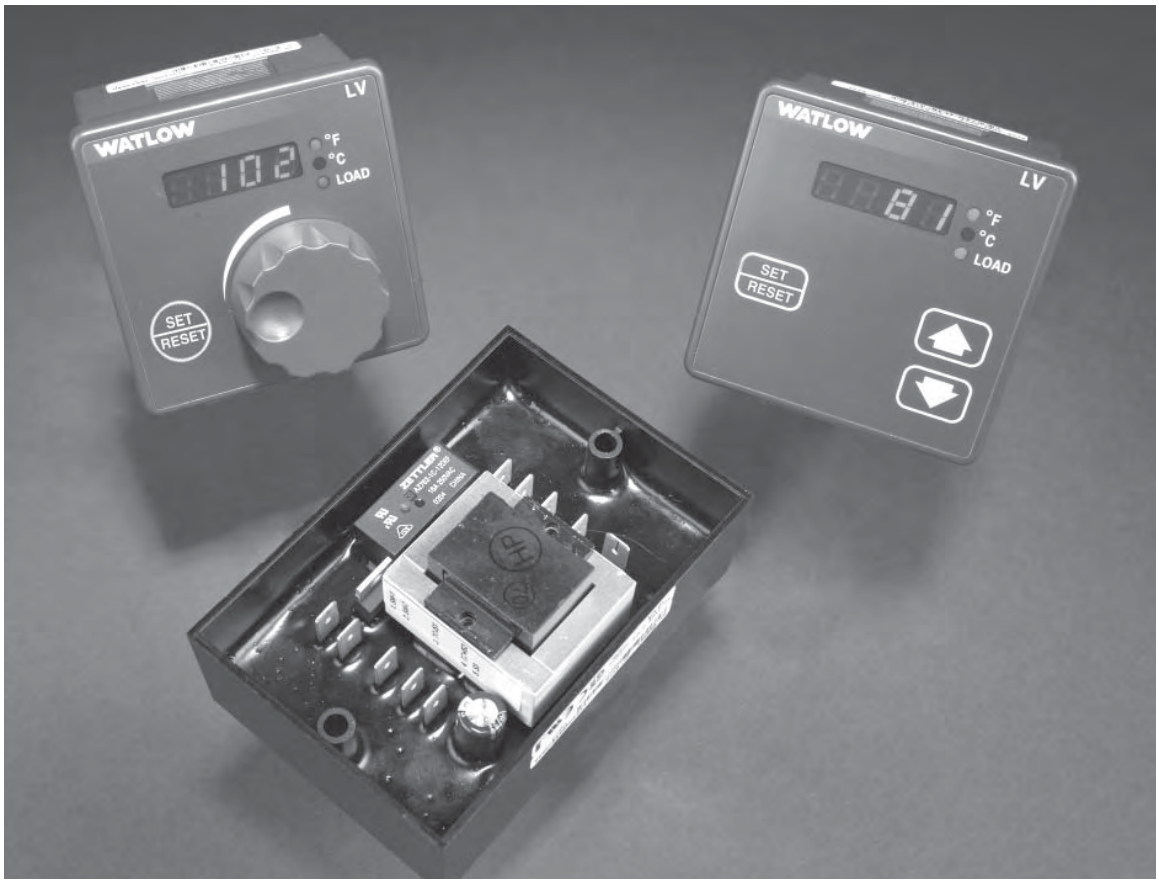
Series L

User's Manual



Series L - Temperature Limit

CE

Industrial & Electric Supply Co.
209 Paredes Line Road
Brownsville, TX 78521
1-800-880-3743

TOTAL CUSTOMER SATISFACTION
3 Year Warranty

ISO 9001
Registered Company
Winona, Minnesota USA

WATLOW

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0600-0044-0001 Rev. G

Made in the U.S.A.

February 2008

$5.00

Safety Information

We use note, caution and warning symbols throughout this book to draw your attention to important operational and safety information.

A "NOTE" marks a short message to alert you to an important detail.

A "CAUTION" safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

CAUTION or WARNING

A "WARNING" safety alert appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.

