# Watlow's Temperature, Process and Power Controller Offering

Watlow is a leading supplier of integrated multi-function, process and temperature controllers, power switching devices, agency-rated safety limits, operator interface terminals, process and event data loggers and recorders and accessories to reliably implement and control a complete thermal system.

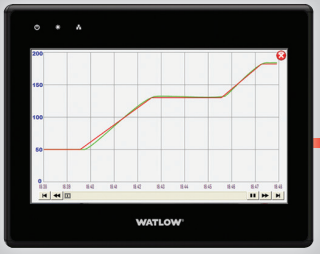
Our expertise is backed by 80 years' experience designing, manufacturing and assisting customers with controller challenges across a broad range of applications. In industrial machines, processes and commercial equipment, Watlow products control parameters including temperature, over/under temperature limits, relative humidity, flow, position and pH, to name a few.

A variety of flexible, standard products are offered to address a multitude of control needs. Complementary accessories extend the controller solution seamlessly, and easy-to-understand user manuals and product documentation make it easy to quickly and effectively apply Watlow products. Our experienced and knowledgeable applications engineers will help you to find the ideal solution without added cost and time delay.

Watlow's solution development capabilities address all aspects of challenging control problems with just the right combination of proven techniques and innovation. While standard products are extremely flexible, some applications require accelerating a solution to the next level. Whether you use a standard product or a customized solution, our focus is to be your control expert.


CONTROLLERS

# EZ-ZONE® Connectivity Options via Ethernet



SILVER SERIES
Operator Interface
Terminal (OIT)

Ethernet Switch

To LAN

Ethernet

EZ-ZONE® RUI Gateway

EZ-ZONE PM Family

EZ-ZONE RM with Access Module

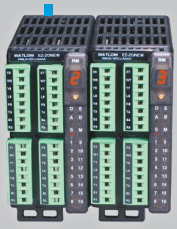
F4T With INTUITION

Third-Party Automation Products

EZ-ZONE Standard Bus

EZ-ZONE ST Family

EZ-ZONE PM Family



EZ-ZONE RM Family

EtherNet/IP™ and Modbus® TCP

EZ-ZONE Standard Bus

EtherNet/IP™ conformance tested

WATLOW®

CONTROLLERS

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## Controllers

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## Controllers

### *Integrated Multi-Function*

| | Maximum Control Loops | Maximum Limit Loops | Maximum Monitor Channels | Fiber Optic Temperature Measurement | Profiling | Mounting | Maximum Output (A) | Ambient Operating Range °F | Ambient Operating Range °C | Communication Protocols | Dimensions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **F4T with INTUITION®**  See page 189 | 4 | 6 | 24 | — | ✓ | 1/4 DIN front panel or flush mount | 12A | 0 to 122 | -18 to 50 | Standard bus, Modbus® TCP (Ethernet), Modbus® RTU, SCPI, USB host (2), USB device | Dimensions vary based on mounting style |
| **EZ-ZONE RM**  See page 200 | 152 | 192 | 256 | — | ✓ | DIN-rail | 15A | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Per module: 2.03 in. W x 4.41 in. H x 6.1 in. D (51.56 mm W x 44.45 mm H x 148 mm D) |
| **EZ-ZONE RMF**  See page 220 | 8 | — | 8 | ✓ | — | DIN-rail | — | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Per module: 2.03 in. W x 4.41 in. H x 6.1 in. D (51.56 mm W x 44.45 mm H x 148 mm D) |
| **EZ-ZONE RMZ**  See page 220 | 48 | — | — | ✓ | — | DIN-rail | — | 0 to 149 | -18 to 65 | EtherCAT®, Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Per module: 2.03 in. W x 4.41 in. H x 6.1 in. D (51.56 mm W x 44.45 mm H x 148 mm D) |
| **EZ-ZONE ST**  See page 222 | 1 | 1 | — | — | ✓ | DIN-rail | 75A | 0 to 158 | -18 to 70 | Standard bus, Modbus® RTU | With 25 or 40A heat sink: 7.43 in. H x 2.5 in. W x 6.14 in. D (188.6 mm H x 63.5 mm W x 156 mm D) (See details for size with other options) |
| **EZ-ZONE PM**  See page 229 | 2 | 1 | 1 | — | ✓ | 1/32, 1/16, 1/8, 1/4 DIN front panel | 15A | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Dimensions vary with DIN size |

## Controllers

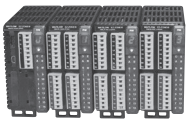
### *Integrated Multi-Function*

| | Maximum Control Loops | Maximum Limit Loops | Maximum Monitor Channels | Fiber Optic Temperature Measurement | Profiling | Mounting | Maximum Output (A) | Ambient Operating Range °F | Ambient Operating Range °C | Communication Protocols | Dimensions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **EZ-ZONE PM Express**  See page 239 | 1 | 1 | — | — | — | 1/32, 1/16 DIN front panel | 15A | 0 to 149 | -18 to 65 | Standard bus | Dimensions vary with DIN size |
| **SERIES EHG SL10**  See page 244 | 1 | 1 | — | — | — | In-line, sub panel | 10A | 32 to 158 | 0 to 70 | Modbus® RTU | 3.496 in. W x 2.196 in. H x 1.907 in. D (88.80 mm W x 55.78 mm H x 48.07 mm D) without optional module |
| **SERIES EHG**  See page 248 | 1 | — | — | — | — | In-line | 10A | 32 to 158 | 0 to 70 | — | 3.75 in. L x 1.85 in. D in. (95 mm L x 47 mm D) |

# Product Selection Guide

## Controllers

### *Temperature and Process*

| | Maximum Control Loops | Maximum Limit Loops | Maximum Monitor Channels | Fiber Optic Temperature Measurement | Profiling | Mounting | Maximum Output (A) | Ambient Operating Range °F | Ambient Operating Range °C | Communication Protocols | Dimensions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **F4T with INTUITION**  See page 253 | 4 | 6 | 24 | — | — | 1/4 DIN front panel or flush mount | 12A | 0 to 122 | -18 to 50 | Standard bus, Modbus® TCP (Ethernet), Modbus® RTU, SCPI, USB host (2), USB device | Dimensions vary based on mounting style |
| **EZ-ZONE RM**  See page 254 | 152 | 192 | 256 | — | ✓ | DIN-rail | 15A | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Per module: 2.03 in. W x 4.41 in. H x 6.1 in. D (51.56 mm W x 44.45 mm H x 148 mm D) |
| **EZ-ZONE RMF**  See page 255 | 8 | — | 8 | ✓ | — | DIN-rail | — | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Per module: 2.03 in. W x 4.41 in. H x 6.1 in. D (51.56 mm W x 44.45 mm H x 148 mm D) |
| **EZ-ZONE RMZ**  See page 255 | 48 | — | — | ✓ | — | DIN-rail | — | 0 to 149 | -18 to 65 | EtherCAT®, Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Per module: 2.03 in. W x 4.41 in. H x 6.1 in. D (51.56 mm W x 44.45 mm H x 148 mm D) |
| **EZ-ZONE ST**  See page 256 | 1 | 1 | — | — | ✓ | DIN-rail | 75A | 0 to 158 | -18 to 70 | Standard bus, Modbus® RTU | With 25 or 40A heat sink: 7.43 in. H x 2.5 in. W x 6.14 in. D (188.6 mm H x 63.5 mm W x 156 mm D) (See details for size with other options) |
| **EZ-ZONE PM**  See page 257 | 2 | 1 | 1 | — | ✓ | 1/32, 1/16, 1/8, 1/4 DIN front panel | 15A | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Dimensions vary with DIN size) |
| **EZ-ZONE PM Express**  See page 258 | 1 | 1 | — | — | — | 1/32, 1/16, DIN front panel | 15A | 0 to 149 | -18 to 65 | Standard bus | Dimensions vary with DIN size) |

## Controllers

### *Temperature and Process*

| | Maximum Control Loops | Maximum Limit Loops | Maximum Monitor Channels | Fiber Optic Temperature Measurement | Profiling | Mounting | Maximum Output (A) | Ambient Operating Range °F | Ambient Operating Range °C | Communication Protocols | Dimensions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **SERIES CV**  See page 259 | 1 | — | — | — | — | DIN-rail, front panel, chassis | 8A | 32 to 158 | 0 to 70 | — | Front panel mount: 2.85 in. W x 2.85 in. H x 2.04 in. D (72.4 mm W x 72.4 mm H x 51.7 mm D) |
| **SERIES CF**  See page 262 | 1 | — | — | — | — | DIN-rail, front panel, chassis | 8A | 32 to 158 | 0 to 70 | — | Front panel mount: 2.85 in. W x 2.85 in. H x 2.04 in. D (72.4 mm W x 72.4 mm H x 51.7 mm D) |
| **SERIES EHG SL10**  See page 265 | 1 | 1 | — | — | — | In-line, sub panel | 10A | 32 to 158 | 0 to 70 | Modbus® RTU | Without optional module: 3.496 in. W x 2.196 in. H x 1.907 in. D (88.80 mm W x 55.78 mm H x 48.07 mm D) |
| **SERIES EHG**  See page 266 | 1 | — | — | — | — | — | 10A | 32 to 158 | 0 to 70 | — | 3.75 in. L x 1.85 in. D (95.25 mm L x 47 mm D) |

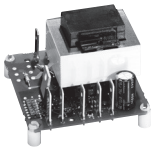
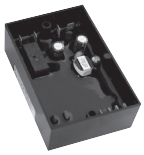
# Controllers

## *Limits and Scanners*

| | Maximum Limit Loops | Maximum Monitor Channels | Mounting | Maximum Output (A) | Ambient Operating Range °F | Ambient Operating Range °C | Communication Protocols | Dimensions |
|---|---|---|---|---|---|---|---|---|
| **F4T with INTUITION**  See page 269 | 8 | 24 | DIN-rail, flush mount | 12A | 0 to 122 | -18 to 50 | Standard bus, Modbus® TCP (Ethernet), Modbus® RTU, SCPI, USB host (2), USB device | Dimensions vary based on mounting style |
| **EZ-ZONE RM High-Density Limit**  See page 270 | 192 | 192 | DIN-rail | 5A | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Per module: 2.03 in. W x 4.41 in. H x 6.1 in. D (51.56 mm W x 44.45 mm H x 148 mm D) |
| **EZ-ZONE RM High-Density Scanner**  See page 272 | — | 256 | DIN-rail | 5A | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Per module: 2.03 in. W x 4.41 in. H x 6.1 in. D (51.56 mm W x 44.45 mm H x 148 mm D) |
| **EZ-ZONE PM Limit**  See page 274 | 1 | 1 | 1/32, 1/16, 1/8, 1/4 DIN front panel | 5A | 0 to 149 | -18 to 65 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | Dimensions vary with DIN size |
| **EZ-ZONE PM Express Limit**  See page 280 | 1 | 1 | 1/32, 1/16 DIN front panel | 5A | 0 to 149 | -18 to 65 | Standard bus | Dimensions vary with DIN size |

# Controllers

## *Limits and Scanners*

| | Maximum Limit Loops | Maximum Monitor Channels | Mounting | Maximum Output (A) | Ambient Operating Range | | Communication Protocols | Dimensions |
|---|---|---|---|---|---|---|---|---|
| | | | | | °F | °C | | |
| **SERIES LV**   See page 284 | 1 | 1 | DIN-rail, front panel, chassis | 8A | 32 to 158 | 0 to 70 | — | Front panel mount: 2.85 in. W x 2.85 in. H x 2.04 in. D (72.4 mm W x 72.4 mm H x 51.7 mm D) |
| **SERIES LF**  See page 287 | 1 | 1 | DIN-rail, front panel, chassis | 8A | 32 to 158 | 0 to 70 | — | DIN-rail mount: 3.08 in. W x 4.42 in. H x 3.57 in. D (78.1 mm W x 122.3 mm H x 90.7 mm D) |
| **SERIES LS**  See page 290 | 1 | 1 | Potted case with mounting screws | 8A | 32 to 158 | 0 to 70 | — | 3.5 in. W x 1.38 in. H x 2.76 in. D (88.9 mm W x 35.1 mm H x 70.1 mm D) |

# Controllers

## *Power Switching Devices*

| | Maximum Current | Phase Configurations | Inputs | Output Firing | Data Logging | Connectivity | Closed Loop V, I, P Contol | Mounting | Other Features | Ambient Operating Range °F | Ambient Operating Range °C | Dimensions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ASPYRE**  See page 295 | 700A | 1 or 3 | 2 analog (0-5VDC or 4-20mA) 2 digital | Zero cross, Single cycle, Burst firing, Phase angle, Delayed triggering | Yes | Profibus DP, Modbus® RTU, Modbus® TCP (Ethernet), ProfiNet, USB port for config up/ download | Yes | Back panel | OLED display, Heater bakeout, Smallest footprint | 32 to 104 | 0 to 40 | 4.77 in. H x 2.84 in. W x 7.28 in. D (smallest) to 20.47 in. H x 10.32 in. W x 10.63 in. D (largest) |
| **EZ-ZONE ST**  See page 302 | 75A | 1 | Driven by on-board controller 2 digital input/ outputs | Zero-cross, phase angle | No | Isolated EIA-485 Modbus® RTU serial communi-cations | No | DIN-rail | — | 0 to 158 | -18 to 70 | With 25 or 40A heat sink: 7.43 in. H x 2.5 in. W x 6.14 in. D (188.6 mm H x 63.5 mm W x 156 mm D) (See details for size with other options) |
| **DIN-A-MITE A**  See page 303 | 25A | 1 | VAC/VDC contactor, 4-20mA | Zero-cross | No | No | No | DIN-rail, back panel | — | 0 to 176 | -18 to 80 | 3.7 in. H x 1.8 in. W x 3.9 in. D (95 mm H x 45 mm W x 98 mm D) |
| **DIN-A-MITE B**  See page 306 | 40A | 1 or 3 | VAC/VDC contactor, 4-20mA, multi-zone input | Zero-cross | No | No | No | DIN-rail, back panel | Shorted SCR alarm | 0 to 176 | -18 to 80 | 3.7 in. H x 3.1 in. W x 4.9 in. D (95 mm H x 80 mm W x 124 mm D) |
| **DIN-A-MITE C**  See page 309 | 80A | 1 or 3 | VAC/VDC contactor, 4-20mA, multi-zone input, linear voltage, potentiom-eter | Zero-cross, phase angle | No | No | No | DIN-rail, through wall, back panel | Shorted SCR alarm, open heater alarm on zero-cross, current limit | 0 to 176 | -18 to 80 | DIN-rail mount, without fan: 5.45 in. H x 3.25 in. W x 5.89 in. D (138 mm H x 83 mm W x 150 mm D) |
| **DIN-A-MITE D**  See page 315 | 100A | 1 | VAC/VDC contactor, 4-20mA | Zero-cross | No | No | No | DIN-rail, back panel | Shorted SCR alarm, load current monitor | 0 to 176 | -18 to 80 | 7.25 in. H x 2.5 in. W x 9.4 in. D (185 mm H x 65 mm W x 240 mm D) |

# Controllers

## *Power Switching Devices*

| | Maximum Current | Phase Configurations | Inputs | Output Firing | Data Logging | Connectivity | Closed Loop V, I, P Control | Mounting | Other Features | Ambient Operating Range °F | Ambient Operating Range °C | Dimensions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **POWER SERIES**  See page 318 | 250A | 1 or 3 | 0 to 20mA and 0-10VDC scalable, multi-zone input | Zero-cross, phase angle | No | Modbus® RTU | V only | Back panel | Load current monitor, soft start, heater bakeout, current limiting, shorted SCR, open heater alarm output Modbus® RTU com | 32 to 149 | 0 to 65 | 14 in. H x 7.5 in. W x 7.9 in. D (354 mm H x 191 mm W x 200 mm D) |
| **E-SAFE II**  See page 323 | 35A | 1, 2 or 3 | VAC/VDC contac-tor | Zero-cross | No | No | No | Back panel | — | 32 to 158 | 0 to 70 | 3.82 in. H x 5.54 in. W x 1.85 in. D (97.03 mm H x 140.72 mm W x 46.99 mm D) |
| **SERIES CZR**  See page 326 | 42A | 1 | VAC/VDC contac-tor | Zero-cross | No | No | No | DIN-rail, back panel | — | 176 max. | 80 max. | 18A models: 3.95 in. H x 0.89 in. W x 3.9 in. D (100 mm H x 22.6 mm W x 99 mm D) 24 to 42A models: 3.95 in. H x 1.75 in. W x 4.3 in. D (100 mm H x 45 mm W x 109 mm D) |
| **Solid State Relays (SSR)**  See page 329 | 75A | 1 | VAC/VDC contac-tor | Zero-cross, random fire | No | No | No | Back panel | Shorted SSR alarm, 20A DC output, 4 to 20 mAdc variable time base firing | -40 to 185 | -40 to 85 | Without heat sink: 2.25 in. H x 1.75 in. W x 0.9 in. D (57.2 mm H x 44.5 mm W x 23 mm D) |

# Output Comparison Guide

| I want to switch... I want to control... | Controller Output | Output Life |
|---|---|---|
| • DC input solid state relay (SSR)<br>• PLC-dc input<br>• Low voltage panel lamp | Switched dc, open collector |  |
| • Resistive 120 or 240VAC heater at less than 15A | NO-ARC 15A power control |  |
| • AC input SSR<br>• AC input solid state contactor<br>• High impedance load, typ. ≥5kΩ<br>• Piezoelectric buzzer<br>• Indicator lamps | Solid state relay, Form A |  |
| • Solenoid coil/valve<br>• Mercury displacement relay (MDR)<br>• Electromechanical relay<br>• General purpose contactor | Solid state relay, Form A with external contact suppression |  |
| • Various devices in on-off mode with contact suppression | Electromechanical relay, Form A |  |
| • Various high impedance or inductive devices in on-off mode with coils suppressed<br>• Indicator lamps<br>• Small heaters<br>• AC input solid state contactor | Electromechanical relay, Form A or C |  |
| • A safety limit circuit with contactor, electromechanical relay or MDR | Electromechanical relay, Form A with external contact suppression | N/A |
| • Various devices in on-off mode<br>• Solenoid coil/valve<br>• MDR<br>• Electromechanical relay<br>• General purpose contactor<br>• Pilot duty relays | Electromechanical relay, Form C with external contact suppression |  |
| • Phase-angle or burst fire SCRs<br>• 0-20mA(dc), 4-20mA(dc), 0-5VDC, 1-5VDC or 0-10VDC valve positioner<br>• Inner loop's set point for cascading controllers<br>• Other instruments with process inputs | Universal process |  |

## Retransmit/Alarms

| I want to switch... I want to control... | Controller Output | Output Life |
|---|---|---|
| • Multiple devices, impedance dependent<br>• Chart recorder<br>• Master-remote (slave) system<br>• Data logging device | Universal process |  |
| • Various devices in on-off mode | Electromechanical relay, Form A or C |  |

 **Best Life**

 **Better Life**

 **Good Life**

# Integrated Multi-Function

| Product | Control/ Limit Loops | Mounting | Fiber Optic Temp. Measure-ment | Profiling | Maximum Output | Communication Protocols | Page |
|---|---|---|---|---|---|---|---|
| **F4T with INTUITION®** | 4/6 | DIN-rail, Flush mount | – | ✓ | 12A | Standard bus, Modbus® TCP (Ethernet), Modbus® RTU, SCPI, USB Host (2), USB device | 189 |
| **EZ-ZONE® RM** | 152/192 | DIN-rail | – | ✓ | 15A | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 200 |
| **EZ-ZONE RMF** | 8/0 | DIN-rail | ✓ | – | – | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 220 |
| **EZ-ZONE RMZ** | 48/0 | DIN-rail | ✓ | – | – | EtherCAT®, Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 220 |
| **EZ-ZONE ST** | 1/1 | DIN-rail | – | ✓ | 75A | Standard bus, Modbus® RTU | 222 |
| **EZ-ZONE PM** | 2/1 | 1/32, 1/16, 1/8, 1/4 DIN front panel | – | ✓ | 15A | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 229 |
| **EZ-ZONE PM Express** | 1/1 | 1/32, 1/16, 1/8, 1/4 DIN front panel | – | – | 15A | Standard bus | 239 |
| **SERIES EHG® SL10** | 1/1 | In-line/Sub panel | – | – | 10A | Modbus® RTU | 244 |
| **SERIES EHG** | 1/0 | In-line | – | – | 10A | N/A | 248 |

**Note:** The specifications in the table above are the best available values in each category. Not all combinations of these values are available in a single model number.

