PHASE MONITOR RELAYS

PRODUCT SUMMARY

Phase Monitor Relays provide protection against premature equipment failure caused by voltage faults on 3 Phase systems. All Macromatic Phase Monitor Relays are designed to be compatible with most Wye or Delta systems with no connection to Neutral required. Phase Monitor Relays protect against single phasing regardless of any regenerative voltages.

The Reference Guide below provides general information on the different versions of Phase Monitor Relays offered by Macromatic (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 *	See Page
PCP	Plug-in *		✓					c UL us	6
PLP	Plug-in *	✓	✓					c UL us	6
PAP	Plug-in *	✓	✓		✓ (adj.)		50ms fixed	c UL us	8
PMP	Plug-in *	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1 - 20 sec.	c UL us CE	10
PMP-FA	Plug-in *	✓	✓	✓ (fixed)	✓ (fixed)	✓ (fixed)	4 seconds fixed	c UL us CE	12
PMD	Surface	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1 - 20 sec.	c UL us CE	14

* In addition to the above approvals, all Plug-in Products are also UL Listed when used with the appropriate Macromatic socket.

PROTECTION

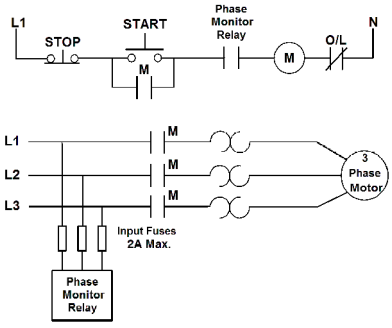
Depending on the unit selected, it will protect three phase equipment against:

- **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.
- **overvoltage -** when voltage in all three lines of a three phase system increase simultaneously.

TYPICAL CONNECTIONS

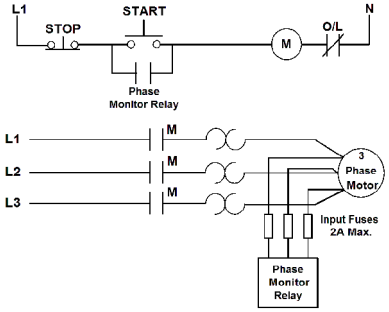
Line Side Monitoring

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.



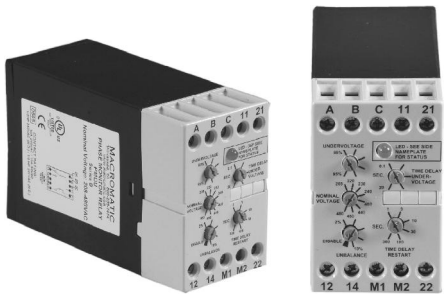
Load Side Monitoring

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



PHASE MONITOR RELAYS

Phase Loss, Phase Reversal, Phase Unbalance, and Under/Over Voltage
PMD Series Surface-Mount



- Universal voltage range of 208-480V on PMDU provides the flexibility to cover a variety of applications with one unit
- Protects against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage
- Variety of user-selectable and adjustable settings for the ultimate in three-phase protection
- Automatic & Manual Reset in Same Unit
- Multi-Color LED indicates normal condition and provides specific fault indication to simplify troubleshooting
- 45mm DIN-style surface-mount case
- 10A SPDT & SPNC output contacts
- c UL us CE

MACROMATIC

800-238-7474

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sales@macromatic.com

The PMD Series Phase Monitor Relays utilize a microprocessor-based design to provide protection against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage. The PMDU is a universal voltage product that works on any three-phase system voltage from 208-480V (separate 120V & 575V versions are available). These devices are designed to be compatible with most Wye or Delta systems with no connection to Neutral required. PMD 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. As standard, re-energization is automatic upon correction of the fault condition. Manual reset 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 PMD Series offers a variety of user-adjustable settings. The percent phase unbalance is adjustable from 2-10%, and also has a “Disable” setting for those applications where poor voltage conditions could cause nuisance tripping. The undervoltage drop-out can be set at 80-95% of operating voltage (overvoltage setting is fixed at 110% of nominal). The adjustable time delay drop-out on undervoltage (0.1-20 seconds) eliminates nuisance tripping caused by momentary voltage fluctuations. There is also an adjustable time delay (1-300 seconds) on both power up and restart after a fault has been cleared.

