

The DLMU Series is a universal voltage, 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, SPDT and 2A alarm output relay contacts 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 16 for dimensional drawing.  
Appendix C, page 168, Figure 11 for connection diagram.

### Operation

Upon application of line voltage, the output is de-energized and the restart delay begins. If all the 3-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 undervoltage trip points are set automatically. 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:

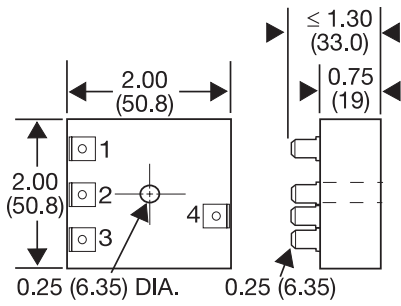
<b>DLM</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
	<b>Line Voltage</b>	<b>Output</b>	<b>Restart Function</b>	<b>Voltage Unbalance</b>	<b>Trip Delay</b>	<b>Restart Delay</b>
	-U - 200-480VAC	-B - SPDT & NO	-L - Lockout, min off time	-A - Adjustable 2-10%	-A - Adjustable 1-30s	-A* - Adjustable 0.6-300s
	-H - 500-600VAC	-C - SPDT & NC	-R - Staggered restarting	-Fixed - Specify unbalance	-Fixed - Specify delay	-N - No Restart Delay
			-N - No Restart Delay	2-10% in 1% increments	1-30s in 1s increments,	* Selection "A" is only available
				using two digits [04]	using two digits [20]	for L or R Restart Functions

### Specifications

Line Voltage	Type	Operating Voltage	200-480VAC	Range	Voltage Adj.Range	Line Frequency	Line Voltage Max.	Restart Delay	Range	Adjustable from 0.6 - 300s; if no restart delay is selected a 0.6s initialization delay applies	
			240		200-240VAC	50/60Hz	550VAC	Tolerance		± 15%	
			380		340-420VAC	50Hz	600VAC	Over/Under Frequency		±4%; Reset ±3%; 50/60 Hz	
			480		400-480VAC	60Hz		Phase Sequence		A, B, C, L1, L2, L3	
			600		500-600VAC	50/60Hz		Response Time -Phase Reversal & Phase Loss		≤200 ms	
600VAC								Reset		Automatic	
AC Line Frequency								Output			
								Type		Isolated Electromechanical Relay	
Phase Loss								Rating		10A resistive @ 240VAC; 8A resistive @ 277VAC;	
										NO-1/4 hp @ 120VAC; 1/3 hp @ 240VAC	
Response Time								Life		Mechanical - 1 x 10 <sup>6</sup> ; Electrical - 1 x 30 <sup>3</sup>	
								Protection			
Undervoltage & Voltage Unbalance								Surge		IEEE C62.41-1991 Level B	
Type								Isolation Voltage		≥ 2500V RMS input to output	
Overvoltage	Trip Voltage							Mechanical			
								Mounting		Surface mount with 2 #8 (M4 x 0.7) screw or snap on 35mm DIN Rail	
	Reset Voltage									Note: 0.25 in. (6.35 mm) spacing between units or other devices is required	
Undervoltage	Trip Voltage									Dimensions	4.33 x 2.95 x 1.97 in. (110 x 75 x 50 mm)
										Termination	Screw terminals with captive wire clamps for up to #14 AWG (2.5 mm <sup>2</sup> ) wire
	Reset Voltage									Environmental	
Voltage Unbalance										Operating / Storage Temperature	-40° to 60°C / -40° to 85°C
										Humidity	95% relative, non-condensing
	Reset on balance									Weight	≈ 8.6 oz (244 g)
Trip Delay	Active On										
	Range										
	Tolerance										