## F4T with INTUITION®

The F4T with INTUITION® temperature process controller offers a wide range of field removable I/O modules for maximum design flexibility. Configurations can be custom tailored to meet the scaling needs of a tremendous range of equipment and applications while providing exactly the hardware types required for compatibility. The F4T controller also features a 4.3 inch, color, graphical touch panel. Combining power, flexibility and functionality, this new controller offers unmatched versatility, and its best-in-class ease of use could very well make user manuals a thing of the past.

### Features and Benefits

**4.3-inch, color touch panel with high-resolution, graphical user-interface**

- Shortens learning curve and reduces operator errors
- Allows channels, profiles, alarms, inputs and outputs to be personalized with user defined names

**Temperature PID, data logger, trend chart, over/under-temperature limit, power switching, math, logic, timers and counters combined into an integrated system**

- Lowers ownership costs
- Eliminates the need for separate discrete components
- Reduces complexity
- Simplifies design, ordering and installation
- Saves money

**Robust algorithms for temperature, cascade, altitude, humidity and compressor**

- Improves process control
- Offers one to four channels of control
- Provides multiple PID sets
- Enables TRU-TUNE®+ adaptive control algorithm
- Offers 40 ramp and soak profiles with real-time clock and battery backup

**COMPOSER® graphical configuration PC software**

- Speeds up and simplifies commissioning
- Archives and documents controller setup
- Connects with controller easily via Ethernet

**Many communications options available including Ethernet Modbus® TCP and SCPI and EIA-232/485 Modbus® RTU**

- Offers two USB host ports and one device port
- Simplifies file transfers
- Connects easily


**Batch Processing with Bar Code Data Entry**

- Easily collects and manages data records
- Inputs information from bar code scan for fast and easy data entry
- Offers foolproof processing via smart profile to part linkage
- Provides data security through password and data log encrypted file options
- Improves manufacturing robustness via reminder screens ensuring all data is entered during processing
- Helps ensure compliance with growing regulations and minimizes warranty exposure
- Eliminates part processing skips or walk arounds due to improved quality control
- Produces formatted data record report for easy receipt or record management uses

**Modular design**

- Adapts quickly to evolving requirements
- Offers numerous types of field pluggable modules for maximum flexibility and easiest compatibility
- Features scalable and modular firmware functions
- Delivers scalable input/output quantities from 1 to 36

**Agency certifications include UL®, FM, CE, RoHS, W.E.E.E., NEMA 4X/IP65**

- Ensures high quality and reliability
- Verifies performance in installations worldwide

**SERIES F4S/F4D/F4P backward compatible**

- Provides easy retrofit with minimum pain and disruption
- Ensures proper fit in existing SERIES F4 panel cutout

**Off-the-shelf solution**

- Provides cost-effective “make versus buy”
- Offers preconfigured touch-panel screens
- Assures quicker time to market

# F4T with INTUITION

## Key Features and Options

- 1 to 4 control loops with TRU-TUNE+ adaptive control algorithm for superior controllability
- 40 profiles for ramp and soak
- Ethernet Modbus® TCP connectivity
- Multiple high-speed USB host ports
- Over/under-temperature limits for safety shutdown
- Universal, thermistor and ac current measurement inputs
- Inputs and outputs expandable from 1 to 36
- SENSOR GUARD prevents unplanned process shutdowns and product loss by switching to a backup sensor if the primary sensor fails
- High current outputs for up to 10A heaters or other loads
- Programmable timers, counters, math and logic
- Temperature, cascade, altitude, relative humidity, compressor algorithms and Vaisala® humidity compensation
- Sequencer start-up and control
- Retransmit and remote set point
- USB configuration port
- Configuration settings can be stored and recalled
- Removable modules and connectors
- Front-panel mount and flush mounting options
- Right angle and front-screw terminal options
- UL® listed, CSA, CE, RoHS, W.E.E.E., FM

## Common Specifications

**Line Voltage/Power**

- Data retention upon power failure via nonvolatile memory

**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

**Calibration Accuracy**

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

**Configuration Diagnostics**

- Indicates if modules present match the expected configuration settings

**USB Device Port (Coming soon, consult factory for availability.)**

- Version: USB 2.0 full-speed
- Connector: USB Mini Type B, 5 position
- Recognized as a mass storage device/serial communications
- Driver for Microsoft® Windows® 7 and Windows® 8

**USB Host Port**

- Total of 2 available
- Version: USB 2.0 hi-speed
- Connector: USB Type A, high-retention
- Flash drive must be FAT32 file system
- Max. current 0.5A/port

**System Configuration Requirements**

- F4T has 6 slots for flex modules (FM)
- EIA-232/485 Modbus® RTU flex module, if used, must occupy slot 6 location
- A maximum of two 10A SSR FM modules can be used in the F4T and each will require space for 2 slots. Valid in slots 1, 2, 4 or 5

**Wiring Termination—Touch-Safe Terminals**

- Right-angle and front-screw terminal blocks for input, output and power supply connections
- Input, output and power terminals: touch safe, removable, 12 to 30 AWG

## F4T Base Specifications

**Line Voltage/Power**

- High voltage option: 100 to 240VAC +10/-15%, 50/60Hz ±5%
- Low voltage option: 24 to 28VAC/VDC+10/-15%, 50/60Hz ±5%
- Power consumption: 23 W, 54VA

**Environment**

- NEMA 4X/IP65 front panel mount configuration only
- Operating temperature: 0 to 122°F (-18 to 50°C)
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Relative humidity: 0 to 90%, non-condensing

**User Interface**

- 4.3 inch TFT PCAP color graphic touch screen
- LED backlife >50K hours
- 4 keys; Home, Main Menu, Back, Help

## F4T with INTUITION

**Agency Approvals**
- UL®/EN 61010 Listed, File E185611 QUYX
- UL® 508 Reviewed
- CSA CC.C#14, File 158031
- FM Class 3545 (configurations with limit modules)
- AMS 2750 E compliant: Analog input process values. Tip: Maximize field calibration accuracy and uniformity by using advanced F4T features such as Calibration Offset and Linearization Function blocks. refer to user manual for details.
- RoHS by design, China RoHS Level 2, W.E.E.E.
- CE
- Windows® Hardware Certification

**Control Loops**
- 1 to 4 PID or ON-OFF control loops
- 0 to 6 Limit loops
- User-selectable action: heat, cool or heat/cool
- Auto-tune with TRU-TUNE+ adaptive control

**Control Loops and Over-temperature Limits**
- Input sampling: 10Hz
- Output update: 10Hz

**Communications**
- Ethernet Modbus® TCP
- Isolated communications

**Profile Ramp and Soak Option**
- Profile engine affects 1 to 4 loops in sync
- 40 profiles with 50 steps per profile

**Data Logging**
- User selectable parameters: Up to a maximum of 128 active parameters depending on configuration
- Logging interval: Programmable increments between 0.1 seconds and 60 minutes if logging to internal memory. Logging directly to USB; 1.0 seconds to 60 minutes
- File types: .CSV for standard data logging or proprietary format for encrypted data log option
- Storage: 80MB internal memory or to USB memory stick
- File transfer: Internal memory to USB host port or to Ethernet Modbus® TCP
- Transfer options: On demand by user or user programmable based on time (hours) or immediately when a new data log file record is available or percent of memory used. Utilizes TFTP and Sambo protocols
- Record: Date and time stamped

**Batch Processing with Bar Code Data Entry Via USP Scanner**
- Compatible with many bar code types including Code 128, Code 39, Extended Code 39, Data Matrix, Interleaved 2 of 5, ISSN, SISAC, LOGMARS, QR, UCC/EAN-128 (GS1-128, UPC-A & E)
- Compatible with most USB scanner types such as Zebra DS4308, DS2208, LI2208 and LS2208
- USB port provides 500mA max. power supply for bar code scanner/base charging
- Display can show bar code fields up to a maximum length of 48 characters. Characters might wrap to 2 rows after 24 characters
- Part-Profile list entries – approximately 1,000 typical length part numbers of 15 characters each can be stored. Can easily import different part files via USB thumb drive connection to cover a higher quantity range of part lists
- Program the bar code scanner to add an enter key (carriage return feed) at the end of each bar code data field sent to F4T/D4T. Refer to USB scanner user manual.

**Trending**
- 4 user programmable charts
- 6 pens available per chart
- View analog sensors, process values, set points and power

**Real Time Clock with Battery Backup**
- Accuracy (typical): +/-3ppm over -15 to 50°C
- Typical battery life: 10 years at 77°F (25°C)
- Field replaceable lithium battery

**Number of Function Blocks by Ordering Option**

| Function Block | Basic | Set 1 | Set 2 |
|---|---|---|---|
| Alarm | 6 | 8 | 14 |
| Compare | None | 4 | 16 |
| Counter | None | 4 | 16 |
| Linearization | 4 | 4 | 8 |
| Logic | None | 12 | 24 |
| Math | None | 12 | 24 |
| Process Value | 4 | 4 | 8 |
| Special Output Function (including compressor) | None | 2 | 4 |
| Timer | None | 6 | 16 |
| Variable | 4 | 12 | 24 |

**Compare**
- Greater than, less than, equal, not equal, greater than or equal, less than or equal

**Counters**
- Counts up or down, loads predetermined value on load signal

## F4T with INTUITION

**Linearization**
- Interpolated or stepped

**Logic**
- And, nand, or, nor, equal, not equal, latch, flip-flop

**Math**
- Average, process scale, switch over, deviation scale, differential (subtract), ratio (divide), add, multiply, absolute difference, minimum, maximum, square root, sample and hold, pressure-to-altitude and dew point

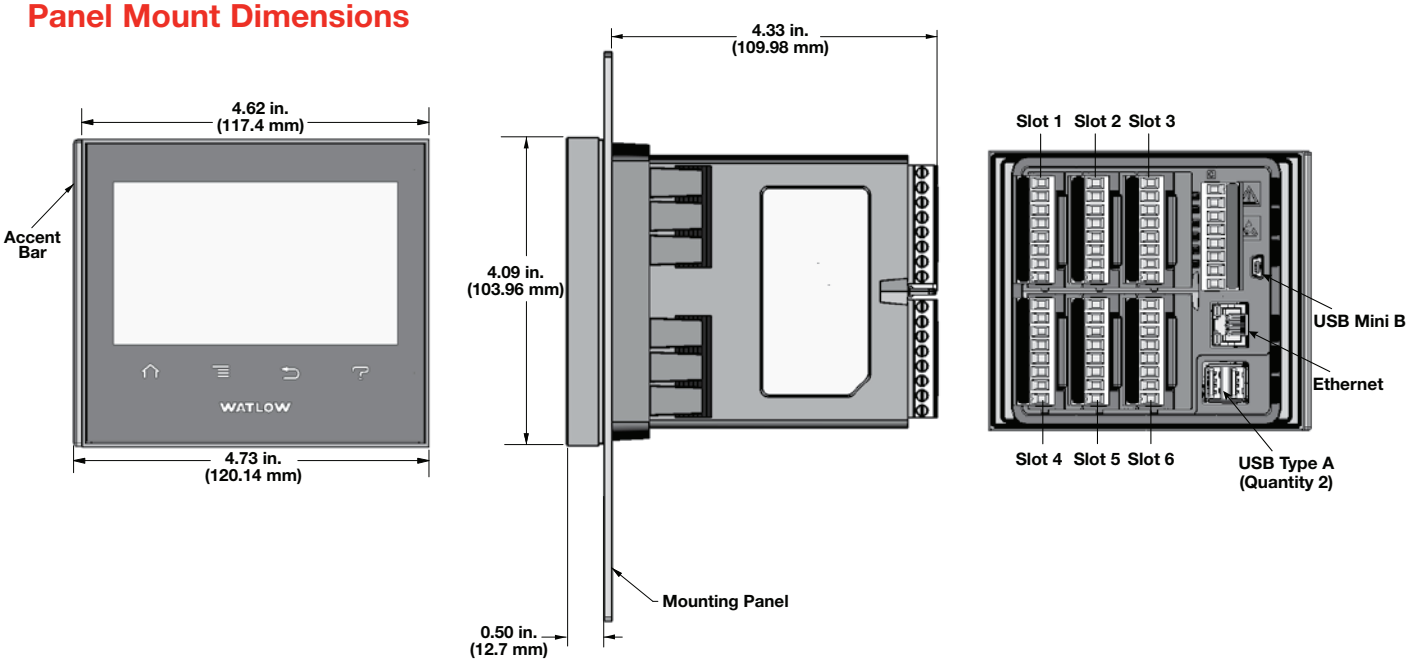
**Process Value**
- Sensor backup, average, crossover, wet bulb-dry bulb, switch over, differential (subtract), ratio (divide), add, multiply, absolute difference, minimum, maximum, square root, altitude, Vaisala® relative humidity and pressure-to-altitude

**Special Output Function**
- Compressor control (cool and/or dehumidify with single compressor), motorized valve, sequencer

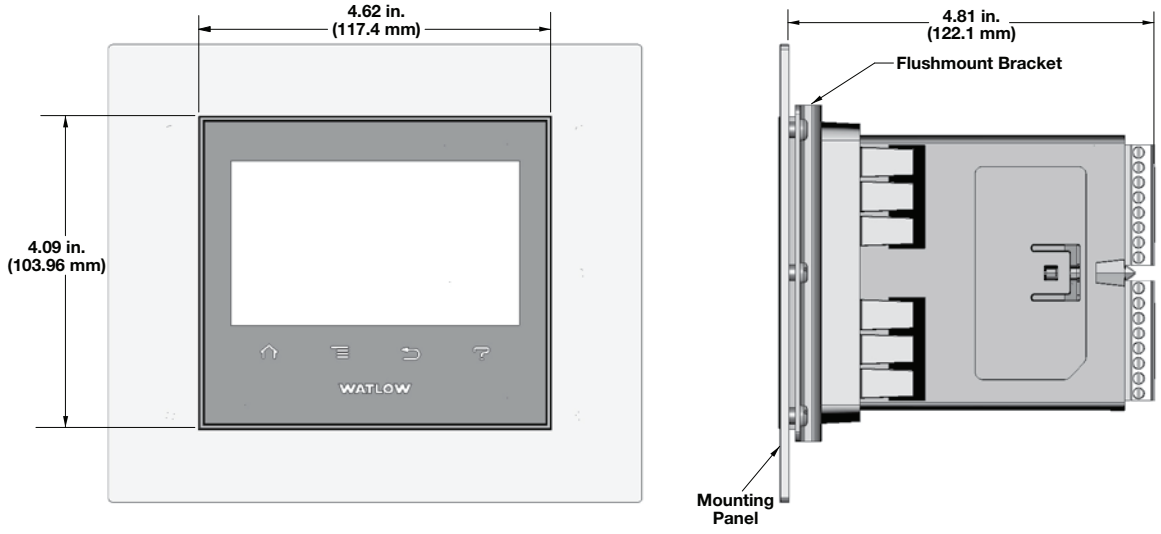
**Timers**
- On pulse, delay, one shot or retentive

**Variable**
- User value for digital or analog variable

### Panel Mount Dimensions




### Flush Mount Dimensions



# F4T with INTUITION

## F4T Base Ordering Information

Base includes: 4.3 inch color graphical touch panel, 2 USB host, USB configuration port, standard bus, Ethernet Modbus® TCP. SCPI protocol and backwards compatible Modbus® for select key SERIES F4D/P/S parameters.

**Part Number**

| ①② | ③ Base Type | ④ Application Type | ⑤ Data Logging | ⑥ Power Supply Connector & Voltage, Logo | ⑦ Profiles & Function Blocks | ⑧⑨ Future Options | ⑩⑪ Documentation, Accent Bar, Replacement Connector & Custom | ⑫ Control Algorithms | ⑬⑭⑮ Populated Flex Modules |
|---|---|---|---|---|---|---|---|---|---|
| F4 | T | | | | | AA | | | |

| ③ | Base Type |
|---|---|
| T = | Touch screen |

| ④ | Application Type |
|---|---|
| 1 = | Standard |
| X = | Custom options, contact factory |

| ⑤ | Data Logging and Graphic Trend Charts |
|---|---|
| A = | None |
| B = | Graphical trend chart |
| J = | Data logging |
| K = | Data logging with encrypted files |
| L = | Data logging and graphical trend chart |
| M = | Data logging with encrypted files, graphical trend charts and batch processing with bar code data entry① |

①Must also order digit 7: Profiles option D, E or F for batch processing with bar code data entry feature to be enabled.

| ⑥ | Power Supply | Power Supply Connector | Watlow Logo |
|---|---|---|---|
| 1 = | 100 to 240VAC | Right angle (standard) | Yes |
| 2 = | 100 to 240VAC | Right angle (standard) | No |
| 3 = | 100 to 240VAC | Front screw | Yes |
| 4 = | 100 to 240VAC | Front screw | No |
| 5 = | 24 to 28VAC or VDC | Right angle (standard) | Yes |
| 6 = | 24 to 28VAC or VDC | Right angle (standard) | No |
| 7 = | 24 to 28VAC or VDC | Front screw | Yes |
| 8 = | 24 to 28VAC or VDC | Front screw | No |

| ⑦ | Profiles | | Function Blocks | | |
|---|---|---|---|---|---|
| | None | 40 Profiles, Battery Backup and Real-Time Clock | Basic Set | Set 1 | Set 2 |
| A = | X | | X | | |
| B = | X | | | X | |
| C = | X | | | | X |
| D = | | X | X | | |
| E = | | X | | X | |
| F = | | X | | | X |

**Note:** Refer to page 191 "Number of Function Blocks by Ordering Option" for quantities and types of functions blocks in each set in the F4T specification sheet on the website.

| ⑧⑨ | Future Options |
|---|---|
| AA = | Future Options |

| ⑩⑪ | Documentation DVD / QSG | Decorated Brushed Aluminum Accent Bar | | | |
|---|---|---|---|---|---|
| | | Gray | Blue | Red | None |
| 1A = | Yes | X | | | |
| 1B = | Yes | | X | | |
| 1C = | Yes | | | X | |
| 1D = | Yes | | | | X |
| 1E = | No | X | | | |
| 1F = | No | | X | | |
| 1G = | No | | | X | |
| 1H = | No | | | | X |
| 1J = | Replacement connectors only - for the model number entered | | | | |
| XX = | Contact factory, other custom-firmware, preset parameters, locked code, logo | | | | |

| ⑫ | Control Loop | Cascade Loop |
|---|---|---|
| 1 = | 1 | 0 |
| 2 = | 2 | 0 |
| 3 = | 3 | 0 |
| 4 = | 4 | 0 |
| 5 = | 0 | 0 |
| 6 = | 0 | 1 |
| 7 = | 1 | 1 |
| 8 = | 2 | 1 |
| 9 = | 3 | 1 |
| A = | 0 | 2 |
| B = | 1 | 2 |
| C = | 2 | 2 |

**Note:** Each control loop algorithm requires 1 universal or thermistor input from a flex module.
**Note:** Each cascade loop algorithm requires 2 universal or thermistor inputs from flex modules.

| ⑬⑭⑮ | Populated Flex Modules |
|---|---|
| AAA = | No populated flex modules |
| XXX = | Contact factory - Populated flex modules |

**Note:** If AAA is selected you will need to order Flex Modules (FM) next to account for input and output hardware.

# F4T with INTUITION

## Flex Modules—High Density I/O Specifications

**Four Universal Inputs (Control Loops, Auxiliary Input)**

- Thermocouple: grounded or ungrounded sensors, greater than 20MΩ input impedance, 2kΩ source resistance max.
- RTD: 2-wire, platinum, 100Ω and 1000Ω at 32°F (0°C) calibration to DIN curve (0.00385Ω/Ω/°C)
- Process: 0-20mA at 100Ω, or 0-10VDC, 0-50mVDC at 20kΩ input impedance; scalable
- Potentiometer: 0 to 1,200Ω
- Inverse scaling

**Four Thermistor Inputs (Control Loops, Auxiliary Input)**

- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)
- Preprogrammed Steinhart-Hart coefficients for Alpha Techniques (A curve 2.252k and 10k, C curve 10k), BetaTHERM (2.2K3A, 10K3A and 10K4A) and YSI (004, 016 and 006)
- User-settable Steinhart-Hart coefficients for other thermistors

**Three Universal Process/Retransmit Outputs**

- Output range selectable
- 0 to 10VDC ±15mV into a min. 4,000Ω load with 2.5mV nominal resolution
- 0 to 20mA ±30µA into max. 400Ω load with 5µA nominal resolution
- Temperature stability 100ppm/°C

**Three Mechanical Relays**

- 2 Form C relays, 1 Form A relay. Form A relay shares common with 1 Form C relay
- Each relay is 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 120/240VAC, 25VA at 24VAC

**Four Mechanical Relays**

- Form A, 5A ea., 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

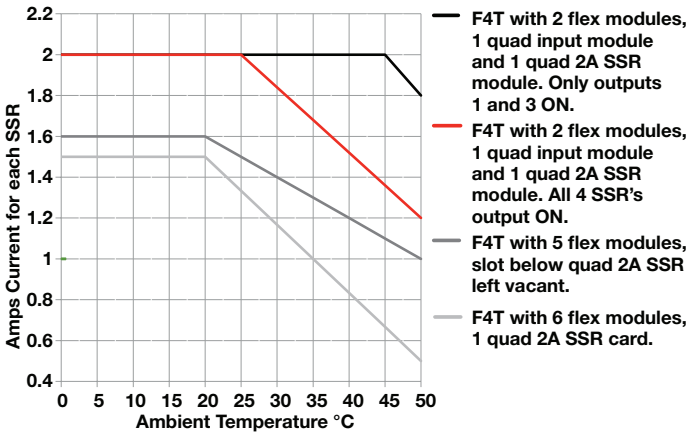
**Two Solid State Relays**

- Form A, 10A max. each SSRs combined at 24VAC min., 264VAC max., opto-isolated, without contact suppression, max. resistive load 10A per output at 240VAC, max. 20A per card at 122°F (50°C), max.

