The ECSW Series of single-phase, AC window, current sensors includes adjustable overcurrent and undercurrent trip points. Detects locked rotor, jam, loss of load, an open heater or lamp load, a broken belt, or loss of suction. LED's aid in trip point adjustment and provide fault indication. The built-in toroidal sensor eliminates the need for an external current transformer. The output can be electrically latched after a fault, or automatically reset. Remote resetting of a latched output by removing input voltage. The unit includes switch selectable zero current detection and normally de-energized or energized output operation. Time delays are included to improve operation and eliminate nuisance tripping.

For more information see:
Appendix B, page 166, Figure 20 for dimensional drawing.
Appendix C, page 169, Figure 18 for connection diagram.

Features:

- Overcurrent & undercurrent (window current) sensing
- Adjustable overcurrent & undercurrent trip points
- Current sensor is included
- Isolated, 10A, SPDT output contacts
- LED indicators

Approvals:

Available Models:

ECSW3LABT
ECSW4HBHT
ECSW4LABT
ECSW4LBHT
ECSW4MBHT

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

Operation

When the input voltage is applied, sensing delay on startup begins and the output transfers (if normally energized is selected). Upon completion of the startup delay, sensing of the monitored current begins. As long as current is above undercurrent trip point and below the overcurrent trip point (inside the window), the output relay remains in its normal operating condition and both red LED's are OFF. The green LED glows when the output is energized. If current varies outside the window, the associated red LED glows, and the trip delay begins. If the current remains outside the window for the full trip delay, the relay transfers to fault condition state. If the current returns to normal levels (inside the window) during the trip delay, the red LED goes OFF, the trip delay is reset, and the output remains in the normal condition.
Reset: Remove input voltage or open latch switch. If zero current detection is selected, the unit will reset as soon as zero current is detected.
Operation With Zero Current Detection Enabled: If the current decreases to zero within the trip delay period, then zero current is viewed as an acceptable current level. The unit's output remains in its normal operating state. This allows the monitored load to cycle ON and OFF without nuisance tripping the ECSW. Zero current is defined as current flow of less than 250 milliamp-turns. Note: When zero current detect is selected, the latching operation of switch SW2 is canceled; the output will not latch after a fault trip.

Notes on Operation:

1) There is no hysteresis on the trip points. The overcurrent and undercurrent trip points should be adjusted to provide adequate protection against short cycling.
2) If the upper setpoint is set below the lower setpoint, both red LED's will glow indicating a setting error.
3) If zero current detection is selected (SW2 ON), and the system is wired to disconnect the monitored load, the system may short cycle. After the unit trips, the load de-energizes, and zero current is detected. The ECSW resets, and the load energizes again immediately and may be short cycled.
4) The sensing delay on start up only occurs when input voltage is applied. When zero current detection is selected, the trip delay must be longer than the duration of the inrush current or the unit will trip on the inrush current.

Typical Pump or Fan Protection Circuit Operation

Window Current Sensing: With the ECSW connected as shown in the diagram, a load may be monitored and controlled for over and undercurrent. The ECSW Series' on board CT (CS) may be placed on the line or load side of the contactor. The ECSW selection switches are set for zero current sensing (see Selector Switch SW2) and the output selection is normally de-energized (see Selector Switch SW3). The input voltage (V) is applied to the ECSW continually. As the control switch (FSW) is closed, the input voltage (V) is applied to the motor contactor coil (MCC), and the motor (M) energizes. As long as the current remains below the overcurrent and above the undercurrent trip points, the ECSW's output contacts remain de-energized. If the load current should rise above or fall below a trip point, for the full trip delay, the normally open (NO) contact will close, energizing the control relay (CR) coil. The CR normally closed contact (CR1) opens and the MCC de-energizes and CR latches on through its normally open contacts (CR2). Reset is accomplished by momentarily opening the normally closed reset switch (RSW). Note: If the current falls to zero within the trip delay, the ECSW remains de-energized. The sensing delay on startup occurs when input voltage is applied therefore trip delay must be longer than the duration of the motor's inrush current. The external latching relay CR2 is required in this system to prevent rapid cycling. A timer can be added to provide an automatic reset.

