



Series 101

User's Manual



Temperature Controller



TOTAL
CUSTOMER
SATISFACTION
3 Year Warranty



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General Description

The Watlow Series 101 is an on-off temperature controller that comes in three common temperature ranges or can be custom ordered to meet your requirements. The input sensor can be either Type J or K thermocouple. The setpot is integral and has both degree Celsius and Fahrenheit scales.

Specifications

(2060)

Control Mode

- On-Off
- Nominal switching hysteresis:
Type J thermocouple; 1.7°C (3°F);
Type K thermocouple; 2.2°C (4°F)

Operator Interface

- 76 mm (3 in.) dial scale calibrated to compensate for sensor non-linearities
- Dual °C and °F scales
- D-shaft pot and adjustable ratchet knob

Input

- Thermocouple with automatic cold junction compensation
- Sensor may be isolated or grounded
- Sensor break protection de-energizes output

Output

- Electromechanical relay with contact suppression, 3A, SPST: 3A @ 230V~ 3A @ 30V= (dc), 125VA pilot duty @ 120 or 230V~
- Solid-state relay, Form A, 0.5A @ 24V~ min., 230V~ max., opto-isolated burst fire switched, without contact suppression. Off state output impedance is 31MΩ.
- Switched dc signal provides a non-isolated minimum turn on voltage of 3V= (dc) into a minimum 500W load maximum on voltage not greater than 28V= (dc) into an infinite load.

Accuracy

- Calibration accuracy and sensor conformity: ±1% of span, at 25°C ± 3°C (77°F ±5°F) ambient and rated line voltage ±1%
- Set point accuracy: ±2% of dial scale
- Accuracy span: 540°C (1000°F) minimum
- Temperature stability: 9µV/°C (5µV/°F) ambient, maximum referred to the input
- Voltage stability: ±0.01% of span per % of rated line voltage

Agency Approvals

- CE approved:
89/336/EEC Electromagnetic Compatibility Directive
EN 55011: 1991 Emissions class B
EN 50082-1: 1992 Immunity
73/23/EEC Low Voltage Directive
EN 61010-1: 1993 Safety
- 873, File #E43684
- to C22.2 No. 24, File #E43684
- ANSI Z21.23. Gas Appliance Thermostats

Classification

- Installation category II, Pollution category II

Terminals

- Quick connects, 1/4 in. (6 mm) appliance

Power

- 115V~, ±10%, 50/60 Hz
- 230V~, ±10%, 50/60 Hz
- 24V~, ±10%, 50/60 Hz
- 4VA power consumption

Operating Environment

- 0 to 70°C (30 to 158°F)
- 0 to 90% RH, non-condensing

Dimensions

- See page 2.

Weight

- 0.3kg (0.7 lb)

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Note: Specifications subject to change without notice.

Ordering Information

(1576) **101** - - **0000**

Output

- A = Electromechanical relay, Form A, 3A, with contact suppression
- B = Solid-state relay, 0.5A, Form A, without contact suppression
- C = Switched dc, non-isolated

Line Voltage

- 1 = 120V~
- 2 = 230V~
- 3 = 24V~

Input and Range

- | | |
|--------|-----------------------------------|
| Type J | 601 = -20 to 260°C (0 to 500°F) |
| | 602 = -20 to 540°C (0 to 1000°F) |
| | 608 = -20 to 120°C (0 to 250°F) |
| Type K | 603 = -20 to 1100°C (0 to 2000°F) |

Note: User documentation may be available in French, German, Spanish, Italian, and Dutch, as well as English. Check Watlow's website (www.watlow.com/) for availability. Specify language at time of order.

Safety



A Caution symbol (an exclamation point in a triangle) appears with information that is important to protect equipment and performance. Read and follow all cautions that apply to your application.



The equipment is protected throughout by double or reinforced insulation. Use only to Watlow specifications. If the Series 101 is used in a manner not specified by Watlow, the protection provided by the equipment may be impaired.