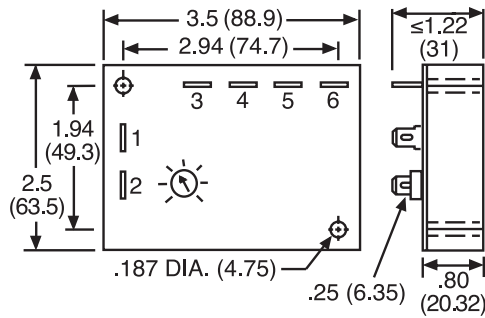
# Appendix B - Dimensional Drawings

FIGURE 13



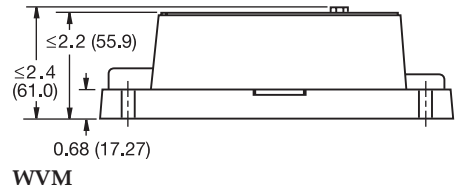
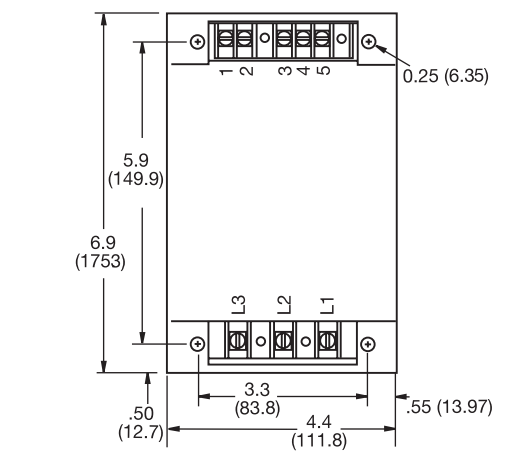
AF

