

DIN-a-mite[®] Style C

Solid State Power Control

User's Manual



CE 96



DIN-a-mite Solid State Power Control

The Watlow DIN-a-mite power control includes single-phase, three-phase, two-leg, and three-phase, three-leg, 120 - 600V~ (ac) operation. Current switching capabilities range from 30 to 65A, depending on model ordered. See output rating curves.

Variable time base, 4-20mA process control or V~ (ac)/V= (dc) input contactor versions are available. All configurations are model number-dependent and factory-selectable.

The DIN-a-mite power control is designed and manufactured by Watlow in Winona, Minnesota.



Watlow Controls, 1241 Bundy Blvd., P.O. Box 5580, Winona, MN 55987-5580
Phone: 507-454-5300, Fax: 507-452-4507

WDIN-CUMN Rev A07 (1157)
Supersedes WDIN-CUMN Rev A06
August, 1997



Made in the U.S.A.
Printed on Recycled Paper
10% Postconsumer Waste

General Specifications — (1158)

Operator Interface

- Command signal input
- Input signal indication LED
- Alarm output indication

Amperage Rating

- See output rating curves on page 3 for all natural convection, fan cooled, and thru-wall mount models. Ratings are into a resistive heater load.
- Max. surge current for 16.6mSec. 1,000 amp peak
- Max. I^2t for fusing 4,150 A² Sec.
- Fan current: 0.12A for 120V~ (ac); 0.06A for 240V~ (ac)

Shorted Output Alarm Option

- Triac output 24/240V~ (ac) 300mA @ 25°C, 125mA @ 80°C
- Energizes on alarm
- Holding current: 200 μ A max.
- Latching current 5mA typical

Dimensions

- See pages 5-7
- Weight: 3.2 lbs., 4.0 lbs. (includes fan)

Agency Approvals

- UL 50 Type 4X Enclosure & UL 1604 File #E184390
- UL 508 Listed and C-UL, File #E73741
- VDE 0160, License # 91623
- U.S. Patent No. 5,598,322

Terminals

- Compression - will accept #6-14 AWG wire
- Torque to 35 inch lbs.

Operating Environment

- Up to 80°C. See output rating curves for your application.
- 0 to 90% RH, non-condensing
- Contactor V \rightleftharpoons (dc) / V~ (ac) type input cycle time should be less than 3 seconds
- Insulation only tested to 3,000 meters
- Units are suitable for "Pollution degree 2"

Mounting

- Options include DIN rail or standard back panel mounting
- The DIN rail specification is:
DIN EN 50022, 35mm x 7.5mm
- Minimum clipping distance: 1.37" (34.8mm)
- Maximum clipping distance: 1.39" (35.3mm)
- See page 7 for thru-wall cutout
- Mount with cooling fins vertical

Accessory

- 54-0259: MDR to DIN Rail Adapter Plate

Frequency

- 50/60 Hz independent

Additional Specifications for Output Control Types "C" and "V"

Control Mode-Zero Cross

- V~ (ac) input contactor
- V \rightleftharpoons (dc) input contactor
- 4-20mA variable time base control

Input Command Signal

- 24, 120, 240V~ (ac) @ 13mA max.
- 4.5 - 32 V \rightleftharpoons (dc): max. current @ 4.5V \rightleftharpoons (dc) is 8.5mA per leg plus 1.2mA LED current
- 4-20mA (\rightleftharpoons dc): 375 ohms input impedance, loop powered. Output control Type 'V' option only.

Output Voltage

- 120-240V~ (ac) unit: 48V~ (ac) min. to 280V~ (ac) max.
- 277-600V~ (ac) unit: 80V~ (ac) min. to 660V~ (ac) max.
- Off-state leakage 1mA at 25°C max.

Additional Specifications for Output Control Types "S", "P" and "L"

Operation

- Burst firing (zero cross) control, single cycle variable time base, type "S" single and three phase
- Phase angle control, type "P" single phase only
- Phase angle control with current limit, type "L" single phase only

Input Command Signal

- 4-20mA, 0-5V \rightleftharpoons (dc), 1-5V \rightleftharpoons (dc), and 0-10V \rightleftharpoons (dc)
- Input impedance 250 Ω for 4-20mA, 5K Ω for linear voltage input
- Process input factory set by model number

Output Voltage

- 120, 208, 240, 277, 400, and 480V~ (ac)
- 1, 2, or 3 pole for type "S" burst fire only
- 1 pole only for phase angle type "P" and "L"

Line Voltage Compensation

- 10% Δ in line, 5% max. Δ in load in the 30% to 70% region (control type "P" and "L" only)

Isolation

- Command signal to load 4000V~ (ac) minimum

Linearity (Control type "S")

- Better than \pm 5% input to output power over 0 to 100% of span

Linearity (Phase Angle Control type "P" and "L")

- \pm 5% input to output power reference sinusoidal power curve

Soft Start

(Phase Angle Control type "P" and "L")

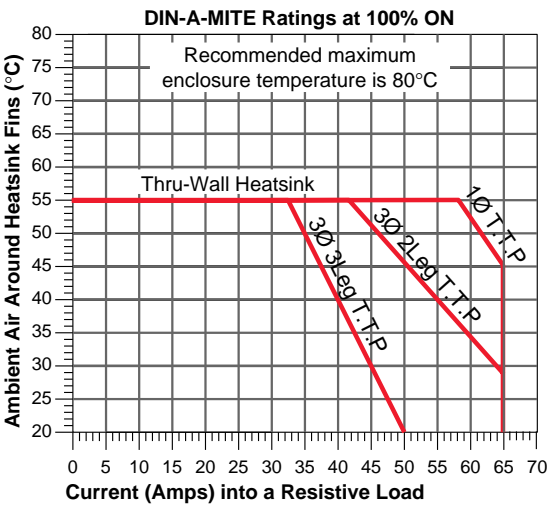
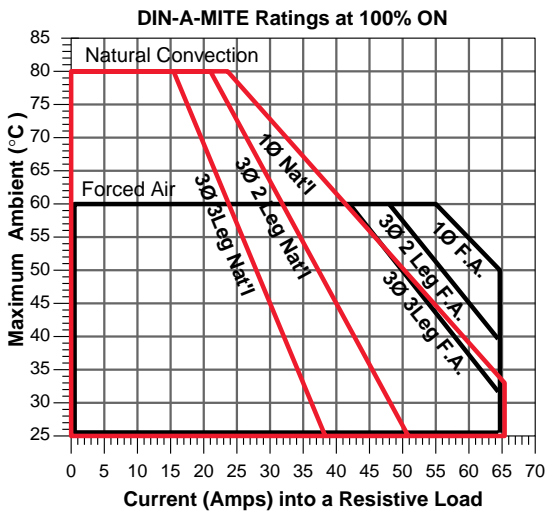
Typically:

- 5 seconds on power up
- 1 second on set point change
- Soft start on thermostat overtemperature
- 1/2 cycle drop out detection restarts soft approximately 5 seconds

Options

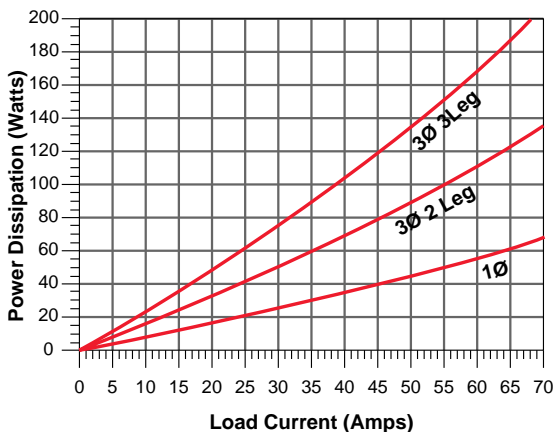
- Manual Control Kit (1K Ω potentiometer) #08-5362
- Shorted SCR alarm option is **not** available on phase angle type "P" or "L"

Output Rating Curves



Power Dissipation

Use this line graph to determine the heat that one DIN-a-mite will contribute to the enclosure.



