PM LEGACY™

The PM LEGACY™ series panel mount controller is an industry leading PID controller that allows optimal performance utilizing simple control and menu functionality without complex features. It is ideally suited for basic applications and usage levels.

The LEGACY includes one universal input and an option for up to two outputs and is available in 1/32, and 1/16 DIN panel mount packages. It can be ordered as a PID process controller or as a dedicated over and under-temperature limit controller.

Features and Benefits

Simplified menu
- Fits basic applications with a user-friendly interface supported by two menus and a streamlined list of parameters
- Eliminates user complexity often experienced with more advanced controllers and unnecessary features
- Reduces user training costs and user programming errors

PID auto-tune
- Provides auto-tune for fast, efficient start-up

Standard bus communications
- Allows easy product configuration via PC communications protocol and free software
- Saves time, simplifies programming process and improves reliability of controller setup

Factory Mutual (FM) approved over and under limit with auxiliary outputs
- Increases user and equipment safety for over and under-temperature conditions

Touch-safe package
- Increases installer and operator safety
- Complies with IP2X requirements

EZ-LINK™ mobile application for iPhone® and Android™
- Expedites controller setup with intuitive navigation
- Simplifies setting parameters with plain text names and descriptions
- Connects quickly and easily via Bluetooth® wireless communications

SMOOTH TOUCH™ keypad
- Eliminates contamination points on the front of the controller
- Prevents premature failure of mechanical components
- Creates a better seal on front panel
- Ensures an easy to clean surface

Agency approvals: UL® listed, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200, Class 1, Div. 2 rating on selected models
- Assures prompt product acceptance
- Reduces end product documentation costs

P3T armor sealing system
- Complies to NEMA 4X, IP66 and IP67 specifications
- Allows controller to be cleaned and washed
- Certified UL® 50 independent to NEMA 4X specification

Consistent Termination Labeling (CTL) connection system
- Simplifies switching between products
- Speeds up user's system documentation

Three-year warranty
- Demonstrates Watlow's reliability and product support

High-amperage power control output (1/16 DIN only)
- Drives 15 ampere resistive loads direct
- Reduces component count
- Saves panel space and simplifies wiring
- Reduces cost of ownership

PM LEGACY

Specifications

Line Voltage/Power

- 85 to 264VAC, 47 to 63Hz
- 20 to 28VAC, +10/-15%; 50/60Hz, ±5%
- 12 to 40VDC
- 10VA ($^1/_{32}$ and $^1/_{16}$ DIN)
- Data retention upon power failure via non-volatile memory
- Compliant SEMI F47-0200, Figure R1-1 voltage sag requirements @ 24VAC or higher

Environment

- 0 to 149°F (-18 to 65°C) operating temperature
- -40 to 185°F (-40 to 85°C) storage temperature
- 0 to 90% RH, non-condensing

Accuracy

- Calibration accuracy and sensor conformity: ±0.1% of span, ±1°C @ the calibrated ambient temperature and rated line voltage
  - Type S: 0.2%
  - Type T below -50°C: 0.2%
- Calibration ambient temperature @ 77°F ±5°F (25°C ±3°C)
- Accuracy span: 1000°F (540°C) min.
- Temperature stability: ±0.1°F/°F (±0.1°C/°C) rise in ambient max.

Agency Approvals

- cULus® UL®/EN/CSA C22.2 No 61010-1 Listed, File E185611
- CSA C22.2 No. 24, File 158031
- UL® 50 4X indoor locations, NEMA 4X, IP66, IP67 front seal
- cULus® ANSI/ISA 12.12.01-2007, CSA-C22.2 No. 213-1987, Class 1, Div. 2, Groups A, B, C and D, temperature code T4A, File E184390 (optional)
- CE, RoHS by design, W.E.E.E.
- FM Class 3545 (limit controls)

Controller

- User selectable heat/cool, on-off, P, PI, PD, PID or alarm action, not valid for limit controllers
- Auto-tune with control algorithm
- Control sampling rates: Input = 10Hz, outputs = 10Hz
- Input and output capacity per controller type ordering information

Serial Communications

- Isolated communications
- Standard bus configuration protocol

Wiring Termination—Touch-Safe Terminals

- Input, power and controller output terminals are touch safe removable 12 to 22 AWG

Universal Input

- Thermocouple, grounded or ungrounded sensors, greater than 20MΩ input impedance, 2kΩ source resistance max.
  - Non-isolated to switched dc and process output
- RTD 2- or 3-wire, platinum, 100Ω @ 0°C calibration to DIN curve (0.00385 Ω/Ω/°C)
- Process, 4-20mA @ 100Ω, or 0-10VDC @ 20kΩ input impedance; scalable

Functional Operating Range

Type J: -346 to 2192°F (-210 to 1200°C)
Type K: -454 to 2500°F (-270 to 1371°C)
Type T: -454 to 750°F (-270 to 400°C)
Type E: -454 to 1832°F (-270 to 1000°C)
Type N: -454 to 2372°F (-270 to 1300°C)
Type C: 32 to 4200°F (0 to 2315°C)
Type D: 32 to 4200°F (0 to 2315°C)
Type F: 32 to 2449°F (0 to 1343°C)
Type R: -58 to 3214°F (-50 to 1767°C)
Type S: -58 to 3214°F (-50 to 1767°C)
Type B: 32 to 3300°F (0 to 1816°C)
RTD (DIN): -328 to 1472°F (-200 to 800°C)
Process: -1999 to 9999 units

