Series 145

User's Manual

Temperature Limit

TOTAL CUSTOMER SATISFACTION 3 Year Warranty

ISO 9001 Registered Company Winona, Minnesota USA

WATLOW

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$5.00 Made in the U.S.A.
Printed on Recycled Paper
10% Postconsumer Waste

General Description

The Watlow Series 145 is a 1/16 DIN temperature limit controller with a thermocouple or RTD sensor input. The 1/16 DIN case features a front panel that provides the Series 145 with water and corrosion resistance.

The Series 145 is designed to meet the needs of a wide range of safety applications. It is available with a wide variety of thermocouple and RTD ranges.

The compact size of the limit allows more flexibility in applications where space is a problem. The Series 145 has a standard integral setpot and a front panel LED output status indicator.

Specifications

(1927)

Control Mode
- High or low limit, factory selectable
- Manual or automatic reset on power loss, factory selectable
- Latching alarm with manual reset on over or under temperature

Operator Interface
- Sealed membrane front panel
- Integral set point
  - Dual temperature scale (°F and °C)
- LED indication of output status
- Dial scale calibrated to compensate for sensor non-linearities
- Integral reset switch

Input
- Thermocouple or RTD available
- Thermocouple with automatic cold junction compensation
- Thermocouple may be isolated or grounded
- 2- or 3-wire RTD input, platinum 100Ω, 500Ω, or 1000Ω @ 0°C calibrated for DIN 0.003850Ω/Ω °C curve
- Sensor break protection de-energizes output

Output
- Electromechanical relay, 3A, Form C, SPDT: 3A @ 240V~, 3A @ 28V⎓ (dc), resistive, 275VA pilot duty rated

Accuracy

Adjustable Set Point
- Calibration accuracy: ±1% of span, at 77°F ±5°F (25°C ± 3°C) ambient and rated line voltage ± 1%
- Set point accuracy: ±3% of dial scale
- Accuracy span: 1000°F (540°C) minimum

Fixed Set Point
- Calibration accuracy: ±10°F/±6°C of setting, at 77°F ±5°F (25°C ±3°C) ambient and rated line voltage ±1%

Temperature Stability
- Thermocouple: Typically 5µV/°F ambient (9µV/°C ambient) input referenced
- RTD: Typically 0.2°F/°F ambient (0.2°C/°C ambient)

Voltage Stability
- ±0.01% of span (min span of 1000°F or 540°C) per % of rated line voltage

Agency Approvals
- CE: EN61010 - Safety
  EN61326 - Industrial Immunity, Class B Emissions
  Installation Category 2, Pollution Degree 2
- 873, File #E43684
- to C22.2 No. 24, File #E43684
- Approved for use in commercial cooking applications
- FM Class 3545, File #J.I.3008516

Terminals
- Screw clamp terminal: 12-26 gauge wire

Power
- 120V~, +10%/-15%, 50/60 Hz
- 230V~ to 240~, +10%/-15%, 50/60 Hz
- 10VA maximum power

Operating Environment
- 32 to 131°F (0 to 55°C)
- 0 to 90% RH, non-condensing
- Storage temperature: -4 to 185°F (-20 to 85°C)

Dimensions
- Height: 2.1 in (55 mm)
- Width: 2.1 in (55 mm)
- Depth: 4.0 in (102 mm)
- Behind panel: 3.50 in (89 mm)
- Front panel: 0.5 in (13 mm)

Weight
- 0.7 lb (0.3 kg)

Note: Specifications subject to change without notice.

Dimensions

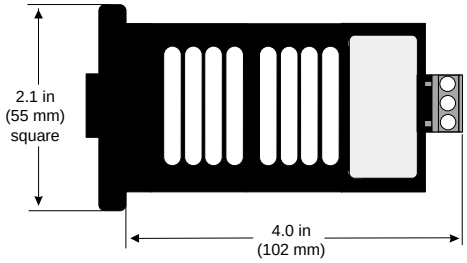


Figure 2a — Series 145 dimensions.

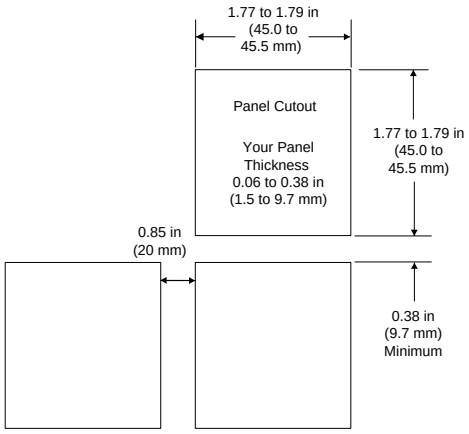


Figure 2b — Series 145 panel cutout.