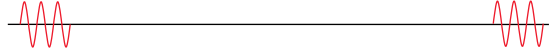
NOTE: Seventy percent of the above heat will be outside the enclosure on the thru-wall model.

Extended Heater And SCR Life With Variable Time Base

With variable time base control, the power control automatically adjusts the time base and output power with respect to process input. Accelerated life testing verified that variable time base control significantly reduces expansion and contraction of the heater element. This extends heater and SCR life while improving process temperature control. You save money on heaters, downtime and maintenance.

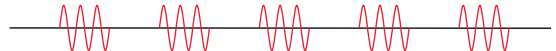
Models: DCXV-XXXX-XXXX

20% Power



3AC cycles on, 12AC cycles off

50% Power



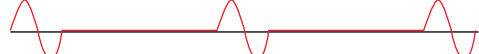
3AC cycles on, 3AC cycles off

Single Cycle Variable Time Base

Models: DCXS-XXXX-FOXX V1 V2 V3

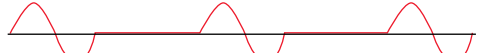


25% Power



1 AC Line Cycle On, 3 Cycles Off

50% Power

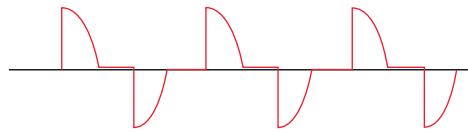


1 AC Line Cycle On, 1 Cycle Off

Variable Time Base (control type "S") single cycle variable. At 50% power, it is on one cycle, and off one cycle. At 25% it is on for one cycle and off for three. Under 50% the unit is not on for more than one consecutive cycle. Over 50% the unit is not off for more than one consecutive cycle. This model will work with a linear voltage input, a 4-20mA input or a potentiometer input.

Phase Angle

Models: DC1P-XXXX-FOXX V1 V2 V3



Phase Angle (control type "P") Phase control is infinitely variable inside the sine wave. This provides a variable voltage and/or current output. This option includes soft start and line voltage compensation. This model will work with a linear voltage input, a 4-20mA input or a potentiometer input. This is single phase only.

NOTE: The P & S Output Control Type options are only available with input options F0, V1-V3. You must select the exact operating and output voltage when selecting either of these output control types and input options.



WARNING:

If input signal on "S" is opened it will have a 6% output to the load

DIN-a-mite C Ordering Information– (1158)

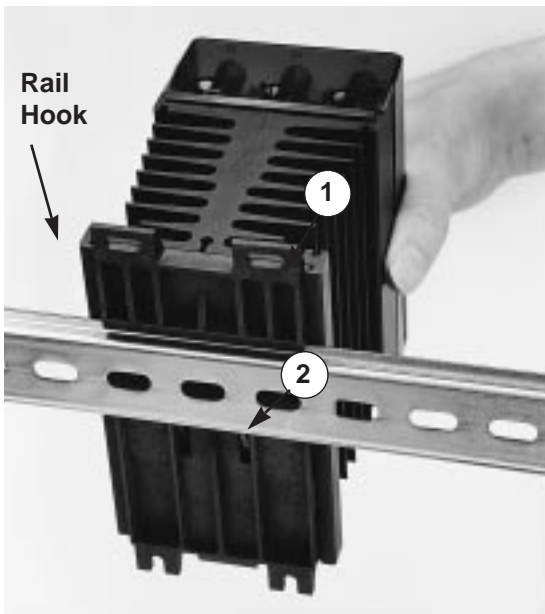
To order, complete the code number on the right with the information below:

	D C								
Phase									
1 = 1-phase									
2 = 3-phase, 2 leg									
3 = 3-phase, 3 leg									
Output Control Type									
C = Burst fire contactor									
V = Burst fire variable time base—loop powered (Input type F0 only.)									
S = Burst fire single cycle variable time base (Input type F0, V1, V2 or V3 only.)									
P ¹ = Phase angle (Phase option 1 only.)									
Alarm 0 only. Input type F0, V1, V2, V3 only.)									
L ¹ = Phase angle with Current Limit (Phase option 1 only.)									
Alarm 0 only. Input type F0, V1, V2, V3 only.)									
Output Amperage									
DIN Rail/Sub-panel Mount									
30 = 30 Amp (Phase option 3 only.)									
40 = 40 Amp (Phase option 2 only.)									
50 = 50 Amp (Phase option 1 or 3 only. Must select Cooling option 1 or 2 with Phase option 3.)									
56 = 56 Amp (Phase option 2 only. Must select Cooling option 1 or 2.)									
65 = 65 Amp (Phase option 1 only. Must select Cooling option 1 or 2.)									
Thru Wall Heatsink Mounting									
35 = 35 Amp (Phase option 3 only. Must select Cooling option T.)									
45 = 45 Amp (Phase option 2 only. Must select Cooling option T.)									
60 = 60 Amp (Phase option 1 only. Must select Cooling option T.)									
Operating & Output Voltage									
12 = 120V~ (ac) (Output Control Type S, P or L only.)									
20 = 208V~ (ac) (Output Control Type S, P or L only.)									
24 = 240V~ (ac) (Output Control Type S, P or L only.)									
27 = 277V~ (ac) (Output Control Type S, P or L only.)									
40 = 400V~ (ac) (Output Control Type S, P or L only.)									
48 = 480V~ (ac) (Output Control Type S, P or L only.)									
24 = 120 to 240V~ (ac) (Output Control Type C or V only.)									
60 = 277 to 600V~ (ac) (Output Control Type C or V only.)									
Input Type									
C0 = V [≡] (dc) burst fired contactor (Output Control Type C only.)									
C2 = Two independent input V [≡] (dc) burst fired contactors (2 leg models only.)									
Alarm 0 only. Output Control Type C only.)									
C3 = Three independent input V [≡] (dc) burst fired contactors (3 leg models only.)									
Alarm 0 only. Output Control Type C only.)									
F0 = 4-20 mA (DC input) (Output Control Type V, S, P and L only.)									
K1 = 24V~ (ac) contactor (Output Control Type C only.)									
K2 = 120V~ (ac) contactor (Output Control Type C only.)									
K3 = 240V~ (ac) contactor (Output Control Type C only.)									
V1 = Linear 0-5V [≡] (dc) and manual control potentiometer input (1kΩ pot not included.)									
(Output Control Type S, P or L only.)									
V2 = Linear 1-5V [≡] (dc) (Output Control Type S, P or L only.)									
V3 = Linear 0-10V [≡] (dc) (Output Control Type S, P or L only.)									
Alarm									
0 = No shorted SCR detector									
S = Shorted SCR detector—includes one current transformer (Not available with Output Control Type P or L, or Input Type C2 or C3. Do not use on 3 leg with ungrounded load.)									
Cooling									
0 = No fan									
1 = 120V~ (ac) fan									
2 = 240V~ (ac) fan									
T = No fan, cabinet thru wall heatsink mounting. (Only available with output amperage 35, 45, 60.)									