Output Hardware

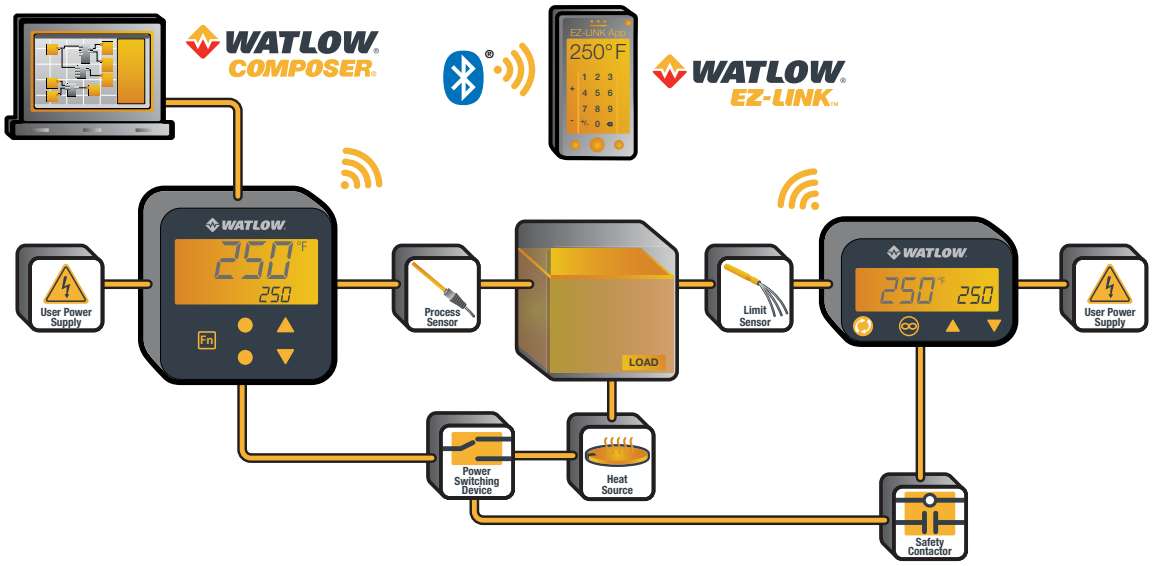
- Switched dc = 22 to 32VDC @ 30mA
- Open collector = 30VDC max. @ 100mA max. current sink
- Solid state relay (SSR), Form A, 0.5A @ 24VAC min., 264VAC max., opto-isolated, without contact suppression
- Electromechanical relay, Form C, 24 to 240VAC or 30VDC max., 5A resistive load, 100,000 cycles at rated load
- Electromechanical relay, Form A, 24 to 240VAC or 30VDC max., 5A resistive load, 100,000 cycles at rated load
  - Output 2 is limit for limit models
- NO-ARC relay, Form A, 24 to 240VAC, 15A @ 122°F (50°C), resistive load, no VDC, 2 million cycles at rated load
- Universal process output: Range selectable; 0 to 10VDC ±15mV into a min. 1,000Ω load with 2.5mV nominal resolution; 4 to 20mA ±30µA into max. 800Ω load with 5µA nominal resolution; temperature stability 100ppm/°C

Operator Interface

- Dual 4 digit, 7 segment LED displays
- Typical display update rate 1Hz
- Advance, infinity (RESET), up and down keys plus a FUNCTION KEY (not available in $^1/_{32}$ DIN)
- Infinity key is also labeled RESET on limit control models
- FUNCTION KEY on $^1/_{16}$ DIN package automatically programmed as an auto/manual transfer mode function on PID models

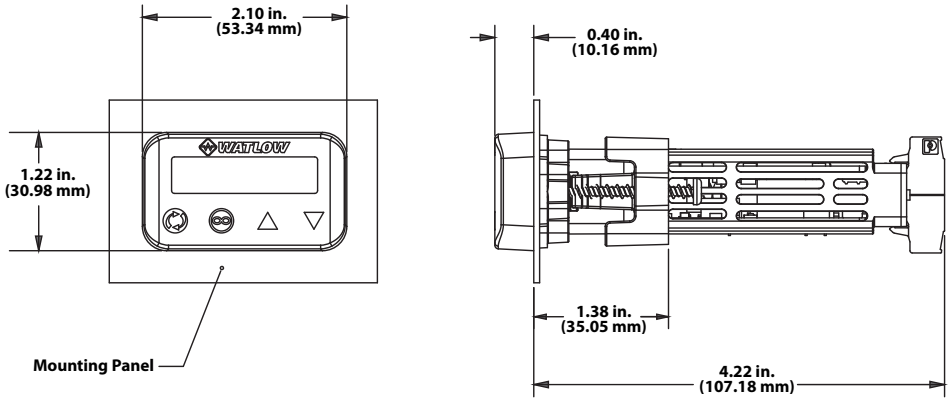
PM LEGACY

Typical Block Diagram

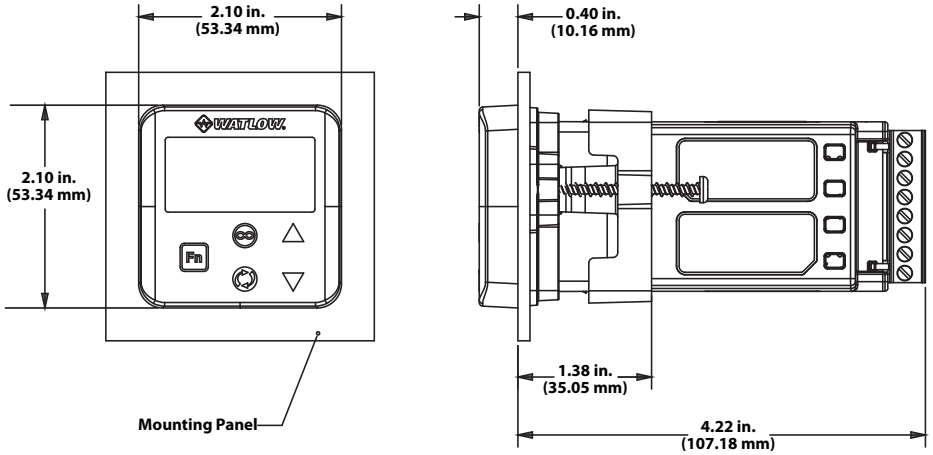


Dimensional Drawings

PM LEGACY 1/32 DIN



PM LEGACY 1/16 DIN



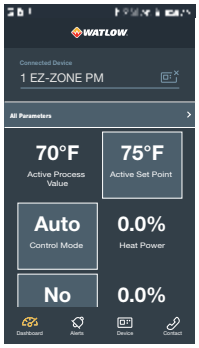
PM LEGACY

Comparison of Available Features

	1/32 DIN	1/16 DIN
PID Loops	1	1
Profile Ramp/Soak	40 total steps	None
Full Menu	Yes	None
Express Menu	Yes	Yes
Number of Digital Inputs/Outputs	0 to 2	0 to 2
Number of Outputs	1 to 4	1 to 6
Integrated Limits	None	None
Discrete Limit	Yes	Yes
Maximum Power Output	5A mechanical relay	15A NO-ARC
Current Measurement	None	None
Standard Bus Communications	Yes	Yes
Bluetooth® Technology	Yes	Yes
Field Bus Communications	Modbus® RTU 485	Limit only
Countdown Timer	Yes	None

Compatible Accessories

More information is available on these products at www.watlow.com



Watlow's new EZ-LINK™ app allows users to easily setup, monitor and adjust Watlow PM LEGACY controllers via Bluetooth®. The app is available free-of-charge from the app store for phones and tablets, and provides access to the controller's parameters with fully spelled out names in plain text with help topics that explain each parameter and option. EZ-LINK mobile application connects quickly and easily via Bluetooth® wireless communications. Download the EZ-Link App EZ-LINK at Google Play for Android™ or Download on the App Store for iPhone®.