The safety alert symbol, ⚠ (an exclamation point in a triangle) precedes a general CAUTION or WARNING statement.

Electrical Shock Hazard

CAUTION or WARNING

The electrical hazard symbol, ⚠ (a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.

Technical Assistance

If you encounter a problem with your Watlow controller, review your configuration information to verify that your selections are consistent with your application: inputs, outputs, alarms, limits, etc. If the problem persists, you can get technical assistance from your local Watlow representative (see back cover), by e-mailing your questions to wintechsupport@watlow.com or by dialing +1 (507) 494-5656 between 7 a.m. and 5 p.m., Central Standard Time (CST). Ask for for an Applications Engineer. Please have the following information available when calling:

- Complete model number
- System wiring information
- Series L Limit User's Manual

Warranty

These controllers are manufactured by ISO 9001-registered processes and are backed by a three-year warranty.

Return Material Authorization (RMA)

1. Call Watlow Customer Service, (507) 454-5300, for a Return Material Authorization (RMA) number before returning any item for repair. We need this information:
    - Ship to address
    - Bill to address
    - Contact name
    - Phone number
    - Method of return shipment
    - Your P.O. number
    - Detailed description of the problem
    - Any special instructions
    - Name and phone number of person returning the product.

2. Prior approval and an RMA number, from the Customer Service Department, is needed when returning any unused product for credit. Make sure the RMA number is on the outside of the carton, and on all paperwork returned. Ship on a Freight Prepaid basis.

3. After we receive your return, we will examine it and try to verify the reason for the return.

4. In cases of manufacturing defect, we will enter a repair order, replacement order or issue credit for material returned.

5. To return products that are not defective, goods must be be in new condition, in the original boxes and they must be returned within 120 days of receipt. A 20 percent restocking charge is applied for all returned stock controls and accessories.

6. If the unit is unrepairable, it will be returned to you with a letter of explanation.

7. Watlow reserves the right to charge for no trouble found (NTF) returns.

1 Overview

Watlow's Series L family of temperature limit controllers* provide an economical limit controller solution for applications where thermal system protection is needed.

A limit controller is added to applications to prevent over or under temperature conditions. The limit provides safety assurances against instances where a thermal runaway condition occurs as a result of a failed sensor, controller or output device.

The Series L limit controller is recommended for any application where thermal system runaway could result in large product scrap costs, damage to system equipment, potential fire hazard or risk to personnel. All Series L limit controllers are Factory Mutual and CSA approved.

These controllers are available with or without an operator interface and can be ordered in square 1/8th DIN panel mount, din rail mount, open board or potted module design configurations. Push-on, quick connect spade terminal or removable screw clamp style terminal block ordering options provide the electrical connections.

The microprocessor design platform provides improvements in the performance, repeatability, and accuracy offered by Watlow's current line of basic control products.

The Series LV includes an operator interface to allow viewing and selection of the limit set point. A red four character, seven-segment LED displays the limit set point. The limit set point selection is made with a continuous turn, velocity-sensitive rotary encoder. Push-to-Set operation reduces accidental limit set point adjustments. Limit set point operating range temperature values are customer definable in the product configuration part number.

The Series LF offers fixed limit set points. These units are supplied without an operator interface. Limit set point temperature values are customer definable in the product configuration part number.

The features and performance of these products make them ideally suited for a wide range of industrial limit control applications in the food preparation, industrial machinery, packaging and plastic markets.

Watlow's Series L limit controllers include industry-leading service, support and a 3-year warranty.

*Also available, Series C, an on-off temperature controller version.

Features and Benefits

Four-Character LED Display

- Improves limit set point adjustment accuracy.

Fixed or Adjustable Limit Set Points

- Tamper proof operation.
- Control flexibility.

Set Point Adjustment Opetions

- Rotary encoder.
- Tactile increment and decrement keys.

Push to Set

- Reduce accidental limit set point adjustments.

Multiple Mounting Options

- Minimizes installation time.

High or Low Limit Operation

- Application flexibility.

Fahrenheit or Celsius Operation with Indication

- Application flexibility.

Sensor Break Protection

- Provides positive system shutdown.