Recommended semiconductor fuse for applications through 600V~ (ac):	DIN-a-mite model	Fuse part number		Fuse Holder part number	
		Bussmann	Watlow	Bussmann	Watlow
	30A	FWP-40A14F	17-8040	CH141G	17-5114
	35A-40A	FWP-50A14F	17-8050	CH141G	17-5114
	45A-50A	FWP-63A22F	17-8063	170H0271	17-5122
	56A-65A	FWP-80A22F	17-8080	170H0271	17-5122

¹ Not CE Approved.

Mount



1. Push unit in and down to catch rail hook on top of rail.
2. Rotate bottom of unit in toward rail.
3. Rail clasp will audibly "snap" into place. If the DIN-a-mite does not snap into place, check to see if the rail is bent.
4. Mount cooling fins vertical.

Dismount



4. Press down on release tab while rotating unit up and away from rail.



WARNING:
Installation and service should be performed by qualified personnel only. Failure to follow this guideline could result in damage to equipment, and personal injury or death.



WARNING:
Hot surface, do not touch heat sink. Failure to follow this guideline could result in personal injury.

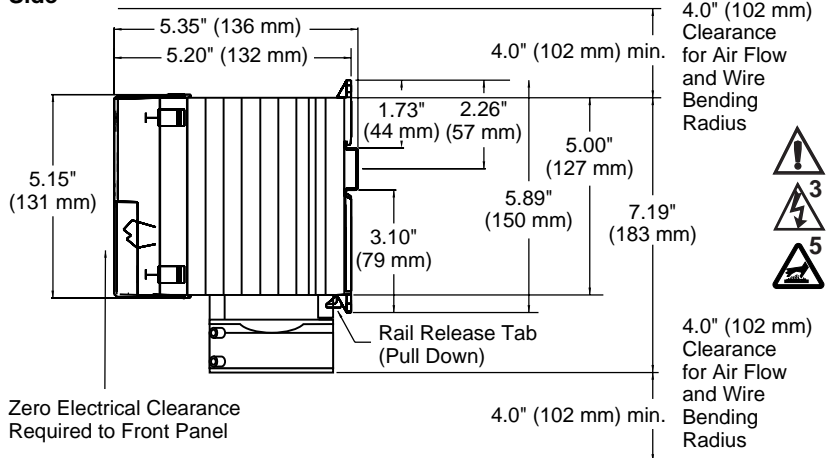


Mount cooling fins vertical.



Unit Dimensions - Fan Cooled

Side



Unit Dimensions - Rail Mounted



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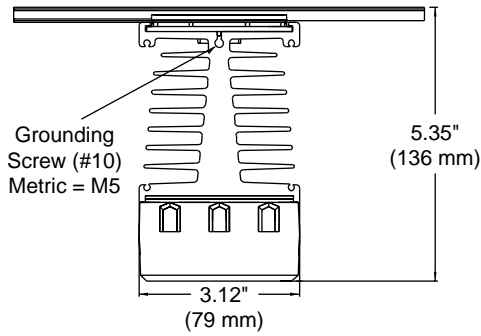
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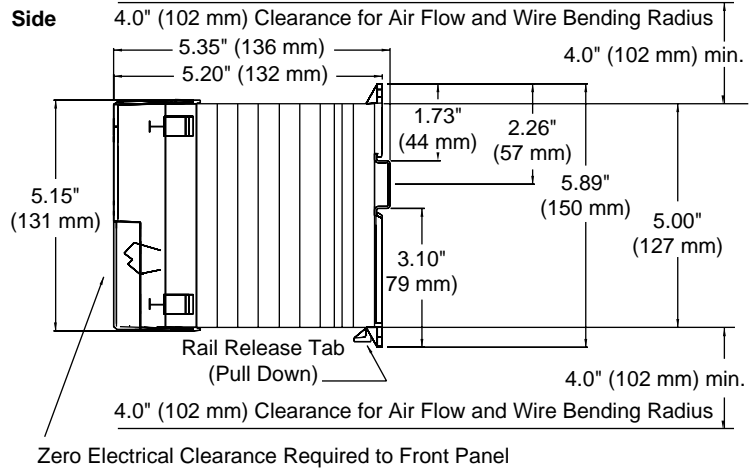
Mount cooling fins vertical.