SpecView is designed for industrial users with features such as data logging, trending and support for bar code readers and touch screens. Errors are reduced, for any process, by creating application-specific screens. The software provides a historical replay option, easy-to-use recipe features and remote access options, including LAN, Internet and modem.

COMPOSER® is Watlow's easy-to-use software for configuring and customizing controllers. Use it to optimize Watlow's F4T®, PM LEGACY and EZ-ZONE® RM controllers for specific applications. Task-specific views simplify all aspects of commissioning new controllers including managing the inputs and outputs from pluggable flex modules, setting up functions such as control loops and alarms and creating and editing profiles. COMPOSER software is available for download at www.watlow.com.

Silver Series EM touch screen operator interface terminals provide a customizable user interface, email event notifications and log and graph data for Watlow controllers and other devices. A Silver Series EM operator interface teminal paired with Watlow controllers is the perfect solution for your industrial process or machine control application.

PM LEGACY

PM LEGACY Control Configuration Information

Part Number

① ②	③	④	⑤	⑥ ⑦	⑧	⑨ ⑩ ⑪	⑫	⑬ ⑭
PM	Package Size	Primary Functions	Power Supply, Digital I/O	Output 1 and 2 Hardware Options	Comm. Options	Future Options	Model Selection	Customs Options
						AAA		

③	Power Supply
3 =	1/32 DIN
6 =	1/16 DIN

④	Primary Functions
C =	PID controller with universal input
R =	PID controller with universal input and profiling ramp/soak **(Not available on 1/16 DIN or Express version)**
T =	PID controller with universal input and countdown timer **(Not available on 1/16 DIN or Express version)**
J =	PID controller with thermistor input **(Not available on 1/16 DIN or Express version)**
N =	PID controller with thermistor input and profiling ramp/soak **(Not available on 1/16 DIN or Express version)**

⑤	Power Supply, Digital Inputs/Outputs (I/O)
1 =	100 to 240VAC
2 =	100 to 240VAC plus 2 digital I/O points **(Not available on 1/16 DIN or Express version)**
3 =	20 to 28VAC or 12 to 40VDC
4 =	20 to 28VAC or 12 to 40VDC, plus 2 digital I/O points **(Not available on 1/16 DIN or Express version)**

⑥ ⑦	Output 1 and 2 Hardware Options	
	Output 1	**Output 2**
CA =	Switched dc/open collector	None
CH*=	Switched dc/open collector	NO-ARC 15A power control
CC =	Switched dc/open collector	Switched dc
CJ =	Switched dc/open collector	Mechanical relay 5A, Form A
CK =	Switched dc/open collector	SSR Form A, 0.5A
EA =	Mechanical relay 5A, Form C	None
EH*=	Mechanical relay 5A, Form C	NO-ARC 15A power control
EC =	Mechanical relay 5A, Form C	Switched dc
EJ =	Mechanical relay 5A, Form C	Mechanical relay 5A, Form A
EK =	Mechanical relay 5A, Form C	SSR Form A, 0.5A
FA =	Universal process	None
FC =	Universal process	Switched dc
FJ =	Universal process	Mechanical relay 5A, Form A
FK =	Universal process	SSR Form A, 0.5A
AK =	None	SSR Form A, 0.5A
KH*=	SSR Form A, 0.5A	NO-ARC 15A power control
KK =	SSR Form A, 0.5A	SSR Form A, 0.5A

*CH, EH, KH - Not available with the 1/32 DIN (PM3) package size.

⑧	Communication Options
Standard bus always included	
A =	None
B =	Bluetooth®
E =	EIA-485 Modbus® RTU and Bluetooth® **(Not available on 1/16 DIN or Express version)**
1 =	EIA-485 Modbus® RTU **(Not available on 1/16 DIN or Express version)**
Note: Bluetooth® not available in all countries, contact factory.	

⑫	Model Selection
N =	PM LEGACY Version **(Only available in PM3) (Input 1 always isolated)**
H =	PM LEGACY EXPRESS Version **(Available in PM3 or PM6) (Input 1 always isolated)**

⑬ ⑭	Custom Options
WP =	Watlow logo face plate
WN =	No logo/no name face plate
AG =	Conformal coating
12 =	Class 1, Div. 2 (not available with mechanical relay Output Types E, H or J)

EZ-ZONE® RM

The EZ-ZONE RM controller simplifies thermal system management. The EZ-ZONE RM controller family is comprised of six module types: An integrated on-off or PID control, monitoring and over/under temperature limit module, a high-density on-off or PID control module, a high-density limit only module, an input/output (I/O) expansion module, a high-density monitor/scanner module and a data logging and field communications access module. A system is configured by connecting any combination of module types to address specific application needs. The EZ-ZONE RM is extremely flexible and scalable allowing mixing and matching of I/O to configure one to 152 control loops and up to 256 monitor points.

Now Watlow's EZ-ZONE RM is available through Watlow ***SELECT***®, a program that enables you to quickly identify, configure and receive your thermal products faster and easier than ever before. Visit www.watlow.com/select to learn more.

Optional integrated controller functions can be combined or ordered in different quantities:

- PID control loops
- Over/under temperature limit control loops
- 10 and 15 ampere power output/heater driver options
- On-board data logging
- Current measurement input
- Sequencer start up and control function
- Programmable timer and counter functions
- Programmable math and logic options
- Multiple communication protocol options
- Mobile configuration with removable secure digital (SD) flash card

Benefits of using an integrated controller solution:

- Reduces wiring time and termination complexity compared with connecting multiple discrete products
- Improves system reliability
- Reduces termination and installation cost
- Eliminates compatibility issues often encountered with using various discrete components and brands
- Reduces troubleshooting time and downtime costs because the system can specifically identify any problems with a sensor, controller, solid state relay (SSR) power output or heater load
- Complete thermal solution saves engineering time and labor costs while shortening project schedules

Features and Benefits

Multiple inputs; from one to 152 PID loops of control or monitor up to 256 analog inputs

