



The HLMU Series is a universal voltage, encapsulated, 3-phase voltage monitor. It continuously measures the voltage of each of the three phases with microcontroller accuracy and compares the value to preset trip points. It separately senses phase reversal and loss; over, under and unbalanced voltages; and over or under frequency. Protection is assured during periods of large average voltage fluctuations, or when regenerated voltages are present. The unit trips within 200ms when phase loss is detected. Adjustable time delays are included to prevent nuisance tripping and short cycling of sensitive equipment. The isolated, 10A, DPDT relay contacts trip when a phase voltage exceeds the trip limits for the trip delay. Nominal line voltage, voltage unbalance, and time delays are knob adjustable. The phase loss setpoint and the acceptable frequency range are fixed. Both delta and wye systems can be monitored; no connection to neutral is required.

For more information see:

Appendix B, page 166, Figure 17 for dimensional drawing.

Appendix C, page 168, Figure 12 for connection diagram.

#### Operation

Upon application of line voltage, the output is de-energized and the restart delay begins. If all the three-phase voltages are within the acceptable range, the output energizes at the end of the restart delay. The microcontroller circuitry automatically senses the voltage range, and selects the correct operating frequency (50 or 60Hz). The over and under voltage trip points are set at  $\pm 10\%$  of the adjusted line voltage. When the measured value of any phase voltage exceeds the acceptable range limits (lower or upper) the trip delay begins. At the end of the trip delay the output relay de-energizes. If the phase voltage returns to an acceptable value before the trip delay expires, the trip delay is reset and the output remains energized. Under, over, and unbalanced voltages plus over or under frequency must be sensed for the complete trip delay before the unit trips. The unit trips in 200ms when phase loss or reversal are sensed. The unit will not energize if a fault is sensed as the line voltage is applied.

Reset: Reset is automatic upon correction of the voltage or frequency fault or phase sequence.

#### Restart Delay Options:

L= Lockout or minimum OFF time. The restart delay begins when the output trips. The unit cannot be re-energized until the restart delay is complete. This provides a minimum off time or lockout time to allow equipment sensitive to short cycling, time to reset. If the fault is corrected after the restart delay is complete, the output energizes immediately. The restart delay also occurs when line voltage is applied/reapplied.

R= Restart Delay on fault correction. The restart delay begins when line voltage is reapplied or when a voltage fault is corrected. This option is normally selected when staggered restarting of multiple motors on a power system is required.

N= No Restart Delay. 0.6 second initialization delay on application of line voltage applies.

#### Restart Notes:

All restart options remain reset when the following conditions are detected:

1.) Phase loss (phase unbalance greater than 25%) 2.) Average line voltage less than 120VAC 3.) Phase reversal

The restart delay begins when the condition is corrected.

#### 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 a fault is sensed during the restart delay, the LED will glow red during that portion or the full restart delay.

#### Order Table:



HLMU	X	X	X	X	X	
<b>Output</b>	<b>Restart Function</b>	<b>Voltage Unbalance</b>	<b>Trip Delay</b>	<b>Restart Delay</b>		
-D - DPDT	-L - Lockout, Min Off Time	-A - Adjustable 2-10%	-A - Adjustable 1-30s	-A* - Adjustable 0.6-300s		
-S - SPDT	-R - Staggered Restarting	-Fixed - Specify Unbalance	-Fixed - Specify delay	-N - No Restart Delay		
	-N - No Restart Delay	2-10% in 1% increments, using two digits [04]	1-30s in 1s increments, using two digits [05]			*Selection "A" is only available for Restart Functions "L" and "R"

