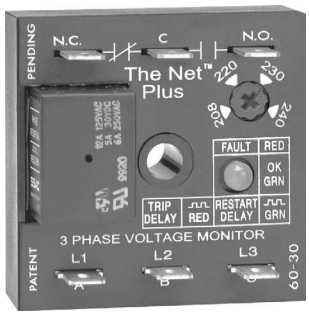


Provides protection for motors and other sensitive loads. Continuously measures the voltage of each of the three phases using a microcontroller circuit design that senses under and overvoltage, voltage unbalance, phase loss, and phase reversal. Protection is provided even when regenerated voltages are present. Includes a trip delay to prevent nuisance tripping and a restart delay to prevent short cycling after a momentary power outage.

For more information see:
Appendix B, page 167, Figure 30 for dimensional drawing.
Appendix C, page 168, Figure 14 for connection diagram.

Features:

- Protects against phase loss & reversal; over, under & unbalanced voltages; short cycling
- Fixed trip points & delays
- Adjustable voltages from 208 to 480VAC in 4 ranges
- Monitor 600VAC lines by connecting VRM accessory
- Isolated, 10A, SPDT output contacts
- Bi-color LED indicates: output status, faults, time delays, phase reversal & setpoint
- ASME A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

Operation

Upon application of line voltage, the restart delay begins. The output is de-energized during restart delay. Under normal conditions, the output energizes after the restart delay. Undervoltage, overvoltage, and voltage unbalance must be sensed for the complete trip delay period before the output de-energizes. The restart delay begins as soon as the output de-energizes. If the restart delay is completed when a fault is corrected, the output energizes immediately. The output will not energize if a fault is sensed as the input voltage is applied. If the voltage selector is set between two voltage marks (i.e. between 220 and 230V), the LED will flash red rapidly. The TVW provides fault protection at the lower of the two line voltages (i.e. 220V).
Reset: Reset is automatic upon correction of a fault.

LED Operation

The LED flashes green during the restart delay, then glows green when the output energizes. It flashes red during the trip delay then glows red when the output de-energizes. It flashes red/green if phase reversal is sensed. If the voltage selector knob is between settings, it rapidly flashes red.

Auxilary Products:

- **3-phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)
- **Female quick connect:**
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)
- **Voltage reduction module:** P/N: VRM6048

Available Models:

TVW575S1M
TVW6510S0.4S
TVW9510S0.4S

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

TVW **X** **Line Voltage**
Wide Range
- **5** - 208-240VAC

Selectable
- **6** - 208, 220, 230 & 240VAC
- **8** - 380, 400 & 415VAC
- **9** - 430, 440, 460 & 480VAC

X **Voltage Unbalance**
- **Fixed -** Specify **4-10**% in 1% increments

X **Trip Delay***
- **Fixed** - Specify from **0.2-1**s in 0.1s increments
- **Fixed** - Specify from **1-100**s in 1s increments

*Must indicate (S) for secs. or (M) for mins.

X **Restart Delay***
- **Fixed** - Specify from **0.4-1**s in 0.1s increments
- **Fixed** - Specify from **1-100**s in 1s increments
- **Fixed** - Specify from **1-999**min in 1min increments

Specifications

Line Voltage

Type	3-phase delta or wye with no connection to neutral
Input Voltage/Tolerance	208 to 480VAC in 4 ranges/-30% - 20%
AC Line Frequency	50 - 100 Hz
Phase Sequence	ABC
Power Consumption	Approx. 2W for 240V units Approx. 3W for 480V units

Overvoltage, Undervoltage, & Voltage Unbalance

Overvoltage & Undervoltage	Voltage detection with delay trip & automatic reset
Undervoltage Trip Point	88 - 92% of the selected line voltage
Reset Voltage	≅ +3% of trip voltage
Overvoltage Trip Point	109 - 113% of the selected line voltage
Reset Voltage	≅ -3% of trip voltage
Trip Variation vs Temperature	≤ ±2%
Voltage Unbalance	Factory fixed, from 4 - 10%
Reset On Balance	≅ -0.7% unbalance
Trip Delay Range	Fixed from 0.2 - 100s ±15% or ±0.1s, whichever is greater
Restart Delay Range	Fixed from 0.4s - 999m ±15% or ±0.2s, whichever is greater
Phase Reversal & Phase Loss Response	≤ 200ms; automatic reset
Phase Loss	≥ 25% unbalance