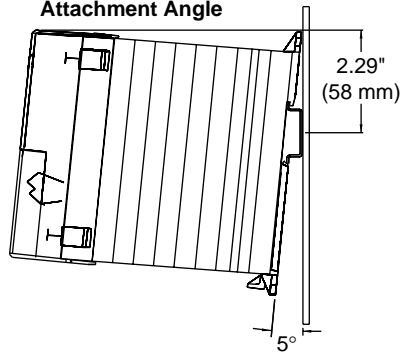
Top



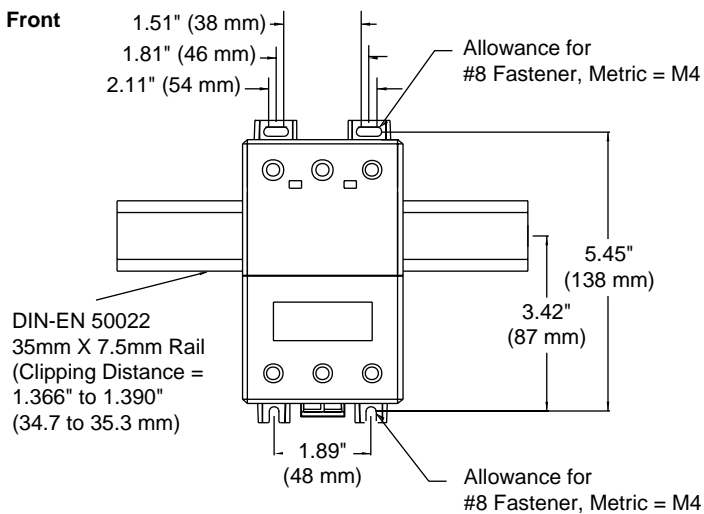
Side



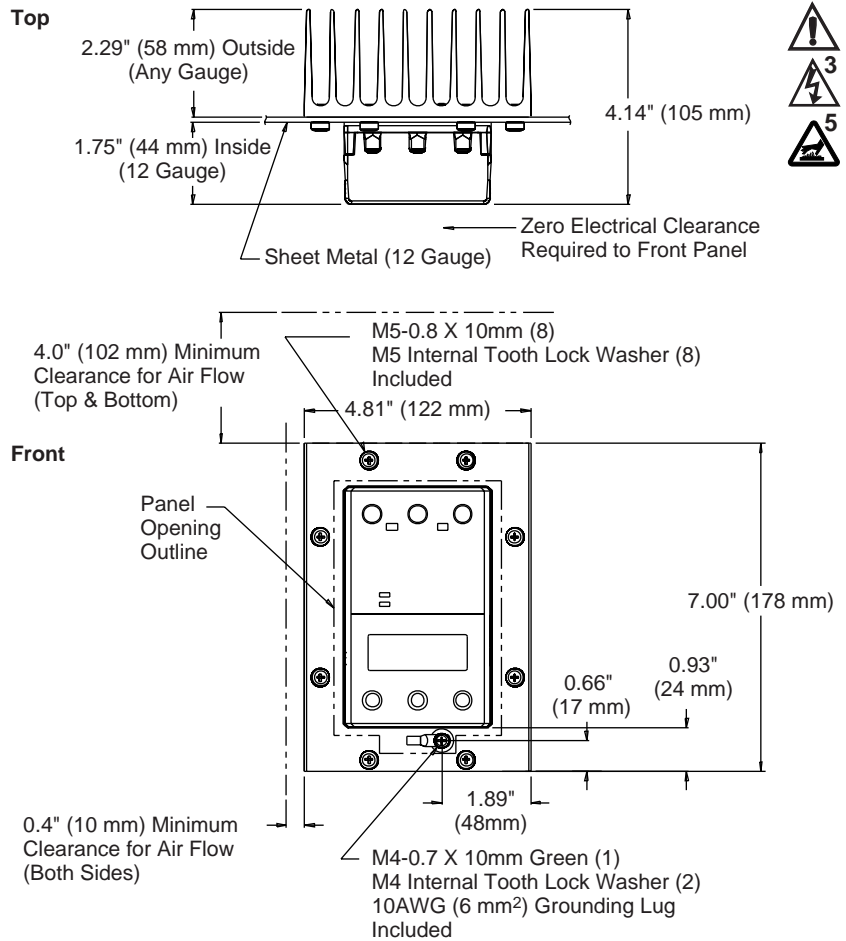
Attachment Angle



Front



Unit Dimensions - Thru-Wall (Cabinet Panel)



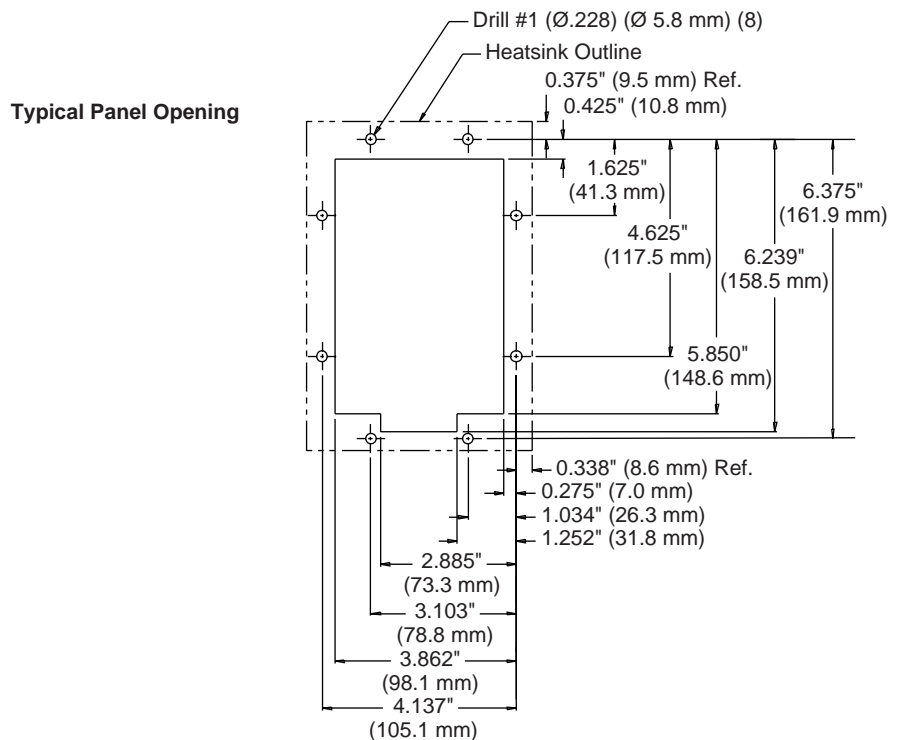
Mounting

Mounting procedure for UL 50 Type 4X Enclosure & UL 1604 Thru-wall mount models

Materials included:

- (1) Silicone gasket
- (8) #M5 Screws and Lockwashers
- (1) DIN-a-mite C Thru-wall

1. Drill and cut panel per the dimensioned drawing at right.
2. Remove mounting screws from heatsink.
3. Peel off protective film from the silicone gasket. Stick the gasket to the heatsink so the gasket holes line up with the screw holes in the heatsink.
4. Mount heatsink vertically. Torque to 20-25 inch lbs.





WARNING:
Wiring must conform to National Electric Code (NEC) safety standards, as well as locally applicable codes. Failure to do so could result in personal injury or death.



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WARNING:
All signal and alarm wires must be tied together beneath the cover. Failure to follow this guideline could result in personal injury or death.

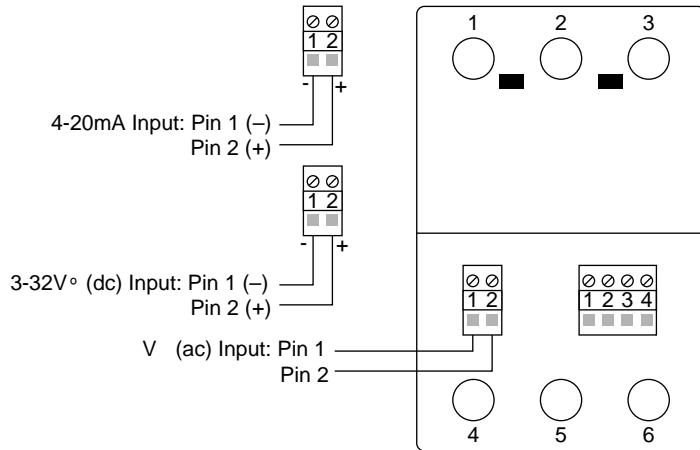


WARNING:
If input signal on "S" is opened it will have a 6% output to the load.

NOTE:
Shorted SCR alarm option not available with multizone input option.

Input Wiring

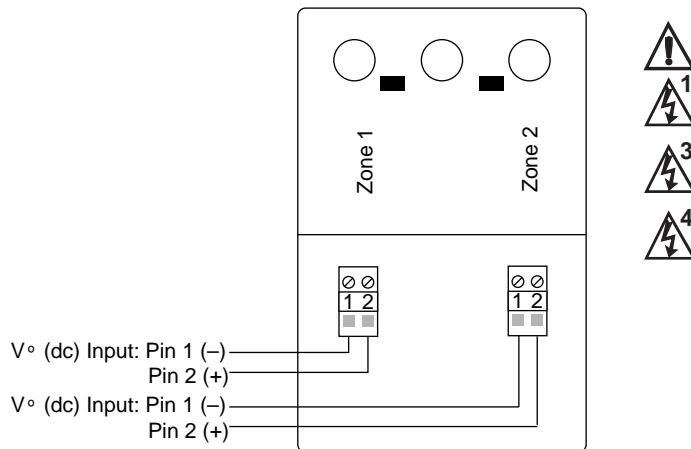
(For models DCXC-XXXX-XXXX and DCXV-XXXX-XXXX)



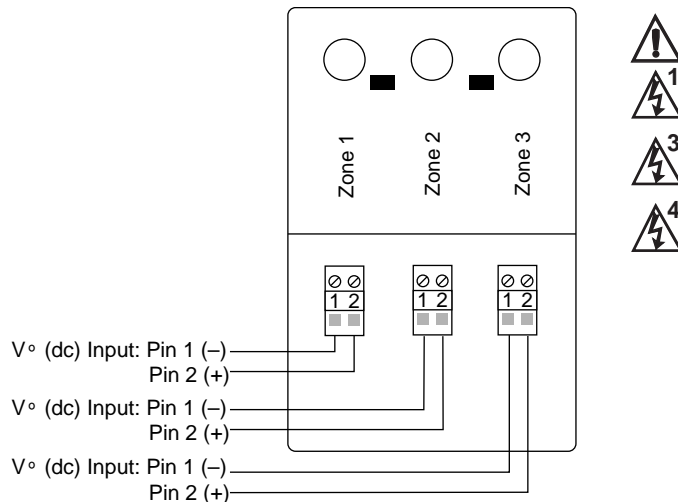
Multizone Input Wiring

(For models DC2C-XXXX-C20X and DC3C-XXXX-C30X)