- Mix and match I/O to fit any application; from one input with two outputs to 152 analog inputs with 152 outputs, or monitor up to as many as 256 analog inputs all in one system
- Reduces cost because only required loops are purchased
- Allows a common controller platform across many design applications as both loops and outputs can be ordered in single increments

Advanced PID control algorithm

- Offers TRU-TUNE®+ adaptive control to provide tighter control for demanding applications
- Enables auto-tune for fast, efficient start-up

Communication capabilities

- Provides a range of protocol options including universal serial bus (USB) device port, Modbus® RTU, EtherNet/IP™, Modbus® TCP, DeviceNet™ and PROFIBUS

USB port

- Provides data log retrieval

SPLIT-RAIL control

- Allows modules mounted in separate high-voltage and low-voltage cabinets to function as an integrated system
- Minimizes the length and cost of wire runs and improves system reliability by locating inputs closer to sensors and outputs closer to loads

AUTO CLONE

- Reduces time and configuration complexity by automatically building a new module with the same parameter settings as the replaced module

SENSOR GUARD

- Prevents unplanned process shutdowns and product loss by switching to a backup sensor if the primary sensor fails

EZ-ZONE RM

Additional Key Functions

- Configuration communication port (standard bus)
- Removable modules and connectors
- Ring lug and front-screw terminal options
- Profile ramp soak with 400 total steps
- Retransmit and remote set point input virtually inside controller eliminating costs for input/output hardware
- User configuration settings can be stored and recalled
- Thermistor input
- Elevated operating range of 0 to 149°F (-18 to 65°C)
- UL® listed, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200, Class 1, Div. 2 rating on selected models

Common Specifications (Applies to all models)

Line Voltage/Power

- 20.4 to 30.8VAC/VDC, 50/60Hz ±5%
- Any external power supply used should comply with a Class 2 or SELV rating (see specific module specification listing for max. VA power consumption)
- Data retention upon power failure via non-volatile memory
- Compliant with Semi F47-0200, Figure R1-1 voltage sag requirements

Environment

- 0 to 149°F (-18 to 65°C) operating temperature
- -40 to 185°F (-40 to 85°C) storage temperature
- 0 to 90% RH, non-condensing

Functional Operating Range for RMC, RMH, RML and RMS

Type J: -346 to 2192°F (-210 to 1200°C)
Type K: -454 to 2500°F (-270 to 1371°C)
Type T: -454 to 750°F (-270 to 400°C)
Type E: -454 to 1832°F (-270 to 1000°C)
Type N: -454 to 2372°F (-270 to 1300°C)
Type C: 32 to 4200°F (0 to 2315°C)
Type D: 32 to 4200°F (0 to 2315°C)
Type F: 32 to 2449°F (0 to 1343°C)
Type R: -58 to 3214°F (-50 to 1767°C)
Type S: -58 to 3214°F (-50 to 1767°C)
Type B: 32 to 3300°F (0 to 1816°C)
RTD (DIN): -328 to 1472°F (-200 to 800°C)
Process: -1999 to 9999 units

Agency Approvals

- UL®/EN 61010 Listed, File E185611, C-UL® C22.2 #61010ANSI/ISA 12.12.01-2007 Class 1, Div. 2 - Group A, B, C, D temperature code T4 (optional)
- UL® 1604 Class 1, Div. 2 (optional)
- EN 60529 IP20
- UL® 50, NEMA 4X, EN 60529 IP66; 1/16 DIN remote user interface (RUI)
- CSA 610110 CE
- RoHS by design, W.E.E.E.
- FM Class 3545 on limit control versions
- CE

Serial Communications

- All modules ship with standard bus protocol for configuration and communication with all other EZ-ZONE products

Implicit Messaging

Number of data members accessible through implicit messaging

Protocol	RM System	RMC	RMH	RML	RME	RMS	RMA
EtherNet/IP™	100	20	40	40	20	40	20
DeviceNet™	200	20	40	40	20	40	20

User Interface

- 7-segment LED, address/protocol indicator programmed via push button switch
- Communication activity, 2 LEDs
- Error condition of each loop, 4 LEDs
- Output status indication, 16 LEDs

Maximum System Configuration

- 1 access module plus up to 16 additional control or expansion modules (any combination), up to 152 loops

Mounting

- DIN-rail specification EN50022, 1.38 x 0.30 in. (35 x 7.5 mm)
- DIN-rail mounted or chassis mounted with customer supplied screws

Wiring Termination—Touch-Safe Terminals

- Right angle and front screw type terminal blocks (slots A, B, D, E)
- Input, power and controller output terminals, touch safe, removable, 12 to 30 AWG

EZ-ZONE RM

High-Density Limit Module Specifications (RML)

(Select an RML module for 4 to 12 safety limits.)

Line Voltage/Power

- Power consumption: 7 W, 14VA
- Any external power supply used should comply with a Class 2 or SELV rating

Isolated Serial Communications

- All modules ship with standard bus protocol for configuration and communication with all other EZ-ZONE controllers
- Optional EIA-485, Modbus® RTU

Calibration Accuracy

- ±0.1% of span, ±1°C. See user manual for details

Universal Input

- Thermocouple, grounded or ungrounded sensors
- >20MΩ input impedance
- Max. of 2kΩ source resistance
- RTD 2-wire, platinum, 100Ω and 1000Ω @ 32°F (0°C) calibration to DIN curve (0.00385Ω/Ω/°C)
- Process, 0-20mA @100Ω, or 0-10VDC @ 20kΩ input impedance; scalable, 0-50mV

Thermistor Input

- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)

Digital Input

- Update rate 10Hz
- Max. input 36VDC at 3mA
- Min. high state 3VDC at 0.25mA

Dry Contact Input

- Update rate 10Hz
- Min. open resistance 10kΩ, max. closed resistance 50Ω

Output Hardware

- 6 digital inputs/outputs:
  - Switched dc, max. 20VDC @ 40mA, 12VDC @ 80mA
  - Open collector, max. 32VDC @ 1.5A, max. 8A per 6 outputs combined
- Electromechanical relay, Form A, 5A, 24 to 240VAC or 30VDC max., resistive load, 100,000 cycles at rated load, requires a min. load of 20mA at 24V, 125VA pilot duty

EZ-ZONE RM

High-Density Limit Module Ordering Information

Requires 24 to 28VAC/VDC power supply, includes communication port for configuration with EZ-ZONE configurator and PC.