Order Table:

ECSW **X**

Input
- **1** - 12VDC
- **2** - 24VAC
- **3** - 24VDC
- **4** - 120VAC
- **6** - 230VAC

X

Trip Point
- **L** - 0.5-5A adjustable
- **M** - 2-20A adjustable
- **H** - 5-50A adjustable

X

Trip Delay
- **F** - Specify: **0.1-50**s factory fixed*
- **A** - 0.150-7s adjustable
- **B** - 0.5-50s adjustable

*If fixed delay is selected, insert delay (**0.1-50**) in seconds. 0.1-1.9s in 0.1s increments; 2-50s in 1s increments.

X

Sensing Delay on Start up
- **B** - 0.1s
- **C** - 1s
- **D** - 2s
- **E** - 3s
- **F** - 4s
- **G** - 5s
- **H** - 6s

X

Connection
- **T** - Terminal Blocks

Selector Switch

ON ↔ OFF

SW1		Not Used
SW2		Latched
SW3		Zero I
		Output - Normally Energized

Mode Selection Switches
SW1 = Latched or Auto reset selector
OFF - Automatic reset after a fault
ON - Output relay latches after a fault trips the unit
SW2 = Zero current detection (below 250 mA)
OFF- Zero current detection disabled
ON- Zero current detection enabled
SW3 = Output during normal operation
OFF- Output relay de-energized
ON - Output relay energized

Specifications

Sensor

Type	Toroid, through hole wiring for up to #4 AWG (21.1 mm²) THHN wire
Mode	Over & undercurrent trip points (window current sensing)
Trip Point Range	0.5 - 50A in 3 adjustable ranges
Tolerance	Guaranteed range
Maximum Allowable Current	Steady - 50A turns; Inrush - 300A turns for 10s
Time Point vs Temp. & Voltage	±5%
Response Time	≤ 75ms
Frequency	45/500 Hz
Type of Detection	Peak detection
Zero Current Detection	< 250mA turns typical

Time Delay

Range	0.15 - 50s in 2 adjustable ranges or 0.1 - 50s fixed
Tolerance	Adjustable: guaranteed range; Fixed: ±10%
Sensing Delay On Start Up	Fixed □ 0.1 - 6s in 1s increments
Tolerance	+40% -0%
Delay vs. Temperature & Voltage	±15%

Input

Voltage	24, 120, or 230VAC; 12 or 24VDC
Tolerance 12VDC & 24VDC/AC	-15% - 20%
120 & 230VAC	-20% - 10%
AC Line Frequency	50/60 Hz

Output

Type	Electromechanical relay
Mode: Switch selectable after a fault	ON - Energized during normal operation, de-energized
	OFF - De-energized during normal operation, energizes during a fault
Form	Isolated, SPDT
Rating	10A resistive @ 240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC
Life	Mechanical - 1 x 10^6; Electrical - 1 x 10^5
Latch Type	Electrical
Reset	Remove input voltage
Function	Switch selectable latching function

Protection

Surge	IEEE C62.41-1991 Level A
Circuitry	Encapsulated
Isolation Voltage	≥ 2500V RMS input to output
Insulation Resistance	≥ 100 MΩ

Mechanical

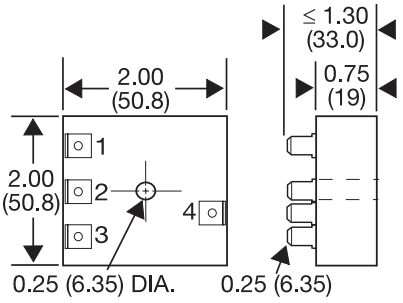
Mounting	Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions	3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)
Termination	0.197 in. (5 mm) terminal blocks for up to #12 (3.2 mm²) AWG wire

Environmental

Operating / Storage Temperature	-40° to 60° C/-40° to 85° C
Humidity	95% relative, non-condensing
Weight	≅ 6.4 oz (181 g)