#### Specifications

Line Voltage	Type.....	3-phase delta or wye with no connection to neutral	Over/Under Frequency.....	$\pm 4\%$ ; Reset $\pm 3\%$ ; 50/60 Hz
Operating Voltage	200 - 480VAC	Range	Voltage Adj. Range	Frequency
		240	200-240VAC	50 or 60Hz
		380	340-420VAC	50Hz
		480	400-480VAC	60Hz
Line Voltage Max.	550VAC			
AC Line Frequency	50/60 Hz automatically detected			
Phase Loss	$\geq 25\%$ unbalance			
Response Time	$\leq 200\text{ms}$			
Undervoltage & Voltage Unbalance	Type.....	Voltage detection with delayed trip & automatic reset	Protection	
Overvoltage	Trip Voltage.....	109 - 113% of the adjusted line voltage	Surge.....	IEEE C62.41-1991 Level B
	Reset Voltage.....	$\approx -3\%$ of the trip voltage	Isolation Voltage.....	$\geq 2500\text{V RMS}$ input to output
Undervoltage	Trip Voltage.....	88 - 92% of the adjusted line voltage	Circuitry.....	Encapsulated
	Reset Voltage.....	$\approx +3\%$ of the trip voltage	Mechanical	
Voltage Unbalance	Trip Setpoint.....	Adjustable 2 - 10% or specify fixed unbalance of 2 - 10% in 1% increments	Mounting.....	Surface mount with one #10 (M5 x 0.7) screw
	Reset on Balance.....	$\approx -0.7\%$ unbalance	Note: 0.25 in. (6.35 mm) spacing between units or other devices is required	
Trip Delay	Active On.....	Over/undervoltage, voltage unbalance, over/under frequency	Dimensions.....	3 x 2 x 1.64 in. (76.7 x 51.3 x 41.7 mm)
	Range.....	Adjustable from 1 - 30s or specify fixed delay 1 - 30s in 1s increments	Termination.....	Screw terminal connection up to 12 AWG (3.3 mm <sup>2</sup> ) wire
	Tolerance.....	$\pm 15\%$	Environmental	
Restart Delay	Range.....	Adjustable from 0.6 - 300s; if no restart delay is selected a 0.6s initialization delay applies	Operating / Storage Temperature.....	$-40^\circ$ to $60^\circ\text{C}$ / $-40^\circ$ to $85^\circ\text{C}$
			Humidity.....	95% relative, non-condensing
			Weight.....	$\approx 3.9$ oz (111 g)

#### Features:

- Protects against phase loss & reversal; over, under & unbalanced voltages; & over & under frequency
- Encapsulated circuitry
- Isolated, 10A, DPDT output contacts
- LED indicates relay status, faults, & time delays
- Universal line voltage 200 to 480VAC in one unit
- Compact design
- Finger-safe terminal blocks, up to 12 AWG
- ASME A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:  

#### Auxiliary Products:

- **3-Phase fuse block/disconnect:** P/N: FH3P
- **2 Amp fuse:** P/N: P0600-11
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: P1023-20

#### Available Models:

HLMUDLAAA	HLMUDRAAA
HLMUDN0405N	HLMUSR0604A
HLMUDNAAA	

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

# Appendix B - Dimensional Drawings

FIGURE 13

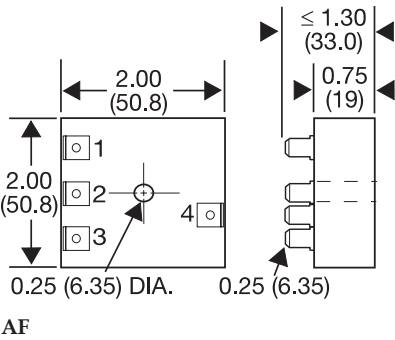


FIGURE 14

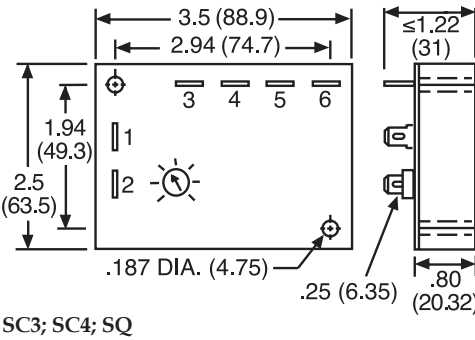


FIGURE 15

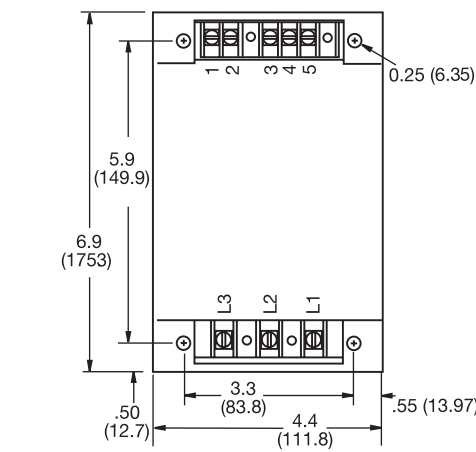


FIGURE 16

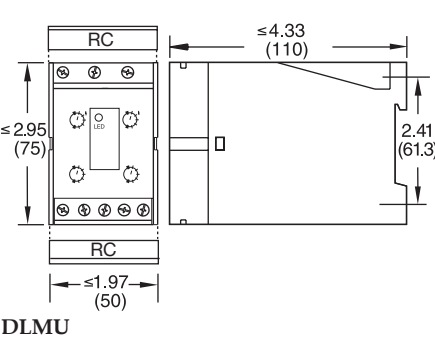


FIGURE 17

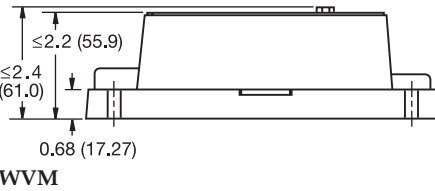
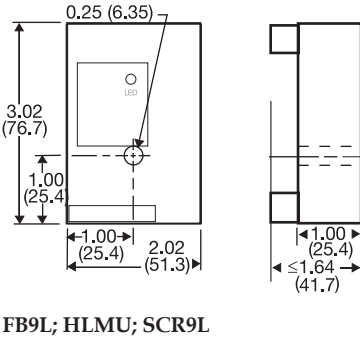