2-zone



3-zone



Input Wiring

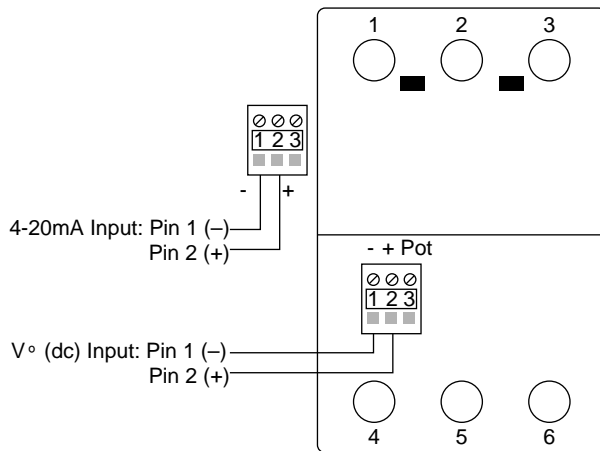
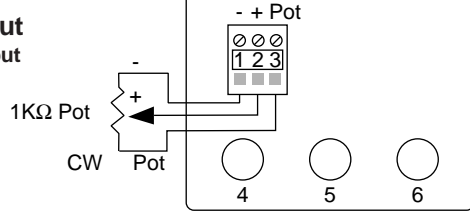


NOTE:
Potentiometer is customer supplied.
For potentiometer only, order Watlow part number 08-5362.

(For models DC1P-XXXX-XXXX and DCXS-XXXX-XXXX)

4-20mA and Linear Voltage Input
For input options F0, V1, V2 and V3

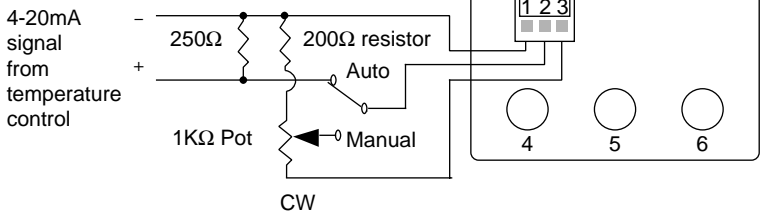
1K Ω Potentiometer Input
Use with V1 (0 - 5V \Rightarrow [dc]) Input



Auto/Manual Input application

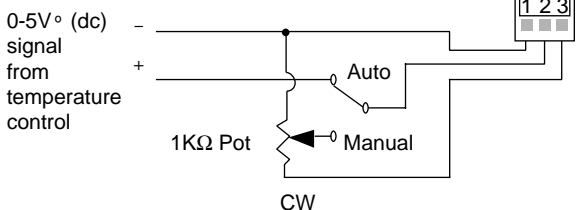
(For models DC1P-XXXX-XXXX and DCXS-XXXX-XXXX)

If using 4-20mA temperature control output,
order DIN-a-mite control input V2 (1-5V \circ [dc]).



NOTE:
Potentiometer and resistors are customer supplied. For potentiometer only, order Watlow part number 08-5362.

If using 0-5V \circ (dc) temperature control output,
order DIN-a-mite control input V1 (0-5V \circ [dc]).





NOTE:

Adjust potentiometer clockwise to increase current; counterclockwise to decrease current.

NOTE:

The DIN-a-mite is shipped factory calibrated with potentiometer adjusted fully clockwise (no current limiting).



WARNING:

Wiring must conform to National Electric Code (NEC) safety standards, as well as locally applicable codes. Failure to do so could result in personal injury or death.



WARNING:

Wiring examples show L2 in 240V~ (ac) or 480V~ (ac) configuration. In 120V~ (ac) applications, L2 is neutral and must not be fused or switched. Failure to follow this guideline could result in personal injury or death.



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WARNING:

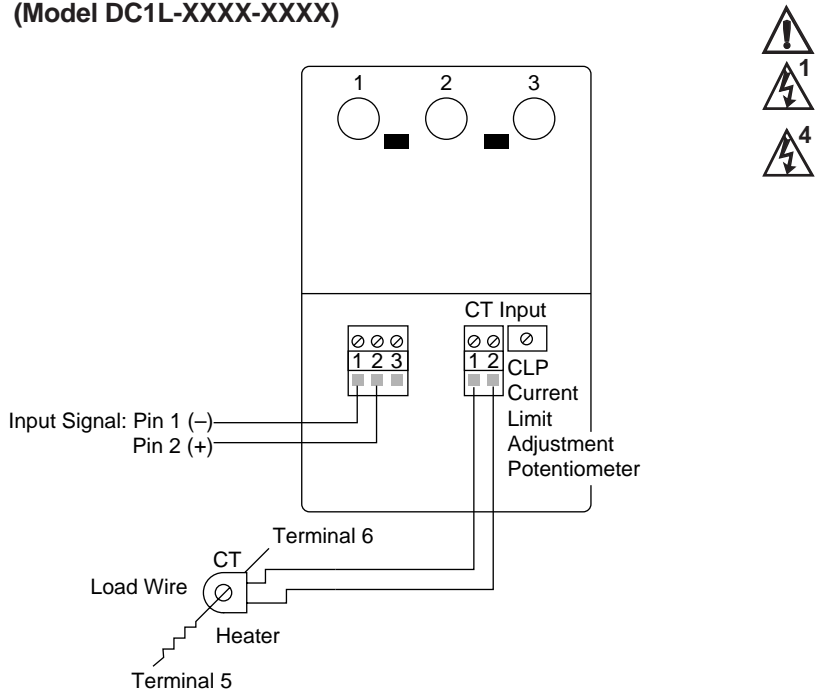
All signal and alarm wires must be tied together beneath the cover. Failure to follow this guideline could result in personal injury or death.

NOTE:

Shorted SCR alarm option not available with phase angle units.

Input Wiring Phase Angle with Current Limit

(Model DC1L-XXXX-XXXX)



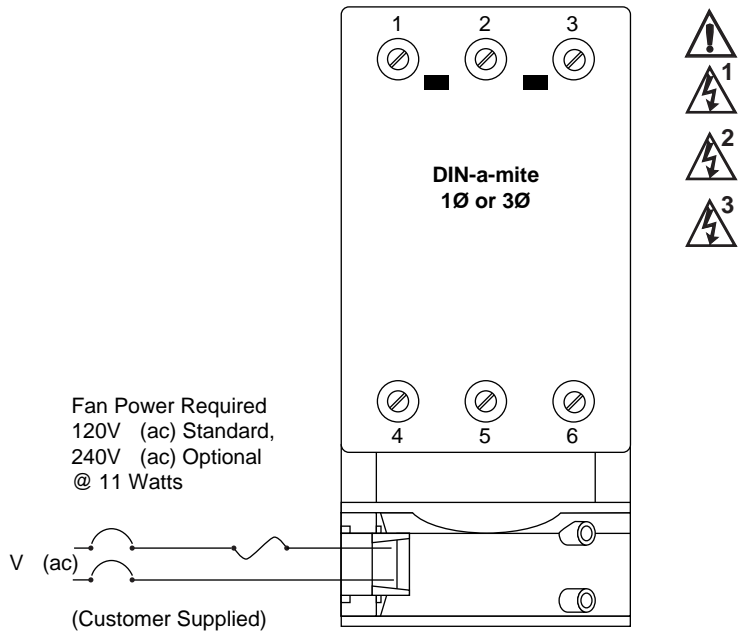
Current Limit Adjustment Procedure

The DC1L model is a phase angle control with the capability to limit the maximum current to the load. A potentiometer on the DIN-a-mite adjusts the current limit setting. Use the following steps to adjust the current limit on initial setup. The purpose of the procedure is to bring the power to the load slowly so that the desired maximum current to the load is not exceeded before the current limit is adjusted.