Agency Approvals

- Meets requirements for agency certification.
- NEMA 4X/IP65 seal panel mount versions available.
- W.E.E.E.; CE; RoHS

Micro Processor Based Technology

- Accurate and repeatable protection.

Stock to Four-Day Delivery

2 Installation

Installing the Open Board Controller

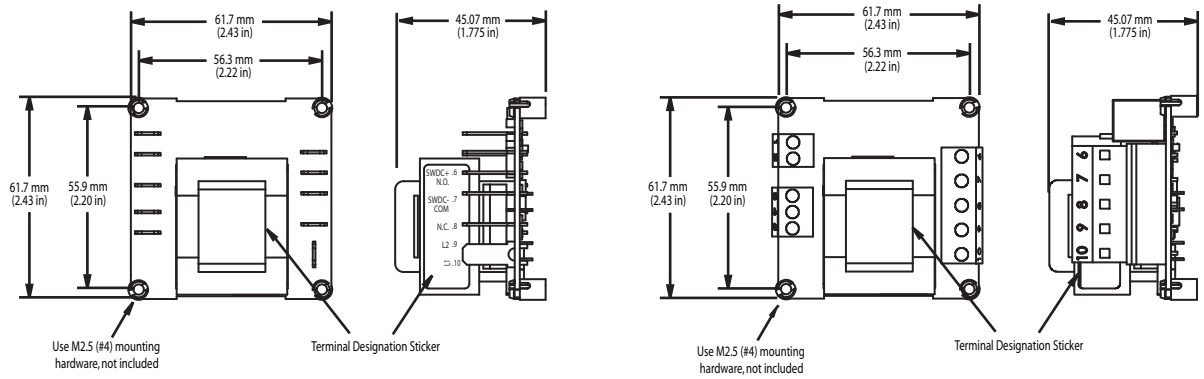


Figure 2a

1. Locate and drill four 3.2 mm (0.125 in) holes in the desired panel location. See Figure 2a for hole locations.
2. Mount the controller using four M2.5 (#4) screws.

Installing the Potted Controller

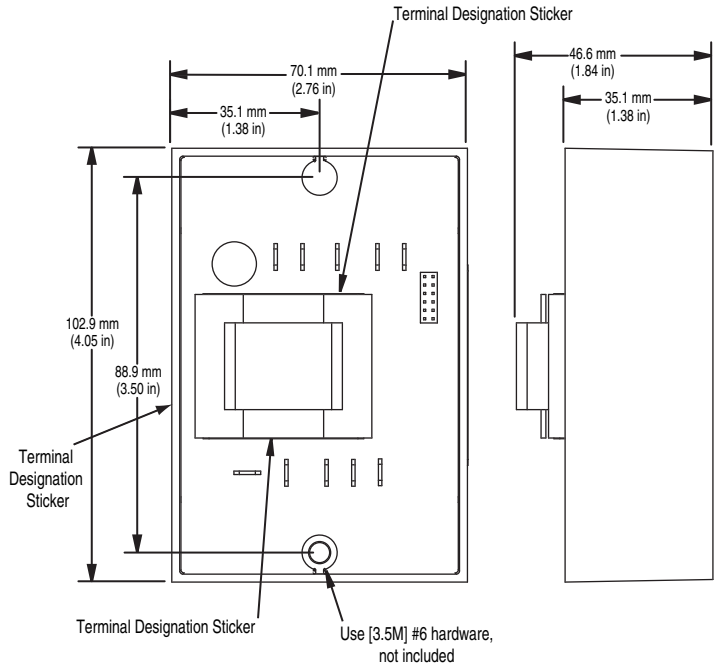


Figure 2b

1. Drill two 5 mm (0.187 in) diameter holes in the desired panel location. See Figure 2b for hole locations.
2. Mount the controller using two M3.5 (#6) screws.