Installation

1. Remove the setpot knob and the dial scale from the Series 101 control. See the side view in Figure 2a.
2. Using the dial scale as a location/drilling template, locate and center punch the setpot locating tab, setpot shaft and four mounting holes at the desired location. See Figure 2c.
3. Drill one 4 mm (0.156 in.) setpot locating tab hole, one 10.3 mm (0.406 in.) setpot shaft hole and four 3.2 mm (0.128 in.) diameter mounting holes.
4. Insert the setpot shaft of the controller through the 10.3 mm (0.4064 in.) diameter hole. Replace the dial scale and align the mounting holes, then tighten the pot shaft nut.
5. Insert #4 thread-forming screws in mounting holes and tighten in place.
6. Wire the control following the wiring diagrams. See next page.

NOTE: The Series 101 has a 2.3 mm (0.090 in.) diameter by 13 mm (0.500 in.) deep screw hole cavity. Design is based on using Textron Camcar Division "Plastite" or "Pushite" thread forming hardware or equivalent. Screw length is 9.5 to 12.7 mm (0.375 to 0.500 in.) maximum.

Dimensions

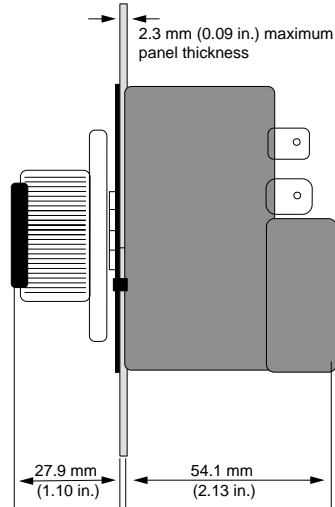


Figure 2a — Series 101 side dimensions.

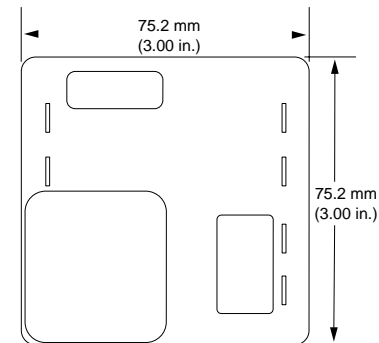


Figure 2b — Series 101 dimensions.

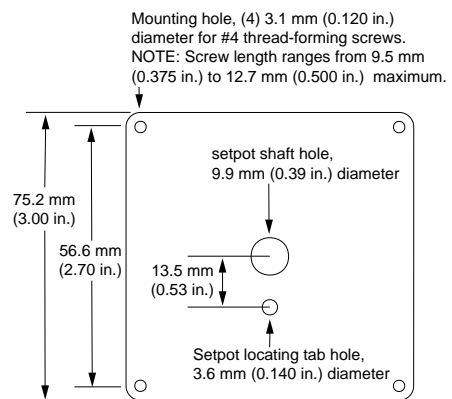


Figure 2c — Series 101 mounting.

Wiring Guidelines

- Use the correct thermocouple type matching the model number on the unit sticker. See the underside of the unit.
- Use the proper thermocouple polarity. Red is negative.
- Insulate the thermocouple mounting from the mounting surface to prevent heat migration input errors.
- Thermocouple leads should be twisted pair wire and routed separately from any other lines.
- In electrically noisy environments (heavy switching of contactor, motors, solenoids, etc.) use shielded thermocouple lead wire with the shield connected at the sensor end only.
- All wiring and fusing must conform to the National Electric Code (NEC) NFPA70 and any other locally applicable codes.
- Fuse the independent load voltage on the L1 (hot) side and connect it to the common (COM) side of the relay.

Power Wiring

120V~ 101 _ - 1 _ _ _ - 0000

230V~ 101 _ - 2 _ _ _ - 0000

24V~ 101 _ - 3 _ _ _ - 0000

NOTE: The line voltage is specified by your model number.

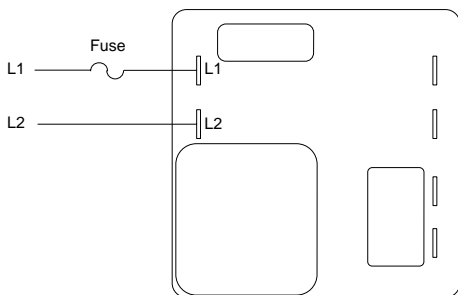


Figure 3a — Power wiring.