**Four Solid State Relays**

- Two pairs of SSRs, each pair shares a common
- Form A, 24VAC min., 264VAC max., opto-isolated, without contact suppression, resistive load 2A per output at 240VAC, max. See table for max. current per output

**Quad 2A SSR Card Derating Curves**




**Six Digital I/O**

- Each independently configurable as input or output
- Dry contact input: update rate 10Hz, min. open resistance 10kΩ, max. closed resistance 50Ω, max. short circuit 13mA
- DC voltage input: update rate 10Hz, max. input 36V at 3mA, min. high state 3V at 0.25mA, max. low state 2V
- Switched dc output: max. 5VDC at 130mA, or 19-22VDC at 80mA; field selectable
- Open collector output: 32VDC at 1.5A max., 8A max. per 6 outputs combined

# F4T with INTUITION

## F4T Flex Module—High Density I/O Ordering Information

**Part Number**

| ①② | ③ Module ID Type | ④ Future Option | | ⑤ Input and Output Hardware | ⑥⑦⑧ Future Options | | ⑨ Future Option | ⑩ Custom Options and Connectors | ⑪⑫ Custom Options- Firmware, Overlay, Preset Parameters, Locked Code |
|---|---|---|---|---|---|---|---|---|---|
| FM | H | A | - | | AAA | - | A | | |

| ③ | Module ID Type |
|---|---|
| H = | High Density I/O |

| ④ | Future Option |
|---|---|
| A = | Future Option |

| ⑤ | Input and Output Hardware |
|---|---|
| R = | 4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) |
| P = | 4 thermistor inputs |
| C = | 6 digital I/O |
| F = | 3 universal process/retransmit outputs |
| B = | 3 mechanical relay 5A, 2 Form C and 1 Form A (Form A shares a common with one Form C) |
| J = | 4 mechanical relay 5A, Form A |
| K = | 2 SSRs 10A① |
| L = | 4 SSRs at 2A each. SSRs grouped in 2 pairs with each pair sharing a common |

① **Notes:** Input and Output hardware option K: 2 SSR's 10A.

The 2 SSR's 10A FM module requires 2 F4T slots. Valid slot locations are 1, 2, 4 or 5.

The F4T can support a maximum of two total of the K option FM module types (4 total SSR, 10A).

| ⑥⑦⑧ | Future Options |
|---|---|
| AAA = | Future Options |

| ⑨ | Future Option |
|---|---|
| A = | Future Option |

| ⑩ | Custom Options and Connectors |
|---|---|
| A = | Right angle screw connector (standard) |
| F = | Front screw connector |

| ⑪⑫ | Custom Options - Firmware, Overlay, Preset Parameters, Locked Code |
|---|---|
| AA = | Standard with quick start guide |
| AB = | Standard without quick start guide |
| AC = | Replacement connectors hardware only - for the entered model number |
| XX = | Custom |

# F4T with INTUITION

## Flex Modules—Mixed and Limit I/O Specifications

**Universal Input**
- Thermocouple: grounded or ungrounded sensors, greater than 20MΩ input impedance, 2kΩ source resistance max.
- RTD: 2- or 3-wire, platinum, 100Ω and 1000Ω at 32°F (0°C) calibration to DIN curve (0.00385Ω/Ω/°C)
- Process: 0-20mA at 100Ω, or 0-10VDC, 0-50mVDC at 20kΩ input impedance; scalable
- Potentiometer: 0 to 1,200Ω
- Inverse scaling

**Thermistor Input**
- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)
- Preprogrammed Steinhart-Hart coefficients for Alpha Techniques (A curve 2.252k and 10k, C curve 10k), BetaTHERM (2.2K3A, 10K3A and 10K4A) and YSI (004, 016 and 006)
- User-settable Steinhart-Hart coefficients for other thermistors

**Temperature Input**
- Thermocouple: grounded or ungrounded sensors, greater than 20MΩ input impedance, 2kΩ source resistance max.
- RTD: 2-wire, platinum, 100Ω and 1000Ω at 32°F (0°C) calibration to DIN curve (0.00385Ω/Ω/°C)

**Digital Input**
- Update rate 10Hz
- DC voltage: max. input 36V at 3mA, min. high state 3V at 0.25mA, max. low state 2V
- Dry contact input: min. open resistance 10kΩ, max. closed resistance 50Ω, max. short circuit 13mA

**Current Transformer Input**
- Accepts 0-50mA signal (user programmable range)
- Displayed operating range and resolution can be scaled and are user programmable
- Current input range: 0 to 50mA ac, 100Ω input impedance
- Response time: 1 second max., accuracy ±1mA typical
- Use with current transformer (Watlow part number: 16-0246)

**Switched DC Output**
- Max. 32VDC open circuit
- Max. current 30mA per single output
- Max. current 40mA per pair

**Open Collector Output**
- Max. 30VDC at 100mA

**Solid State Relay (SSR) Output**
- Form A, 1A at 50°F (10°C) to 0.5A at 149°F (65°C), 0.5A at 24VAC min., 264VAC max., opto-isolated, without contact suppression

**Form A Electromechanical Relay Output**
- 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

**Form C Electromechanical Relay Output**
- 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

**NO-ARC Relay Output**
- Form A, 12A at 122°F (50°C), 85 to 264VAC, no VDC, resistive load, 2 million cycles at rated load

**Universal Process/Retransmit Output**
- Range selectable
- 0 to 10VDC ±15mV into a min. 1,000Ω load with 2.5mV nominal resolution
- 0 to 20mA ±30µA into max. 800Ω load with 5µA nominal resolution
- Temperature stability 100ppm/°C

## F4T with INTUITION

### F4T Flex Module—Mixed I/O Ordering Information

**Part Number**

| ①② | ③ Module ID Type | ④ Future Option | | ⑤ Input Hardware | ⑥⑦ Output Hardware Options | ⑧ Future Option | | ⑨ Future Option | ⑩ Custom Options and Connectors | ⑪⑫ Custom Options- Firmware, Overlay, Preset Parameters, Locked Code |
|---|---|---|---|---|---|---|---|---|---|---|
| FM | M | A | - | | | A | - | A | | |

| ③ Module ID Type | |
|---|---|
| M = | Mixed I/O |

| ④ Future Option | |
|---|---|
| A = | Future Option |

| ⑤ Input Hardware | |
|---|---|
| A = | None |
| U = | Universal input - T/C, RTD 2- or 3-wire, 0-10VDC, 0-20mA |
| T = | Thermistor input |
| C* = | Current transformer input |
| ***Note:** If option C is ordered than the following options are NOT valid for Outputs 1 & 2: FA, FC, FJ and FK. | |

| ⑥⑦ Output Hardware Options | | |
|---|---|---|
| | **Output 1** | **Output 2** |
| AA = | None | None |
| AJ = | None | Mechanical relay 5A, Form A |
| AK = | None | SSR Form A, 0.5A |
| CA = | Switched dc/open collector | None |
| CH = | Switched dc/open collector | NO-ARC 12A 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 12A 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/retransmit | None |
| FC = | Universal process/retransmit | Switched dc |
| FJ = | Universal process/retransmit | Mechanical relay 5A, Form A |
| FK = | Universal process/retransmit | SSR Form A, 0.5A |
| KH = | SSR Form A, 0.5A | NO-ARC 12A power control |
| KK = | SSR Form A, 0.5A | SSR Form A, 0.5A |

| ⑧ Future Option | |
|---|---|
| A = | Future Option |

| ⑨ Future Option | |
|---|---|
| A = | Future Option |

| ⑩ Custom Options and Connectors | |
|---|---|
| A = | Right angle screw connector (standard) |
| F = | Front screw connector |

| ⑪⑫ Custom Options - Firmware, Overlay, Preset Parameters, Locked Code | |
|---|---|
| AA = | Standard with quick start guide |
| AB = | Standard without quick start guide |
| AC = | Replacement connectors hardware only - for the entered model number |
| XX = | Custom |

# F4T with INTUITION

## F4T Flex Module—Limit Ordering Information

**Part Number**

| ①② | ③ Module ID Type | ④ Future Option | | ⑤⑥⑦ Input and Output Hardware | ⑧ Future Option | | ⑨ Future Option | ⑩ Custom Options and Connectors | ⑪⑫ Custom Options- Firmware, Overlay, Preset Parameters, Locked Code |
|---|---|---|---|---|---|---|---|---|---|
| FM | L | A | - | | A | - | A | | |

| ③ | Module ID Type |
|---|---|
| L = | Limit |

| ④ | Future Option |
|---|---|
| A = | Future Option |

| ⑤⑥⑦ | Functions | Auxiliary Output Hardware | Limit Output Hardware | Auxiliary Input Hardware |
|---|---|---|---|---|
| LCJ = | Limit control with universal input | Switched dc/ open collector | Mechanical relay 5A, Form A | None |
| LEJ = | Limit control with universal input | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A | None |
| LAJ = | Limit control with universal input | None | Mechanical relay 5A, Form A | None |
| MCJ = | Limit control with thermistor input | Switched dc/ open collector | Mechanical relay 5A, Form A | None |
| MEJ = | Limit control with thermistor input | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A | None |
| MAJ = | Limit control with thermistor input | None | Mechanical relay 5A, Form A | None |
| YEB = | Limit control with temperature input | None | Mechanical relay 5A, Form C | Single digital input (limit reset) |

**Notes:** Universal input = T/C, RTD 2- or 3-wire, 0-10VDC, 0-20mA
Temperature input = T/C and RTD 2-wire only

| ⑧ | Future Option |
|---|---|
| A = | Future Option |

| ⑨ | Future Option |
|---|---|
| A = | Future Option |

| ⑩ | Custom Options and Connectors |
|---|---|
| A = | Right angle screw connector (standard) |
| F = | Front screw connector |

| ⑪⑫ | Custom Options - Firmware, Overlay, Preset Parameters, Locked Code |
|---|---|
| AA = | Standard with quick start guide |
| AB = | Standard without quick start guide |
| AC = | Replacement connectors hardware only - for the entered model number |
| XX = | Custom |

## F4T with INTUITION

## F4T Flex Modules—Communication Ordering Information

**Part Number**

| ①② | ③ Module ID Type | ④ Future Option | | ⑤ Comm. Option | ⑥⑦⑧ Future Options | | ⑨ Future Option | ⑩ Custom Options and Connectors | ⑪⑫ Custom Options- Firmware, Overlay, Preset Parameters, Locked Code |
|---|---|---|---|---|---|---|---|---|---|
| FM | C | A | - | 2 | AAA | - | A | | |

| ③ | Module ID Type |
|---|---|
| C = | Communications |

| ④ | Future Option |
|---|---|
| A = | Future Option |

| ⑤ | Communications Option |
|---|---|
| 2 = | Modbus® RTU 232/485 |

**Note:** EIA-232/485 Modbus® RTU flex module, if used, must occupy F4T slot 6 location.

| ⑥⑦⑧ | Future Options |
|---|---|
| AAA = | Future Options |

| ⑨ | Future Option |
|---|---|
| A = | Future Option |

| ⑩ | Custom Options and Connectors |
|---|---|
| A = | Right angle screw connector (standard) |
| F = | Front screw connector |

| ⑪⑫ | Custom Options - Firmware, Overlay, Preset Parameters, Locked Code |
|---|---|
| AA = | Standard with quick start guide |
| AB = | Standard without quick start guide |
| AC = | Replacement connectors hardware only - for the entered model number |
| XX = | Custom |

## Accessories

| Part Number | Description |
|---|---|
| **0830-0870-0000** | Protective screen cover (2 per pack) |
| **0822-0705-0000** | F4T 1/4 DIN mounting collar - thru front panel mount |
| **0216-1285-0000** | Flushmount - mounting adapter plate |
| **0847-0400-0000** | USB 2.0 to RJ45 Ethernet adapter |
| **0238-1245-ALUM** | Accent bar (brushed aluminum gray) |
| **0238-1245-REDD** | Accent bar (brushed aluminum red) |
| **0238-1245-BLUE** | Accent bar (brushed aluminum blue) |
| **16-0246** | Current transformer |
| **0804-0147-0000** | RC supression - Quencharc® |
| **0601-0001-0000** | Controller support tools (DVD) |
| **0830-0808-0001 (CAPUSB-MB5)** | Rubber plug USB mini |
| **0830-0808-0002 (CAPUSB-A)** | Rubber plug USB host |
| **0830-0858-0000** | Replacement battery |
| **0822-0769-0000** | Module slot plug (for vacant F4T slots without flex modules) |

## Recommended Third-Party Components

| Mfg. | Mfg. Part Number | Description | Web Site |
|---|---|---|---|
| **Amphenol** | **USBF 21N SCC** | USB - A receptacle with self closing cap | www.alliedelec.com |
| **Amphenol** | **USBBF 21N SCC** | USB - B receptacle with self closing cap | www.alliedelec.com |
| **Amphenol** | **RJF 21N SCC** | RJ45 receptacle with self closing cap | www.alliedelec.com |
| **Molex** | **847290006** | USB type A panel mount with 2 m cord | www.alliedelec.com |
| **Molex** | **84700-0003** | Dust cover | www.alliedelec.com |

## Documentation

**0600-0092-0000** Installation and Troubleshooting User's Guide
**0600-0093-0000** Setup and Operations User Guide
**0600-0094-0000** F4T Controller Quick Start Guide
**0600-0095-0000** Communications Flex Modules Quick Start Guide
**0600-0096-0000** High Density Flex Modules Quick Start Guide
**0600-0097-0000** Mixed I/O Flex Modules Quick Start Guide

# EZ-ZONE® RM

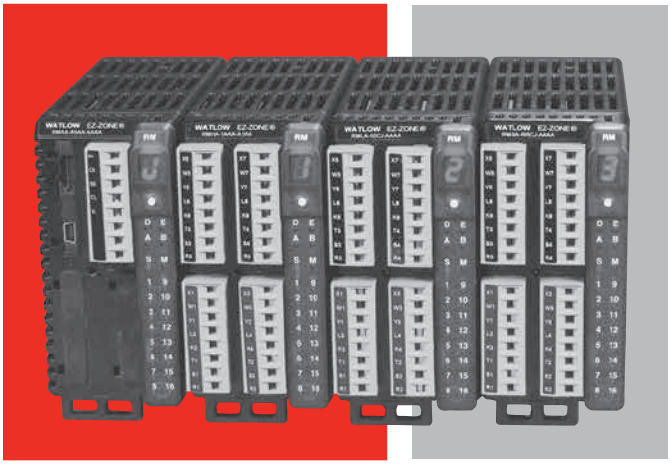
The EZ-ZONE® RM controller simplifies thermal system management. The EZ-ZONE RM controller family is comprised of six module types: an integrated on-off or PID control, monitoring and over/under temperature limit module, a high-density on-off or PID control module, a high-density limit only module, an 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.