Output

Type		Isolated, SPDT
Rating	208 to 240VAC (55°C)	10A resistive @ 125VAC, 5A @ 250VAC, 1/4 hp @ 125VAC
	380 to 480VAC	10A resistive @ 240VAC, 1/4 hp @ 125VAC, 1/3 hp @ 250VAC, max. voltage 277VAC
Life		Mechanical - 1 x 10^6; Electrical - 1 x 10^5

Protection

Surge		IEEE C62.41-1991 Level B
Dielectric Breakdown	208 to 240VAC	≥ 1500V RMS input to output terminals
	380 to 480VAC	≥ 2500V RMS input to output terminals

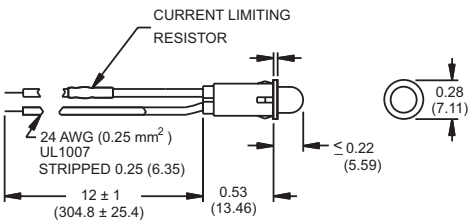
Mechanical

Mounting	Surface mount with one #8 (M5 x 0.8) screw
Dimensions	2 x 2 x 1.25 in. (50.8 x 50.8 x 31.8 mm)
Termination	0.25 in. (6.35 mm) male quick connect terminals

Environmental

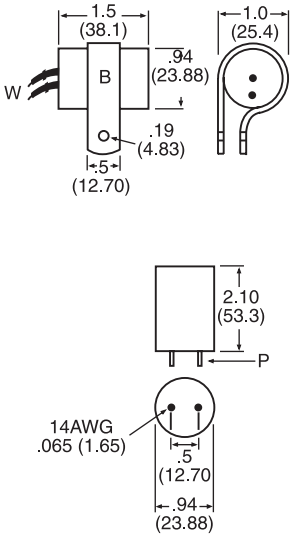
Operating / Storage Temperature	-40° to 55°C / -40° to 85°C
Humidity	95% relative, non-condensing
Weight	≅ 2.8 oz (79 g)

FIGURE 24



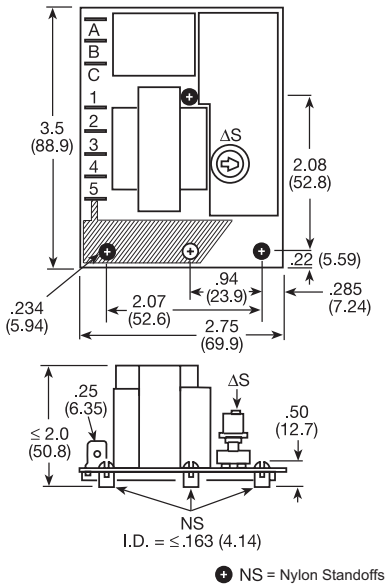
LPM

FIGURE 25



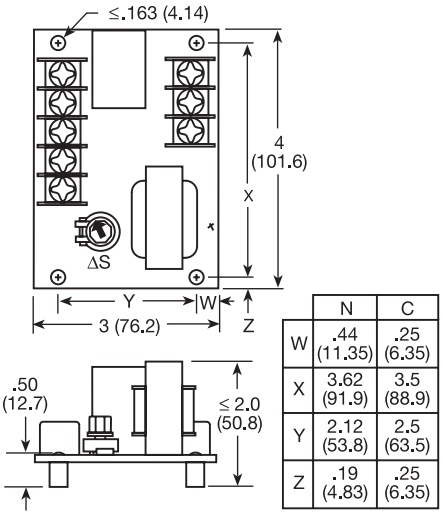
MSM

FIGURE 26



LLC1

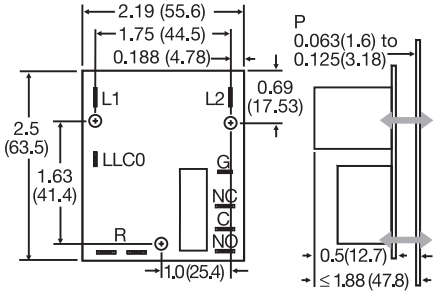
FIGURE 27



	N	C
W	.44 (11.35)	.25 (6.35)
X	3.62 (91.9)	3.5 (88.9)
Y	2.12 (53.8)	2.5 (63.5)
Z	.19 (4.83)	.25 (6.35)