Wiring Guidelines

- Use the correct sensor type per the model number on the unit sticker.
- Use the proper thermocouple or RTD polarity.
- 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.

CAUTION: A power disconnect switch located near the controller is recommended to shut down power in case of controller failure.

- Long lead lengths create electrical resistance. When using a two-wire RTD, there will be an additional 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. To overcome this problem, use a three-wire RTD sensor, which compensates for lead length resistance. When extension wire is used for a three-wire RTD, all three extension wires must have the same electrical resistance (i.e. same gauge, copper stranded).

Installation

To Mount the Series 145

1. Make a panel cutout, using the dimensions in Figure 2b.
2. Check to see that the external case gasket of the Series 145 is facing the panel surface. Insure that the gasket is not twisted and is seated within the case bezel flush with the bezel. Insert the Series 145 into the cutout.
3. Slide the mounting collar over the back of the controller. The two tabs of the mounting collar will fit into one of the vent openings of the case.
4. While pressing the front of the case firmly against the panel, tighten the two #8-32 screws until tight. Make sure you cannot move the case within the cutout.

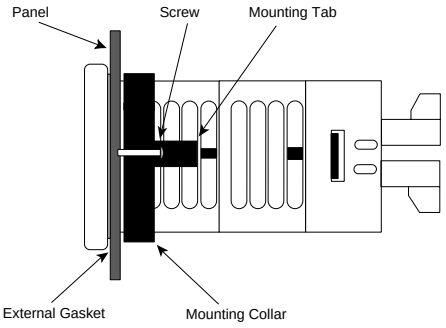


Figure 2c — Series 145 mounting.

NOTE: FM Approval requires limit switches to be suitably enclosed to minimize casual readjustment of set temperature.

To Remove the Series 145

1. Remove the Series 145 by loosening the mounting screws located on the mounting collar.
2. Using the screws, gently pry them away from the case. This will lift the mounting tabs, allowing the collar to slide backwards.

NOTE: To guarantee a proper seal, make sure the gasket between the panel and the rim of the case is not twisted and is seated properly. Press firmly.

NOTE: Make sure the rounded side of the D-shaped external case gasket faces the panel surface and the gasket is fully seated.

User Interface

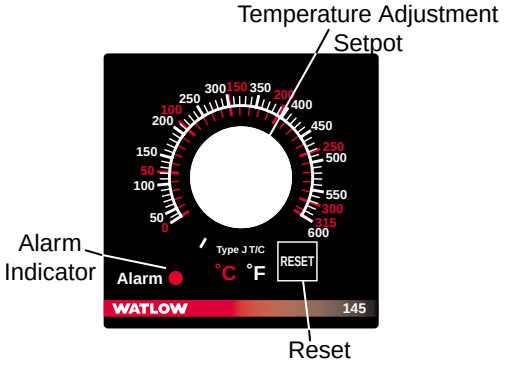


Figure 2d — Series 145 interface.

Power Wiring

120V~ 145 _ - 1 _ _ _ - 0000

230 to 240 V~ 145 _ - 2 _ _ _ - 0000

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

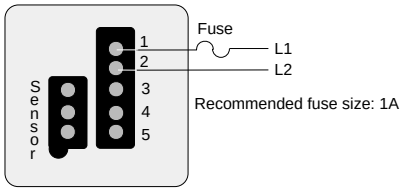


Figure 3a — Power wiring.

CAUTION Applying incorrect voltage may result in irreversible damage to the controller.

WARNING: To avoid potential electric shock, use National Electrical Code (NEC) safety practices when wiring and connecting this unit to a power source and to electrical sensors or peripheral devices. Failure to do so could result in injury and death.

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

WARNING: The Series 145 Temperature Limit Switch should be mounted in an inconspicuous location to discourage unauthorized changes to the set point. Only approved personnel should have the authority to change the set point on the limit switch. Failure to comply with these recommendations could result in damage to equipment and property, and injury to personnel.

Input Wiring

Thermocouple

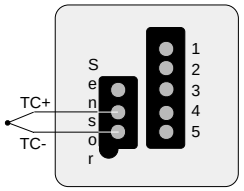


Figure 3b — Thermocouple wiring.

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.