**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

- Seven-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

- One 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

## Programmable Application Blocks

### Compare
- Greater than, less than, equal, not equal, greater than or equal, less than or equal

### Counters
- Counts up or down, loads predetermined value on the load signal. Output is active when the count value equals or exceeds predetermined target value

### Linearization
- Interpolated or stepped relationship

### Logic
- And, nand, or, nor, equal, not equal, latch, flip flop

### Math
- Average, process scale, deviation scale, differential (subtraction), ratio (divide), add, multiply, absolute difference, min., max., square root, sample and hold, altitude and dew point

### Process Value
- Sensor backup, average, crossover, wet/dry bulb, switch over, differential (subtraction), ratio (divide), add, multiply, absolute difference, min., max., square root, altitude, visala and dew point

### Special Output Function
- Compressor – turns on-off compressor for one or two loops (cool and dehumidify with single compressor)
- Motorized valve – turns on-off motor open/closed outputs causing valve to represent desired power level
- Sequencer – turns on-off up to four outputs to distribute a single power across all outputs with linear and progressive load wearing

### Timers
- On pulse – produces an output of fixed time on the active edge of timer run signal
- Delay – output is a delayed start of timer run and off at same time
- One shot – oven timer
- Retentive – measures timer run signal and output on when accumulated time exceeds target

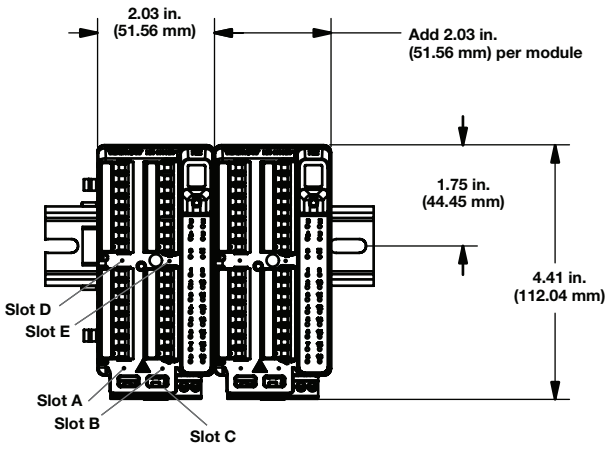
### Variable
- User value for digital or analog variable

**EZ-ZONE RM Family Comparison**

| | Control Module | High-Density Control Module | High-Density Limit Module | Expansion Module | High-Density Scanner Module |
|---|---|---|---|---|---|
| Number of modules per system | 1 to 16 | 1 to 16 | 1 to 16 | 1 to 16 | 1 to 16 |
| Number of PID loops per module | 1 to 4 | 4, 8, 12 or 16 | 0 | 0 | 0 |
| Number of limit loops per module | 1 to 4 | 0 | 4, 8 or 12 | 0 | 0 |
| Number of monitoring points per module | 1 to 3 | 0 | 0 | 0 | 4, 8, 12 or 16 |
| Mechanical relays per module | 1 to 8 | 4 or 8 | 4, 6 or 8 | 4, 8 or 12 | 4 or 8 |
| Digital I/O points per module | 6 | 6 or 12 | 6 or 7 | 6, 12, 18 or 24 | 6, 7 or 12 |
| Actions (events) per module | 8 | 24 | 16 | 8 | 16 |
| Alarms per module | 8 | 24 | 16 | 8 | 16 |
| Compare per module | 4 | 24 | 16 | 8 | 24 |
| Counters per module | 4 | 24 | 16 | 8 | 24 |
| Linearization per module | 4 | 24 | 16 | 8 | 24 |
| Logic per module | 16 | 24 | 16 | 16 | 24 |
| Math per module | 8 | 24 | 16 | 8 | 24 |
| Process value per module | 1 to 4 | 4, 8, 12 or 16 | 4, 8 or 12 | 0 | 4, 8, 12 or 16 |
| Special output function per module | 4 | 0 | 0 | 4 | 0 |
| Timers per module | 4 | 24 | 16 | 8 | 24 |
| Variable per module | 16 | 24 | 16 | 16 | 24 |

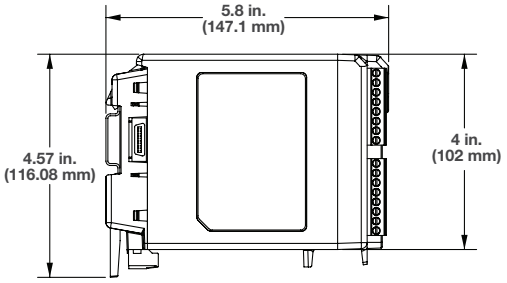
# EZ-ZONE RM

## Dimensional Drawings

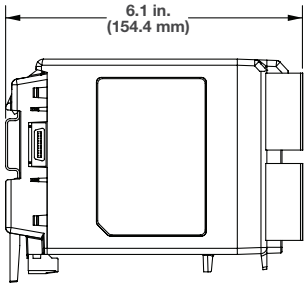



| Connector Type | Module Depth in. (mm) |
|---|---|
| Standard (Right Angle) | 5.8 (148) |
| Straight (Front Screw) | 6.1 (155) |
| Ring Terminal | 6.5 (166) |

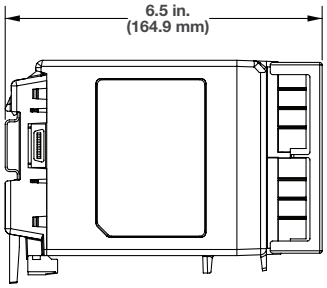
### Standard Connectors




### Front-Screw Connectors




### Ring Terminal Connectors



# EZ-ZONE RM

## Control Module Specifications (RMC)

**(Select an RMC module for 1 to 4 loops of control.)**

### Line Voltage/Power

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

### Controller

- User-selectable heat/cool, on-off, P, PI, PD, PID or alarm action, not valid for limit controllers

### Process PID or Over-temperature Limit Mode Options

- Auto-tune with TRU-TUNE+ adaptive control
- Control sampling rates: input = 10Hz, output = 10Hz (non-divisional)

### 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

### Profile Ramp and Soak (RMC only, not available with high-density controller)

- Profile engine affects one to four loops
- 25 profiles and 15 sub-routines, 400 steps total
- Option for battery backup and real time clock is via the access module

### 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- or 3-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
- Potentiometer: 0 to 1,200Ω
- Inverse scaling
- Current: input range is 0 to 50mA, 100Ω input impedance
  Response time: 1 second max., accuracy ±1mA typical

### 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
- Max. low state 2V

### Dry Contact Input

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

### Current Measurement Input

- Accepts 0-50mA signal (user programmable range)
- Displayed operating range and resolution can be scaled and are user programmable

### Output Hardware

- Switched dc:
  - Max. 32VDC open circuit
  - Max. current 30mA per single output
  - Max. current 40mA per paired outputs (1 & 2, 3 & 4, 5 & 6, 7 & 8)
- Open collector:
  - Max. 30VDC @ 100mA
- 6 digital inputs/outputs:
  - Switched dc, max. 20VDC @ 40mA, 12VDC @ 80mA
  - Open collector, max. 32VDC @ 1.5A, max. 8A per 6 outputs combined
- SSR, Form A, 1A at 50°F (10°C) to 0.5A at 149°F (65°C), 0.5A @ 24VAC min., 264VAC max., opto-isolated, without contact suppression
- Electromechanical relay, Form C, 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
- 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
- NO-ARC relay, Form A, 15A @ 122°F (50°C), 85 to 264VAC, no VDC, resistive load, 2 million cycles at rated load
- Universal process/retransmit, output range selectable:
  - 0 to 10VDC ±15mV into a min. 1,000Ω load with 2.5mV nominal resolution
  - 0 to 20mA ±30µA into max. 800Ω load with 5µA nominal resolution
  - Temperature stability is 100ppm/°C

# EZ-ZONE RM

## Control Module Ordering Information

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

**Part Number**

| ① ② EZ-ZONE Rail Mount | ③ Control Module | ④ Input 1 Primary Function | ⑤ Output 1 and 2 Hardware Options | ⑥ Input 2 | ⑦ Output 3 and 4 Hardware Options | ⑧ Input 3 | ⑨ Output 5 and 6 Hardware Options | ⑩ Input 4 | ⑪ Output 7 and 8 Hardware Options | ⑫ Connector Style | ⑬ Enhanced Options | ⑭ ⑮ Additional Options |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RM | C | | | | | | | | | | | |

| ④ | Input 1 Primary Function |
|---|---|
| 1 = | Control with universal input |
| 2 = | Control with thermistor input |
| 3 = | Ramp/Soak control with universal input **(R/S applies to all loops in module)** |
| 4 = | Ramp/Soak control with thermistor input **(R/S applies to all loops in module)** |
| 5 = | Limit with universal input **(only valid Output 1 and 2, options will be B, F, L)** |
| 6 = | Limit with thermistor input **(only valid Output 1 and 2, options will be B, F, L)** |
| 7 = | Current transformer input **(not valid Output 1 and 2, options are A, B, N, P, R, S, T)** |
| 9 = | Custom |

| ⑤ | Output 1 and 2 Hardware Options | |
|---|---|---|
| | **Output 1** | **Output 2** |
| A = | None | None |
| B = | None | Mechanical relay 5A, Form A |
| U = | Switched dc/open collector | None |
| D = | Switched dc/open collector | NO-ARC 15A power control |
| E = | Switched dc/open collector | Switched dc |
| F = | Switched dc/open collector | Mechanical relay 5A, Form A |
| G = | Switched dc/open collector | SSR Form A, 0.5A |
| H = | Mechanical relay 5A, Form C | None |
| J = | Mechanical relay 5A, Form C | NO-ARC 15A power control |
| K = | Mechanical relay 5A, Form C | Switched dc |
| L = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |
| M = | Mechanical relay 5A, Form C | SSR Form A, 0.5A |
| N = | Universal process | None |
| P = | Universal process | Switched dc |
| R = | Universal process | Mechanical relay 5A, Form A |
| S = | Universal process | SSR Form A, 0.5A |
| T = | None | SSR Form A, 0.5A |
| Y = | SSR Form A, 0.5A | NO-ARC 15A power control |
| Z = | SSR Form A, 0.5A | SSR Form A, 0.5A |

| ⑥ | Input 2 |
|---|---|
| A = | None |
| 1 = | Control with universal input |
| 2 = | Control with thermistor input |
| 5 = | Limit with universal input **(only valid Output 3 and 4, options will be B, F ,L)** |
| 6 = | Limit with thermistor input **(only valid Output 3 and 4, options will be B, F, L)** |
| 7 = | Current transformer input **(not valid Output 3 and 4, options are N, P, R, S)** |
| R = | Auxiliary 2nd input (universal input) |
| P = | Auxiliary 2nd input (thermistor input) |

| ⑦ | Output 3 and 4 Hardware Options | |
|---|---|---|
| | **Output 3** | **Output 4** |
| A = | None | None |
| B = | None | Mechanical relay 5A, Form A |
| U = | Switched dc/open collector | None |
| D = | Switched dc/open collector | NO-ARC 15A power control |
| E = | Switched dc/open collector | Switched dc |
| F = | Switched dc/open collector | Mechanical relay 5A, Form A |
| G = | Switched dc/open collector | SSR Form A, 0.5A |
| H = | Mechanical relay 5A, Form C | None |
| J = | Mechanical relay 5A, Form C | NO-ARC 15A power control |
| K = | Mechanical relay 5A, Form C | Switched dc |
| L = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |
| M = | Mechanical relay 5A, Form C | SSR Form A, 0.5A |
| N = | Universal process | None |
| P = | Universal process | Switched dc |
| R = | Universal process | Mechanical relay 5A, Form A |
| S = | Universal process | SSR Form A, 0.5A |
| T = | None | SSR Form A, 0.5A |
| Y = | SSR Form A, 0.5A | NO-ARC 15A power control |
| Z = | SSR Form A, 0.5A | SSR Form A, 0.5A |

| ⑧ | Input 3 |
|---|---|
| A = | None |
| 1 = | Control with universal input |
| 2 = | Control with thermistor input |
| 5 = | Limit with universal input **(only valid Output 5 and 6, options will be B, F, L)** |
| 6 = | Limit with thermistor input **(only valid Output 5 and 6, options will be B, F, L)** |
| 7 = | Current transformer input **(not valid Output 5 and 6, options are N, P, R, S)** |
| R = | Auxiliary 2nd input (universal input) |
| P = | Auxiliary 2nd input (thermistor input) |

*(Ordering Information continued on next page.)*

# EZ-ZONE RM

## Control Module Ordering Information *(Continued)*

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

**Part Number**

| ① ② EZ-ZONE Rail Mount | ③ Control Module | ④ Input 1 Primary Function | ⑤ Output 1 and 2 Hardware Options | ⑥ Input 2 | ⑦ Output 3 and 4 Hardware Options | ⑧ Input 3 | ⑨ Output 5 and 6 Hardware Options | ⑩ Input 4 | ⑪ Output 7 and 8 Hardware Options | ⑫ Connector Style | ⑬ Enhanced Options | ⑭ ⑮ Additional Options |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RM | C | | | | | | | | | | | |

### ⑨ Output 5 and 6 Hardware Options

| | Output 5 | Output 6 |
|---|---|---|
| A = | None | None |
| B = | None | Mechanical relay 5A, Form A |
| U = | Switched dc/open collector | None |
| D = | Switched dc/open collector | NO-ARC 15A power control |
| E = | Switched dc/open collector | Switched dc |
| F = | Switched dc/open collector | Mechanical relay 5A, Form A |
| G = | Switched dc/open collector | SSR Form A, 0.5A |
| H = | Mechanical relay 5A, Form C | None |
| J = | Mechanical relay 5A, Form C | NO-ARC 15A power control |
| K = | Mechanical relay 5A, Form C | Switched dc |
| L = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |
| M = | Mechanical relay 5A, Form C | SSR Form A, 0.5A |
| N = | Universal process | None |
| P = | Universal process | Switched dc |
| R = | Universal process | Mechanical relay 5A, Form A |
| S = | Universal process | SSR Form A, 0.5A |
| T = | None | SSR Form A, 0.5A |
| Y = | SSR Form A, 0.5A | NO-ARC 15A power control |
| Z = | SSR Form A, 0.5A | SSR Form A, 0.5A |

### ⑩ Input 4

| | |
|---|---|
| A = | None |
| 1 = | Control with universal input |
| 2 = | Control with thermistor input |
| 5 = | Limit with universal input **(only valid Output 7 and 8, options will be B, F ,L)** |
| 6 = | Limit with thermistor input **(only valid Output 7 and 8, options will be B, F, L)** |
| 7 = | Current transformer input **(not valid Output 7 and 8, options are N, P, R, S)** |
| R = | Auxiliary 2nd input (universal input) |
| P = | Auxiliary 2nd input (thermistor input) |

### ⑪ Output 7 and 8 Hardware Options

| | Output 7 | Output 8 |
|---|---|---|
| A = | None | None |
| B = | None | Mechanical relay 5A, Form A |
| U = | Switched dc/open collector | None |
| D = | Switched dc/open collector | NO-ARC 15A power control |
| E = | Switched dc/open collector | Switched dc |
| F = | Switched dc/open collector | Mechanical relay 5A, Form A |
| G = | Switched dc/open collector | SSR Form A, 0.5A |
| H = | Mechanical relay 5A, Form C | None |
| J = | Mechanical relay 5A, Form C | NO-ARC 15A power control |
| K = | Mechanical relay 5A, Form C | Switched dc |
| L = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |
| M = | Mechanical relay 5A, Form C | SSR Form A, 0.5A |
| N = | Universal process | None |
| P = | Universal process | Switched dc |
| R = | Universal process | Mechanical relay 5A, Form A |
| S = | Universal process | SSR Form A, 0.5A |
| T = | None | SSR Form A, 0.5A |
| Y = | SSR Form A, 0.5A | NO-ARC 15A power control |
| Z = | SSR Form A, 0.5A | SSR Form A, 0.5A |
| C = | 6 digital inputs/outputs **(valid option only if Input 4 selection = A)** | |

### ⑫ Connector Style

| | |
|---|---|
| A = | Right angle screw connector (standard) |
| F = | Front screw connector (slots A, B, D and E only) |

### ⑬ Enhanced Options

| | |
|---|---|
| A = | Standard bus |
| 1 = | Standard bus and Modbus® RTU 485 (selectable via dipswitch) |

### ⑭ ⑮ Additional Options

**Firmware, overlays, parameter settings**

| | |
|---|---|
| AA = | Standard |
| AB = | Replacement connectors hardware only for the entered part number. Additional cost for the model can be disregarded as you are only ordering replacement connectors. |
| 12 = | Class 1, Div. 2 (not available with integrated limit controller or mechanical relay options) |
| XX = | Custom |

# EZ-ZONE RM

## High-Density Control Module Specifications (RMH)

**(Select an RMH module for 4 to 16 loops of control.)**

**Line Voltage/Power**

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

**Controller**

- User-selectable heat/cool, on-off, P, PI, PD, PID or alarm action, not valid for limit controllers

**Process PID Options**

- Auto-tune with TRU-TUNE+ adaptive control
- Control sampling rates: input = 10Hz, output = 10Hz (non-divisional)

**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

**Tri-Process (Three universal process/retransmit outputs)**

- Output range selections: 0 to 10VDC into a min. 4KΩ load
- 0 to 20mA into max. 400Ω load

**Quad SSR**

- Four SSRs at 2A each. SSRs are grouped in 2-pairs with each sharing a common. See table

| Ambient Temp. | Maximum Current Per Relay | |
|---|---|---|
| | 1 Quad SSR Card | More than 1 Quad SSR Card |
| -18 to 20°C | 2A | 1.5A |
| 20 to 65°C | 1A | 0.75A |

# EZ-ZONE RM

## High-Density Control Module Ordering Information

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

**Part Number**

| ①② EZ-ZONE Rail Mount | ③ Control Module | ④ Connector Style | | ⑤ Slot A | ⑥ Slot B | ⑦ Slot D | ⑧ Slot E | | ⑨ Future Option | ⑩ Enhanced Options | ⑪⑫ Additional Options |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RM | H | | - | | | | | - | A | | |

| ④ | Connector Style/Custom Product |
|---|---|
| A = | Right angle screw connector (standard) |
| F = | Front screw connector |
| S = | Custom |

| ⑤ | Slot A |
|---|---|
| 1 = | 4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with control loops |
| 2 = | 4 thermistor inputs with control loops |

| ⑥ | Slot B |
|---|---|
| A = | None |
| 1 = | 4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with control loops |
| 2 = | 4 thermistor inputs with control loops |

| ⑦ | Slot D |
|---|---|
| A = | None |
| 1 = | 4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with control loops |
| 2 = | 4 thermistor inputs with control loops |
| C = | 6 digital I/O |
| F = | 3 universal process/retransmit outputs |
| J = | 4 mechanical relay 5A, Form A |
| L = | 4 SSR's at 2A each. SSR's grouped in 2-pairs with each pair sharing a common. |

| ⑧ | Slot E |
|---|---|
| A = | None |
| 1 = | 4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with control loops |
| 2 = | 4 thermistor inputs with control loops |
| C = | 6 digital I/O |
| F = | 3 universal process/retransmit outputs |
| J = | 4 mechanical relay 5A, Form A |
| L = | 4 SSR's 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) |

| ⑪⑫ | Additional Options |
|---|---|
| **Firmware, Overlays, Parameter Settings** | |
| AA = | Standard |
| AB = | Replacement connectors hardware only for the entered part number |
| XX = | Custom |

# 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 |
| S = | Custom |

| ⑤ | Slot A |
|---|---|
| 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 |
| 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 |
| 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

## Expansion Module Specifications (RME)

**(Select an RME module for additional inputs and outputs and higher amperage outputs.)**

**Line Voltage/Power**

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

**Serial Communications**

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

**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
- Ring lug terminal blocks (slots A and D only)
  - Input, power and controller output terminals are touch safe and removable

**Digital Input**

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

**Dry Contact**

- Min. open resistance 100kΩ
- Max. closed resistance 50Ω

**Output Hardware (6 digital inputs/outputs)**

- Update rate 10Hz
- Switched dc
  - Output voltage 20VDC max.
  - Max. supply current source 40mA at 20VDC and 80mA at 12VDC
- Open collector
  - Switched voltage max. 32VDC
  - Max. switched current per output 2.5A
  - Max. switched current for all six outputs combined 10A

**Dual Solid State Relay**

- Two SSR board options, Form A, 10A max. each SSRs combined @ 24VAC min., 264VAC max., opto-isolated, without contact suppression, max. resistive load 10A per output at 240VAC, max. 20A per card at 122°F (50°C), max. 12A per card at 149°F (65°C)

**Four Mechanical Relay**

- Four electro mechanical relays, 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

**Tri-Process (Three universal process/retransmit outputs)**

- Output range selections: 0 to 10VDC into a min. 4KΩ load
- 0 to 20mA into max. 400Ω load

**Quad SSR**

- Four SSRs at 2A each. SSRs are grouped in 2-pairs with each sharing a common. See table.

| Ambient Temp. | Maximum Current Per Relay | |
|---|---|---|
| | 1 Quad SSR Card | More than 1 Quad SSR Card |
| -18 to 20°C | 2A | 1.5A |
| 20 to 65°C | 1A | 0.75A |

# EZ-ZONE RM

## Expansion Module Ordering Information

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

**Part Number**

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

| 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 |
|---|---|
| A = | None |
| C = | 6 digital I/O |
| F = | 3 universal process/retransmit outputs |
| J = | 4 mechanical relay 5A, Form A |
| K = | 2 SSRs, Form A, 10A max. each **(if ordered, then slot B must be = A)** |
| L = | 4 SSRs at 2 each SSR's grouped in 2-pairs with each pair sharing a common |
| T = | Quad inputs for external current transformers. Can do either single-phase or three-phase system measurement for all hardware outputs ordered within the expansion module. |

| ⑥ | Slot B |
|---|---|
| A = | None |
| C = | 6 digital I/O |
| F = | 3 universal process/retransmit outputs |
| J = | 4 mechanical relay 5A, Form A |
| L = | 4 SSRs at 2 each SSR's grouped in 2-pairs with each pair sharing a common |
| T = | Quad inputs for external current transformers. Can do either single-phase or three-phase system measurement for all hardware outputs ordered within the expansion module. |

| ⑦ | Slot D |
|---|---|
| A = | None |
| C = | 6 digital I/O |
| F = | 3 universal process/retransmit outputs |
| J = | 4 mechanical relay 5A, Form A |
| K = | 2 SSRs, Form A, 10A max. each **(if ordered, then slot E must be = A)** |
| L = | 4 SSRs at 2 each SSR's grouped in 2-pairs with each pair sharing a common |
| T = | Quad inputs for external current transformers. Can do either single-phase or three-phase system measurement for all hardware outputs ordered within the expansion module. |

| ⑧ | Slot E |
|---|---|
| A = | None |
| C = | 6 digital I/O |
| F = | 3 universal process/retransmit outputs |
| L = | 4 SSRs at 2 each SSR's grouped in 2-pairs with each pair sharing a common |
| T = | Quad inputs for external current transformers. Can do either single-phase or three-phase system measurement for all hardware outputs ordered within the expansion module. |

| ⑪ ⑫ | Additional Options |
|---|---|
| **Firmware, Overlays, Parameter Settings** | |
| AA = | Standard |
| AB = | Replacement connectors hardware only, for the entered part number. Additional cost for the model can be disregarded as you are only ordering replacement connectors. |
| 12 = | Class 1, Div. 2 (not available with integrated limit controller or mechanical relay options) |
| XX = | Custom |

# 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 |
| S = | Custom |

| ⑤ | Slot A |
|---|---|
| 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 |
| 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 |
| 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's at 2A each. SSR's grouped in 2-pairs with each pair sharing a common. |

| ⑧ | Slot E |
|---|---|
| A = | None |
| 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's 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 |

# EZ-ZONE RM

## Access Module Specifications (RMA)

**(Select an RMA module for communication protocol options, datalogging and automatic configuration backup.)**

**Line Voltage/Power**

- Power consumption: 4 W, 9VA
- 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 connection to all EZ-ZONE products

**Additional Communication Options**

- EIA-232/485, Modbus® RTU
- EtherNet/IP™, Modbus® TCP, 10 BASE-T/100 BASE-TX
- DeviceNet™
- PROFIBUS DP (future option, contact factory)
- USB, controller recognized as a device

**Note:** If an access module is present, all other modules must have Modbus® disabled in order to achieve communications with all of the modules.