Part Number

① ② EZ-ZONE Rail Mount	③ Limit Module	④ Connector Style		⑤ Slot A	⑥ Slot B	⑦ Slot D	⑧ Slot E		⑨ Future Option	⑩ Enhanced Options	⑪ ⑫ Additional Options
RM	L		-					-	A		

④	Connector Style/Custom Product
A =	Right angle screw connector (standard)
F =	Front screw connector (slots A, B, D and E only)
S =	Custom

⑤	Slot A
4 =	4 high accuracy thermocouple inputs with limits (defaults to Type K)
5 =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with limit control loops
6 =	4 thermistor inputs with limit control loops

⑥	Slot B
A =	None
4 =	4 high accuracy thermocouple inputs with limits (defaults to Type K)
5 =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with limit control loops
6 =	4 thermistor inputs with limit control loops

⑦	Slot D
A =	None
4 =	4 high accuracy thermocouple inputs with limits (defaults to Type K)
5 =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with limit control loops
6 =	4 thermistor inputs with limit control loops
J =	4 mechanical relay 5A, Form A
C =	6 digital I/O*

⑧	Slot E
J =	4 mechanical relay 5A, Form A
B =	1 digital input and 2 mechanical relays, 5A (1 Form A and 1 Form C)*

⑩	Enhanced Options
A =	Standard bus
1 =	Standard bus and Modbus® RTU 485* (user-selectable)

⑪ ⑫	Additional Options
Firmware, Overlays, Parameter Settings	
AA =	Standard
AB =	Replacement connectors hardware only for the entered part number
XX =	Custom

* Reset limits via digital input, EZ key on RUI or communications commands

EZ-ZONE RM

High-Density Scanner Module Specifications (RMS)

(Select an RMS module for 4 to 16 auxiliary analog inputs.)

Line Voltage/Power

- Power consumption: 7 W, 14VA
- Any external power supply used should comply with a Class 2 or SELV rating

Isolated Serial Communications

- All modules ship with standard bus protocol for configuration and communication with all EZ-ZONE controllers
- Optional EIA-485, Modbus® RTU

Calibration Accuracy

- ±0.1% of span, ±1°C. See user manual for details.

Universal Input

- Thermocouple, grounded or ungrounded sensors
- >20MΩ input impedance
- Max. of 2kΩ source resistance
- RTD 2-wire, platinum, 100Ω and 1000Ω @ 32°F (0°C) calibration to DIN curve (0.00385Ω/Ω/°C)
- Process, 0-20mA @100Ω, or 0-10VDC @ 20kΩ input impedance; scalable, 0-50mV

Thermistor Input

- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)

Digital Input

- Update rate 10Hz
- Max. input 36VDC at 3mA
- Min. high state 3VDC at 0.25mA

Dry Contact Input

- Update rate 10Hz
- Min. open resistance 10kΩ, max. closed resistance 50Ω

Output Hardware

- 6 digital inputs/outputs:
  - Switched dc, max. 20VDC @ 40mA, 12VDC @ 80mA
  - Open collector, max. 32VDC @ 1.5A, max. 8A per 6 outputs combined
- Electromechanical relay, Form A, 5A, 24 to 240VAC or 30VDC max., resistive load, 100,000 cycles at rated load, requires a min. load of 20mA at 24V, 125VA pilot duty

EZ-ZONE RM

High-Density Scanner Module Ordering Information

Requires 24 to 28VAC/VDC power supply, includes communication port for configuration with EZ-ZONE configurator and PC.

Part Number

① ② EZ-ZONE Rail Mount	③ Scanner Module	④ Connector Style		⑤ Slot A	⑥ Slot B	⑦ Slot D	⑧ Slot E		⑨ Future Option	⑩ Enhanced Options	⑪ ⑫ Additional Options
RM	S		-					-	A		

④	Connector Style/Custom Product
A =	Right angle screw connector (standard)
F =	Front screw connector (slots A, B, D and E only)
S =	Custom

⑤	Slot A
4 =	4 high accuracy thermocouple inputs (defaults to Type K)
R =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) without control loops
P =	4 thermistor inputs without control loops

⑥	Slot B
A =	None
4 =	4 high accuracy thermocouple inputs (defaults to Type K)
R =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) without control loops
P =	4 thermistor inputs without control loops

⑦	Slot D
A =	None
4 =	4 high accuracy thermocouple inputs (defaults to Type K)
R =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) without control loops
P=	4 thermistor inputs without control loops
C =	6 digital I/O
F =	3 universal process/retransmit outputs
J =	4 mechanical relay 5A, Form A
L =	4 SSR at 2A each. SSR grouped in 2-pairs with each pair sharing a common.

⑧	Slot E
A =	None
4 =	4 high accuracy thermocouple inputs (defaults to Type K)
R =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) without control loops
P =	4 thermistor inputs without control loops
B =	1 digital input and 2 mechanical relays, 4A
C =	6 digital I/O
F =	3 universal process/retransmit outputs
J =	4 mechanical relay 5A, Form A
L =	4 SSR at 2A each. SSR's grouped in 2-pairs with each pair sharing a common.

⑩	Enhanced Options
A =	Standard bus
1 =	Standard bus and Modbus® RTU 485 (user-selectable)

⑪ ⑫	Additional Options
Firmware, Overlays, Parameter Settings	
AA =	Standard
AB =	Replacement connectors hardware only, for the entered part number.
XX =	Custom

SERIES LF

Watlow's family of microprocessor-based limit controllers provide an economical solution for applications requiring temperature limit control. Limits are available in a broad range of packaging options, allowing selection of the best version for an individual application. Controllers are available without an operator interface and can be ordered in square 1/8 DIN-panel mount, DIN-rail mount or open board design configurations.

The SERIES LF limit family incorporates a microprocessor design platform. This design provides significant improvements in the performance, repeatability and accuracy offered by Watlow's current line of analog basic temperature controllers.

The SERIES LF limit offers fixed set points and can be supplied with or without an operator interface. Operating set point temperature values are customer defined in the product configuration part number.

The LF limit controllers are factory mutual (FM) approved with special UL® approval for the open board potted versions. Watlow's limit controllers include industry leading service and support and are protected by a three-year warranty.