WARNING: To avoid potential electric shock, use National Electrical Code safety practices when wiring and connecting this unit to a power source and to electrical sensors or peripheral devices.

All wiring and fusing must conform to the National Electric Code and to any locally applicable codes.



WARNING: Applying incorrect voltage may result in irreversible damage to the control.

NOTE: We strongly recommend that all control loops use an approved temperature limit control for over or under temperature limit protection. Failure to install temperature limit control protection where a potential hazard exists could result in damage to equipment and property and injury to personnel.

Input Wiring

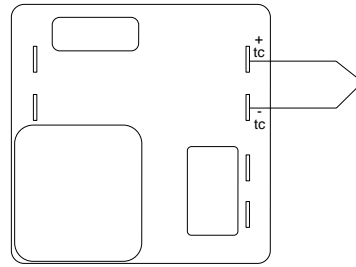


Figure 3b — Thermocouple wiring.

NOTE: When an external device with a non-isolated circuit common is connected to the dc output, you must use an isolated or ungrounded thermocouple.

Output Wiring

Electromechanical Relay, Form C with suppression 3A

101A - _ _ _ _ - 0000

Solid State Relay, Form A, 0.5A without suppression

101B - _ _ _ _ - 0000

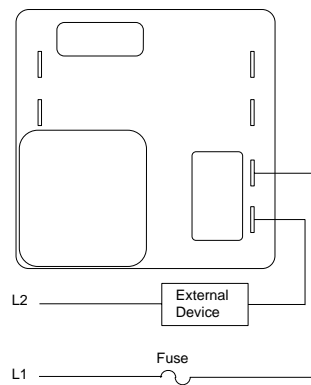


Figure 3c — Mechanical and solid-state relay wiring.

Switched DC

10 1C - _ _ _ _ - 0000

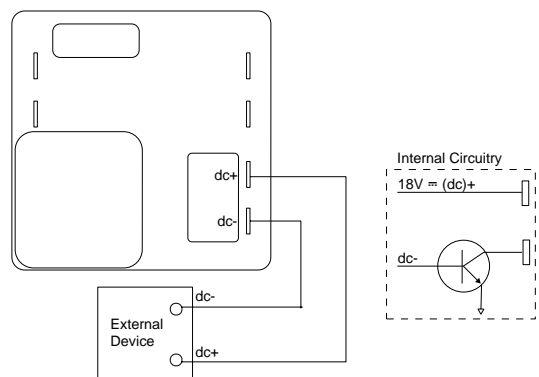


Figure 3d — Switched dc wiring.

Field Calibration

Required Equipment

- A calibration quality portable temperature indicator.
- A sensor for the portable indicator.

Setup

1. With the Series 101 installed in your system, set the controller to your desired set point.
2. Apply power to your system and allow it to stabilize.

Procedure

1. Measure temperature at the point you wish to control (near the Series 101 sensor) with a portable temperature indicator.
2. Adjust the Series 101 until the portable indicator reads the average of the system temperature variations as the Series 101 switches on and off.
3. Carefully pull the Series 101 knob straight off the D-shaft.
4. Slightly loosen the two screws on the back of the knob.
5. Carefully replace the knob on the D-shaft without moving the shaft.
6. Read the portable indicator. Then hold the black part of the knob in place while turning the clear plastic skirt to match the portable indicator reading. Simply put the white line on the clear skirt over the dial scale position which is the average of the portable indicator readings.
7. Carefully remove the knob from the D-shaft again and tighten the screws.
8. Replace the knob on the shaft and check the portable indicator for agreement. Repeat as required.

Warranty

The Series 101 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 unit has not been misapplied. Since Watlow has no control over its use or misuse, we cannot guarantee against failure. Watlow's obligations hereunder, at Watlow's option, are limited to replacement or refund of purchase price of a unit which upon examination proves to be defective within the warranty period. This warranty does not apply to damage resulting from transportation, alteration, misuse or abuse.

Returns

- Call or fax Customer Service for a Return Material Authorization (RMA) number before returning a product.
- Put the RMA number on the shipping label, and also a description of the problem.
- A 20% of net price restocking charge applies to all standard units returned to stock.