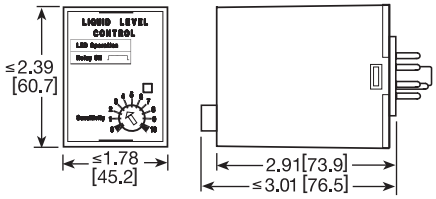
LLC2

FIGURE 28



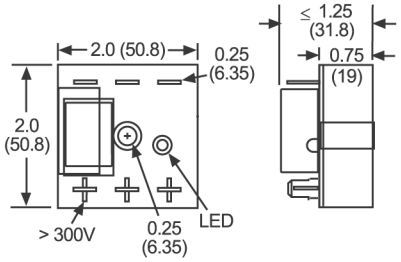
LLC8

FIGURE 29



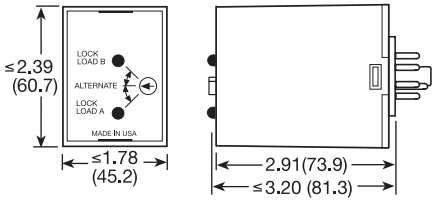
LLC5

FIGURE 30



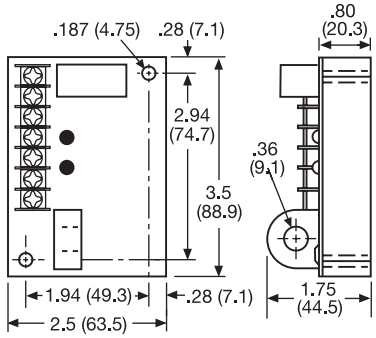
TVM; TVW

FIGURE 31



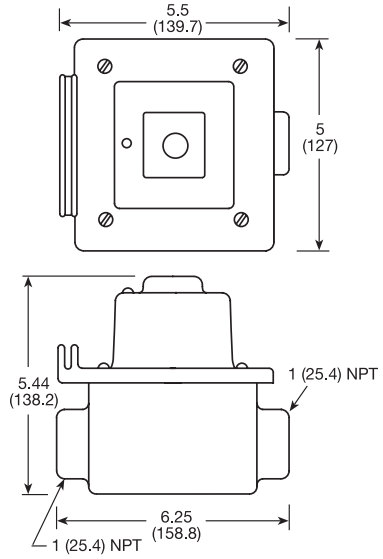
ARP

FIGURE 32



FB; SCR

FIGURE 33

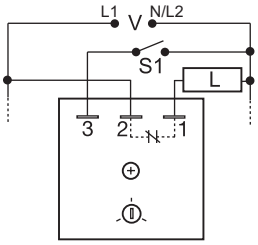


PCR

inches (millimeters)

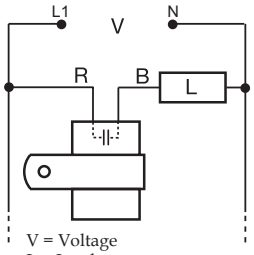
Appendix C - Connection Diagrams

FIGURE 1 - FSU1000 Series



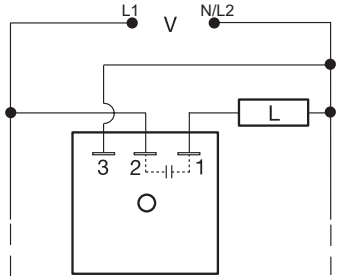
S1 = Optional low current switch
V = Voltage
L = Load

FIGURE 2 - FS100 Series



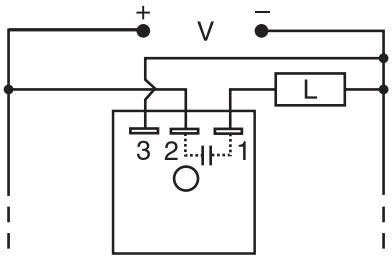
V = Voltage
L = Load
R = Red Wire
B = Black Wire

FIGURE 3 - FS100 Series



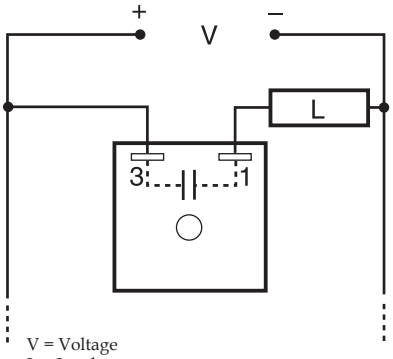
V = Voltage
L = Load

FIGURE 4 - FS200 Series



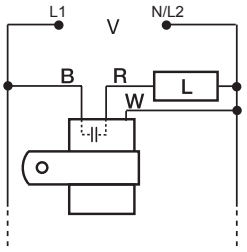
V = Voltage
L = Load

FIGURE 5 - FS300 Series



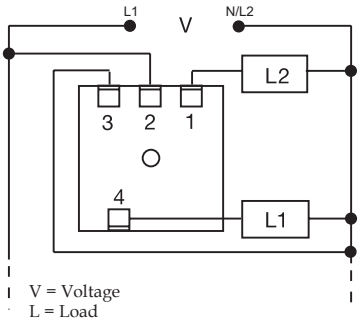
V = Voltage
L = Load
Note: Load may be in positive side.