FIGURE 14



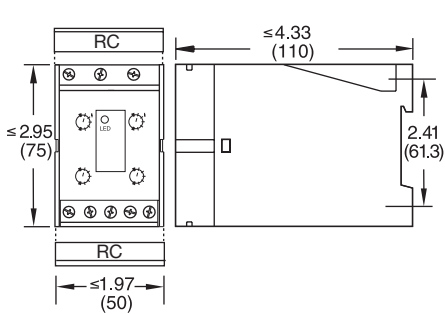
SC3; SC4; SQ

FIGURE 15



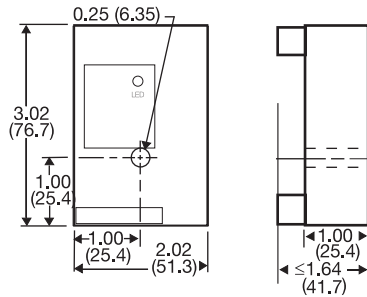
WVM

FIGURE 16



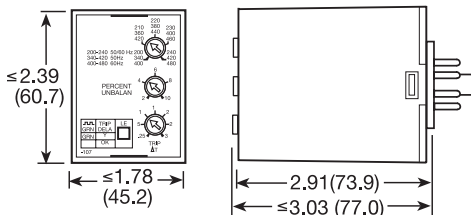
DLMU

FIGURE 17



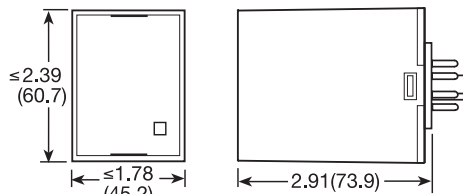
FB9L; HLMU; SCR9L

FIGURE 18



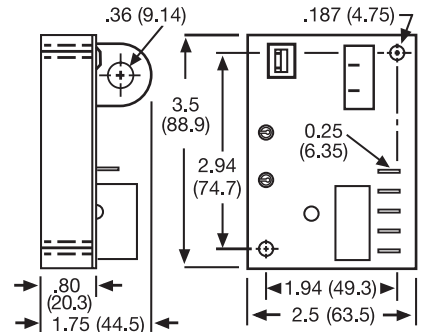
PLMU

FIGURE 19



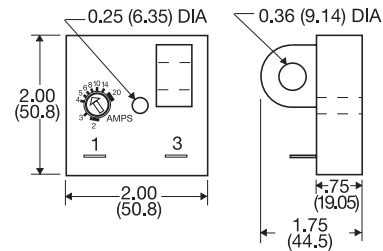
LLC4; LLC6; PLS

FIGURE 20



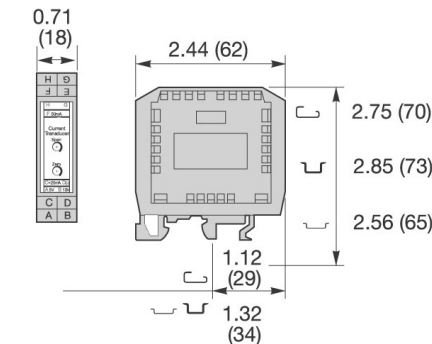
ECS; ECSW (ECS has spade connectors and ECSW has terminal board)

FIGURE 21



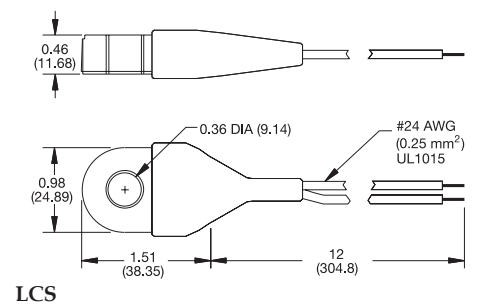
TCS; TCSA

FIGURE 22



DCSA

FIGURE 23

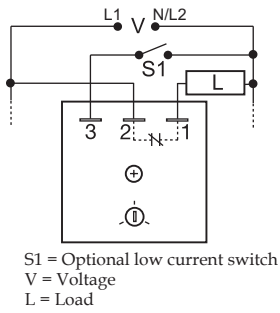


LCS

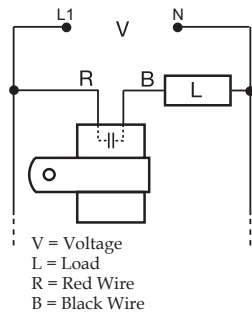
inches (millimeters)