Features and Benefits

Fixed set points
- Provides tamper-proof operation

Multiple mounting options
- Minimizes installation time

High or low limit with auto or manual reset
- Provides application flexibility

Fahrenheit or Celsius operation with indication
- Offers application flexibility

Sensor break protection
- Provides positive system shutdown

Agency approvals
- Meets certification requirements/compliance

Microprocessor based technology
- Ensures accurate, repeatable control

SERIES LF

Specifications

Limit Controller

- Microprocessor based, limit controller
- Nominal switching hysteresis, typically 3°F (1.7°C)
- High or low limit, factory selectable
- Latching output requires manual reset upon over or under temperature condition
- Manual or automatic reset on power loss, factory selectable
- External customer supplied momentary reset switch
- Input filter time: 1 second

Standard Conditions For Specifications

- Rated line voltage, 50 to 60Hz, 0 to 90% RH non-condensing, 15-minute warm-up
- Calibration ambient range: 77°F (25°C) ±3°C

Sensor Input

Thermocouple

- Grounded or ungrounded
- Type E, J, K, T thermocouple
- >10 MΩ input impedance
- 250 nV input referenced error per 1Ω source resistance

RTD

- 2-wire platinum, 100Ω
- DIN-curve (0.00385 curve)
- 125µA nominal RTD excitation current

Input Accuracy Span Range

Type E:	-328	to	1470°F	(-200	to	800°C)
Type J:	32	to	1382°F	(0	to	750°C)
Type K:	-328	to	2282°F	(-200	to	1250°C)
Type T:	-328	to	662°F	(-200	to	350°C)
RTD (DIN)	-328	to	1472°F	(-200	to	800°C)

Thermocouple Input

- Calibration accuracy: ±1% of input accuracy span, ±1° at standard conditions and actual calibration ambient. Exception: Type T, ±2.4% of input accuracy span for -328 to 32°F (-200 to 0°C)
- Temperature stability: ±0.3° per degree change in ambient

RTD Input

- Calibration accuracy ±1% of input accuracy span ±1° at standard conditions and actual calibration ambient
- Temperature stability: ±0.2° per degree change in ambient

Allowable Operating Ranges

Type E:	-328	to	1470°F	(-200	to	800°C)
Type J:	-346	to	1900°F	(-210	to	1038°C)
Type K:	-454	to	2500°F	(-270	to	1370°C)
Type T:	-454	to	750°F	(-270	to	400°C)
RTD (DIN)	-328	to	1472°F	(-200	to	800°C)

Output Types

Electromechanical Relay, Form C

- Min. load current: 100mA
- 8A @ 240VAC or 30VDC max., resistive
- 250VA pilot duty, 120/240VAC max., inductive
- Use RC suppression for inductive loads
- Electrical life 100,000 cycles at rated current

External Reset Switch

- Momentary, dry contact closure

Agency Approvals

SERIES LF (potted version only)

- UL® 991 recognized temperature limit for cooking industry
- UL® 60730-1

SERIES LF (including potted version)

- UL® 873 recognized temperature regulator
- UL® 197 reviewed for use in cooking appliances
- UL® 991
- ANSI Z21.23 gas appliance thermostat approval
- CSA C22.2 #24 approved limit control
- FM Class 3545 temperature limit switches
- RoHS, W.E.E.E.

Terminals

- 0.25 in. (6.3 mm) quick connect, push on terminal or removable screw terminals

Power

- 24VAC +10%; -15%; 50/60Hz, ±5%
- 120VAC +10%; -15%; 50/60Hz, ±5%
- 230 to 240VAC +10%; -15%; 50/60Hz, ±5%
- 10VA max. power consumption
- Data retention upon power failure via nonvolatile memory

Operating Environment

- 32 to 158°F (0 to 70°C)
- 0 to 90% RH, non-condensing
- Storage temperature: -40 to 185°F (-40 to 85°C)

Dimensions

- DIN-rail model can be DIN-rail or chassis mount DIN-rail spec DIN 50022, 1.38 in. x 0.30 in. (35 mm x 7.5 mm)

Style	Width	Height	Depth
Open Board	2.43 in. (61.7 mm)	2.43 in. (61.7 mm)	1.78 in. (45.1 mm)
Potted	2.76 in. (70.1 mm)	4.05 in. (102.9 mm)	1.84 in. (46.6 mm)
DIN-rail	3.08 in. (78.1 mm)	4.42 in. (112.3 mm)	3.57 in. (90.7 mm)
Square ⅛ DIN-panel	2.85 in. (72.4 mm)	2.85 in. (72.4 mm)	Behind panel 2.04 in. (51.7 mm)

SERIES LF

Ordering Information

Limit controller with 8A relay output, fixed set point

Part Number

① ②	③ Power Supply	④ Package	⑤ Sensor Type and Scale	⑥ Limit Type	⑦⑧⑨⑩ Fixed Set Point Temp. Value	⑪⑫⑬⑭	⑮ Overlay/ Custom Options
LF						AAAA	

③	Power Supply
C =	120VAC
E =	230 to 240VAC
G =	24VAC

④	Package
1 =	Panel mount, 1/8 DIN square - spade terminals
2 =	DIN-rail mount - spade terminals
3 =	Open, non potted - spade terminals
4 =	Potted case - spade terminals
5 =	Panel mount, 1/8 DIN square - screw terminals
6 =	DIN-rail mount - screw terminals
7 =	Open, non potted - screw terminals

⑤	Sensor Type and Scale
H =	T/C Type J Fahrenheit (-346 to 1900°F)
J =	T/C Type J Celsius (-210 to 1038°C)
K =	T/C Type K Fahrenheit (-454 to 2500°F)
L =	T/C Type K Celsius (-270 to 1370°C)
M =	T/C Type T Fahrenheit (-454 to 750°F)
N =	T/C Type T Celsius (-270 to 400°C)
P =	RTD Fahrenheit (-328 to 1472°F)
R =	RTD Celsius (-200 to 800°C)
S =	T/C Type E Fahrenheit (-328 to 1470°F)
T =	T/C Type E Celsius (-200 to 800°C)

⑥	Limit Type
U =	High limit manual reset
W =	High limit auto reset
Y =	Low limit manual reset
Z =	Low limit auto reset

⑦⑧⑨⑩	Fixed Set Point Temperature Value
Note: A (-) is used in the left most digit of the fixed set point indicates a negative temperature value.	

⑮	Overlay/Custom Options
A =	Standard with Watlow logo
1 =	Standard without Watlow logo

SERIES LV

Watlow's family of microprocessor-based limit controllers provides an economical solution for applications requiring temperature limit control. Limits are available in a broad range of packaging options, allowing selection of the best version for an application. Limits are available with an operator interface and can be ordered in 1/8 DIN-square panel mount or DIN-rail mount design configurations.

The SERIES LV limit family incorporates a microprocessor design platform. This design provides significant improvements in the performance, repeatability and accuracy offered by Watlow's current line of analog limit controllers.