Installing the DIN Rail Mount Controller

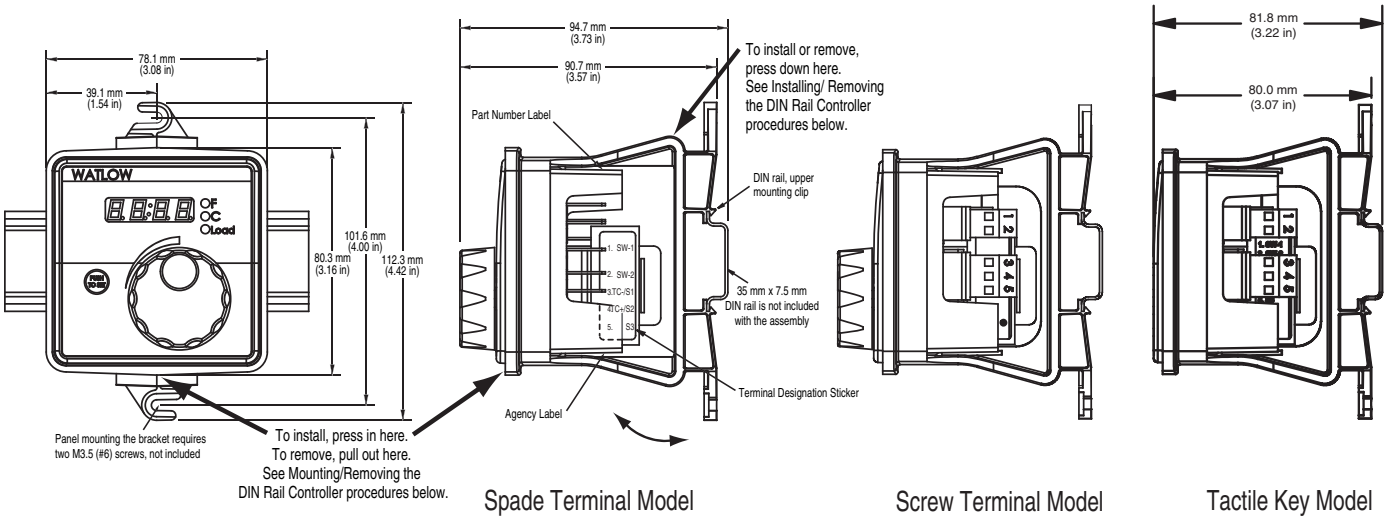


Figure 3a

Sub-Panel Mounting

1. Using the controller as a location template, mark both mounting holes.
2. Drill and tap two 2.7 mm (0.106 in) diameter holes in the desired panel location. See Figure 3a above for hole locations.
3. Mount the controller using two M3.5 (#6) screws.

DIN Rail Mounting

1. Place the DIN rail upper mounting clip on the top edge of the DIN rail. See Figure 3a. DIN rail spec, DIN 50022, 35 mm x 7.5 mm (1.38 in x 0.30 in).
2. Press down firmly on the top back edge of the DIN rail bracket and push in on the bottom, front edge of the bracket. The controller snaps securely onto the rail. See Figure 3a. If the controller does not snap on, check to see if the DIN rail is bent. Minimum clipping distance is 34.8 mm (1.37 in), the maximum is 35.3 mm (1.39 in).

Removing the DIN Rail Controller

1. Remove power from the system.
2. Remove all the wiring connections from the back of the controller.
3. While pressing down on the top, back edge of the DIN rail bracket, pull forward on the bottom, front edge of the DIN rail bracket. See Figure 3a.

Removing the Controller from the DIN Rail Bracket

1. Remove power from the system.
2. Remove all the wiring connections from the back of the controller.
3. Remove the DIN rail bracket from the DIN rail.
4. Insert a flat blade screwdriver between the DIN rail bracket and the case. Rotate the screwdriver to release the DIN rail bracket hooks from the ridges on the case, while firmly pushing the controller out the front of the DIN rail bracket. Alternate back and forth between the top and then the bottom. Be sure to support the controller as it comes out of the bracket. See Figure 3b.