FIGURE 18

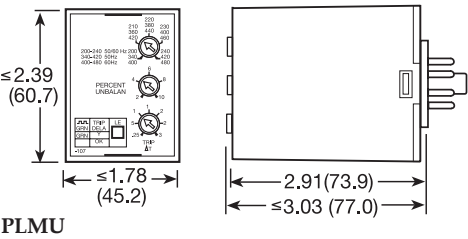


FIGURE 19

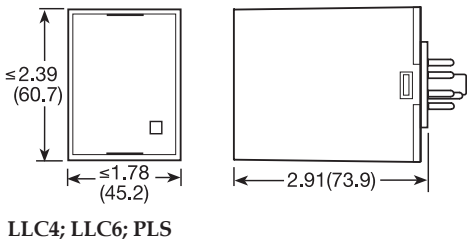


FIGURE 20

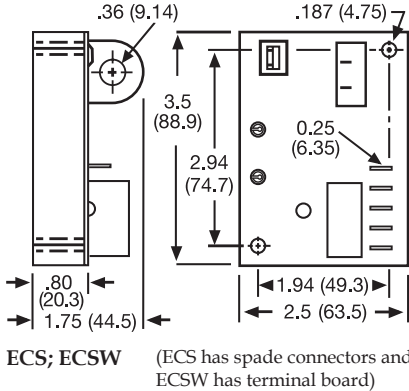


FIGURE 21

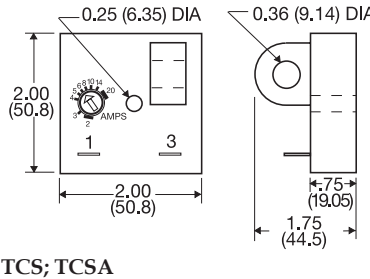


FIGURE 22

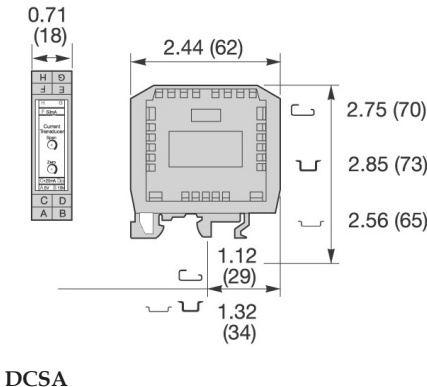
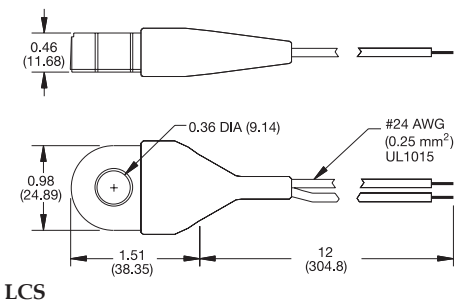