2- and 3-Wire RTD

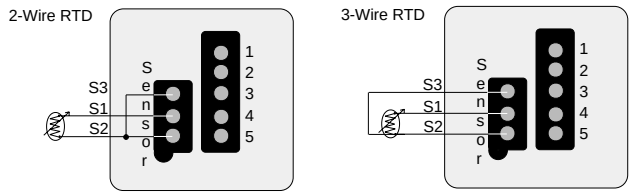


Figure 3c — 2- and 3-wire RTD wiring.

NOTE: Using 2- or 3-wire RTD input, platinum 100Ω, 500Ω, or 1000Ω at 0°C calibrated for DIN 0.003850Ω/Ω °C curve.

Output Wiring

Electromechanical Relay, 3A, Form C with suppression

145**D** - _ _ _ _ - 0000

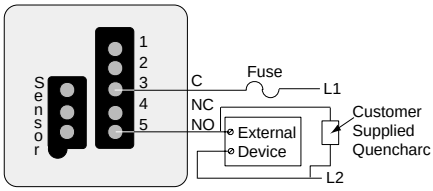


Figure 3d — Electromechanical relay wiring.

NOTE: No external reset wiring is available.

NOTE: Switching inductive loads (relay coils, solenoids, etc.) with the mechanical relay, switched dc or solid-state relay output options 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.

Safety Information

Note, caution and warning symbols appear 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.

