

# PRODUCT SUMMARY

Three-Phase Monitor Relays provide protection against premature equipment failure caused by voltage faults on three-phase systems. They are compatible with most Wye or Delta systems with no connection to Neutral required. These relays protect against single phasing regardless of any regenerative voltages, except the PCP Series, which offers Phase Reversal protection only.

The Reference Guide below provides general information on the different versions of Three-Phase Monitor Relays offered by Macromatic.



Series	Mounting Style	Phase Loss	Phase Reversal	Phase Unbalance	Under Voltage	Over Voltage	Time Delay on Undervoltage	Approvals •
PCP	Plug-in ●		✓					cULus CE cULus
PLP	Plug-in ●	✓	✓					
PAP	Plug-in ●	✓	✓		✓ (adj.)		4 seconds fixed	
PJP	Plug-in ●	✓	✓	Indication only	✓ (fixed)		4 seconds fixed	
PMP	Plug-in ●	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1 - 30 sec.	
PMP-FA	Plug-in ●	✓	✓	✓ (fixed)	✓ (fixed)	✓ (fixed)	4 seconds fixed	
PMD	DIN-Rail	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1 - 30 seconds	cULus CE
PBDU	DIN-Rail	✓	✓	✓ (adj.)				cULus CE
PC ●●	DIN-Rail	✓	✓	✓ (adj.)	✓ (adj.)	✓ (adj.)	0.3 - 30 seconds	cULus

- All Plug-in Products are cULus Listed when used with the appropriate Macromatic socket.
- PC Series have embedded communication via Modbus TCP, which makes data available within smart connected control systems.

## PROTECTION

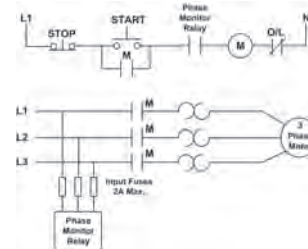
Depending on the unit selected, it will protect three-phase equipment against:

- ◆ **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 contact. This condition would result in a motor drawing locked rotor current during start-up. In addition, a three-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 three-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 three-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 three-phase system drop simultaneously. This could result in an increase in current and motor heating and a reduction in motor performance.
- ◆ **Overvoltage** - when voltage in all three lines of a three-phase system increase simultaneously. Could cause a decrease in load current and poor power factor.

## TYPICAL CONNECTIONS

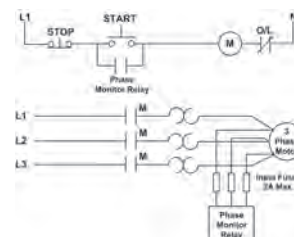
### Line Side Monitoring

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

With the relay connected directly to the motor, the total feed lines are monitored. However, this connection should not be used with reversing motors.



# PHASE LOSS, PHASE REVERSAL, PHASE UNBALANCE, UNDERVOLTAGE & OVERVOLTAGE

## PMP SERIES



- ◆ Protects against phase loss, phase reversal, phase unbalance, undervoltage, overvoltage & rapid cycling
- ◆ Wide voltage ranges to cover more global applications
- ◆ 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
- ◆ 10A SPDT output contacts



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The PMP 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. This provides a more accurate method to measure the voltages, regardless of load type or wave shape, and results in improved protection across more applications.

True RMS voltage measurement ensures accurate sensing in most generator and other applications with non-sinusoidal wave forms, 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.

Unlike similar three-phase monitor relays, the PMP Series will continue to function even with a lost phase. They are the only line-powered units in their class to retain fault indication and continuous monitoring of all voltages during a phase loss, increasing the ease of troubleshooting and the level of protection.

The PMP Series is a true universal product, with three units that work on a wide variety of adjustable line-line voltages to cover more global applications. Additional knobs allow adjustment of the undervoltage trip point, trip delay, restart delay and unbalance trip point. They utilize an industry-standard 8 pin octal socket.

### Operation:

When the proper three-phase line voltage is applied to the unit and the phase sequence (rotation) is correct, the relay is energized after the Restart Delay is completed. Any one of five fault conditions will de-energize the relay after a delay. As standard, re-energization is automatic upon correction of the fault condition. Manual reset is available if an external momentary N.C. switch is connected to pins 6 and 7. A bi-color status LED indicates normal condition and also provides specific fault indication to simplify troubleshooting.

### PMP Series

PROTECTS AGAINST	LINE-LINE VOLTAGE ▲ 50/60 Hz	CATALOG NUMBER	WIRING/SOCKET
Phase Loss, Phase Reversal, Phase Unbalance, Undervoltage & Overvoltage	102-138V	PMP120	8 Pin Octal <b>70169-D</b>  <b>DIAGRAM 104</b>
	190-500V	PMPU ● ■	
	460-600V	PMP575 ●	

- ▲ Phase-to-Phase (Line-to-Line).
- Requires a 600V-rated socket when used on system voltages above 300V.
- Dual range unit auto-senses between the 190-250V AC and 350-500V AC ranges (see Application Data on next page).