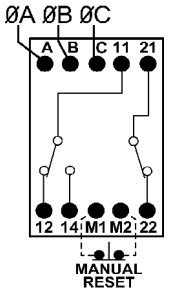
PROTECTS AGAINST	NOMINAL VOLTAGE▲ 50/60 Hz	PRODUCT NUMBER ◆	WIRING ■
Phase Loss, Phase Reversal, Phase Unbalance, Undervoltage & Overvoltage	120V	PMD120	
	208-480V	PMDU	
	575V	PMD600	

DIAGRAM 105

▲ Phase-to-Phase (Line-to-Line).

◆ These products come standard with one (1) SPDT & one (1) SPNC output. To order PMD units with a second N.O. contact instead of the N.C. (terminals 21-22), add a suffix “-A1” to the Product Number, i.e., PMDU-A1. To order PMD units with DPDT output contacts instead of one SPDT and one SPNC, **but** with no manual reset feature, add a suffix “-A2” to the Product Number, i.e., PMDU-A2.

■ See Page 80 & 81 for **Accessories**.

PHASE MONITOR RELAYS

Phase Loss, Phase Reversal, Phase Unbalance, and Under/Over Voltage PMD Series Surface-Mount

Application Data & Dimensions

Application Data

Phase Loss:
Unit trips on loss of any Phase A, B or C.

Phase Reversal:
Unit trips if rotation (sequence) of the three phases is anything other than A-B-C.

Undervoltage:
Adjustable from 80-95% of nominal voltage. Unit trips when the average of all three lines is less than the adjusted set point for a period longer than the adjustable time delay drop-out.

Overvoltage:
Fixed at 110% of nominal voltage. Unit trips when the average of all three lines is greater than the fixed set point for a period longer than the time delay drop-out.

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 . There is also a "Disable" setting adjustment that will turn off the Phase Unbalance Protection if nuisance tripping is a problem.

Output Contacts:
10A SPDT & SPNC @ 240V AC/30VDC,
1/2HP @ 120/240V AC (N.O.), 1/3HP @ 120/240V AC (N.C.)

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

Response Times:

Power Up & Restart After Fault:	1 - 300 seconds adjustable
Drop-out Due to Fault:	
Phase Loss & Reversal	100ms fixed
Phase Unbalance	2 seconds fixed
Undervoltage	0.1 - 20 seconds adjustable
Overvoltage	Fixed Time Based on Inverse Time Curve

Hysteresis: 2 - 3%

Load (burden): Less than 3VA

Temperature: -28° to 65°C (-18° to 149°F)

Mounting:
Does not require a socket. Can either be mounted directly on 35mm DIN track with no additional parts or to a back-panel with Panel Mounting Kit (supplied) & two screws (see Dimensions below).

Indicator LED:

LED Status	Indicator
Green Steady	Normal / Relay ON
Green Flashing	Power Up / Restart Delay
Red Steady	Unbalance
Red Flashing	Undervoltage / Overvoltage
Amber Steady	Reversal
Amber Flashing	Loss
Green / Red Alternating	Undervoltage / Overvoltage Trip Pending
Red / Amber Alternating *	Nominal Voltage Set Error