The variable SERIES LV limit includes an operator interface for viewing and selecting the set point. A red, four-character seven segment LED displays the set point. Set point selection is made with a continuous turn rotary encoder. Operating range temperature values are customer defined in the product configuration part number.

The limit controllers are factory mutual (FM) approved with special UL® approval for the open board potted versions. Watlow's limit controllers include industry leading service and support and are protected by a three-year warranty.

Features and Benefits

Adjustable set points
- Offers control flexibility

Four character LED display
- Improves set point selection accuracy

Multiple mounting options
- Minimizes installation time

High or low limit with auto or manual reset
- Provides application flexibility

Fahrenheit or Celsius operation with indication
- Offers application flexibility

Sensor break protection
- Provides positive system shutdown

Agency approvals
- Meets certification requirements/compliance

Microprocessor based technology
- Ensures accurate, repeatable control

SERIES LV

Specifications

Limit Controller

- Microprocessor-based limit controller
- Nominal switching hysteresis, typically 3°F (1.7°C)
- High or low limit, factory selectable
- Latching output requires manual reset upon over or under temperature condition
- Manual or automatic reset on power loss, factory selectable
- Internal front panel or external customer supplied momentary reset switch
- Input filter time: 1 second

Operator Interface

- 4 digit, 7 segment LED displays, 0.28 in. (7 mm) high
- °F or °C indicator LED
- Alarm indicator LED
- Continuous turn, velocity sensitive rotary encoder for set point adjustment
- Front panel SET/RESET

Standard Conditions for Specifications

- Rated line voltage, 50 to 60Hz, 0 to 90% RH non-condensing, 15-minute warm-up
- Calibration ambient range: 77°F (25°C) ±3°C

Sensor Input

Thermocouple

- Grounded or ungrounded
- Type E, J, K, T thermocouple
- >10 MΩ input impedance
- 250 nV input referenced error per 1Ω source resistance

RTD

- 2-wire platinum, 100Ω
- DIN-curve (0.00385 curve)
- 125µA nominal RTD excitation current

Input Accuracy Span Range

Type E:	-328	to	1470°F	(-200	to	800°C)
Type J:	32	to	1382°F	(0	to	750°C)
Type K:	-328	to	2282°F	(-200	to	1250°C)
Type T:	-328	to	662°F	(-200	to	350°C)
RTD (DIN)	-328	to	1472°F	(-200	to	800°C)

Thermocouple Input

- Calibration accuracy: ±1% of input accuracy span, ±1° at standard conditions and actual calibration ambient. Exception: Type T, ±2.4% of input accuracy span for -328 to 32°F (-200 to 0°C)
- Temperature stability: ±0.3° per degree change in ambient

RTD Input

- Calibration accuracy ±1% of input accuracy span ±1° at standard conditions and actual calibration ambient
- Temperature stability: ±0.2° per degree change in ambient

Allowable Operating Ranges

Type E:	-328	to	1470°F	(-200	to	800°C)
Type J:	-346	to	1900°F	(-210	to	1038°C)
Type K:	-454	to	2500°F	(-270	to	1370°C)
Type T:	-454	to	750°F	(-270	to	400°C)
RTD (DIN)	-328	to	1472°F	(-200	to	800°C)

Electromechanical Relay, Form C

- Min. load current: 100mA
- 8A @ 240VAC or 30VDC max., resistive
- 250VA pilot duty, 120/240VAC max., inductive
- Use RC suppression for inductive loads
- Electrical life 100,000 cycles at rated current

External Reset Switch

- Momentary, dry contact closure

Agency Approvals

SERIES LV (potted version only)

- UL® 991 recognized temperature limit for cooking industry
- UL® 60730-1

SERIES LV (including potted version)

- UL® 873 recognized temperature regulator
- UL® 197 reviewed for use in cooking appliances
- UL® 991
- UL® 50 IP65 for tactile key models
- ANSI Z21.23 Gas appliance thermostat approval
- CSA C22.2#24 approved limit control
- FM Class 3545 temperature limit switches
- RoHS, W.E.E.E.

Terminals

- 0.25 in. (6.3 mm) quick connect, push on terminal or removable screw terminals

Power

- 24VAC +10%; -15%; 50/60Hz, ±5%
- 120VAC +10%; -15%; 50/60Hz, ±5%
- 230 to 240VAC +10%; -15%; 50/60Hz, ±5%
- 10VA max. power consumption
- Data retention upon power failure via nonvolatile memory

Operating Environment

- 32 to 158°F (0 to 70°C)
- 0 to 90% RH, non-condensing
- Storage temperature: -40 to 185°F (-40 to 85°C)

SERIES LV

Specifications *(Continued)*

Dimensions

DIN-rail model can be DIN-rail or chassis mount DIN-rail spec DIN 50022, 1.38 in. x 0.30 in. (35 mm x 7.5 mm)

Style	Width	Height	Depth
DIN-rail	3.08 in. (78.1 mm)	4.42 in. (112.3 mm)	3.57 in. (90.7 mm)
Square ⅛ DIN-panel	2.85 in. (72.4 mm)	2.85 in. (72.4 mm)	Behind panel 2.04 in. (51.7 mm)

Ordering Information

Limit controller with 8A relay output, rotary set point adjustment, 4 character, 7 segment display, reset switch

Part Number

① ②	③	④	⑤	⑥	⑦⑧⑨⑩	⑪⑫⑬⑭	⑮
	Power Supply	Package	Sensor Type and Scale	Limit Type	Low Set Point Operating Range Value	High Set Point Operating Range Value	Overlay/ Custom Options
LV							

③	Power Supply
C =	120VAC
E =	230 to 240VAC
G =	24VAC

④	Package
1 =	Panel mount, 1/8 DIN square - spade terminals
2 =	DIN-rail mount - spade terminals
5 =	Panel mount, 1/8 DIN square - screw terminals
6 =	DIN-rail mount - screw terminals
A =	NEMA 4X panel mount, tactile keys (spade terminals)
B =	DIN-rail mount, tactile keys (spade terminals)
C =	NEMA 4X panel mount, tactile keys (screw terminals)
D =	DIN-rail mount, tactile keys (screw terminals)

⑤	Sensor Type and Scale
H =	T/C Type J Fahrenheit (-346 to 1900°F)
J =	T/C Type J Celsius (-210 to 1038°C)
K =	T/C Type K Fahrenheit (-454 to 2500°F)
L =	T/C Type K Celsius (-270 to 1370°C)
M =	T/C Type T Fahrenheit (-454 to 750°F)
N =	T/C Type T Celsius (-270 to 400°C)
P =	RTD Fahrenheit (-328 to 1472°F)
R =	RTD Celsius (-200 to 800°C)
S =	T/C Type E Fahrenheit (-328 to 1470°F)
T =	T/C Type E Celsius (-200 to 800°C)

⑥	Limit Type
U =	High limit manual reset
W =	High limit auto reset
Y =	Low limit manual reset
Z =	Low limit auto reset

⑦⑧⑨⑩ Low Set Point Operating Range Value
Note: A (-) is used in the left most digit of the fixed set point indicates a negative temperature value.