**USB**

- USB 1.1 device only
- Mini USB connector type
- Recognized as a mass storage device

**Real Time Clock with Battery Backup**

- Accuracy (typical): +/- 30ppm at 77°F (25°C)
- +30/-100ppm overtemperature operating range
- Battery type and typical lifetime rating: 10 years at 77°F (25°C)
- Lithium battery used, recycle properly

**Data Logging**

- 200 points
- File storage on-board module
- Common separated value (CSV) file type
- Export files via removable SD micro memory card or USB communications port

**Memory Card**

- Removable SD micro card
- 2G SD memory card provided, also accepts other storage space amounts
- -4 to 185°F (-20 to 85°C) ambient rating, non-volatile memory
- Information access to configuration files and the ability to store module auto-configuration settings and datalog files if options have been ordered

**Auto-configuration File Backup**

- Limited memory can support up to four modules
- Limited memory is fixed on board
- Unlimited memory can support up to 16 modules
- Unlimited memory utilizes removable SD micro card option

**Note:** All module parameters are backed up in memory except for USER SET 1 and USER SET 2 parameter settings and address.

# EZ-ZONE RM

## Access Module Ordering Information

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

**Part Number**

| ① ② EZ-ZONE Rail Mount | ③ Access Module | ④ Connector Style | | ⑤ Future Options | ⑥ Comms. Options | ⑦ Ramp/ Soak Functions | ⑧ System Config. & Data Logging Options | | ⑨ ⑩ Future Options | ⑪ ⑫ Additional Options |
|---|---|---|---|---|---|---|---|---|---|---|
| RM | A | | - | A | | | | - | AA | |

| ④ | Connector Style |
|---|---|
| A = | Right angle screw connector (standard) |
| F = | Front screw connector (slots B and E only) |
| S = | Custom |

| ⑥ | Communication Options |
|---|---|
| A = | None |
| 2 = | Modbus® RTU 232/485 |
| 3 = | EtherNet/IP™, Modbus®/TCP |
| 5 = | DeviceNet™ |
| 6 = | PROFIBUS DP |

| ⑦ | Ramp and Soak Functions |
|---|---|
| A = | None |
| B = | Battery backup and real time clock for profile ramp and soak |

⑧ System Configuration and Data Logging Options

| Order Option | USB "Device" Communication | Limited Auto-Configuration File Backup for Up to 4 Modules | Unlimited Auto-Configuration File Backup for Up to 16 Modules | On-Board Data Logging | Mobile Data (2G SD Card) |
|---|---|---|---|---|---|
| A | | ✓ | | | |
| B | | | ✓ | | ✓ |
| Y | ✓ | | ✓ | | ✓ |
| D | ✓ | | ✓ | ✓ | ✓ |

**USB Device Configuration:** USB access to configuration files (and data log files if data logging option is ordered) stored via onboard SD memory card. PC access to product via standard bus protocol.

**Auto-Configuration Backup:** Limited fixed onboard memory can support backing up configuration files for a maximum of four modules. The unlimited option utilizes a SD memory card to enable configuration file backup for up to 16 modules. Feature can be used for cloning configuration files to multiple modules or for easy field replacement to limit downtime.

**Data Logging:** Data log files stored on 2G SD memory card. Data files can be exported via USB communication port transfer or removing SD card into external card reader. Watlow reserves the right to ship a larger memory amount at any point in time.

**Mobile Data:** Transfer configuration files (and data logging files if data logging option is ordered) via removable SD memory card.

| ⑪ ⑫ | Additional Options |
|---|---|
| **Firmware, Overlays, Parameter Settings** | |
| AA = | Standard |
| AB = | Replacement connectors hardware only, for the entered part number. Additional cost for the model can be disregarded as you are only ordering replacement connectors. |
| 12 = | Class 1, Div. 2 (not available with integrated limit controller or mechanical relay options) |
| XX = | Custom |

## Compatible Accessories

### Basic Remote User Interface (RUI) EZKB


The EZ-ZONE Remote User Interface (RUI and communications gateway) can be utilized as a communication gateway device to save cost, space and wiring when digital communications is being used with two or more EZ-ZONE controllers. The EZ-ZONE RUI can also serve as a display for showing all parameter values for up to 16 EZ-ZONE controllers, again saving cost, space and wiring expenses.
See page 341.

# RMA PLUS Remote Access Module

## Specifications

**(Select a RMA PLUS module for communication protocol options, data logging and system configuration)**

**Interoperable with**:
- EZ-ZONE RM (C, E, H, L, S) version 9.0+ (high-speed Watbus)
- EZ-ZONE RM (A, C, E, H, L, S) (low-speed Watbus)
- EZ-ZONE PM, RUI, ST (low-speed Watbus)
- EZ-ZONE RM (F, G, UH, Z)
- POWERGLIDE™

**Line Voltage/Power**
- Power consumption: 4 W, 9VA
- Any external power supply used should comply with a Class 2 or SELV rating

**Isolated Serial Communications**
- All modules ship with standard bus protocol (Watbus) for configuration and communication connection to all EZ-ZONE products

**Standard Communication**
- Watbus over Ethernet (gateway to high-speed Watbus)
- Watbus over USB (gateway to high-speed Watbus)
- Watbus via Serial ('C' connector)
- Modbus® TCP

**Additional Communication Options**
- EIA 232/485, Modbus® RTU
- DeviceNet™ (future option)
- EtherNet/IP™ (future option)

**USB**
- USB 2.0 device
- Mini USB connector type
- Recognized as a composite device: vendor specific and mass storage classes
- USB host (future option)

**Real Time Clock with Battery Backup**
- Accuracy (typical): +/- 30ppm at 77°F (25°C)
- +30/-100ppm overtemperature operating range
- Battery type and typical lifetime rating: 10 years at 77°F (25°C)
- Lithium battery used, recycle properly

**Data Logging**
- Maximum of 2000 valid records
- Maximum of 500 unique data points per Watbus bus and zone
- File storage on embedded micro SD memory
- Comma separated value (CSV) file type
- Access log files via USB device port

**Memory Card**
- Micro SDHC (4-32GB)
- 4GB class 4 SDHC on standard models (operating temperature: -25 to 85°C)
- 16GB class 10 SDHC on data log models (operating temperature: -40 to 85°C)
- -4 to 185°F (-20 to 85°C) ambient rating, non-volatile memory

**Note:** All module parameters are backed up in memory.

# RMA PLUS Remote Access Module

## Ordering Information

Module for communications, data logging and storage. Comes tandard with Modbus® TCP, standard bus over Ethernet, USB device, internal storage and SD card

**Part Number**

| ①②③④ EZ-ZONE Rail Mount | | ⑤ Additional Communication Protocols | ⑥ Ultra High Density Thermocouple Input Card | ⑦ Data Logging | ⑧ Wireless Connectivity | | ⑨ Future Option | ⑩ Future Option | ⑪⑫ Additional Options |
|---|---|---|---|---|---|---|---|---|---|
| RMAP | - | | | | | - | A | A | |

| ⑤ | Additional Communication Protocols |
|---|---|
| A = | None |
| 2 = | Modbus® RTU 232/485 |
| 5 = | DeviceNet™ (future option) |

| ⑥ | Ultra High Density T/C Input Card |
|---|---|
| A = | None |
| 1 = | 18 T/C scanner inputs (future option) |
| 2 = | 18 T/C limit inputs with one global relay output (future option) |

| ⑦ | Data Logging |
|---|---|
| A = | None |
| 2 = | Data logging to 16G SD card |

| ⑧ | Wireless Connectivity |
|---|---|
| A = | None |
| B = | Bluetooth® (future option) |
| W = | Wi-Fi (future option) |

| ⑨ | Future Option |
|---|---|
| A = | Future option |

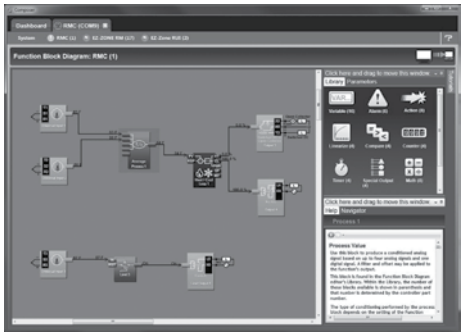
| ⑩ | Future Option |
|---|---|
| A = | Future option |

| ⑪⑫ | Additional Options |
|---|---|
| AA = | Standard |
| XX = | Custom/locked code application specific |

# EZ-ZONE RM

## Compatible Accessories *(Continued)*

### COMPOSER® with INTUITION



COMPOSER® with INTUITION is Watlow's software for configuring F4T and EZ-ZONE RM controllers. It is used to set up functions such as control loops, profiles and alarms and link them to controller inputs and outputs. COMPOSER can be used to edit and save configurations while communicating with controllers and to download previously saved setups. It works without requiring the purchase of any communication options and is available as a free download at www.watlow.com. See page 372.

### EZ-ZONE Configurator Software


The EZ-ZONE configurator software is used to set up Watlow EZ-ZONE products in one simple process. It works without requiring the purchase of any communication options because it uses the standard bus communications protocol that is included with all EZ-ZONE products. EZ-ZONE configurator can be used for online and offline configurations and downloading previously saved setups. It is available as a FREE download at www.watlow.com. See page 374.

### SpecView


SpecView is designed for industrial users and includes 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. See page 361.

### Operator Interface Terminals (OIT)

Silver Series EM touchscreen 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 terminal, paired with Watlow controllers, is the perfect solution for industrial processes or machine control applications. See page 335.

### Power Supplies - See page 394

- AC/DC power supply converter 90-264VAC to 24VDC volts.
- P/N 0847-0299-0000 – 31 W
- P/N 0847-0300-0000 – 60 W
- P/N 0847-0301-0000 – 91 W

### EZ-ZONE RM Product Documentation

- User's manual – electronic DVD, P/N 0601-0001-0000

# EZ-ZONE RMZ/RMF

By combining advances in fluorescent temperature sensing with the power of the proven EZ-ZONE® RM control system, Watlow® developed a best-in-class fiber optic temperature measurement and control system that will provide industry-leading performance for your specific application. By integrating fiber optic sensing capabilities into the EZ-ZONE RM control system, users will save space, improve performance with faster response times while simplifying their control system.

Watlow's EZ-ZONE RMZ and EZ-ZONE RMF make the system adaptable to all system requirements. Both are compatible with all other modules within the EZ-ZONE RM family and self-discover all existing modules within the system making a seamless integration into your temperature control/logic system.

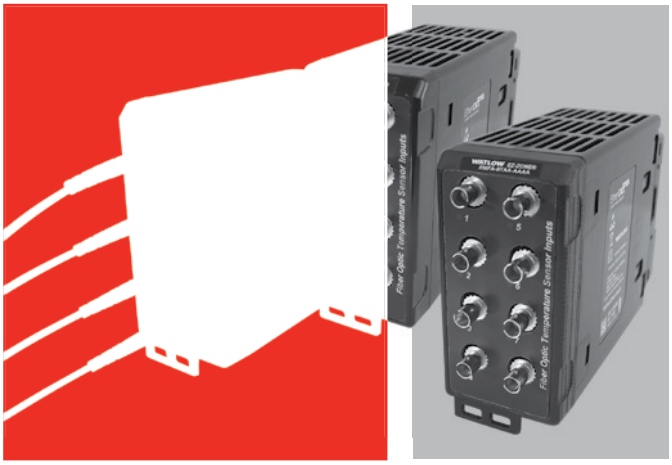
## EZ-ZONE RMZ Offers Fiber Optic Sensing Capabilities and EtherCAT® Communications

The EZ-ZONE RMZ integrates fiber optics, PID temperature control and EtherCAT® communications into a single package. It features multi-channel control, hosting up to four channels of fiber optic inputs as well as supporting up to 44 additional control loops from other EZ-ZONE RM modules. These modules support a wide array of capabilities including I/O, logic, current measurement, power switching and more.

## EZ-ZONE RMF Offers Additional Fiber Optic Inputs for Expansion Opportunities

The EZ-ZONE RMF module is a dedicated fiber optic input module integrating the advanced control technology of the EZ-ZONE system with one to eight channels of fiber optic temperature sensing.

The EZ-ZONE RMF can also serve as additional inputs to the EZ-ZONE RMZ enabling extensive expansion opportunities for future system needs. The EZ-ZONE RMF is ideal either as an expansion module or configured with built-in temperature control loops (outputs via EZ-ZONE RME module). The EZ-ZONE RMF can be used independently when only sensing is required.



## Benefits of Watlow's high-performance fluorescence-based temperature measurement system include:

- Compact integrated fiber optic sensing with temperature control
- Easily expands to increase number of zones as your system needs increase
- Integrates seamlessly with the temperature control system avoiding additional analog signal processing
- Faster temperature sampling rates with high resolution
- Minimizes installed footprint due to the small form factor and DIN-rail mounting
- Highly accurate fluorescent signal processing electronics
- Offers highly reliable LED light source designed to run at low currents for maximum life
- Up to 48 loops of input and control with all EZ-ZONE RM temperature control features
  - Temperature / limit loops
  - Current measurement
  - Power switching
  - Logic

## Specifications

| | EZ-ZONE RMZ | EZ-ZONE RMF |
|---|---|---|
| Optical Inputs | 1 to 4 | 1 to 8 |
| Communications | EtherCAT®, Standard Bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | |
| Short Term Stability | 3σ ±0.03°C | |
| Operating Ambient Temperature | -18°C to 65°C | |
| Unit to Unit Accuracy (electronics) | ±0.05°C | |
| Module Dimensions (mm) | 51.6 (H) x 44.5 (W) x 148 (D) | |
| Measurement Ranges** | -70°C to 300°C (calibrated at -40°C) | |
| Probe Materials (typical) | Polyimide/PEEK/Polyamide-imide | |
| System Accuracy (calibrated) | ±0.05°C | |
| System Accuracy (uncalibrated) | ±0.5°C | |
| Maximum Drift | 0.5°C/yr | |
| Analog Output* | 0-10V, 0-20mA | |

* Outputs via EZ-ZONE RME module.
** Consult engineering center for measurement ranges outside of these values.

# EZ-ZONE RMZ/RMF

## EZ-ZONE RMZ Ordering Information

**Module for EtherCAT® Communications Protocol, Universal Control Inputs, Wireless Development Communications and Legacy Communications**
**Part Number**

| ①②③④ EZ-ZONE Rail Mount | | ⑤⑥ Number of Control Loops | ⑦⑧ Number of Optical Inputs | | ⑨ Wireless Comms. | ⑩ Legacy Comms. | ⑪⑫ Connector Style/Additional Options |
|---|---|---|---|---|---|---|---|
| RMZ4 | - | | | - | | | |

| ⑤⑥ | Number of Control Loops |
|---|---|
| AA = | No control loops |
| 04 = | 4 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 08 = | 8 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 12 = | 12 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 16 = | 16 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 20 = | 20 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 24 = | 24 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 28 = | 28 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 32 = | 32 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 36 = | 36 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 40 = | 40 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 44 = | 44 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |
| 48 = | 48 universal inputs (T/C, 2-wire RTD, 0-10VDC, 0-20mA) |

| ⑨ | Wireless Communications |
|---|---|
| A = | No wireless communications |
| B = | Bluetooth® (wireless) development communications |

| ⑩ | Legacy Communications |
|---|---|
| A = | No wireless communications |
| 1 = | Standard bus |
| 2 = | Modbus® |
| 3 = | Standard bus and Modbus® |
| 4 = | Standard bus and DeviceNet™ |

| ⑪⑫ | Connector Style/Additional Options |
|---|---|
| AA = | Standard |
| 12 = | Class 1, Div. 2 |
| XX = | Custom |

| ⑦⑧ | Number of Optical Inputs |
|---|---|
| AA = | No optical inputs |
| 04 = | 4 fiber optic inputs, temp. range 0-200°C (option for legacy communications is A only) |
| 05 = | 4 fiber optic inputs, temp. range 0-300°C (option for legacy communications is A only) |

## EZ-ZONE RMF Ordering Information

**Module for Fiber Optic Inputs with PID Temperature Control.**
**Part Number**

| ①②③④ EZ-ZONE Rail Mount | | ⑤⑥ Number of Fiber Optic/Temperature Control Loops | ⑦ Future Option | ⑧ Future Option | | ⑨ Future Option | ⑩ Comms. Protocol | ⑪⑫ Add'l Options |
|---|---|---|---|---|---|---|---|---|
| RMFA | - | | | | - | | | |

| ⑤⑥ | Number of Fiber Optic/Temperature Control Loops |
|---|---|
| AA = | No fiber optic/temperature control loops |
| 1A = | 1 fiber optic input without temperature control loop |
| 1T = | 1 fiber optic input with temperature control loop |
| 2A = | 2 fiber optic inputs without temperature control loop |
| 2T = | 2 fiber optic inputs with temperature control loop |
| 3A = | 3 fiber optic inputs without temperature control loop |
| 3T = | 3 fiber optic inputs with temperature control loop |
| 4A = | 4 fiber optic inputs without temperature control loop |
| 4T = | 4 fiber optic inputs with temperature control loop |
| 5A = | 5 fiber optic inputs without temperature control loop |
| 5T = | 5 fiber optic inputs with temperature control loop |
| 6A = | 6 fiber optic inputs without temperature control loop |
| 6T = | 6 fiber optic inputs with temperature control loop |
| 7A = | 7 fiber optic inputs without temperature control loop |
| 7T = | 7 fiber optic inputs with temperature control loop |
| 8A = | 8 fiber optic inputs without temperature control loop |
| 8T = | 8 fiber optic inputs with temperature control loop |

| ⑩ | Communication Protocol Options |
|---|---|
| A = | Standard bus |
| 1 = | Standard bus and Modbus® RTU 485 |
| **Note:** To obtain communication protocol other than standard bus or Modbus® RTU 485 order the applicable EZ-ZONE RMZ4. | |

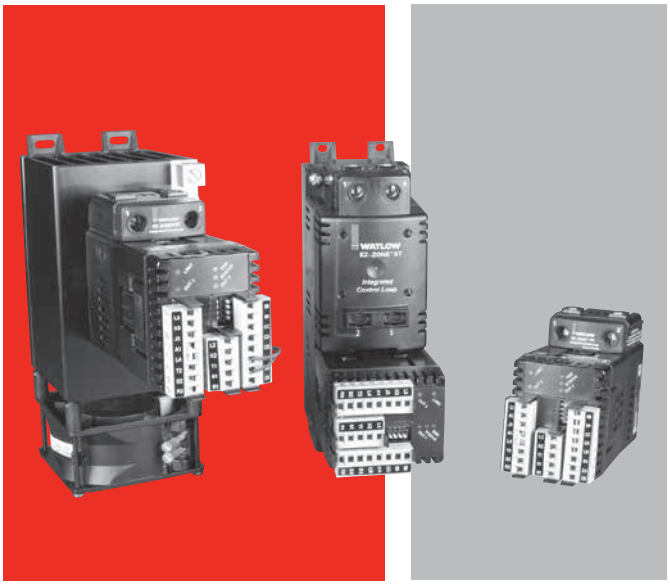
| ⑪⑫ | Additional Options |
|---|---|
| AA = | Standard |
| 12 = | Class 1, Div. 2 |
| XX = | Custom |

## EZ-ZONE ST

The EZ-ZONE ST integrated solid state controller from Watlow offers a complete thermal system control solution in a single package. Features include a PID temperature controller connected to a high-amperage solid state relay with the option of adding a properly sized heat sink, an over- and under-temperature limit, a power shut-down contactor and digital communications in one complete and professionally engineered product.

