750-2C-SKT	8	600V	5A	M3.5	1-12 AWG / 1-14 AWG	9 in-lb	7 in-lb	UL Recognized E225080, CSA, CE

*** To obtain the most current agency approval information, see the Agency Compliance & Certifications Checklist section on the specific part number's web page.**

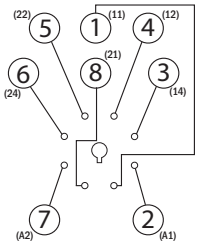
Socket Pinouts



70169-D



70170-D



750-2C-SKT