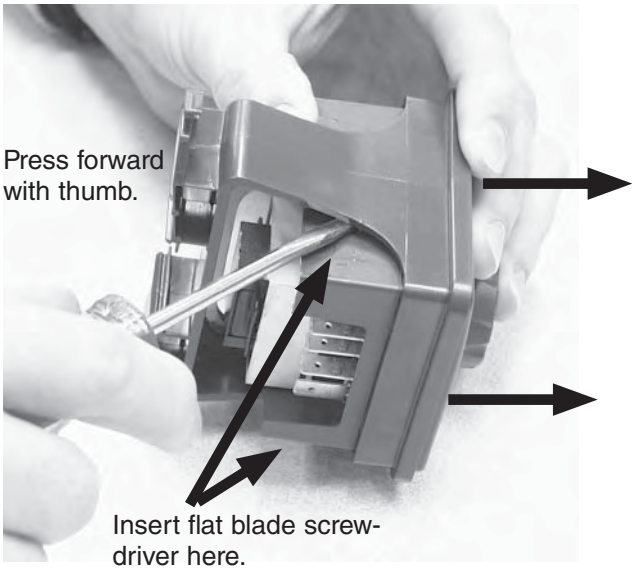


Figure 3b

⚠ **Caution: FM approval requires limit switches to be suitably enclosed to restrict casual user adjustment.**