FIGURE 6 - FS400 Series



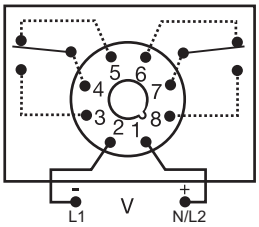
V = Voltage
L = Load
R = Red Wire
B = Black Wire
W= White Wire

FIGURE 7 - AF Series



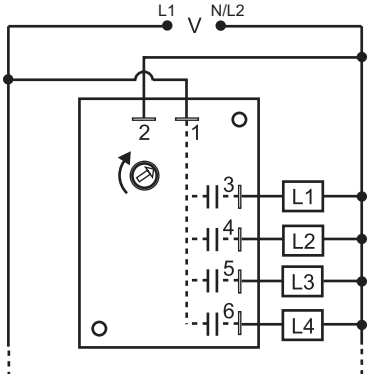
V = Voltage
L = Load

FIGURE 8 - FS500 Series



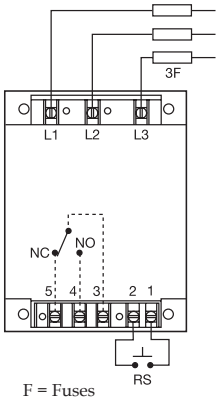
V = Voltage

FIGURE 9 - SC3/SC4 Series



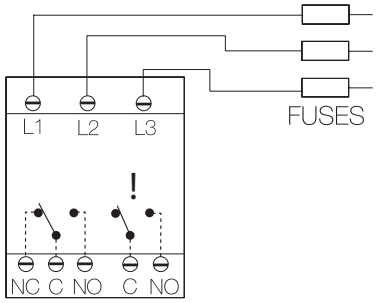
SC4 shown;
for SC3, terminal 6 & load L4 are eliminated.

FIGURE 10 - WVM Series



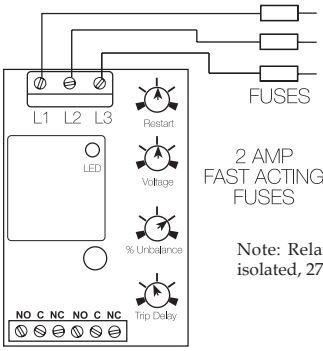
F = Fuses
NO = Normally Open
NC = Normally Closed
RS = Optional Remote Reset Switch
Relay contacts are isolated.
CAUTION:
2 amp max fast acting fuses must be installed externally in series with each input. (3)

FIGURE 11 - DLMU Series



L1, L2, L3 = Line Voltage Input
NO = Normally Open Contact
NC = Normally Closed Contact
C = Common, Transfer Contact
CAUTION: 2 amp max. fast acting fuses are recommended to protect the equipment's wiring. They are not required to protect the DLMU.
! = Select alarm contact connection as N.O. or N.C. when ordering; N.O. Shown.

FIGURE 12 - HLMU Series

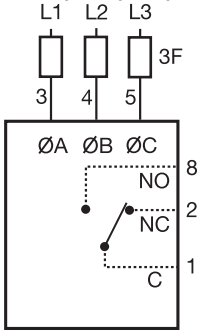


2 AMP
FAST ACTING
FUSES

Note: Relay contacts are isolated, 277VAC max.

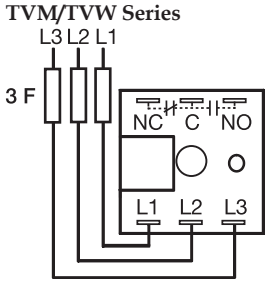
L1, L2, L3 = Line Voltage Input
NO = Normally Open Contact
NC = Normally Closed Contact
C = Common, Transfer Contact
CAUTION: 2 amp max. fast acting fuses are recommended to protect the equipment's wiring. They are not required to protect the HLMU.

FIGURE 13 - PLMU/PLM/PLR/PLS Series



F = Fuses
ØA = Phase A = L1
ØB = Phase B = L2
ØC = Phase C = L3
NO = Normally Open
NC = Normally Closed
2A fast acting fuses recommended for safety (not required)
Relay contacts are isolated.

FIGURE 14 - TVM/TVW Series



L1 = Phase A
L2 = Phase B
L3 = Phase C
NO = Normally Open
NC = Normally Closed
C = Common, Transfer Contact
Relay contacts are isolated.
F = 2A Fast acting fuses are recommended, but not required

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