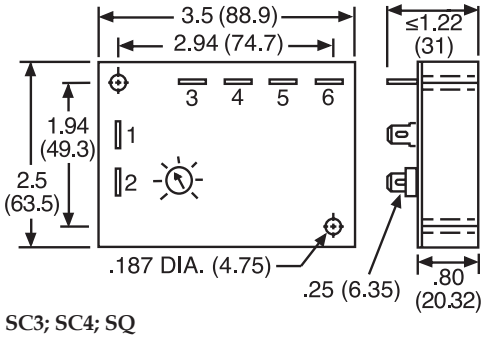
Appendix B - Dimensional Drawings

FIGURE 13



AF

FIGURE 14



SC3; SC4; SQ

FIGURE 15

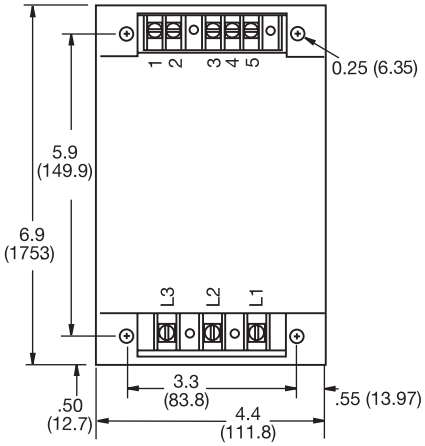
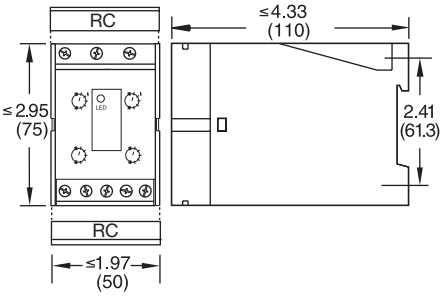
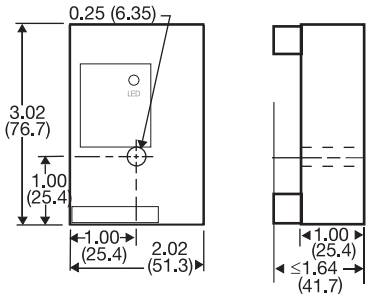