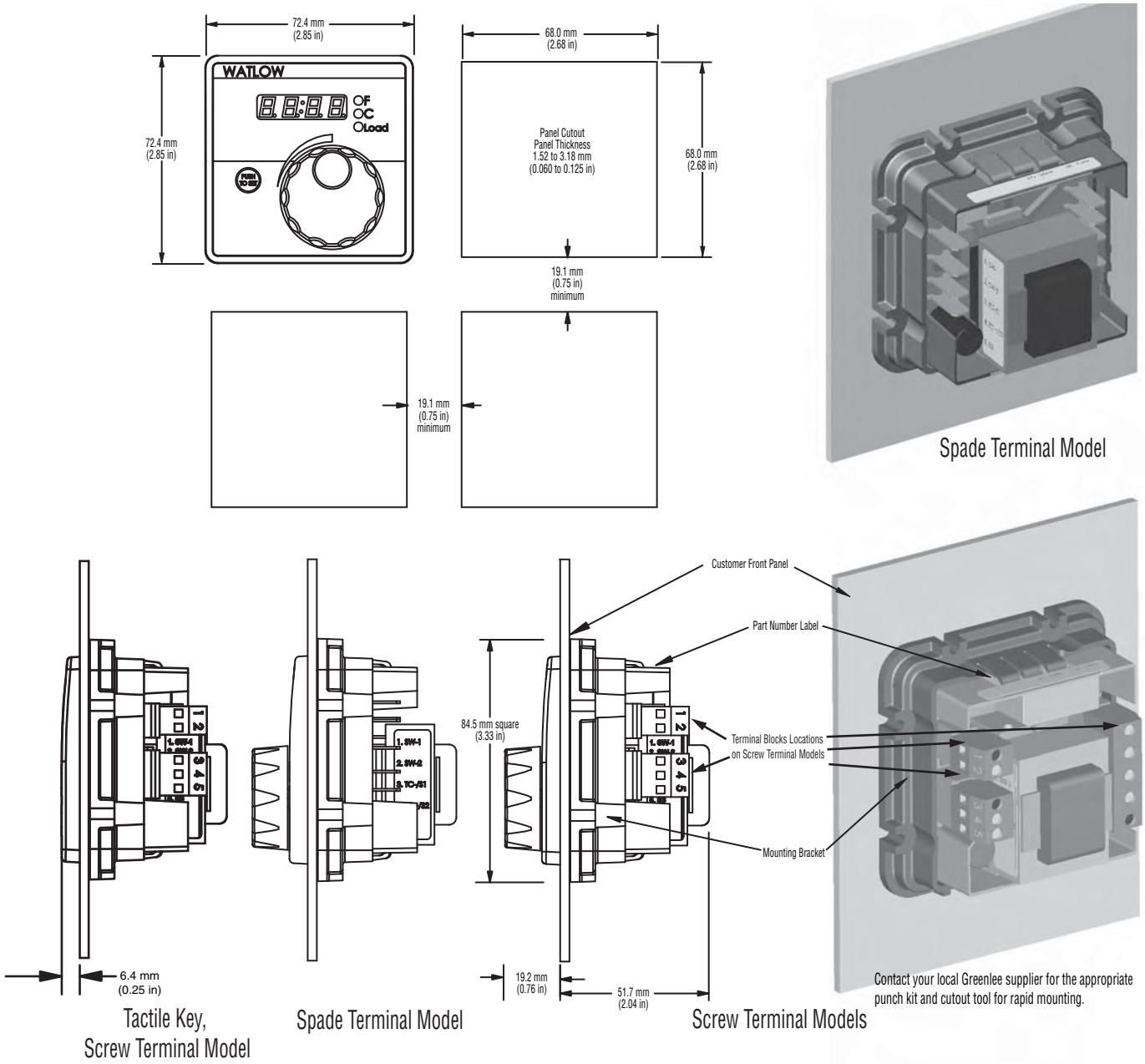


Figure 4

Installing the Square 1/8 DIN Panel Mount Controller

1. Make the panel cutout using the mounting dimensions above.
2. Remove mounting bracket from the back of the controller.
3. If your controller has a gasket, check to see that the gasket is not twisted, and is seated within the case bezel flush with the panel. Place the case in the cutout. Make sure the gasket is between the panel cutout and the case bezel.
4. While pressing the front of the case firmly against the panel, slide the mounting collar over the back of the control. The tabs on the collar must line up with the mounting ridges on the case for secure installation. See Figure 4. Slide the collar firmly against the back of the panel, getting it as tight as possible. To ensure a tight seal, use your thumb to lock the tabs into place while pressing the case from side to side. Don't be afraid to apply enough pressure to install the controller. The tabs on each side of the collar have teeth that latch into the ridges. Each tooth is staggered at a different height, so only one of the tabs on each side are ever locked into the ridges at a time. Confirm that the tabs on one side of the collar correspond with those on the opposite side. Make sure the two corresponding tabs are the only ones locked in the ridges at the same time. If the corresponding tabs are not supporting the case at the same time, you will not have a NEMA 4X seal.
5. Insert the control chassis into its case and press the bezel to seat it. Make sure the inside gasket

is also seated properly and not twisted. The hardware installation is complete. Proceed to the wiring section.

2. Insert the controller into the panel cutout.
3. While pressing the bezel firmly against the panel, slide the mounting bracket over the back of the controller. Be sure the levers on the mounting bracket line up with the teeth on the case.
4. Press the bracket up to the back of the panel. The controller should fit tightly in the panel cutout.

Removing the Panel Mount Square 1/8 DIN Controller

1. Remove power from the system.
2. Remove all the wiring connections from the back of the controller.
3. Slide a thin, wide tool (putty knife) under all three mounting tabs, top then bottom, while pushing forward on the back of the case. Be ready to support the controller as it slides out of the panel cutout.

⚠ Caution: FM approval requires limit switches to be suitably enclosed to restrict casual user adjustment.

3 Wiring

Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

Note:
Insulated terminals required for quick connect style terminals.

For quick connect terminals 1, 2, 6, 7, 8, 9, and 10, AMP P/N 3-520406-2 or equivalent recommended. Use Amp crimp tool P/N 58078-3, insert 90391-3.

For quick connect terminals 3, 4, and 5, AMP P/N 2-520405-2 or equivalent recommended. Amp crimp tool P/N 58078-3, insert 58079-3.

Caution:
FM approval requires limit switches to be suitably enclosed to restrict casual user adjustment.

The terminals on the back of the Series L limits are the same for all of the package styles. They are 6.3 mm (0.25 in) quick connect, push on style terminals or removable screw terminal block. The terminal style is an ordering option.