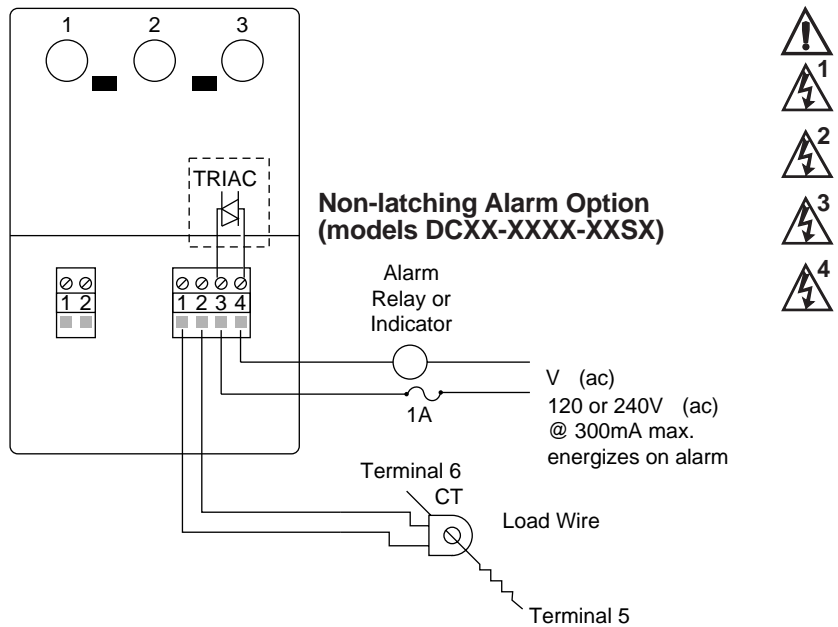
Note: A short overcurrent through the load may occur, as the circuitry detects the high current, if the input signal from the temperature control is abruptly increased.

1. Attach a clamp-on ammeter to the load line.
2. Adjust the current limit potentiometer fully counterclockwise (for minimum current flow).
3. Turn the temperature control ON and adjust the input signal to the DIN-a-mite for zero percent power.
4. Turn the power to the DIN-a-mite ON.
5. Gradually increase the input signal.
6. Adjust the current limit potentiometer clockwise until current to the load is measurable.
7. Gradually increase the input signal to 100% power, then adjust the current limit potentiometer to obtain the desired maximum current to the load.

Fan Cooled



Current Transformer and Alarm



Shorted SCR Alarm Non-latching Operation

The shorted SCR detector compares the input command signal and actual load current. If load current is present without an input signal then the shorted SCR alarm will energize a triac (on board the DIN-a-mite) output. There is about a four second delay before the output switches. This is a non-latching alarm. This output can be used to drive various indication devices, i.e. coil, light, buzzer, etc. See alternative latching circuit, page 14-15.

Load Current

Load Current	Number of Passes of Load Wire Through Current Transformer
5 to 9 Amps	2
10 to 65 Amps	1



WARNING:
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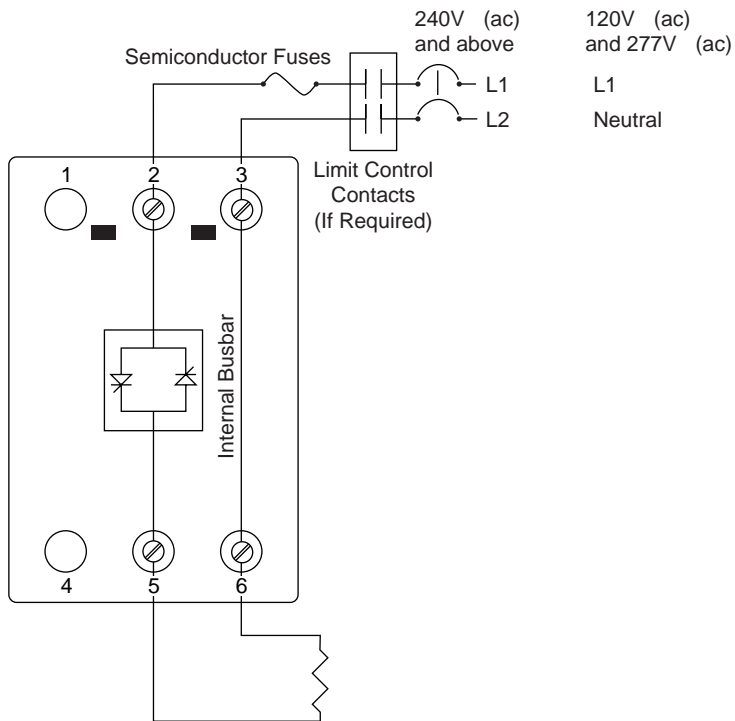


WARNING:
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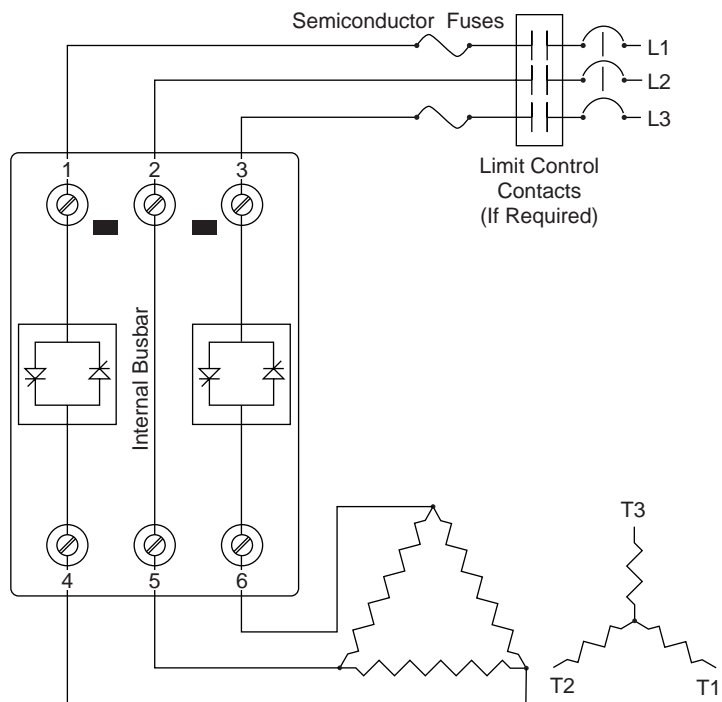