Because the system is modular and scalable, a user only pays for what is needed. Stacking the EZ-ZONE ST integrated controller into multiple configurations enables flexibility to standardize the product platform to solve a wide range of application needs.

This integrated controller also includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.



### Features and Benefits

**Back panel or DIN-rail mount**
- Provides several mounting options

**Compact package**
- Reduces panel size

**Touch-safe package**
- Complies with IP2X increasing user safety

**±0.1 percent temperature accuracy**
- Provides efficient and accurate temperature control

**200KA SCCR with proper fusing**
- Minimizes damage in the event of a short circuit

**Agency approvals: UL®, CSA, CE, RoHS, W.E.E.E.**
- Meets applications requiring agency approvals

**Three-year warranty**
- Ensures Watlow's reliability and product support

**Off-the-shelf designed system solution**
- Improves system reliability and termination reduction
- Reduces installation cost
- Eliminates incompatibility headaches often encountered with using many different components and brands

**Profile capability**
- Includes ramp and soak with four files and 40 total steps

**Ability to communicate with programmable logic controller (PLC), personal computer (PC) or operator interface terminal (OIT)**
- Optional EIA-485 Modbus® RTU
- RUI/communications gateway with optional EIA-232/485 Modbus® RTU, EtherNet/IP™/TCP Modbus®, DeviceNet™ or PROFIBUS DP. Refer to page 341 for further information.

**Solid state relay output**
- Allows faster cycling, more precise control, increased heater life and improves energy efficiency
- Ability to handle up to 75 amperes
- Uses either zero-cross or phase angle control modes for flexibility to control resistive loads such as Nichrome®, tungsten or quartz lamps
- Utilizes phase angle control mode to prevent load failure or blowing fuses for tungsten or quartz loads

**PID temperature control**
- Allows single input/dual output
- Allows standard PID or adaptive TRU-TUNE+ tuning algorithms for demanding controllability requirements

**Optional temperature limit**
- Increases safety in over- and under-temperature conditions

**Optional definite purpose mechanical contactor**
- Enables circuit safety shut down driven by limit control or PID alarm output signal

**Optional current monitoring feature**
- Detects heater current flow and alarm indication of failed solid state relay (SSR) or heater zone

**Optional SSR heat sink**
- Sized and engineered for specific applications
- Factory supplied heat sink is UL® listed

**System diagnostics**
- Provides continuous self-monitoring alerts when there is any system trouble to reduce maintenance and service costs

**PC Software—EZ-ZONE Configurator**
- Wizard style configuration of controller settings
- Online or offline recipe editing

# EZ-ZONE ST

## Specifications

### Line Voltage/Power
- 100 to 240VAC, +10/-15%; (85-264VAC), 50/60Hz, ±5%
- 24VAC/VDC, +10/-15%; 50/60Hz, ±5%
- 12VA max. power consumption without mechanical contactor in system
- 50VA max. power consumption with mechanical contactor used in system, 140VA if using external contactor
- Data retention upon power failure via nonvolatile memory

### Environment
- 0 to 158°F (-18 to 70°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
  - Types R, S, B: 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
- UL®, CSA, CE (zero cross models only), RoHS, W.E.E.E.
- Limit version features FM approval

### Controller
- Microprocessor based user-selectable control modes
- PID module: single universal input, 2 outputs
- Limit module: single universal input, 2 outputs
- Two total additional digital input/outputs shared between PID and limit functions
- Control sampling rates: input = 10Hz, outputs = 10Hz
- Isolated EIA-485 Modbus® RTU serial communications

### Wiring Termination—Touch Safe Terminals
- Input, power and controller output terminals touch safe removable 12 to 22 AWG
- Power load terminals 6 to 12 AWG
  - Tightening torque: 30 in.-lbs

### Universal Input
- Thermocouple, grounded or ungrounded sensors
  - >20MΩ input impedance
  - Max. of 20Ω source resistance
- RTD 2- or 3-wire, platinum, 100Ω and 1000Ω @ 0°C calibration to DIN curve (0.00385Ω/Ω/°C)
- Process, 0-20mA @ 100Ω, or 0-10VDC @ 20kΩ input impedance; scalable, 0-50mV
- Inverse scaling

### Digital Input
- Update rate: 1Hz
- Dry contact or dc voltage
  DC voltage
  - Max. input: 36V at 3mA
  - Min. high state: 3V at 0.25mA
  - Max. low state: 2V

  Dry contact
  - Max. short circuit: 13mA
  - Min. open resistance: 500Ω
  - Max. closed resistance: 100Ω

### Current Measurement
- Accuracy: typical ±1A, max. error ±3A
- Accuracy and operating range: 0 to 75A

### Digital Output
- Update rate: 1Hz
- Output voltage: 24V, current limit 10mA

### Allowable Operating Range
Type J: 32 to 1500°F or 0 to 815°C
Type K: -328 to 2500°F or -200 to 1370°C
Type T: -328 to 750°F or -200 to 400°C
Type N: 32 to 2372°F or 0 to 1300°C
Type E: -328 to 1470°F or -200 to 800°C
Type C: 32 to 4200°F or 0 to 2315°C
Type D: 32 to 4200°F or 0 to 2315°C
Type F: 32 to 2543°F or 0 to 1395°C
Type R: 32 to 3200°F or 0 to 1760°C
Type S: 32 to 3200°F or 0 to 1760°C
Type B: 32 to 3300°F or 0 to 1816°C
RTD (DIN): -328 to 1472°F or -200 to 800°C
Process: -1999 to 9999 units

### Output Hardware
- User selectable for heat/cool as on-off, P, PI, PD, PID, or alarm action. Not valid for limit controls
- Electromechanical relay. Form A, rated 2A
- SSR drive: 20-28VDC low side open collector switch
- SSR, Form A, 0.5A @ 24VAC min., 264VAC max., opto-isolated, without contact suppression
- Electromechanical relay, Form A, rated 5A, auxiliary output on PID module, output 2
- Electromechanical relay, Form C, rated 5A, auxiliary output on limit module, output 3

# EZ-ZONE ST

## Specifications for Mechanical Contactor

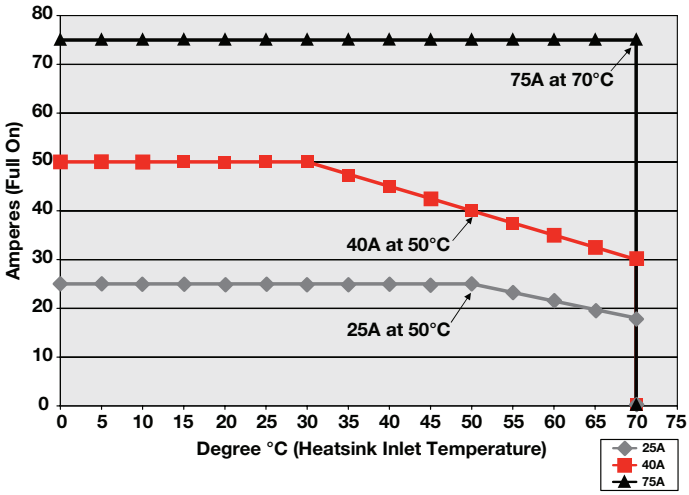
- Insulation class: UL® Class B 266°F (130°C)
- Min. load of 100 watts
- Duty cycle: continuous

### Contact Ratings

| Full Load Amperes | Number of Poles | Line Voltage | Locked Rotor Amps | Resistive Amp Rating | Max. Horsepower | |
|---|---|---|---|---|---|---|
| | | | | | Voltage | Single-Phase |
| 40 | 2 | 240/277 | 240 | 50 | 120 | 2 |
| | | 480 | 200 | 50 | 240 | 3 |
| | | 600 | 160 | 50 | | |

## EZ-ZONE ST Solid State Relay with Heat Sink Specifications

### Temperature and SSR Amperage Performance Curve Watlow 25, 40 and 75 Ampere Solid State Relays



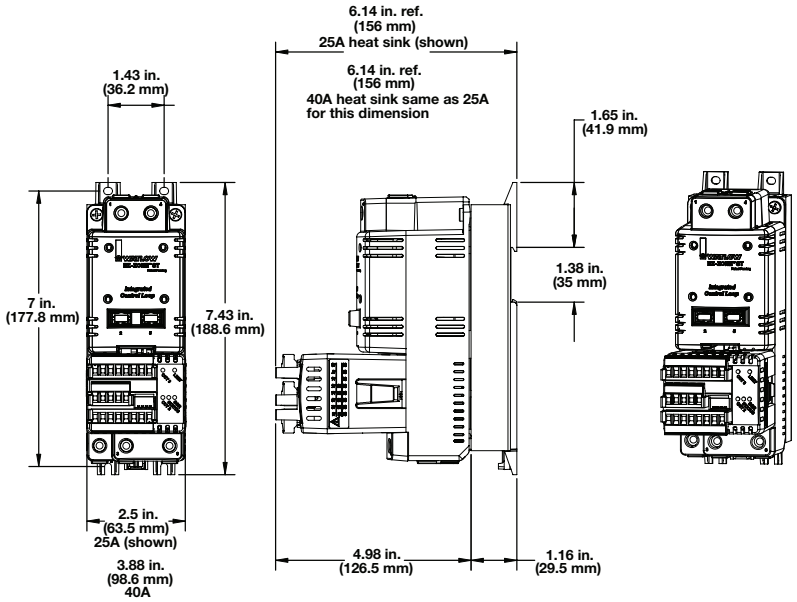

| All Versions | | | |
|---|---|---|---|
| Current output (50°C) | 25 Amps | 40 Amps | 75 Amps |
| One-cycle surge current | 600Apk | 850Apk | 1350Apk |
| Max. $I^2t$ for fusing | 1500$A^2s$ | 3000$A^2s$ | 7560$A^2s$ |
| Thermo resistance | 0.35°C/W | 0.2°C/W | 0.14°C/W |
| Base plate temperature (max.) | 116°C | 115°C | 112°C |
| Forward voltage drop | 1.3Vpk | 1.3Vpk | 1.3Vpk |
| Min. holding current | 150mA | 150mA | 250mA |
| Frequency | 47 to 63Hz | 47 to 63Hz | 47 to 63Hz |

| Time Proportioned Models | |
|---|---|
| Off-state leakage | 1mA |
| Max. off-state dv/dt | 500V/µsec |
| **120/240VAC** | |
| Output voltage range | 24 to 280VAC |
| Over voltage rating | 600Vpk |
| Input voltage range | 0 to 28VDC |
| **277/600VAC** | |
| Output voltage range | 48 to 660VAC |
| Over voltage range | 1200Vpk |
| Input voltage range | 0 to 28VDC |

| Phase Angle Models | |
|---|---|
| Off-state leakage | 6mA |
| Max. off-state dv/dt | 200V/µsec |
| **120/240VAC** | |
| Output voltage range | 100 to 240VAC |
| Over voltage rating | 600Vpk |
| Input voltage range | 2.7 to 10VDC |
| **277/600VAC** | |
| Output voltage range | 260 to 600VAC |
| Over voltage range | 1200Vpk |
| Input voltage range | 2.8 to 10VDC |

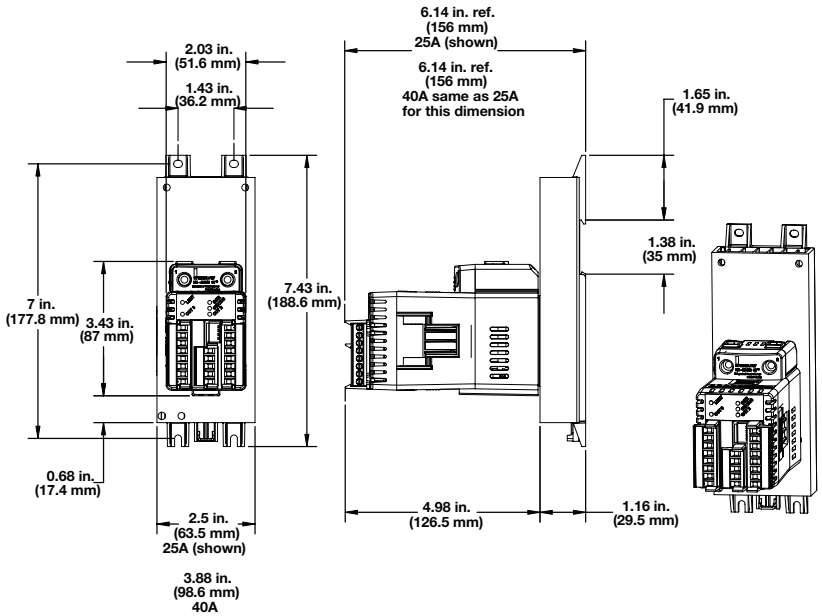
# EZ-ZONE ST

## EZ-ZONE ST with Definite Purpose Mechanical Contactor—Dimensional Drawing




**Note:** EZ-ZONE ST must be mounted vertically (as shown) to meet amp/ambient performance curve.

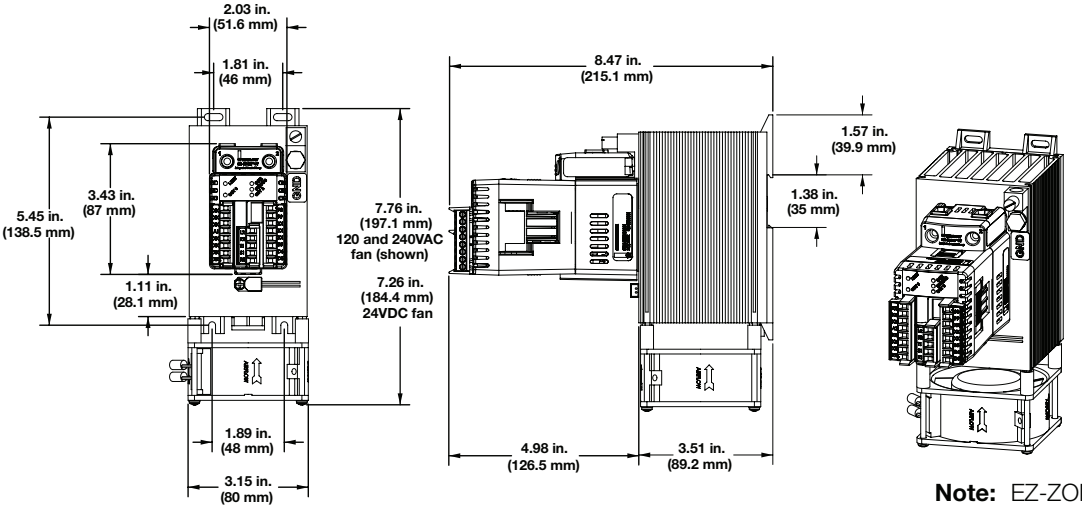
## EZ-ZONE ST with 25 or 40A Heat Sink, without Definite Purpose Mechanical Contactor—Dimensional Drawing




**Note:** EZ-ZONE ST must be mounted vertically (as shown) to meet amp/ambient performance curve.

# EZ-ZONE ST

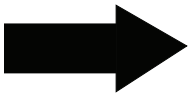
## EZ-ZONE ST with 75A Heat Sink, without Definite Purpose Mechanical Contactor—Dimensional Drawing




**Note:** EZ-ZONE ST must be mounted vertically (as shown) to meet amp/ambient performance curve.

## Communications

Selecting the right communications ordering option for the EZ-ZONE ST:

|  | |  |  |  |  |
|---|---|---|---|---|---|
| **Correct Ordering Option Letter** | **Connecting To** | **Another EZ-ZONE Product** | **RUI, EZ-ZONE Configurator, SpecView** | **Third Party Device (PLC, PC, Touch Panel, etc.)** | **Silver Series Operator Interface Terminal** |
| Option A* |  | | Yes | | |
| Option M** | | | | Yes - Via Modbus® | Yes - Via Modbus® |
| Option A* | | Yes | Yes | | |
| Option M** | | Yes | | Yes - Via Modbus® | Yes - Via Modbus® |

*A = Standard bus used to connect to Watlow PC software, RUI, other EZ-ZONEs

**M = Modbus® RTU (needed to communicate to third-party devices) and standard bus. User selectable

# EZ-ZONE ST

## Ordering Information

**Part Number**

| ① ② | ③ | ④ | ⑤ ⑥ | ⑦ | ⑧ | ⑨ | ⑩ | ⑪ ⑫ |
|---|---|---|---|---|---|---|---|---|
| | Integrated PID Controller | Integrated Limit Controller | Mech. Cont. & Pwr. Supply | Comm. | SSR | Heat Sink/DIN-Rail Mtg. | Firmware | Custom-ization |
| ST | | | | | | | | |

| ③ Integrated PID Controller | Output 1* | Output 2 | Total of 2 Digital I/O Points | Current Measurement |
|---|---|---|---|---|
| K = | SSR drive | 0.5A SSR | No | No |
| B = | SSR drive | 0.5A SSR | Yes | No |
| P = | SSR drive | 0.5A SSR | No | Yes |
| E = | SSR drive | 0.5A SSR | Yes | Yes |
| H = | SSR drive | 5A mechanical relay | No | No |
| D = | SSR drive | 5A mechanical relay | Yes | No |
| J = | SSR drive | 5A mechanical relay | No | Yes |
| C = | SSR drive | 5A mechanical relay | Yes | Yes |

* Output 1 is dedicated to providing the command signal to the internal SSR.