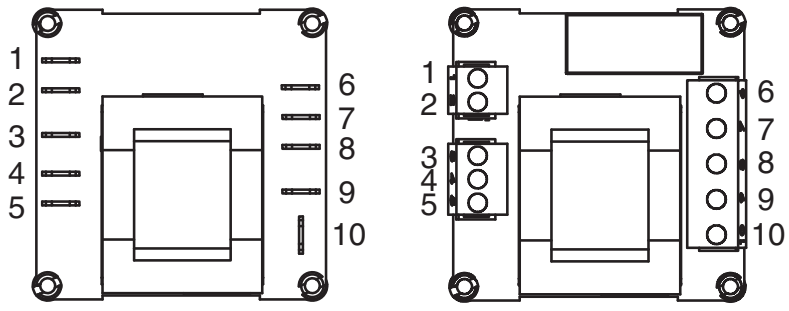
Check the part number to determine your hardware configuration. Refer to the wiring diagrams appropriate for your controller's configuration.

All outputs are referenced to a de-energized state.

Wiring Guidelines

1. Use the correct thermocouple type per the model number on the case sticker of the unit. See dimension drawings for sticker locations.
   - Use correct thermocouple polarity. Red is usually negative.
   - If you must extend thermocouple leads, use thermocouple extension wire to minimize errors.
   - Be sure you have good crimp connections on all wire connections.
   - Insulate the thermocouple mounting from the mounting surface to prevent heat migration input errors.
   - Thermocouple leads should be routed separately from any high voltage lines.
   - Long lead lengths create electrical resistance. When using a two-wire RTD, there will be an additional 2.6° C (4.7° F) error for every 1Ω of lead length resistance. That resistance when added to the resistance of the RTD element, can result in erroneous input to the temperature controller.
2. In electrically-noisy environments (heavy switching contactors, motors, solenoids, etc.), use shielded thermocouple lead wire with the shield connected at the sensor end only.
3. Use a separate thermocouple to maintain the limit function of this controller; do not parallel thermocouple input from the primary controller.
4. All wiring and fusing must conform to the National Electric Code (NEC) NFPA70 and any other locally applicable codes.
5. Fuse the independent load voltage on the L1 (hot) side and connect it to the common (C) side of the relay.

Note: The model number determines the connection terminal style. See below for terminal locations.



Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

WARNING:
If high voltage is applied to a low-voltage controller, irreversible damage will occur.

Note:
Insulated terminals required for quick connect style terminals.

For quick connect terminals 1, 2, 6, 7, 8, 9, and 10, AMP P/N 3-520406-2 or equivalent recommended. Use Amp crimp tool P/N 58078-3, insert 90391-3.

For quick connect terminals 3, 4, and 5, AMP P/N 2-520405-2 or equivalent recommended. Amp crimp tool P/N 58078-3, insert 58079-3.

Figure 7a — **AC Power Wiring**

- Nominal voltage options:
- 24V~ (ac)
- 120V~ (ac)
- 230 to 240V~ (ac)

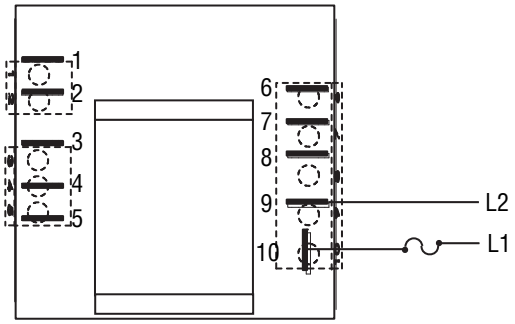


Figure 7b — Thermocouple Input

Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to the negative thermocouple terminal.

- Input impedance: >10 MΩ

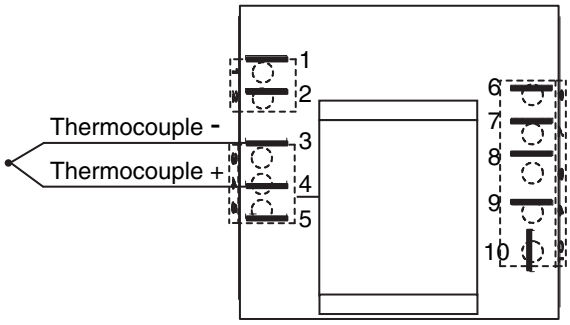
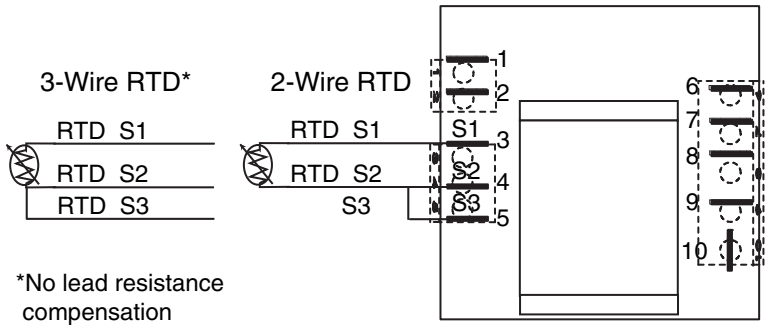