FIGURE 16

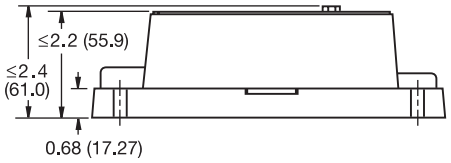


DLMU

FIGURE 17

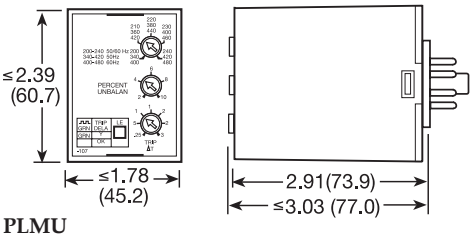


FB9L; HLMU; SCR9L



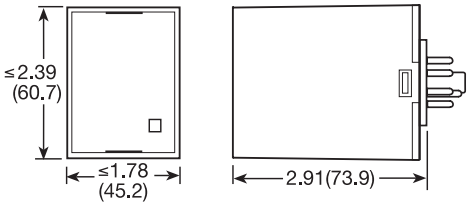
WVM

FIGURE 18



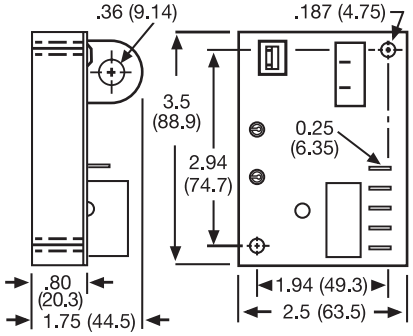
PLMU

FIGURE 19



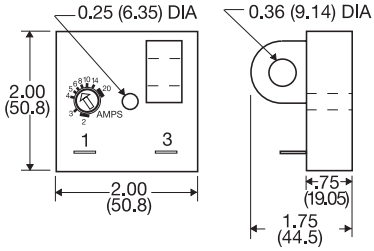
LLC4; LLC6; PLS

FIGURE 20



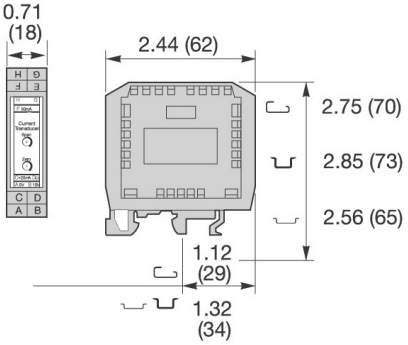
ECS; ECSW (ECS has spade connectors and ECSW has terminal board)

FIGURE 21



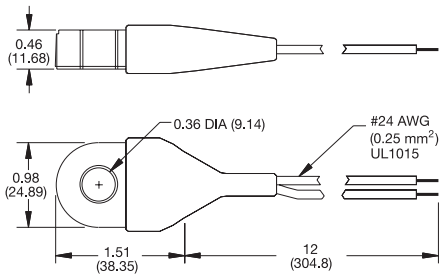
TCS; TCSA

FIGURE 22



DCSA

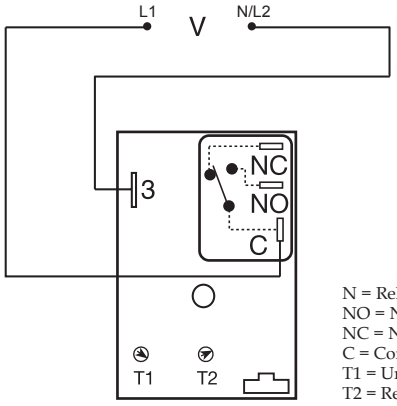
FIGURE 23

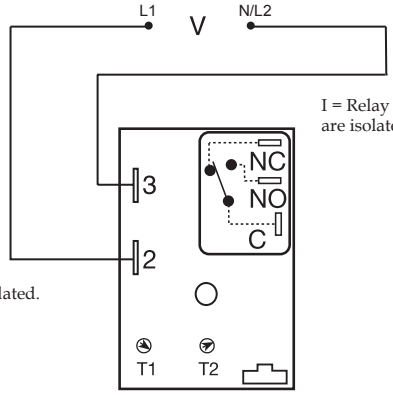


LCS

inches (millimeters)

FIGURE 15 - HLV Series

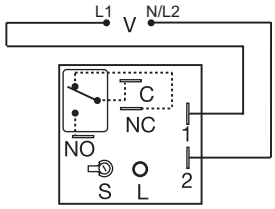




I = Relay contacts are isolated.

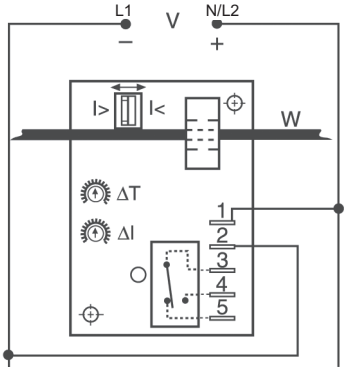
N = Relay contacts are non-isolated.
NO = Normally Open
NC = Normally Closed
C = Common
T1 = Undervoltage Trip Point
T2 = Restart Delay

FIGURE 16 - KVM Series



V = Voltage
L = LED
S = Undervoltage Setpoint
NO = Normally Open
NC = Normally Closed
C = Common, Transfer Contact