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1Ø Output



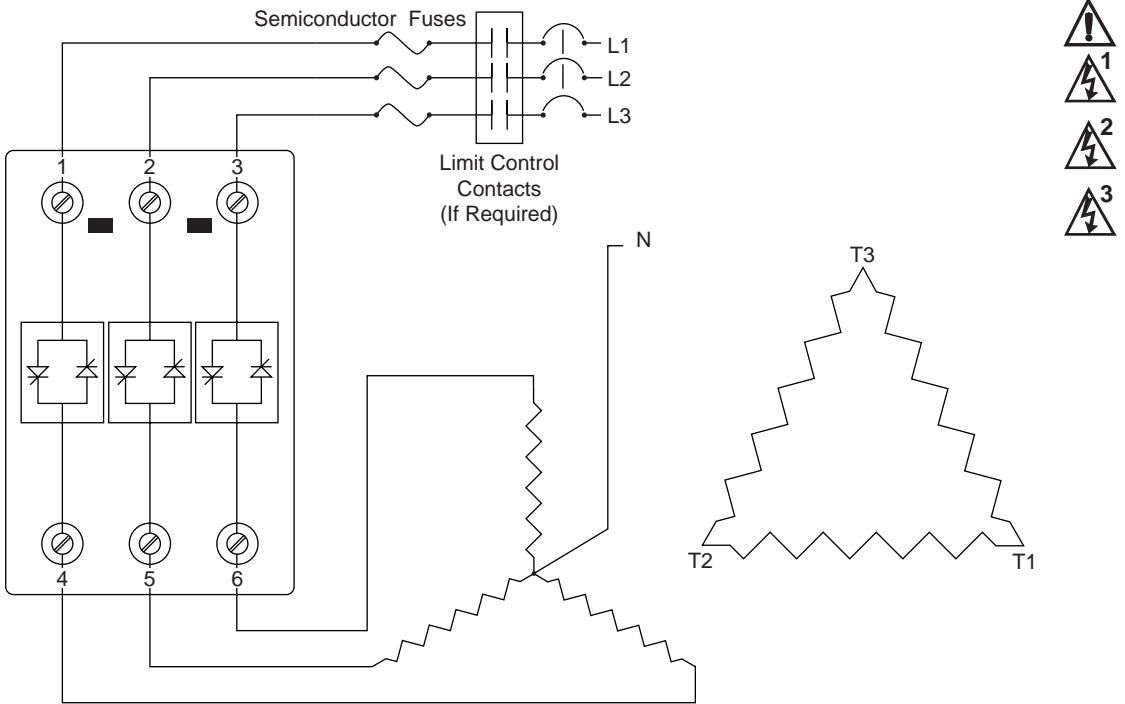
3Ø 2-leg Output



NOTE:

If you notice an imbalance in 3 phase load current on what should be a balanced load, there may be a phase rotation problem. Switch any two incoming power lines to the DIN-a-mite and the current should balance.

3Ø 3-leg, 4-wire Output



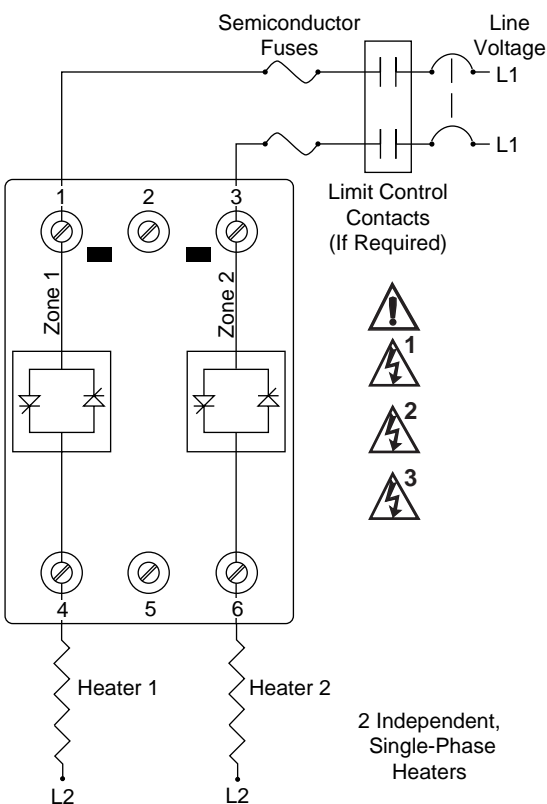
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If you notice an imbalance in 3 phase load current on what should be a balanced load, there may be a phase rotation problem. Switch any two incoming power lines to the DIN-a-mite and the current should balance.

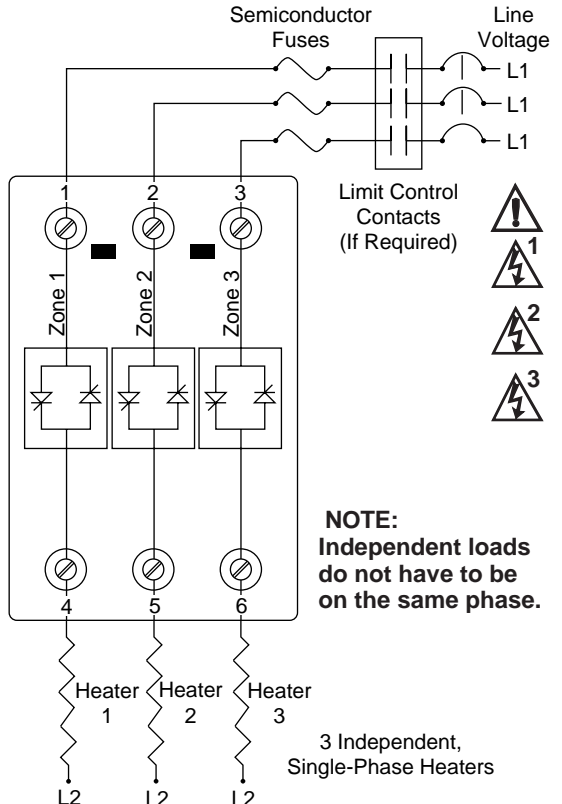
Multizone Output Wiring

For models DC2C-XXXX-C20X and DC3C-XXXX-C30X)

2-zone



3-zone



NOTE:
Independent loads do not have to be on the same phase.