Figure 7c — RTD Input

(100 Ω Platinum DIN curve 0.00385 Ω/Ω/°C)

- Terminals S2 and S3 must be shorted for a two-wire RTD
- Nominal excitation current: 125 µA



Warning:
Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

Note:
Use of an external reset switch may affect FM approval. Only the use of a momentary N.O. switch is valid for approval.

Note:
Insulated terminals required for quick connect style terminals.

For quick connect terminals 1, 2, 6, 7, 8, 9, and 10, AMP P/N 3-520406-2 or equivalent recommended. Use Amp crimp tool P/N 58078-3, insert 90391-3.

For quick connect terminals 3, 4, and 5, AMP P/N 2-520405-2 or equivalent recommended. Amp crimp tool P/N 58078-3, insert 58079-3.

Quencharc Note:
Switching pilot duty loads (relay coils, solenoids, etc.) with the mechanical relay output option requires use of an R.C. suppressor.

Watlow carries the R.C. suppressor Quencharc brand name, which is a trademark of ITW Paktron. Watlow Part No. 0804-0147-0000.

Figure 8a — External Reset Switch

- Momentary normally open (N.O.), dry contact closure

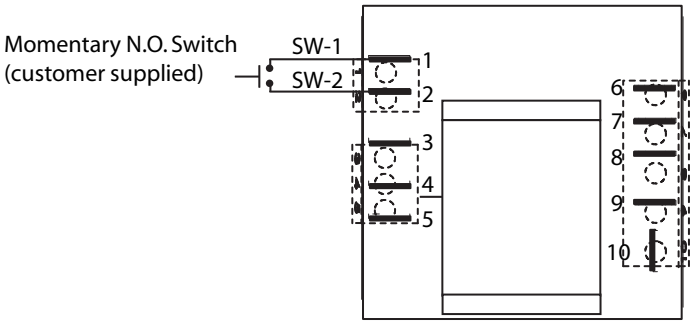
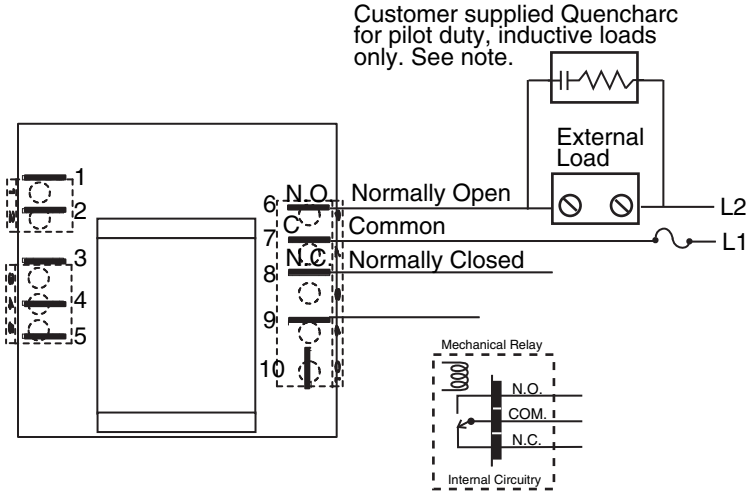


Figure 8b — Mechanical Relay Output

- Form C contacts
- 8 A, resistive
- 250 VA pilot duty, 120/240V~ (ac), inductive
- 240V~ (ac) maximum
- 30V⎓ (dc) maximum
- See Quencharc note
- For use with ac or dc
- Minimum load current 100 mA
- Output does not supply power



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