Sockets & Accessories available

# PHASE LOSS, PHASE REVERSAL, PHASE UNBALANCE, UNDERVOLTAGE & OVERVOLTAGE

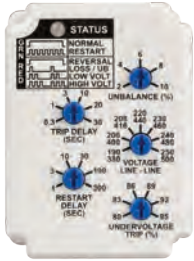
## PMP SERIES

### APPLICATION DATA

#### Voltage Requirements:

RANGE (50/60Hz $\pm 5\%$ )	MIN VOLTAGE	MAX VOLTAGE	CATALOG NUMBER
190-500V AC	156V AC	550V AC	PMPU
102-138V AC	77V AC	152V AC	PMP120
460-600V AC	345V AC	660V AC	PMP575

#### Three-Phase Line-Line Voltage:



The Voltage Line-Line knob on the PMPU has two ranges (left): a 190-250V low voltage scale and a 380-500V high voltage scale. The unit auto senses the three-phase line-line voltage when applied and automatically selects the appropriate range.

The PMP120 has a single adjustable range of 102-138V and the PMP575 has a single adjustable range of 460-600V.

**Power Consumption:** Less than 40VA.

**Phase Loss:** Unit trips on loss of any Phase A, B or C, regardless of any regenerative voltages.

**Phase Reversal (Out-of-Sequence):** Unit trips if sequence (rotation) of the three phases is anything other than A-B-C. It will not work on C-B-A.

**Undervoltage:** Adjustable from 80-95% of the line voltage setting. Unit trips when the average of all three lines is less than the adjusted set point for a period longer than the adjustable trip delay. It will reset at +3% of the Undervoltage trip setting.

**Overvoltage:** Fixed at 110% of the line voltage setting. Unit trips when the average of all three lines is greater than the fixed set point for a period longer than the adjustable trip delay. It will reset at 107% of the line voltage setting.

**Phase Unbalance:** Adjustable from 2-10% unbalance. Unit trips when any one of the three lines deviates from the average of all three lines by more than the adjusted set point for a period longer than the adjustable trip delay.

#### Response Times:

Restart:	1 - 300 seconds adjustable
Drop-out Due to Fault:	
Phase Loss and Reversal:	100ms fixed
Undervoltage and Overvoltage:	0.3 - 30 seconds adjustable
Unbalance:	
Normal:	0.3 - 30 seconds adjustable
Severe (Twice Knob Setting):	0.3 - 2 seconds

**Output Contacts:** SPDT 10 A @ 277V AC / 7A @ 30V DC;  
1HP @ 250V AC, 1/2HP @ 125V AC,  
C300 Pilot Duty

**Life:** Mechanical: 10,000,000 operations; Full Load: 100,000 operations

**Temperature:** Operating: -28° to 65°C (-18° to 149°F)  
Storage: -40° to 85°C (-40° to 185°F)

**Mounting:** Uses an 8 pin octal socket. Requires a 600V-rated socket when used on system voltages greater than 300V such as Macromatic Catalog Number 70169-D.

#### Status LED:

LED STATUS	STATUS
GREEN	NORMAL (RELAY ON)
GREEN	RESTART (DELAY)
RED	REVERSAL
RED	LOSS/UB (UNBALANCE)
RED	LOW VOLT (UNDERVOLTAGE)
RED	HIGH VOLT (OVERVOLTAGE)

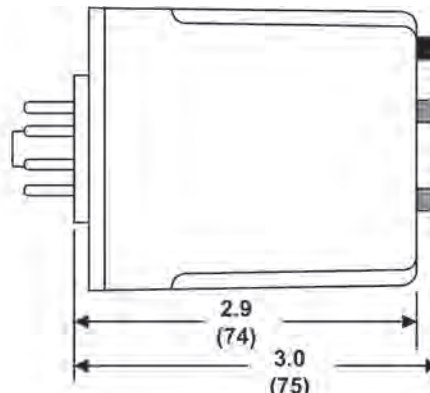
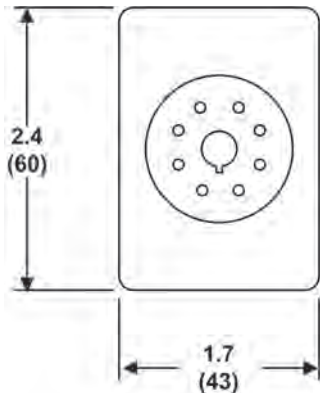
**Reset:** As standard, the PMP Series relays are in the Automatic Reset mode. However, they can be set in the Manual Reset mode by connecting an external N.C. switch across terminals 6 and 7. Upon application of line voltage, the PMP Series will go into Manual Reset mode if it recognizes a closure across terminals 6 and 7. After a fault clears, the relay will not reset until the N.C. switch is opened.

**Note:** When the unit is in the Manual Reset mode, the N.C. switch must be opened after each Power-up to reset the relay and resume normal operation.

#### Approvals:



### DIMENSIONS



All Dimensions in  
Inches (Millimeters)