⑪⑫⑬⑭ High Set Point Operating Range Value
Note: A (-) is used in the left most digit of the fixed set point indicates a negative temperature value.

⑮	Overlay/Custom Options
A =	Standard with Watlow logo
1 =	Standard without Watlow logo

SERIES LS

As manufacturers are required to meet tighter safety standards, Watlow has addressed this need with its new SERIES LS safety limit. This new limit meets UL® 1998 and EN 60730 safety requirements and will shut down a system to prevent damage to equipment or injury to personnel.

Watlow's SERIES LS is recommended for any application where control failure could cause the temperature of the application to continue to increase resulting in large product scrap costs, damage to system equipment or potential fire hazard.

The SERIES LS provides increased safety due to the use of a factory fixed set point, factory fixed hysteresis and the use of redundant temperature sensors to protect against a single point sensor failure. Either sensor can initiate an overtemperature limit condition along with a deviation between sensors greater than the process comparison value.

Watlow's new SERIES LS offers fixed limit set point temperature values that are customer definable in the product configuration part number. It is available with a potted module design configuration and push-on, quick connect spade terminals to provide the electrical connections.

Features and Benefits

Fixed limit set point
- Provides tamper-proof operation
- Offers control flexibility

Dual channel sensors
- Detects sensor faults
- Provides a fail-safe design
- Verifies firmware
- Prevents sensor deviation and sensor placement errors

High-limit operation
- Provides application flexibility

Fahrenheit or Celsius operation
- Delivers application flexibility

Sensor break protection
- Offers positive system shutdown

Agency approvals
- Meets certification requirements/compliance

Microprocessor-based technology
- Ensures accurate, repeatable protection

Status notification
- Signals user of status with two integrated LEDs
- Provides health check signal to inform operator that the process is working correctly

Three-year warranty
- Ensures product support and reliability

Typical Applications

- Foodservice equipment
- Industrial machinery
- Medical equipment
- Packaging equipment
- Plastics processing equipment

SERIES LS

Specifications

Controller

- Microprocessor based, limit controller
- Customer defined hysteresis, model number dependent
- High limit, factory selectable
- Automatic reset on power loss
- Input filter time: 1 second

Thermocouple Sensor Input

- Ungrounded
- Type J and K thermocouple types
- >10 MΩ input impedance

Input Accuracy Span Range

- Type J: 0 to 764°F (-18 to 406°C)
- Type K: 0 to 999°F (-18 to 537°C)
- Calibration accuracy: ±6°C, ±1° at standard conditions and actual calibration ambient
- Temperature stability: ±0.3 degree per degree change in ambient

Allowable Operating Ranges

- Type J: 32 to 626°F (0 to 330°C)
- Type K: 32 to 820°F (0 to 438°C)

Output Types

- Electromechanical relay, Form A, minimum load current: 100mA, 8A resistive load, 120VA pilot duty, 120/240VAC maximum, inductive, electrical life 6,000 cycles at rated current

Terminals

- 0.25 in. (6.4 mm) quick connect, push-on terminals

Agency Approvals

- UL® / EN 60730-1, 2, 9 automatic electronic controls for household and similar use. File #E43684
- UL® 1998 software review class B
- W.E.E.E.; CE – see Declaration of Conformity
- RoHS directive (2011-65-EU)

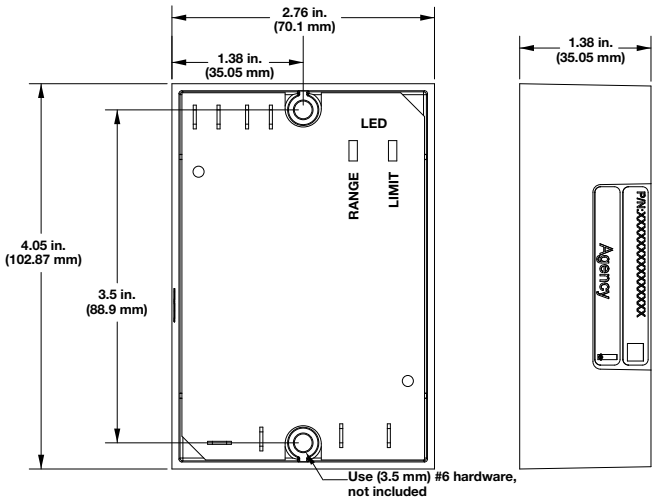
Power

- 100-240VAC +10%; -15%; 50/60Hz, ±5%
- 10VA maximum power consumption
- Data retention upon power failure via nonvolatile memory

Environment

- Operating temperature: 32 to 158°F (0 to 70°C)
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Relative humidity: 0 to 90% RH, non-condensing

Dimensional Drawing



Ordering Information

Part Number

① ②	③ Set Point	④ Package	⑤ Sensor Type and Scale	⑥ Limit Type	⑦ ⑧ ⑨ ⑩ High Set Point Temp. Value	⑪ ⑫ ⑬ Hysteresis	⑭ ⑮ Custom Options
LS	F	4		W			AA

③	Set Point
F =	Fixed set point

④	Package
4 =	Potted case, spade terminals

⑤	Sensor Type and Scale
H =	T/C Type J Fahrenheit (32 to 626°F)
J =	T/C Type J Celsius (0 to 330°C)
K =	T/C Type K Fahrenheit (32 to 820°F)
L =	T/C Type K Celsius (0 to 438°C)

⑥	Limit Type
W =	High limit, power cycle to reset

⑦ ⑧ ⑨ ⑩	High Set Point Temperature Value
XXXX =	A zero (0) is used in the left most digit of the set point

⑪ ⑫ ⑬	Hysteresis
XXX =	The temperature differential below the limit set point at which a reset is possible. Limit high set point - hysteresis must be greater than or equal to the low sensor range

⑭ ⑮	Custom Options
AA =	Standard