# Appendix C - Connection Diagrams

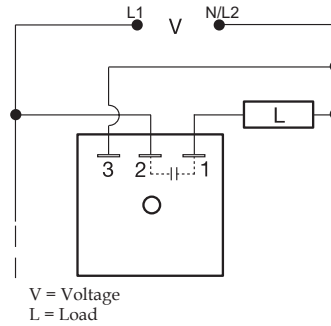
**FIGURE 1 - FSU1000 Series**



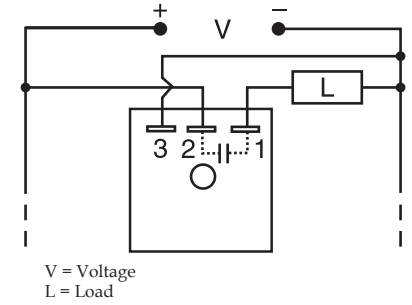
**FIGURE 2 - FS100 Series**



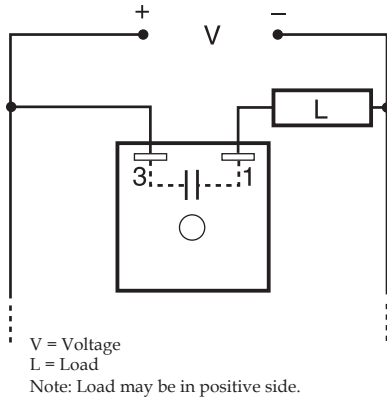
**FIGURE 3 - FS100 Series**



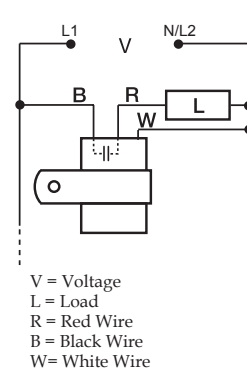
**FIGURE 4 - FS200 Series**



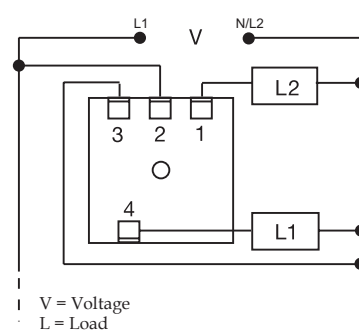
**FIGURE 5 - FS300 Series**



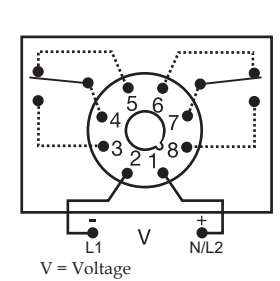
**FIGURE 6 - FS400 Series**



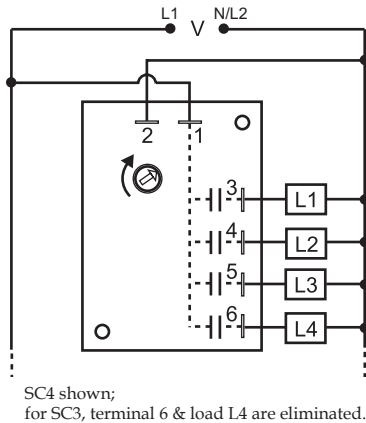
**FIGURE 7 - AF Series**



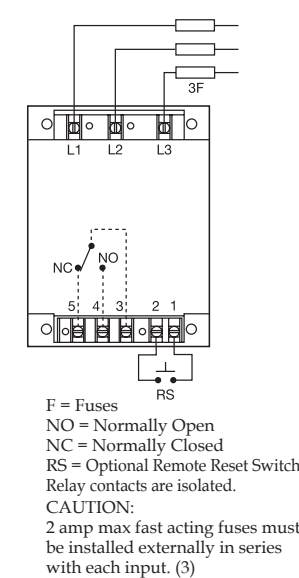
**FIGURE 8 - FS500 Series**



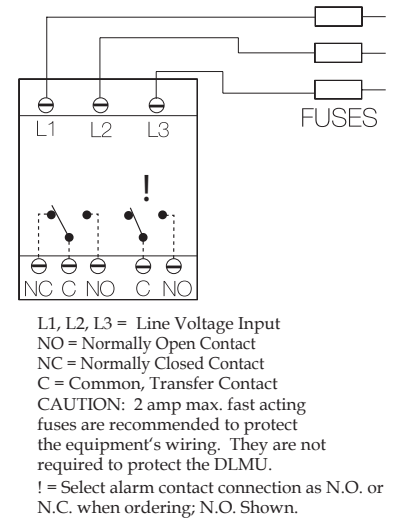
**FIGURE 9 - SC3/SC4 Series**



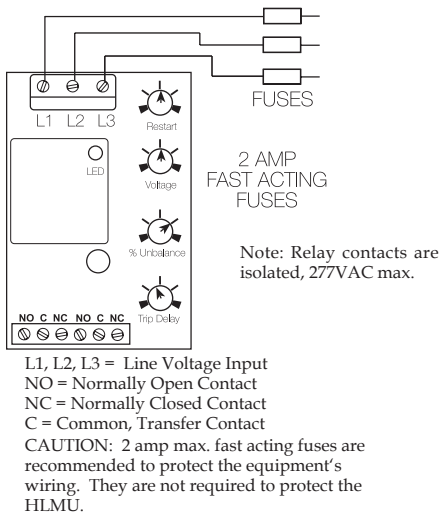
**FIGURE 10 - WVM Series**



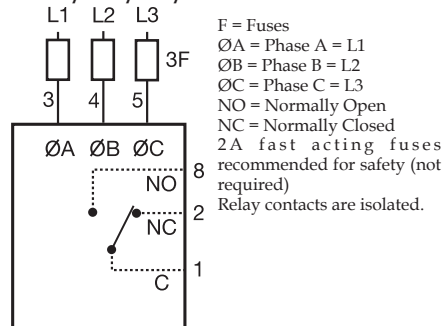
**FIGURE 11 - DLMU Series**



**FIGURE 12 - HLMU Series**



**FIGURE 13 - PLMU/PLM/PLR/PLS Series**



**FIGURE 14 - TVM/TVW Series**