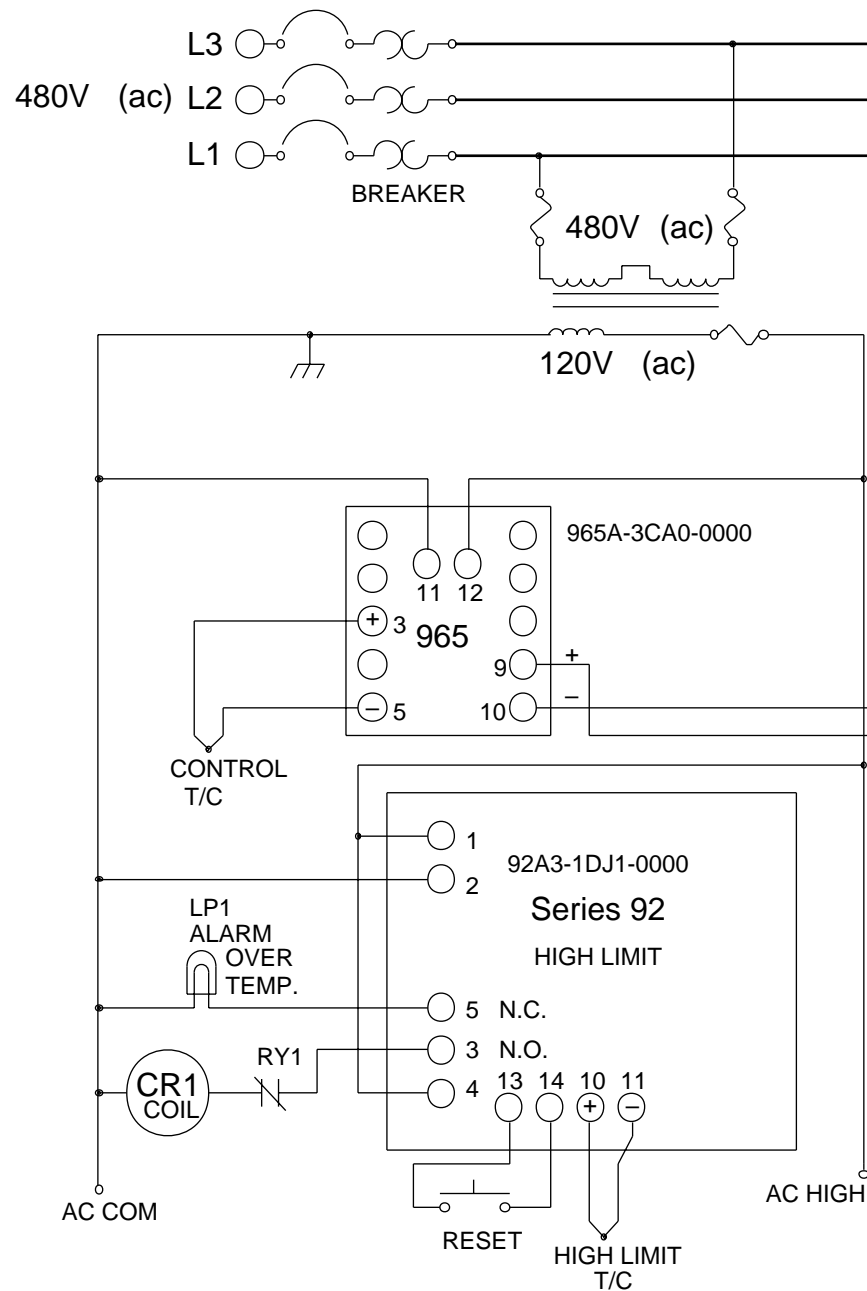
WARNING:
Wiring must conform to National Electric Code (NEC) safety standards, as well as locally applicable codes. Failure to do so could result in personal injury or death.



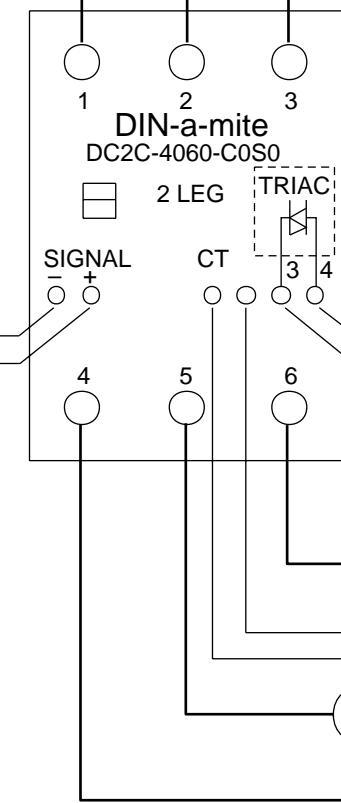
WARNING:
Wiring examples show L2 in 240V~ (ac) or 480V~ (ac) configuration. In 120V~ (ac) applications, L2 is neutral and must not be fused or switched. Failure to follow this guideline could result in personal injury or death.



WARNING:
Installation and service should be performed by qualified personnel only. Failure to follow this guideline could result in damage to equipment, and personal injury or death.



CR1
Semi-conductor Fuses

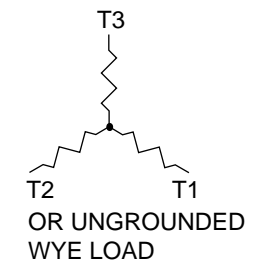


Non-latching Alarm Option (models DCXX-XXXX-XXSX)

Shorted SCR Alarm Non-latching Operation
The shorted SCR detector compares the input command signal and actual load current. If load current is present without an input signal then the shorted SCR alarm will energize a triac (on board the DIN-a-mite) output. There is about a four second delay before the output switches. This is a non-latching alarm. This output can be used to drive various indication devices, i.e. coil, light, buzzer, etc. See alternative latching circuit below.

Alarm Relay or Indicator

V (ac)
120 or 240V (ac)
@ 300mA max.
energizes on alarm

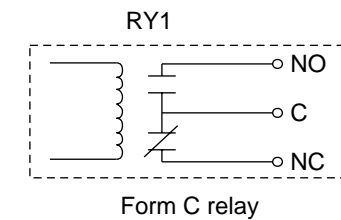
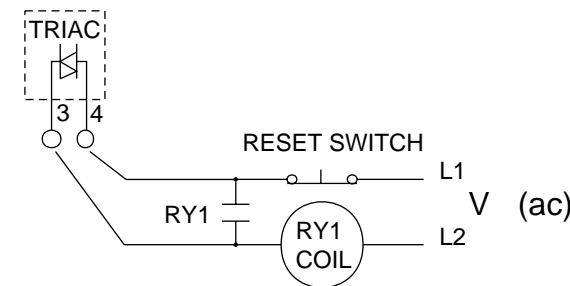


Note:
The CT must be in the center uncontrolled leg on a 2-leg DIN-a-mite.

Latching Alarm Option (models DCXX-XXXX-XXSX)

Alternative Latching Alarm Circuit

If there is a need for a latching alarm in the case of a shorted SCR the DIN-a-mite alarm circuit could be used as shown in the latching alarm example at right. If the DIN-a-mite triac alarm output energizes it will energize the RY1 mechanical relay coil. Once the RY1 coil is energized it will latch on (via the RY1 normally open contact) until power to the relay is removed. You could cycle power via a reset switch. The RY1 normally closed contacts are placed in series with the over temperature limit control output so that it will remove power to the CR1 power contactor and ultimately the heaters. Note that this is not a substitute for an over temperature limit control but rather works with the high limit for added circuit protection.



Warranty



TOTAL CUSTOMER SATISFACTION

The DIN-a-mite is warranted to be free of defects in material and workmanship for 36 months after delivery to the first purchaser for use, providing that the units have not been misapplied. Since Watlow has no control over their use, and sometimes misuse, we cannot guarantee against failure. Watlow's obligations hereunder, at Watlow's option, are limited to replacement, repair, or refund of purchase price, and parts which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse, abuse or improper fusing.

Returns

1. Call Customer Service, 507-454-5300, or send a fax to 507-452-4507, for a Return Material Authorization (RMA) number before returning any item for repair.
2. Make sure the RMA number is on the outside of the carton, and on all paperwork returned. Ship on a freight prepaid basis.
3. A restocking charge of 20% of the net price is applied for all returned stock controls and accessories.
4. If the unit is unrepairable, it will be returned to you with a letter of explanation. Repair costs will not exceed 50% of the original cost.

Watlow DIN-a-mite C User's Manual

Watlow Controls, 1241 Bundy Blvd., P.O. Box 5580, Winona, MN 55987-5580
Phone: 507-454-5300, Fax: 507-452-4507