FIGURE 23



# Appendix C - Connection Diagrams

FIGURE 1 - FSU1000 Series

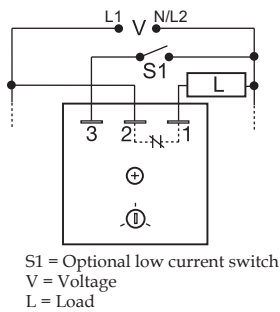


FIGURE 2 - FS100 Series

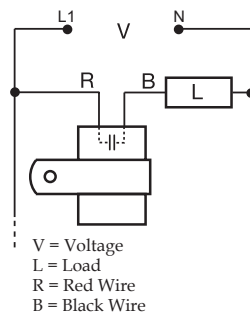


FIGURE 3 - FS100 Series

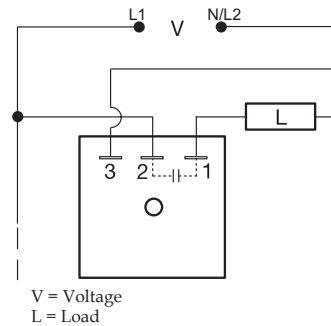


FIGURE 4 - FS200 Series

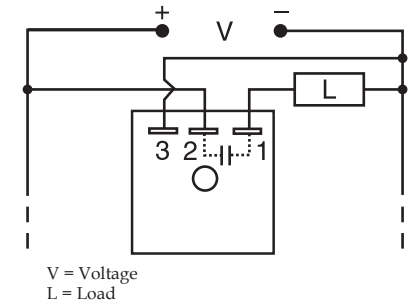


FIGURE 5 - FS300 Series

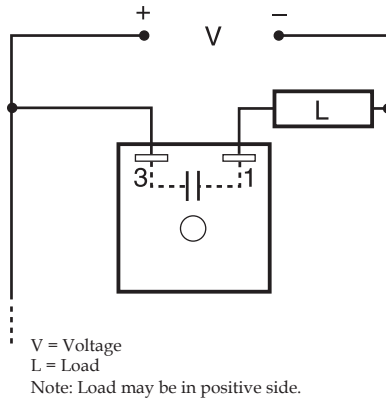


FIGURE 6 - FS400 Series

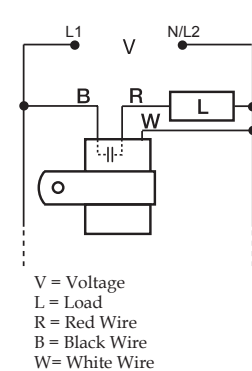


FIGURE 7 - AF Series

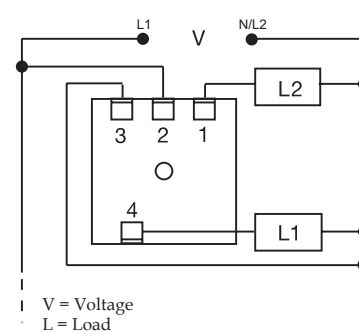


FIGURE 8 - FS500 Series

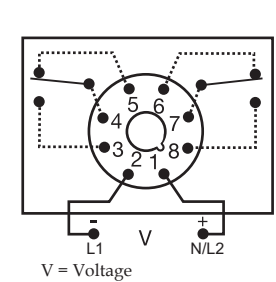


FIGURE 9 - SC3/SC4 Series

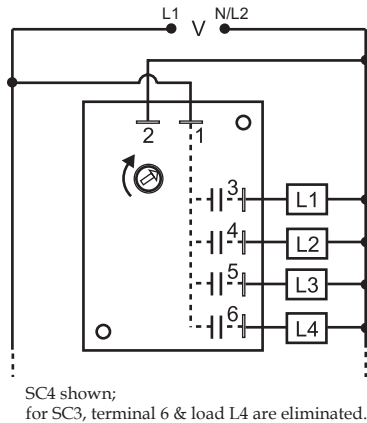
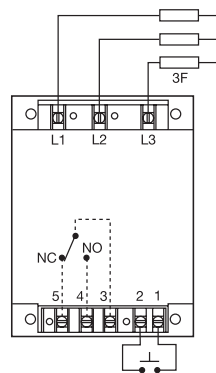


FIGURE 10 - WVM Series



CAUTION:  
2 amp max fast acting fuses must be installed externally in series with each input. (3)

FIGURE 11 - DLMU Series

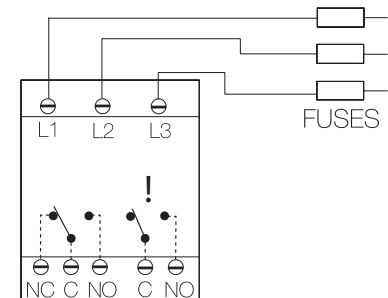


FIGURE 12 - HLMU Series

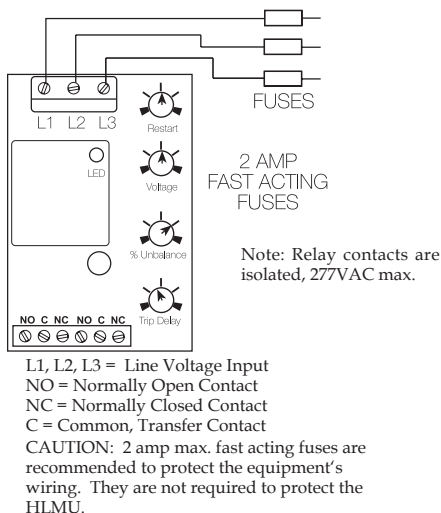


FIGURE 13 - PLMU/PLM/PLR/PLS Series

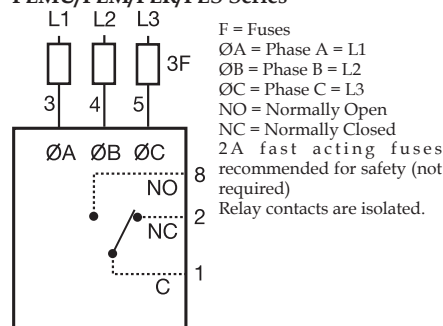


FIGURE 14 - TVM/TVW Series