**Note:** If 75A heat sink is selected below, then 1 digital I/O will be factory set and fixed as the SSR over-temperature digital input.

| ④ Integrated Limit Controller | |
|---|---|
| A = | None |
| L = | Limit control module with output 3, 5A Form C mechanical relay; with output 4, 2A Form A mechanical relay |
| B = | No limit control module but access to coil connection on mechanical contactor |

| ⑤ ⑥ Mechanical Contactor and Power Supply Options | |
|---|---|
| AH = | No contactor and universal high voltage power supply 100-240VAC/VDC |
| AL = | No contactor and universal low voltage power supply 24- 28VAC/VDC |
| B1 = | Single pole, 40A Watlow contactor, 24VAC power supply |
| B2 = | Single pole, 40A Watlow contactor, 110/120VAC power supply |
| B3 = | Single pole, 40A Watlow contactor, 208/240VAC power supply |
| F1 = | Dual pole, 40A Watlow contactor, 24VAC power supply |
| F2 = | Dual pole, 40A Watlow contactor, 110/120VAC power supply |
| F3 = | Dual pole, 40A Watlow contactor, 208/240VAC power supply |

| ⑦ Communications | |
|---|---|
| A = | Standard bus used to connect to Watlow PC software, RUI, other EZ-ZONEs |
| M = | 485 Modbus® RTU (needed to communicate to third-party devices) and standard bus. User selectable |

| ⑧ SSR | |
|---|---|
| B = | Zero cross 10A (24 to 240VAC output) |
| C = | Zero cross 25A (24 to 240VAC output) |
| D = | Zero cross 40A (24 to 240VAC output |
| E = | Zero cross 50A (24 to 240VAC output |
| K = | Zero cross 75A (24 to 240VAC output) |
| F = | Zero cross 90A (24 to 240VAC output) |
| G = | Zero cross 25A (48 to 600VAC output) |
| H = | Zero cross 40A (48 to 600VAC output) |
| L = | Zero cross 75A (48 to 600VAC output) |
| J = | Zero cross 90A (48 to 600VAC output) |
| M = | Phase angle 25A (100 to 240VAC output) |
| N = | Phase angle 40A (100 to 240VAC output) |
| P = | Phase angle 75A (100 to 240VAC output) |
| R = | Phase angle 25A (260 to 600VAC output) |
| S = | Phase angle 40A (260 to 600VAC output) |
| T = | Phase angle 75A (260 to 600VAC output) |

**Note:** EZ-ZONE ST phase angle is designed to work with tungsten or quartz loads. The EZ-ZONE ST should not be used with globars, molybdenum, graphite or transformer loads.

| ⑨ Heat Sinks/DIN-Rail Mounting Bracket | |
|---|---|
| A = | None |
| B = | 25A |
| C = | 40A |
| D = | 75A 24VDC fan cooled |
| E = | 75A 115VAC fan cooled |
| F = | 75A 240VAC fan cooled |

**Note:** If heat sink option D, E or F is selected you must also order integrated PID controller options B, E, D or C. 75A heat sink option includes SSR over-temperature thermostat shut-down feature.

| ⑩ Firmware | |
|---|---|
| A = | Standard Watlow |
| P = | Profile ramp and soak (40 total steps, 1 to 4 profiles total) |
| S = | Custom |

| ⑪ ⑫ Customization (logo, parameters, hardware, firmware) | |
|---|---|
| AA = | Standard |
| XX = | Letters to be determined, contact factory |

**Note:** Maximum rating of final configured product is determined by the lowest component rating of either the mechanical contactor, solid-state relay or heat sink. Maximum UL® rating for product is 75A.

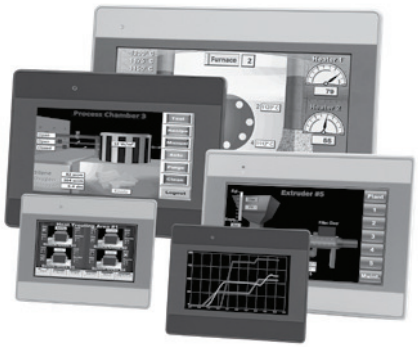
# EZ-ZONE ST

## Compatible Accessories

### Basic Remote User Interface (RUI) EZKB


The EZ-ZONE Remote User Interface (RUI and communications gateway) can be utilized as a communication gateway device to save cost, space and wiring when digital communications are being used with two or more EZ-ZONE controllers. The EZ-ZONE RUI can also serve as a display for showing all parameter values for up to 16 EZ-ZONE controllers, again saving cost, space and wiring expenses. See page 341.

### Operator Interface Terminals (OIT)



Silver Series EM touchscreen 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 terminal, paired with Watlow controllers, is the perfect solution for industrial processes or machine control applications. See page 335.

### EZ-ZONE Configurator Software


The EZ-ZONE configurator software is used to set up Watlow EZ-ZONE products in one simple process. It works without requiring the purchase of any communication options because it uses the standard bus communications protocol that is included with all EZ-ZONE products. EZ-ZONE configurator can be used for online and offline configurations and downloading previously saved setups. It is available as a FREE download at www.watlow.com. See page 374.

### SpecView


SpecView is designed for industrial users and includes 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. See page 361.

# EZ-ZONE PM

The EZ-ZONE PM panel mount controller offers control options that reduce system complexity and thermal loop ownership cost. It can be ordered as a PID controller, an over/under limit controller or its functions can be combined into an integrated controller. An option to integrate a high amperage power controller output with a high-performance PID controller and an over/under limit controller in one space-saving, panel mount package is also available. Many communications options are offered to support connectivity needs.

Because the EZ-ZONE PM controller is highly scalable, pay only for what is needed. This controller is available in 1/32, 1/16, 1/8 and 1/4 DIN panel mount packages. The EZ-ZONE PM controller is easy to use and is ideal for PID, over/under limit or integrated controller needs.

## Features and Benefits

**Integrated PID and limit controller**
- Reduces wiring time and termination complexity compared with connecting discrete products
- Decreases required panel space
- Lowers installation costs
- Increases user and equipment safety for over/under temperature conditions

**High amperage power control output**
- Drives 15 ampere resistive loads directly
- Reduces component count
- Decreases cost of ownership

**Current monitoring**
- Detects heater current flow and provides alarm indication of a failed output device or heater load
- Drives output on open or shorted heater

**Serial communication capabilities**
- Provides a wide range of protocol choices including Modbus® RTU, EtherNet/IP™, Modbus® TCP, PROFIBUS DP, DeviceNet™ and J1939 CAN bus
- Supports network connectivity to a PC or PLC

**Dual-channel controller**
- Provides two PID controllers in one space-saving package

**Enhanced control options**
- Easily handles complex process problems such as cascade, ratio, differential, square-root, motorized valve control without slidewire feedback, wet-bulb/dry-bulb, compressor control and peltier loads

**Countdown timer option**
- Provides batch process control
- Supports set point change during countdown

**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

**Advanced PID control algorithm**
- Offers TRU-TUNE®+ adaptive control to provide tighter control for demanding applications
- Provides auto-tune for fast, efficient startup

**Configuration communications with software**
- Includes Watlow standard bus communications used by COMPOSER® or EZ-ZONE configurator software
- Saves time and improves reliability of controller setup

**10-point linearization curve**
- Improves sensor accuracy

**Built-in sensor compensation curves**
- Saves cost of buying compensated sensors
- Includes Vaisala RH and altitude (pressure) curves

**Remote set point operation**
- Supports convenient set point manipulation from a remote device such as a master control or PLC

**Profile capability**
- Offers pre-programmed process control
- Allows ramp/soak programming with 40 total steps, battery backup and real time clock

# EZ-ZONE PM

## Features and Benefits *(Continued)*

**Retransmit output**
- Supports industry needs for recording

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

**Memory for saving and restoring parameter settings**
- Decreases service calls and time down

**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

**Touch-safe package**
- Increases safety for installer/operator
- Complies with IP2X requirements

**EZ-KEY**
- Enables simple, one-touch operation of user-defined, repetitive activities

**Programmable menu system**
- Reduces setup time and increases operator efficiency

**Three-year warranty**
- Provides product support and reliability

## Specifications

**Controller**
- User-selectable heat/cool, on-off, P, PI, PD, PID or alarm action, not valid for limit controllers
- Auto-tune with TRU-TUNE+ adaptive control algorithm
- Control sampling rates: input = 10Hz, outputs = 10Hz

**Profile Ramp/Soak - Real Time Clock and Battery Backup**
- 4 profiles, 40 total steps
- Accuracy (typical): ±30 PPM at 77°F (25°C) +30/-100 PPM at -4 to 149°F (-20 to 65°C)
- Battery type/typical life: lithium, three cumulative years unpowered at 77°F (25°C)

**Isolated Serial Communications**
- EIA-232/485, Modbus® RTU
- EtherNet/IP™/Modbus® TCP
- DeviceNet™
- PROFIBUS DP
- SAE J1939 CAN bus

**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, 3µA open sensor detection, 2kΩ source resistance max.
- RTD 2- or 3-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, 0-50mV at 20MΩ, 0-1000Ω potentionmeter; scalable; inverse scaling

**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

**Accuracy**
- Calibration accuracy and sensor conformity: ±0.1% of span, ±1°C @ the calibrated ambient temperature and rated line voltage
  - Types R, S, B; 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.

**Thermistor Input**
- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)
- Linearization curves built-in

**Current Transformer Input**
- Accepts 0-50mA signal (user-programmable range)
- Displayed operating range and resolution can be scaled and are user-programmable

**Digital Inputs (DC Voltage)**
- Max. input: 36V at 3mA
- Logic: min. high state 3V at 0.25mA, max. low state 2V

# EZ-ZONE PM

## Specifications *(Continued)*

**Digital Inputs (Dry Contact)**
- Logic: min. open resistance 10kΩ, max. closed resistance 50Ω
- Max. short circuit: 20mA

**2 Digital I/O (ordered with power supply option)**
- Update rate: 10Hz
- Input type: user-selectable, dc voltage or dry contact
- Output type: switched dc
- Output voltage: 24V
- Output 5: 24mA max. or drive one 3-pole DIN-A-MITE®
- Output 6: 10mA max.

**6 Digital I/O (ordered with communications option)**
- Update rate: 10Hz
- Input type: user-selectable, dc voltage or dry contact
- Output type: user-selectable, switched dc or open collector
- Switched dc output voltage: 12 to 24VDC, depending on current draw
- Switched dc max. supplied current: 40mA at 20VDC and 80mA at 12VDC
- Switched dc max. low state: 2V
- Open collector max. switched voltage: 32VDC
- Open collector max. switched current: 1.5A per output; 8A total for all 6 outputs

**Output Hardware**
- Switched dc: 22 to 32VDC @ 30mA max. per single output and 40mA max. total per paired outputs (1 & 2, 3 & 4)
- Open collector: 30VDC max. @ 100mA max.
- SSR, Form A, 24 to 240VAC, 1A at 50°F (10°C) to 0.5A at 149°F (65°C) resistive load, 264VAC max., opto-isolated, without contact suppression, 120/240VAC @ 20VA pilot duty
- Electromechanical relay, Form A, 24 to 240VAC or 30VDC max., 5A resistive load, 100,000 cycles at rated load, 120/240 @ 125VA or 24VAC @ 25VA pilot duty
- Electromechanical relay, Form C, 24 to 240VAC or 30VDC max., 5A resistive load, 100,000 cycles at rated load, 120/240 @ 125VA or 24VAC @ 25VA pilot duty
- NO-ARC relay, Form A, 85 to 264VAC, 15A @ 122°F (50°C), resistive load, no VDC, 2,000,000 cycles at rated load
- Universal process output: range selectable; 0 to 10VDC ±15mV into a min. 1,000Ω load with 2.5mV nominal resolution; 0 to 20mA ±30µA into max. 800Ω load with 5µA nominal resolution; temperature stability 100ppm/°C

**Operator Interface**
- Dual 4-digit, 7-segment LED displays
- Advance, infinity, up and down keys, plus a maximum of 2 programmable EZ-KEY(s) depending on model size
- Typical display update rate: 1Hz
- RESET key substituted for infinity on all models with limit controller

**Line Voltage/Power**
- High voltage option: 85 to 264VAC, 47 to 63Hz
- Low voltage option: 20 to 28VAC, +10/-15%; 50/60Hz, ±5% or 12 to 40VDC
- Max. power consumption: 10VA (1/32 and 1/16 DIN); 14VA (1/8 and 1/4 DIN)
- Data retention upon power failure via nonvolatile memory
- Compliant with SEMI F47-0200, Figure R1-1 voltage sag requirements @ 24VAC or higher

**Environment**
- Operating temperature: 0 to 149°F (-18 to 65°C)
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Relative humidity: 0 to 90% RH, non-condensing

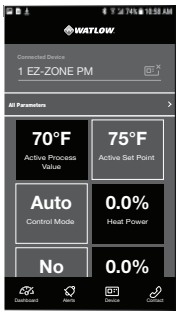
**Agency Approvals**
- cULus® UL®/EN/CSA C22.2 No 61010-1 Listed, File E185611
- CSA C22.2 No. 24, File 158031 (1/32 and 1/16 DIN sizes)
- UL® 50 4X indoor locations, NEMA 4X, UL® 50E, Type 4X front seal
- cULus® ANSI/ISA 12.12.01-2012, CSA-C22.2 No. 213-1987, Class 1, Div. 2, Groups A, B, C and D, Temperature Code T4A, File E184390 (optional)
- FM Class 3545 (limit controls)
- CE, RoHS by design, W.E.E.E.
- EtherNet/IP™ and DeviceNet™ ODVA Conformance Tested

# EZ-ZONE PM

## Comparison of Available Features

| | 1/32 DIN | 1/16 DIN | 1/8 DIN | 1/4 DIN |
|---|---|---|---|---|
| **PID Loops** | 1 | 1 | 1 to 2 | 1 to 2 |
| **Profile Ramp/Soak** | 40 total steps | 40 total steps | 40 total steps | 40 total steps |
| **Profile Battery Backup and Real Time Clock** | None | None | Yes | Yes |
| **Number of Digital Inputs/Outputs** | 0 to 2 | 0 to 2 | 0 to 8 | 0 to 8 |
| **Number of Outputs** | 1 to 4 | 1 to 6 | 1 to 12 | 1 to 12 |
| **Integrated Safety Limits** | Limit must be ordered as separate device | 1 | 1 | 1 |
| **Maximum Power Output** | 5A mechanical relay | 15A NO-ARC | 15A NO-ARC | 15A NO-ARC |
| **Current Measurement** | None | Accepts 0-50mA signal from external current transformer | | |
| **Standard Bus Communications** | Yes | Yes | Yes | Yes |
| **Bluetooth® Technology (PM6 Only)** | No | Yes | No | Yes |
| **Field Bus Communications** | Modbus® RTU 485 | Modbus® RTU 232/485, EtherNet/IP™, Modbus® TCP, DeviceNet™, PROFIBUS DP, SAE J1939 CAN bus | | |
| **10-Point Calibration Offset** | Yes | Yes | Yes | Yes |
| **Ratio, Differential and Square-Root** | None | Yes | Yes | Yes |
| **Sensor Compensation Curves - Altitude (Pressure) and Vaisala® RH** | None | Yes | Yes | Yes |
| **Motorized Valve Control (without Feedback)** | None | Yes | Yes | Yes |
| **Wet Bulb/Dry Bulb** | None | Yes | Yes | Yes |
| **Cascade** | None | None | Yes | Yes |
| **Countdown Timer** | Yes | Yes | Yes | Yes |

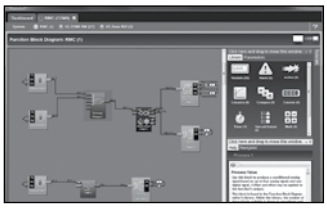
## Compatible Accessories




Watlow's new EZ-LINK app allows users to easily setup, monitor and adjust Watlow EZ-ZONE PM 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 at GET IT ON Google Play for Android™ or Download on the App Store for iPhone®.

SpecView is designed for industrial users and includes 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. See page 361.

Silver Series EM touchscreen 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 terminal paired with Watlow controllers is the perfect solution for industrial processes or machine control applications. See page 335.

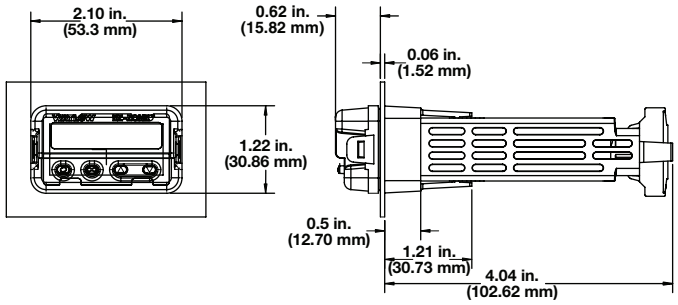


COMPOSER with INTUITION® is Watlow's new, easy-to-use software for configuring and customizing controllers. Use it to optimize Watlow's F4T and EZ-ZONE PM and RM controllers for specific applications. Task-specific views simplify all aspects of commissioning new controllers including managing the inputs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

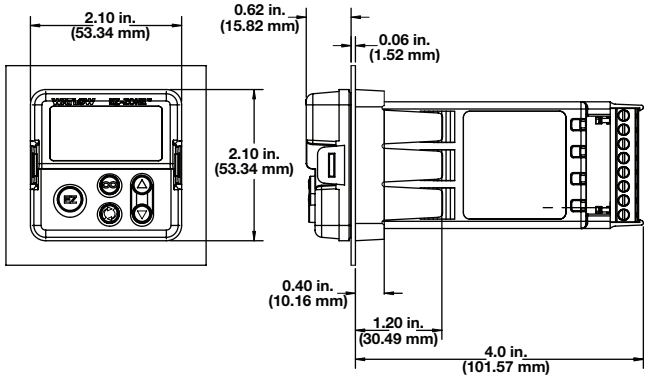
# EZ-ZONE PM

## Dimensional Drawings

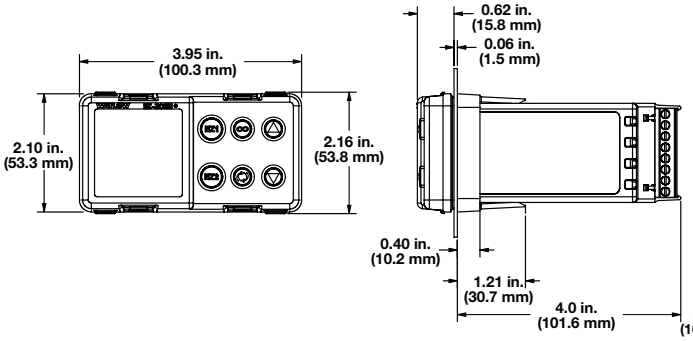
### EZ-ZONE PM 1/32 DIN



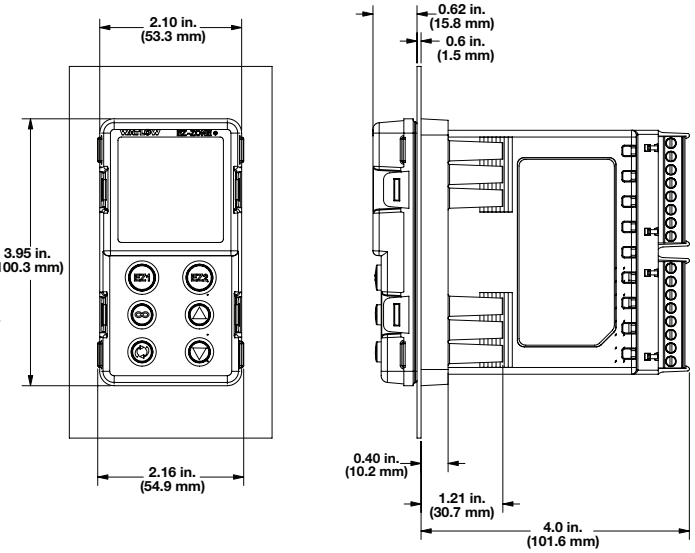

### EZ-ZONE PM 1/16 DIN



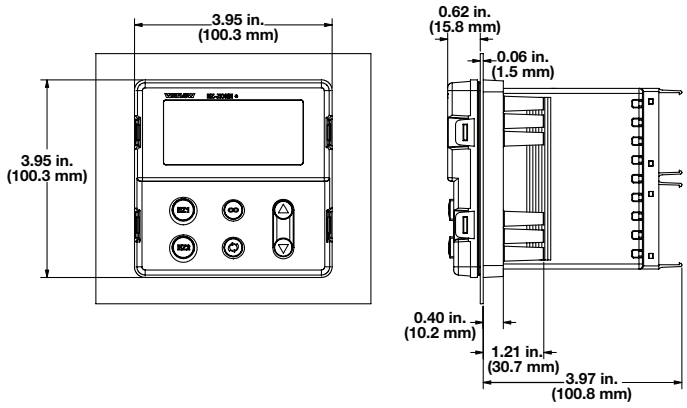

### EZ-ZONE PM 1/8 DIN - Horizontal




### EZ-ZONE PM 1/8 DIN - Vertical




### EZ-ZONE PM 1/4 DIN



# EZ-ZONE PM

## PID Model Ordering Information

**Universal Sensor Input, Standard Bus Communications, TRU-TUNE+ Adaptive Tune, Red and Green Seven-Segment Displays**

**Part Number**

| ①② | ③ Package Size | ④ Primary Function | ⑤ Power Supply, Digital I/O | ⑥⑦ Output 1 and 2 Hardware Options | | ⑧ Comm. Options | ⑨⑩⑪ Future Options | ⑫ Isolated Input Options | ⑬⑭ Custom Options |
|---|---|---|---|---|---|---|---|---|---|
| PM | | | | | - | | AAA | | |

| ③ | Package Size |
|---|---|
| 3 = | 1/32 DIN |
| 6 = | 1/16 DIN |
| 8 = | 1/8 DIN vertical |
| 9 = | 1/8 DIN horizontal |
| 4 = | 1/4 DIN |

| ④ | Primary Function |
|---|---|
| **Options B and E are not available with 1/32 DIN (PM3) or 1/16 DIN (PM6) models** | |
| C = | PID controller with universal input |
| R = | PID controller with universal input and profiling ramp/soak |
| B = | PID controller with universal input and profiling ramp/soak and battery back-up with real time clock |
| T = | PID controller with universal input and countdown timer |
| J = | PID controller with thermistor input |
| N = | PID controller with thermistor input and profiling ramp/soak |
| E = | PID controller with thermistor input and profiling ramp/soak and battery back-up with real time clock |
| S = | Custom firmware |

| ⑤ | Power Supply, Digital Inputs/Outputs (I/O) |
|---|---|
| 1 = | 100 to 240VAC |
| 2 = | 100 to 240VAC plus 2 digital I/O points |
| 3 = | 20 to 28VAC or 12 to 40VDC |
| 4 = | 20 to 28VAC or 12 to 40VDC, plus 2 digital I/O points |

| ⑥ ⑦ | Output 1 and 2 Hardware Options | |
|---|---|---|
| **PM3: CH, EH and KH are not valid options for 1/32 DIN package type** | | |
| | **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 |

| ⑧ | Communication Options |
|---|---|
| **Standard bus always included** | |
| A = | None |
| B = | Bluetooth® (1/16 DIN models only)* |
| E = | EIA-485 Modbus® RTU & Bluetooth® (1/16 DIN models only)* |
| 1 = | EIA-485 Modbus® RTU |
| *Note: Bluetooth® not available in all countries, contact factory | |

| ⑫ | Isolated Input Options |
|---|---|
| A = | None |
| D = | Isolated input 1 |

| ⑬ ⑭ | Custom Options |
|---|---|
| **Firmware, overlays, parameter settings** | |
| AA = | Standard EZ-ZONE PM face plate |
| AB = | EZ-ZONE logo and no Watlow name |
| AC = | No logo and no Watlow name |
| AG = | Conformal coating |
| 12 = | Class 1, Div. 2 (not available with mechanical relay Output types E, H or J) |