Contact:

- Phone: +1 (507) 454-5300
- Fax: +1 (507) 452-4507

Technical Support

If you encounter a problem with your Watlow controller, verify that your wiring is correct for your specific model number. If the problem persists, an Application Engineer can discuss your application with you.

Before calling, please have the complete model number and user's manual available. You can get technical support by dialing +1 (507) 454-5300, 7 a.m. to 7 p.m. Central Standard Time.

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Troubleshooting

Problem	Probable Cause	Action
Control will not operate.	Voltage is not present at ac input or load output.	Check wiring. See wiring page. Check fuses or circuit breakers. Check power sources.
Relay will not energize, ac voltage is present, and the controller is wired correctly.	Sensor is not wired correctly.	Check for open sensor element or open sensor lead wires. Check sensor wiring. See wiring page.
Controller is out of calibration.	Sensor is not measuring actual temperature.	Check sensor element location for proper temperature response.
	Unit is out of calibration.	Calibrate the unit following the field calibration procedure above.

Declaration of Conformity Series 101

Watlow

1241 Bundy Boulevard
Winona, Minnesota USA 55987



Declares that the following product: **English**
Designation: **Series 101**
Model Number(s): 101 (A, B or C) (1 or 2) (Any three numbers) -
(Any four letters or numbers)
Classification: Controller, Installation Category II, Pollution
Degree II
Rated Voltage: 120V~ (ac) or 230V~ (ac)
Rated Frequency: 50/60 Hz
Rated Power Consumption: 4VA

Meets the essential requirements of the following European Union
Directive(s) using the relevant section(s) of the normalized standards and
related documents shown:

89/336/EEC Electromagnetic Compatibility Directive

EN 50082-1: 1992 **EMC Generic immunity standard, Part 1:
Residential, commercial and light industry
environment**
EN 61000-4-2: 1995 Electrostatic discharge
EN 61000-4-4: 1995 Electrical fast transients
EN 60801-2: 1994 Electrostatic discharge requirements
IEC 801-3: 1994 Radiated electromagnetic field requirements
IEC 801-4: 1988 Electrical fast transient/burst requirements
EN 55011: 1991 **Limits and methods of measurement of radio
disturbance characteristics of industrial,
scientific and medical radio-frequency
equipment (Class B)**
EN 61000-3-2: 1995 **Limits for harmonic current emissions**
EN 61000-3-3: 1995 **Limitations of voltage fluctuations and flicker**

73/23/EEC Low-Voltage Directive

EN 61010-1 1993 **Safety requirements for electrical equipment
for measurement, control, and laboratory use,
Part 1: General requirements**

Déclare que le produit suivant : **Français**
Désignation : Série 101
Numéro(s) de
modèle(s) : 101 (A, B ou C) (1 ou 2) (Trois lettres
quelconques) (quatre lettres ou chiffres
quelconques)
Classification : Commande, installation catégorie II, degré de
pollution II
Tension nominale : 120V~ (ac) ou 230V~ (ac)
Fréquence nominale : 50/60 Hz
Consommation
d'alimentation nominale : 4VA

Conforme aux exigences de la (ou des) directive(s) suivante(s) de l'Union
Européenne figurant aux sections correspondantes des normes et
documents associés ci-dessous :

89/336/EEC Directive de compatibilité électromagnétique

EN 50082-1: 1992 **Norme générique sur l'immunité, Partie 1 :
Environnement résidentiel, commercial et
industrielléger**
EN 61000-4-2: 1995 Décharge électrostatique
EN 61000-4-4: 1995 Transitoires rapides électriques
EN 60801-2: 1994 Exigences concernant les décharges
électrostatiques
IEC 801-3: 1994 Insensibilité à l'énergie rayonnée
IEC 801-4: 1988 Exigences concernant les courants électriques
transitoires rapides et les suramplifications
brusques
EN 55011 : 1991 **Limites et méthodes de mesure des
caractéristiques des perturbations
radioélectriques des appareils industriels,
scientifiques et médicaux (Classe B)**
EN 61000-3-2: 1995 **Limites d'émission d'harmoniques**
EN 61000-3-3: 1995 **Limitations d'écart de tensions et de
papillotement**