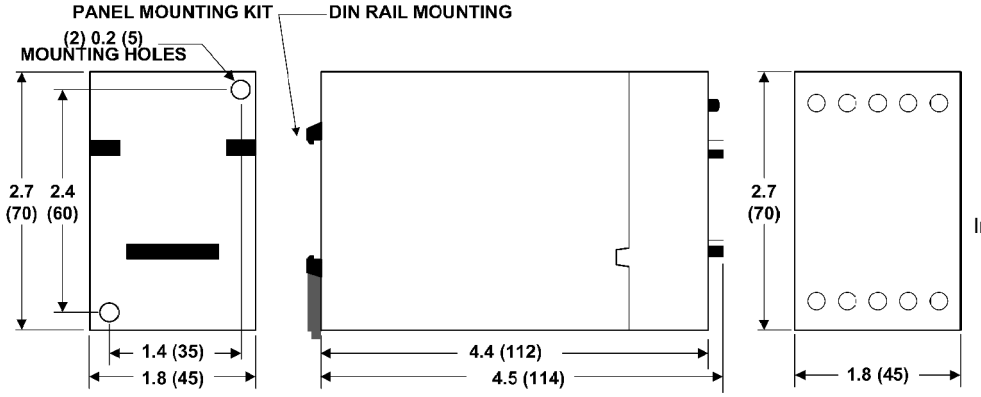
* Applies to 208-480V units only.

Reset:
As standard, reset is automatic upon correction of fault. When a momentary-contact N.C. switch is wired across the Manual Reset terminals (M1 & M2), the unit switches to manual reset mode and remote manual reset is available.

Approvals:
c UL us
File #E109466

CE Low Voltage & EMC Directives
EN60947-1, EN60947-5-1

Dimensions



All Dimensions in Inches (Millimeters)

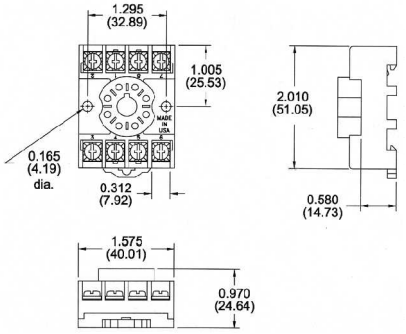
SOCKETS & ACCESSORIES

8 Pin Octal Socket--
Surface or DIN Rail-Mounted

10A @ 600V *
1 or 2 #12-22 AWG Wire
Recommended Tightening Torque
of 6-7 in-lbs. (12 in-lbs maximum)
Pressure Wire Clamp Terminations

File #E169693 File #LR701114

Product Number 70169-D

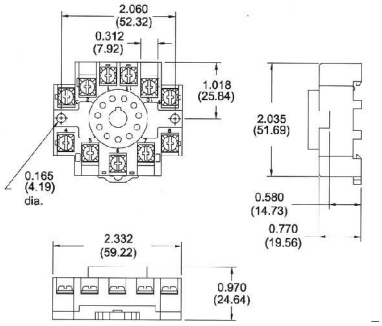


11 Pin Octal Socket--
Surface or DIN Rail-Mounted

10A @ 300V
1 or 2 #12-22 AWG Wire
Recommended Tightening Torque
of 6-7 in-lbs. (12 in-lbs maximum)
Pressure Wire Clamp Terminations