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

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

System Example

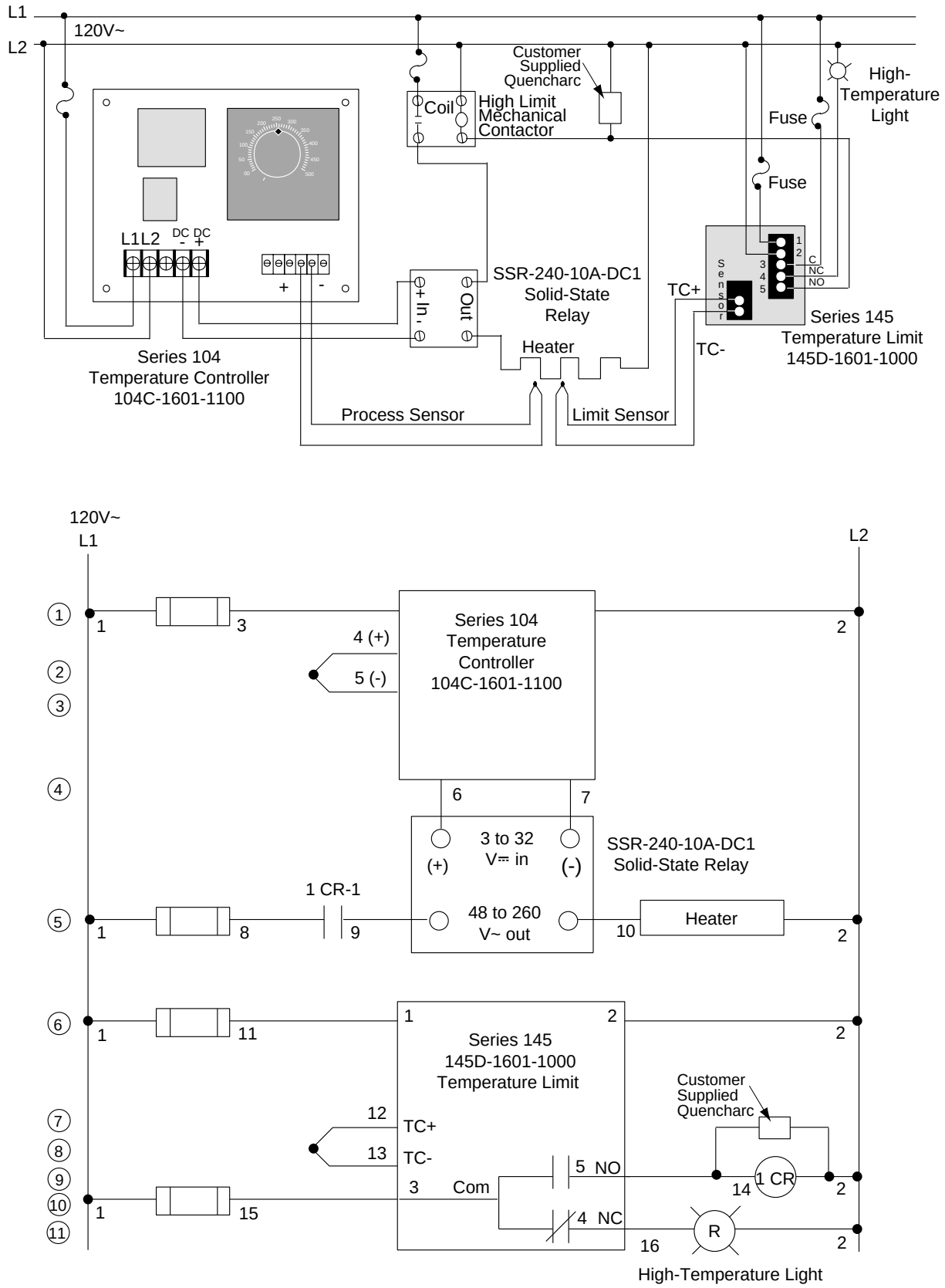


Figure 4 — System wiring examples.

Declaration of Conformity

Series 145

CE

WATLOW WINONA
1241 Bundy Boulevard
Winona, Minnesota 55987 USA

Declares that the following product: ***English***

Designation:	Series 145
Model Number(s):	145D - (1 or 2) (100-999) - (1, 2,3, or 4) (0 or 2) (any 2 letters or numbers)
Classification:	Installation Category II, Polution Degree II
Rated Voltage:	120 or 240V~
Rated Frequency:	50/60 Hz
Rated Power Consumption:	10VA maximum

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 61326:	**1997**	**Electrical equipment for measurement, control and laboratory use - EMC requirements (Emissions Class B)**
EN 61000-3-2:	1995	Limits for harmonic current
EN 61000-3-3:	1995	Limitations of voltage fluctuatuions and flicker
EN 61000-4-2:	1995	Electrostatic discharge
EN 61000-4-3:	1997	Radiated immunity
EN 61000-4-4:	1995	Electrical fast transients
EN 61000-4-5:	1995	Surge immunity
EN 61000-4-6:	1994	Conducted immunity
EN 61000-4-11:	1994	Voltage dips, short interruptions and voltage variations immunity
ENV 50204:	1995	Cellular phone

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 145
Numéro(s) de modèle(s) :	145D - (1 ou 2) (100-999) - (1, 2, 3 ou 4) (0 ou 2) (deux lettres ou chiffres quelconques)
Classification :	Installation catégorie II, degré de pollution II
Tension nominale :	120 ou 240V~
Fréquence nominale :	50/60 Hz
Consommation d'alimentation nominale :	10 volt-ampères maximum

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 61326:	**1995**	**Appareillage électrique pour la mesure, la commande et l'usage de laboratoire — Prescriptions relatives à la Compatilité Electro Magnétique (Émissions classe B)**
EN 61000-3-2 :	1995	Limites d'émission de courant harmonique
EN 61000-3-3 :	1995	Limites de fluctuation de tension
EN 61000-4-2 :	1995	Décharge électrostatique
EN 61000-4-3:	1997	Insensibilité à l'énergie rayonnée
EN 61000-4-4 :	1995	Courants électriques transitoires rapides
EN 61000-4-5 :	1995	Insensibilité aux surtensions
EN 61000-4-6:	1996	Insensibilité à l'énergie par conduction
EN 61000-4-11 :	1994	Insensibilité aux chutes subites, aux courtes interruptions et aux variations de tension
ENV 50204 :	1995	Téléphone cellulaire

73/23/EEC Directive liée aux basses tensions

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

(1929)

Erklärt, daß das folgende Produkt: ***Deutsch***

Beschreibung:	Serie 145
Modellnummer(n):	145D - (1 oder 2) (100-999) - (1, 2, 3 oder 4) (0 oder 2) (2 beliebige Buchstaben oder Ziffern)
Klassifikation:	Installationskategorie II, Emissionsgrad II
Nennspannung:	120 oder 240V~
Nennfrequenz:	50/60 Hz
Nominaler Stromverbrauch:	Maximaler 10VA

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 Elektromagnetische Übereinstimmungsanweisung

EN 61326:	**1997**	**Electrical equipment for measurement, control and laboratory use - EMC requirements (Emissions Class B)**
EN 61000-3-2:	1995	Grenzen der Oberwellenstromemissionen
EN 61000-3-3:	1995	Grenzen der Spannungsschwankungen
EN 61000-4-2:	1995	Elektrostatische Entladung
EN 61000-4-3:	1997	Strahlungsimmunität
EN 61000-4-4:	1995	Elektrische schnelle Stöße
EN 61000-4-5:	1995	Spannungsstoßimmunität
EN 61000-4-6:	1994	Störimmunität
EN 61000-4-11:	1994	Immunität gegen Spannungsgefälle, kurze Unterbrechungen und Spannungsabweichungen
ENV 50204:	1995	Mobiltelefon