73/23EEC Directive sur les basses tensions

EN 61010-1 1993 **Exigences de sécurité pour le matériel
électrique de mesure, commande et de
laboratoire, Partie 1: Exigences générales**

Erklärt, daß das folgende Produkt: **Deutsch**
Beschreibung: **Serie 101**
Modellnummer(n): 101 (A, B oder C) (1 oder 2) (3 beliebige
Ziffern) - (4 beliebige Buchstaben oder Ziffern)
Klassifikation: Regelsystem, Installationskategorie II,
Emissionsgrad II
Nennspannung: 120V~ (ac) oder 230V~ (ac)
Nennfrequenz: 50/60 Hz
Nominaler Strom
verbrauch: 4VA

Erfüllt die wichtigsten Normen der folgenden Anweisung(en) der
Europäischen Union unter Verwendung des wichtigsten Abschnitts bzw.
der wichtigsten Abschnitte der normalisierten Spezifikationen und der
untenstehenden einschlägigen Dokumente:

89/336/EEC EWG Elektromagnetische Verträglichkeit

EN 50082-2: 1992 **EMC-Rahmennorm für Störsicherheit, Teil 1:
Wohngebieten, Handelsverkehr und
Leichtindustrie**
EN 61000-4-2: 1995 Elektrostatische Entladung
EN 61000-4-4: 1995 Elektrische schnelle Stöße
EN 60801-2: 1994 Elektrostatische Entladung (Anforderungen)
IEC 801-3: 1994 Strahlungsimmunität
IEC 801-4: 1988 Elektrische schnelle Stöße/Burst (Anforderungen)
EN 55011: 1991 **Beschränkungen und Methoden der Messung
von Funkstörungsmerkmalen industrieller, wis
senschaftlicher und medizinischer
Hochfrequenzgeräte (Klasse B)**
EN 61000-3-2: 1995 **Grenzen der Oberwellenstromemission**
EN 61000-3-3: 1995 **Grenzen der Spannungsschwankungen und
Flimmern**

72/23/EEC EWG Niederspannungsrichtlinie

EN 61010-1 1993 **Sicherheitsrichtlinien für Elektrogeräte zur
Messung, zur Steuerung und im Labor, Teil 1:
Allgemeine Richtlinien**

Declara que el producto siguiente: **Español**
Designación: **Serie 101**
Números de modelo: 101 (A, B ór C) (1ór 2) (Cualquier
combinación de tres números) - (Cualquier
combinación de cuatro números y letras)
Clasificación: Control, categoría de instalación II, grado de
contaminación ambiental II
Tensión nominal: 120V~ (ac) ór 230V~ (ac)
Frecuencia nominal: 50/60 Hz
Consumo nomina
de energía: 4VA

Cumple con los requisitos esenciales de las siguientes Directivas de la
Unión Europea, usando las secciones pertinentes de las reglas
normalizadas y los documentos relacionados que se muestran:

89/336/EEC - Directiva de Compatibilidad Electromagnética

EN 50082-1: 1992 **Norma de inmunidad genérica del EMC, Parte
1: Ambiente residencial, comercial e industria
ligera**
EN 61000-4-2: 1995 Descarga electrostática
EN 61000-4-4: 1995 Perturbaciones transitorias eléctricas rápidas
EN 60801-2: 1994 Requerimientos de descargas electrostáticas
IEC 801-3: 1994 Inmunidad radiada
IEC 801-4: 1988 Requerimientos de perturbaciones transitorias
eléctricas rápidas
EN 55011: 1991 **Limites y métodos de medición de
características de perturbaciones de radio
correspondientes a equipos de
radiofrecuencia industriales, científicos y
médicos (Clase B)**
EN 61000-3-2: 1995 **Limites para emisiones de corriente armónica**
EN 61000-3-3: 1995 **Limitaciones de oscilaciones y fluctuaciones
de voltaje**

73/23/EEC Directiva de Baja Tensión

EN 61010-1 1993 **Requerimientos de seguridad para equipos
eléctricos de medición, control y uso en
laboratorios, Parte 1: Requerimientos
generales**

Erwin D. Lowell Winona, Minnesota USA
Name of Authorized Representative Place of Issue

November, 1998
Title of Authorized Representative Date of Issue


Signature of Authorized Representative