File #E169693 File #LR701114

Product Number 70170-D

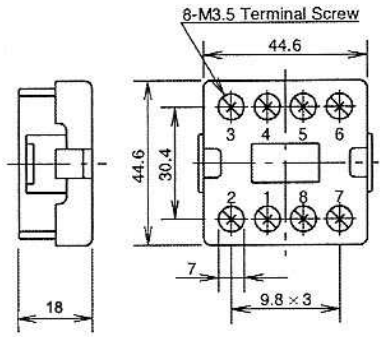


8 Pin Octal Socket--
Back-Mounted

10A @ 300V
Pressure Wire Clamp Terminations

File #E62437

Product Number SR6P-M08G

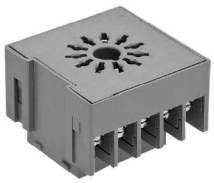


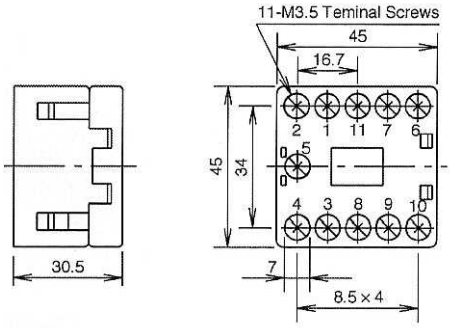
11 Pin Octal Socket--
Back-Mounted

10A @ 300V
Pressure Wire Clamp Terminations

File #E62437

Product Number SR6P-M11G





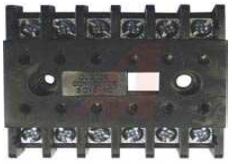
12 Pin Socket--
Surface-Mounted

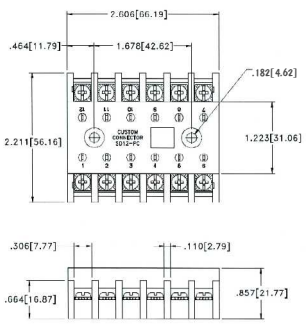
10A @ 600V
#12-20 AWG Wire
Pressure Wire Clamp Terminations

File #E60008 File #LR29513

NOTE: if a 12 Pin Socket is required for DIN-rail mounting, please contact Macromatic.

Product Number SD12-PC





* Plug-in Three-Phase Monitor Relays require a 600V-rated socket when used on system voltages greater than 300V.

SOCKETS & ACCESSORIES

Hold Down Spring
Product Number 70166

Can be used for:

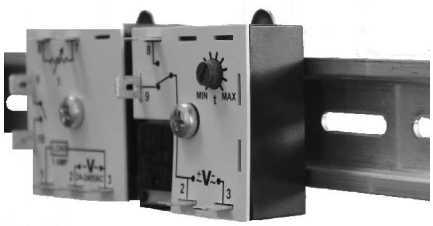
- Panel-Mounted Sockets
- Sockets Mounted to 35mm DIN Track *

* Requires two machine screws with washers & nuts--contact Macromatic or www.macromatic.com/70166 for more information.

DIN Rail Adaptor Kit
Product Number 70500

Quick & Economical Way to Install Any THx Series 2" x 2" Encapsulated Time Delay Relays on 35mm DIN Track

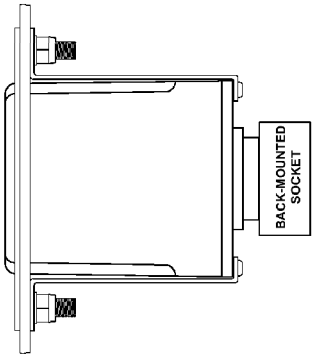
- Clip Comes with a Threaded Hole to Eliminate Need for a Washer & Nut
- All Mounting Hardware Included



Panel Mount Assembly
For Panel Mounting Standard Plug-in Products
Product Number 70400

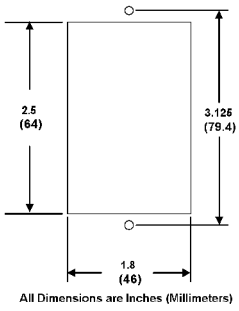
This assembly provides a simple & economical method to mount plug-in products to the deadfront of an enclosure/panel:

- Sturdy Aluminum Construction
- Stainless Steel Studs
- All Mounting Hardware Included
- White Textured Painted Finish
- 2 3/16" W x 3 7/16" H



(Relay Not Included with Assembly--Shown for Reference Only)

Panel Cutout



All Dimensions are Inches (Millimeters)

INDEX BY PRODUCT NUMBER

* The "-xx" suffix denotes the time range for time delay relays with adjustable time delay. Contact Macromatic for any product not listed.

*** The "-yyy" suffix denotes the input voltage, trip delay & sensing delay for CxH Series encapsulated current sensing relays.