73/23/EEC Niederspannungsrichtlinie zu entsprechen

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 145
Números de modelo:	145D - (1 ó 2) (100-999) - (1, 2, 3 ó 4) (0 ó 2) (Cualquier combinación de dos letras)
Clasificación:	Categoría de instalación II, grado de contaminación ambiental II
Tensión nominal:	120 ó 240V~
Frecuencia nominal:	50/60 Hz
Consumo nominal de energía:	10 VA máximo

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 61326:	**1997**	**Equipo elétrico para medición control y uso en laboratorios - Requisitos de compatibilidad electromagnética (Emisiones Clase B)**
EN 61000-3-2	1995	Límites para emisiones de corriente armónica
EN 61000-3-3	1995	Limitaciones de fluctuaciones del voltaje
EN 61000-4-2:	1995	Descarga electrostática
EN 61000-4-3:	1997	Inmunidad radiada
EN 61000-4-4:	1995	Perturbaciones transitorias eléctricas rápidas
EN 61000-4-5:	1995	Sobretensión
EN 61000-4-6:	1994	Inmunidad conducida
EN 61000-4-11:	1994	Caídas de tensión, interrupciones breves y variaciones de tensión
ENV 50204:	1995	Teléfono portátil

73/23/EEC Directiva de Baja Tensión

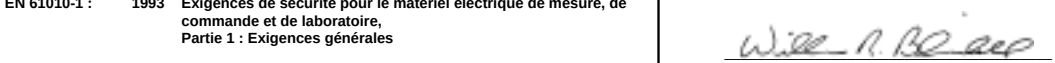
EN 61010-1:	1993	Requerimientos de seguridad para equipos eléctricos de medición, control y uso en laboratorios, Parte 1: Requerimientos generales

William R. Blaisdell
Name of Authorized Representative

Winona, Minnesota, USA
Place of Issue

Plant Manager
Title of Authorized Representative

August 18, 2000
Date of Issue



Signature of Authorized Representative

Ordering Information

(1928) **145 _ - _ _ _ _ - _ 000**

Series 145
Closed loop temperature limit controller, integral setpot

Output Type
D = Electromechanical relay, 3A, Form C

Line Voltage
1 = 120V~
2 = 230 to 240V~

Input and Range

Type J
601 = 32 to 600°F (0 to 315°C)
602 = 32 to 1382°F (0 to 750°C)
609 = 50 to 150°F (10 to 66°C)

Type K
603 = 32 to 2282°F (0 to 1250°C)
611 = 32 to 1112°F (0 to 600°C)
612 = 32 to 482°F (0 to 250°C)

Type R
608 = 32 to 2732°F (0 to 1500°C)

Type S
607 = 32 to 2732°F (0 to 1500°C)

Type T
604 = 150 to 662°F (66 to 350°C)
605 = -328 to 150°F (-200 to 66°C)
610 = -125 to 425°F (-87 to 218°C)

RTD (100Ω)
101 = -100 to 1112°F (-73 to 600°C)
103 = 32 to 482°F (0 to 250°C)

Limit Mode
1 = High limit with manual reset on power loss
2 = Low limit with manual reset on power loss
3 = High limit with automatic reset on power loss
4 = Low limit with automatic reset on power loss

NOTE: Electromechanical relays are warranted for 100,000 closures only. Solid state switching devices recommended for applications requiring extended service life.

NOTE: Conformal coated product is available; consult factory.

NOTE: This output should be used with inductive loads.

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.

Warranty

The Series 145 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) 494-5656, 7 a.m. to 7 p.m. Central Standard Time.

Troubleshooting

Problem	Probable Cause	Action
The load will not turn on.	An open sensor.	Repair or replace.
	The load circuit is open.	Check the fuses, circuit breakers, load and wiring.
	The ac input is not connected or is connected improperly.	Check the the ac input connections. If not present, connect according to power wiring instructions.
The load will not turn off.	The polarity is reversed on the thermocouple.	Connect according to input wiring instructions.
	A faulty unit.	Remove power to the controller and the controller from the system. Apply power to the system with the controller removed. If the load turns off, return the controller to the factory. If the load remains on, there are other problems in the system that must be resolved. Consult the factory.