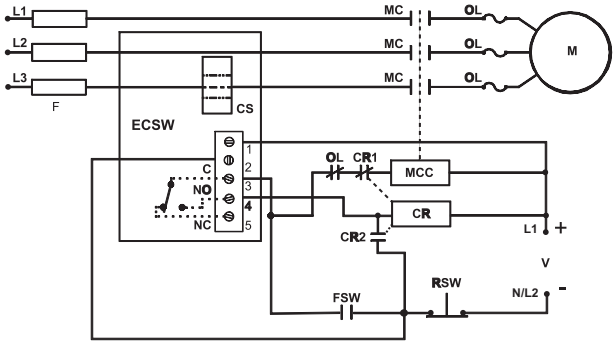
FIGURE 17 - ECS Series



V = Voltage
I> = Overcurrent
I< = Undercurrent

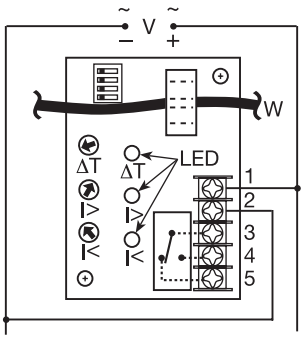
W = Insulated Wire
Carrying Monitored Current
Relay contacts are isolated.

FIGURE 18 - ECSW Series



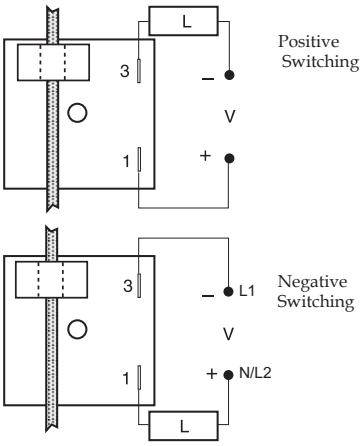
MC = Motor Contactor
M = Motor
F = Fuses
OL = Overload
RSW = Reset Switch

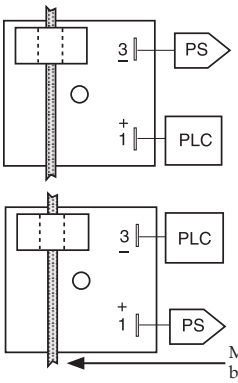
FSW = Fan or Float Contacts
CR = Control Relay
CS = Current Sensor
MCC = Motor Contactor Coil



V = Voltage
I> = Adjustable Overcurrent
I< = Adjustable Undercurrent
W = Monitored Wire
ΔT - Adjustable Trip Delay

FIGURE 19 - TCS Series

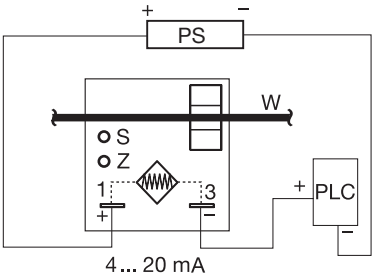




L = Load
V = Voltage
PS = Power Supply
PLC = PLC Digital Input Module

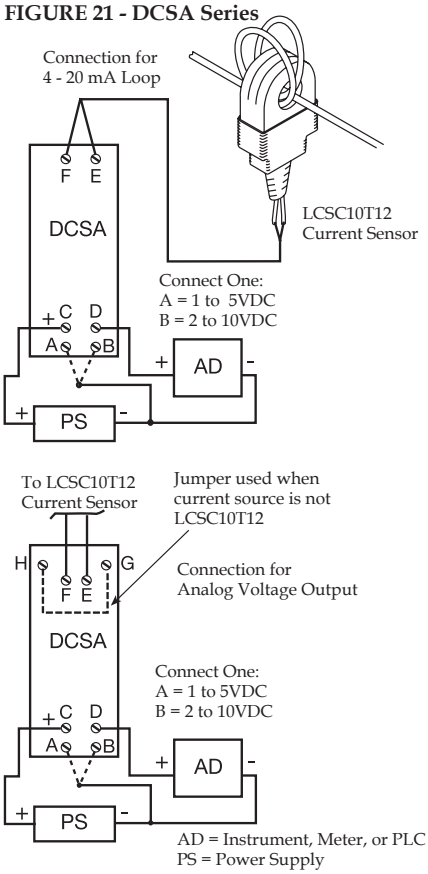
Monitored AC conductor must be insulated.

FIGURE 20 - TCSA Series



PS = Power Supply
Z = Zero Adjust
S = Span Adjust
W = Insulated Wire Carrying Monitored Current
PLC = PLC Analog Input or Meter Input

FIGURE 21 - DCSA Series



AD = Instrument, Meter, or PLC Input
PS = Power Supply