# EZ-ZONE PM

## Limit Model Ordering Information

**Universal Sensor Input, Standard Bus Communications, Red and Green Seven-Segment Displays**

**Part Number**

| ① ② | ③ | ④ | ⑤ | ⑥ ⑦ | | ⑧ | ⑨ ⑩ ⑪ | ⑫ | ⑬ ⑭ |
|---|---|---|---|---|---|---|---|---|---|
| PM | | | | | - | | AAA | | |

| ③ | Package Size |
|---|---|
| 3 = | 1/32 DIN |
| 6 = | 1/16 DIN |
| 8 = | 1/8 DIN vertical |
| 9 = | 1/8 DIN horizontal |
| 4 = | 1/4 DIN |

| ④ | Primary Function |
|---|---|
| L = | Limit controller with universal input |
| M = | Limit controller with thermistor input |
| D = | Custom firmware |

| ⑤ | Power Supply, Digital Inputs/Outputs (I/O) |
|---|---|
| 1 = | 100 to 240VAC |
| 2 = | 100 to 240VAC plus 2 digital I/O points |
| 3 = | 20 to 28VAC or 12 to 40VDC |
| 4 = | 20 to 28VAC or 12 to 40VDC, plus 2 digital I/O points |

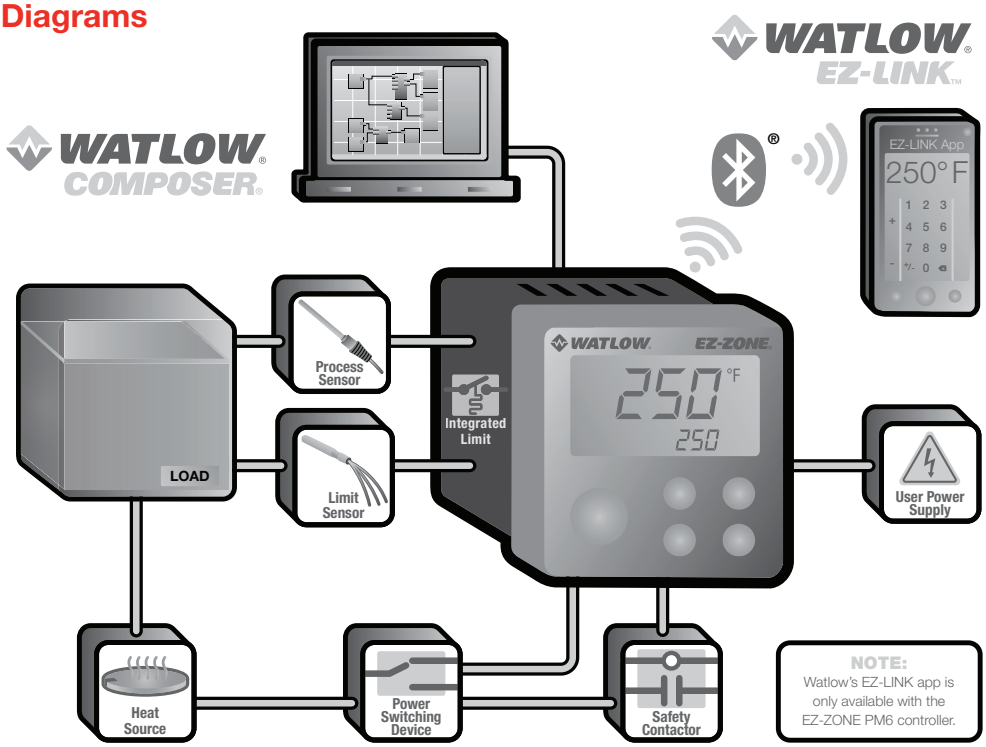
| ⑥ ⑦ | Output 1 and 2 Hardware Options | |
|---|---|---|
| | Output 1 | Output 2 |
| AJ = | None | Mechanical relay 5A, Form A |
| CJ = | Switched dc/open collector | Mechanical relay 5A, Form A |
| EJ = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |

| ⑧ | Communication Options |
|---|---|
| **Standard bus always included** | |
| A = | None |
| B = | Bluetooth® (1/16 DIN models only)* |
| E = | EIA-485 Modbus® RTU & Bluetooth® (1/16 DIN models only)* |
| 1 = | EIA-485 Modbus® RTU |
| *Note: Bluetooth® not available in all countries, contact factory | |

| ⑫ | Isolated Input Options |
|---|---|
| A = | None |
| D = | Isolated input 1 |

| ⑬ ⑭ | Custom Options |
|---|---|
| **Firmware, overlays, parameter settings** | |
| AA = | Standard EZ-ZONE PM face plate |
| AB = | EZ-ZONE logo and no Watlow name |
| AC = | No logo and no Watlow name |
| AG = | Conformal coating |

## Typical Block Diagrams



# EZ-ZONE PM

## Integrated PID Controller Model Ordering Information

**Universal Sensor Input, Standard Bus Communications, TRU-TUNE+ Adaptive Tune, Red and Green Seven-Segment Displays**

**Part Number**

| ① ② | ③ | ④ | ⑤ | ⑥ ⑦ | | ⑧ | ⑨ | ⑩ ⑪ | ⑫ | ⑬ ⑭ |
|---|---|---|---|---|---|---|---|---|---|---|
| PM | | | | | - | | | | | |

| ③ Package Size | |
|---|---|
| 6 = | 1/16 DIN |
| 8 = | 1/8 DIN vertical |
| 9 = | 1/8 DIN horizontal |
| 4 = | 1/4 DIN |

| ④ Primary Function | |
|---|---|
| **Options B and E are not available with 1/16 DIN (PM6) models** | |
| C = | PID controller with universal input |
| R = | PID controller with universal input and profiling ramp/soak |
| B = | PID controller with universal input and profiling ramp/soak and battery back-up with real time clock |
| T = | PID controller with universal input and countdown timer |
| J = | PID controller with thermistor input |
| N = | PID controller with thermistor input and profiling ramp/soak |
| E = | PID controller with thermistor input and profiling ramp/soak and battery back-up with real time clock |
| S = | Custom firmware |

| ⑤ Power Supply, Digital Inputs/Outputs (I/O) | |
|---|---|
| 1 = | 100 to 240VAC |
| 2 = | 100 to 240VAC plus 2 digital I/O points |
| 3 = | 20 to 28VAC or 12 to 40VDC |
| 4 = | 20 to 28VAC or 12 to 40VDC, plus 2 digital I/O points |

| 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 |

| ⑧ Communication Options or Additional Digital Inputs/Outputs (I/O) | |
|---|---|
| **Standard bus always included** | |
| A = | None |
| B = | Bluetooth® (1/16 DIN models only)* |
| E = | EIA-485 Modbus® RTU and Bluetooth® (1/16 DIN models only)* |
| F = | Modbus® RTU 232/485 and Bluetooth® (1/16 DIN models only)* |
| G = | EtherNet/IP™/Modbus® TCP and Bluetooth® (1/16 DIN models only)* |
| H = | DeviceNet™ and Bluetooth® (1/16 DIN models only)* |
| J = | PROFIBUS DP and Bluetooth® (1/16 DIN models only)* |
| K = | SAE J1939 CAN bus and Bluetooth® (1/16 DIN models only)* |
| 1 = | EIA-485 Modbus® RTU |
| 2 = | EIA-232/485 Modbus® RTU |
| 3 = | EtherNet/IP™/Modbus® TCP |
| 5 = | DeviceNet™ |
| 6 = | PROFIBUS DP |
| 7 = | SAE J1939 CAN bus |
| C = | 6 digital I/O (not available on 1/16 DIN models) |
| D = | 6 digital I/O and EIA-485 Modbus® RTU (not available on 1/16 DIN models) |
| ***Note:** Bluetooth® not available in all countries, contact factory | |

| ⑨ Auxiliary Control Functions | |
|---|---|
| A = | None |
| C = | 2nd PID channel with universal input - not available on 1/16 DIN models |
| J = | 2nd PID channel with thermistor input - not available on 1/16 DIN models |
| R = | Auxillary 2nd input (universal input) |
| P = | Auxillary 2nd input (thermistor input) |
| T = | Current transformer input (not valid Output 3 and 4 selections = FA, FC, FJ and FK) |
| L = | Integrated limit controller with universal input (only valid Output 3 and 4 selections = CJ, EJ and AJ |
| M = | Integrated limit controller with thermistor input (only valid Output 3 and 4 selections = CJ, EJ and AJ |
| 1/16 DIN Models: If communication options F, G, H J, K or 2 thru 7 is ordered in previous digit, then Option A must be ordered here. | |
| All Models: Auxiliary input supports remote set point, backup sensor ratio, differential and wet-bulb/dry-bulb input. | |

(continued on next page)

# EZ-ZONE PM

## Integrated PID Controller Model Ordering Information (Con't)

**Universal Sensor Input, Standard Bus Communications, TRU-TUNE+ Adaptive Tune, Red and Green Seven-Segment Displays**

**Part Number**

| ① ② | ③ | ④ | ⑤ | ⑥ ⑦ | | ⑧ | ⑨ | ⑩ ⑪ | ⑫ | ⑬ ⑭ |
|---|---|---|---|---|---|---|---|---|---|---|
| | Package Size | Primary Function | Power Supply, Digital I/O | Output 1 and 2 Hardware Options | | Comm. Options or Add'l Digital I/O | Auxiliary Control Functions | Output 3 and 4 Hardware Options | Additional Options | Custom Options |
| PM | | | | | - | | | | | |

| ⑩ ⑪ | Output 3 and 4 Hardware Options | |
|---|---|---|
| | **Output 3** | **Output 4** |
| AA = | None | None |
| AJ = | None | Mechanical relay 5A, Form A |
| AK = | None | SSR Form A, 0.5A |
| CA = | Switched dc/open collector | None |
| CC = | Switched dc/open collector | Switched dc |
| CH = | Switched dc/open collector | NO-ARC 15A power control |
| 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 |
| EC = | Mechanical relay 5A, Form C | Switched dc |
| EH = | Mechanical relay 5A, Form C | NO-ARC 15A power control |
| 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 |
| KH = | SSR Form A, 0.5A | NO-ARC 15A power control |
| KK = | SSR Form A, 0.5A | SSR Form A, 0.5A |
| 1/16 DIN Models: If communication options F, G, H, J, K or 2 thru 7 is ordered in previous digit, then Option AA must be ordered here. | | |
| 1/16 DIN Models: Output options CH, EH and KH are not valid. | | |

| ⑫ | Additional Options |
|---|---|
| A = | Standard |
| C = | Enhanced firmware which includes compressor control, cascade, ratio, differential, square-root and motorized valve control without feedback. |
| D = | Standard with isolated input 1, input 2 is always isolated |
| F = | Enhanced firmware with isolated input 1, input 2 is always isolated |
| **Note:** Auxiliary control function C or J required for cascade control | |

| ⑬ ⑭ | Custom Options |
|---|---|
| AA = | Standard EZ-ZONE PM face plate |
| AB = | EZ-ZONE logo and no Watlow name |
| AC = | No logo and no Watlow name |
| AG = | Conformal coating |
| 12 = | Class 1, Div. 2 (not available with integrated limit Option "L" or "M", or with Output types E, H, or J) |

# EZ-ZONE PM

## Enhanced Limit Model Ordering Information

**Universal Sensor Input, Configuration Communications, Red and Green Seven-Segment Displays**

**Part Number**

| ① ② | ③ | ④ | ⑤ | ⑥ ⑦ | | ⑧ | ⑨ | ⑩ ⑪ | ⑫ | ⑬ ⑭ |
|---|---|---|---|---|---|---|---|---|---|---|
| | Package Size | Primary Function | Power Supply, Digital I/O | Output 1 and 2 Hardware Options | | Comm. Options or Add'l Digital I/O | Future Option | Output 3 and 4 Hardware Options | Isolated Input Options | Custom Options |
| PM | | | | | - | | A | | | |

| ③ | Package Size |
|---|---|
| 6 = | 1/16 DIN |
| 8 = | 1/8 DIN vertical |
| 9 = | 1/8 DIN horizontal |
| 4 = | 1/4 DIN |

| ④ | Primary Function |
|---|---|
| L = | Limit controller with universal input |
| M = | Limit controller with thermistor input |
| D = | Custom firmware |

| ⑤ | Power Supply, Digital Inputs/Outputs (I/O) |
|---|---|
| 1 = | 100 to 240VAC |
| 2 = | 100 to 240VAC plus 2 digital I/O points |
| 3 = | 20 to 28VAC or 12 to 40VDC |
| 4 = | 20 to 28VAC or 12 to 40VDC, plus 2 digital I/O points |

| ⑥ ⑦ | Output 1 and 2 Hardware Options | |
|---|---|---|
| | Output 1 | Output 2 |
| AJ = | None | Mechanical relay 5A, Form A |
| CJ = | Switched dc/open collector | Mechanical relay 5A, Form A |
| EJ = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |

| Communication Options or Additional Digital Inputs/Outputs (I/O) | |
|---|---|
| **Standard bus always included** | |
| A = | None |
| B = | Bluetooth® (1/16 DIN models only)* |
| E = | EIA-485 Modbus® RTU and Bluetooth® (1/16 DIN models only)* |
| F = | Modbus® RTU 232/485 and Bluetooth® (1/16 DIN models only)* |
| G = | EtherNet/IP™/Modbus® TCP and Bluetooth® (1/16 DIN models only)* |
| H = | DeviceNet™ and Bluetooth® (1/16 DIN models only)* |
| J = | PROFIBUS DP and Bluetooth® (1/16 DIN models only)* |
| 1 = | EIA-485 Modbus® RTU |
| 2 = | EIA-232/485 Modbus® RTU |
| 3 = | EtherNet/IP™/Modbus® TCP |
| 5 = | DeviceNet™ |
| 6 = | PROFIBUS DP |
| ***Note:** Bluetooth® not available in all countries, contact factory | |

| ⑩ ⑪ | Output 3 and 4 Hardware Options | |
|---|---|---|
| | Output 3 | Output 4 |
| AA = | None | None |
| AJ = | None | Mechanical relay 5A, Form A |
| AK = | None | SSR Form A, 0.5A |
| CA = | Switched dc/open collector | None |
| 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 |
| 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 |
| KK = | SSR Form A, 0.5A | SSR Form A, 0.5A |
| 1/16 DIN Models: If communication options F, G, H, J or 2 thru 6 is ordered in previous digit, then Option AA must be ordered here. | | |

| ⑫ | Isolated Input Options |
|---|---|
| A = | None |
| D = | Isolated input 1 |

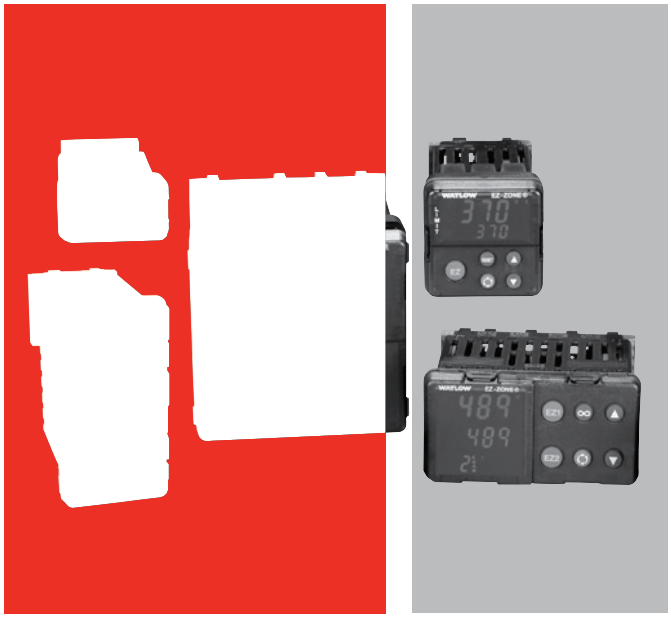
| ⑬ ⑭ | Custom Options |
|---|---|
| **Firmware, overlays, parameter settings** | |
| AA = | Standard EZ-ZONE PM face plate |
| AB = | EZ-ZONE logo and no Watlow name |
| AC = | No logo and no Watlow name |
| AG = | Conformal coating |

# EZ-ZONE PM Express

The EZ-ZONE PM Express panel mount controller is an industry-leading PID controller that allows optimal performance utilizing simple control and menu functionality without complex features. It is ideal for basic applications and usage levels.

The EZ-ZONE PM Express is the next generation controller to follow the legacy of Watlow's SERIES 93, SERIES 935 AND SERIES SD controllers that offer easy-to-use features to perform many basic applications. The EZ-ZONE PM Express includes one universal input and an option for up to two outputs and is available in 1/32, 1/16 ,1/8 and 1/4 DIN panel mount packages. It can be ordered as a PID process controller or as a dedicated over and under-temperature limit controller.

The EZ-ZONE PM Express is a valuable addition to the EZ-ZONE PM controller family which also includes the EZ-ZONE PM integrated controller and the EZ-ZONE PM standard version.



## Features and Benefits

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

**PID auto-tune**
- Provides auto-tune for fast, efficient startup

**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

**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

**Front panel removable**
- Saves time and labor for replacements and troubleshooting

**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

**P3T armor sealing system**
- Complies with NEMA 4X, IP65 specifications
- Allows controller to be cleaned and washed
- Certified UL® 50 independent to NEMA 4X specification

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

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

**High-amperage power control output**
- Drives 15 ampere resistive loads direct
- Reduces component count
- Saves panel space and simplifies wiring
- Reduces cost of ownership

# EZ-ZONE PM Express

## 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) 14VA (1/8 and 1/4 DIN) max. power consumption
- Data retention upon power failure via non-volatile memory
- Compliant with 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 R, S, B: 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, IP65 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

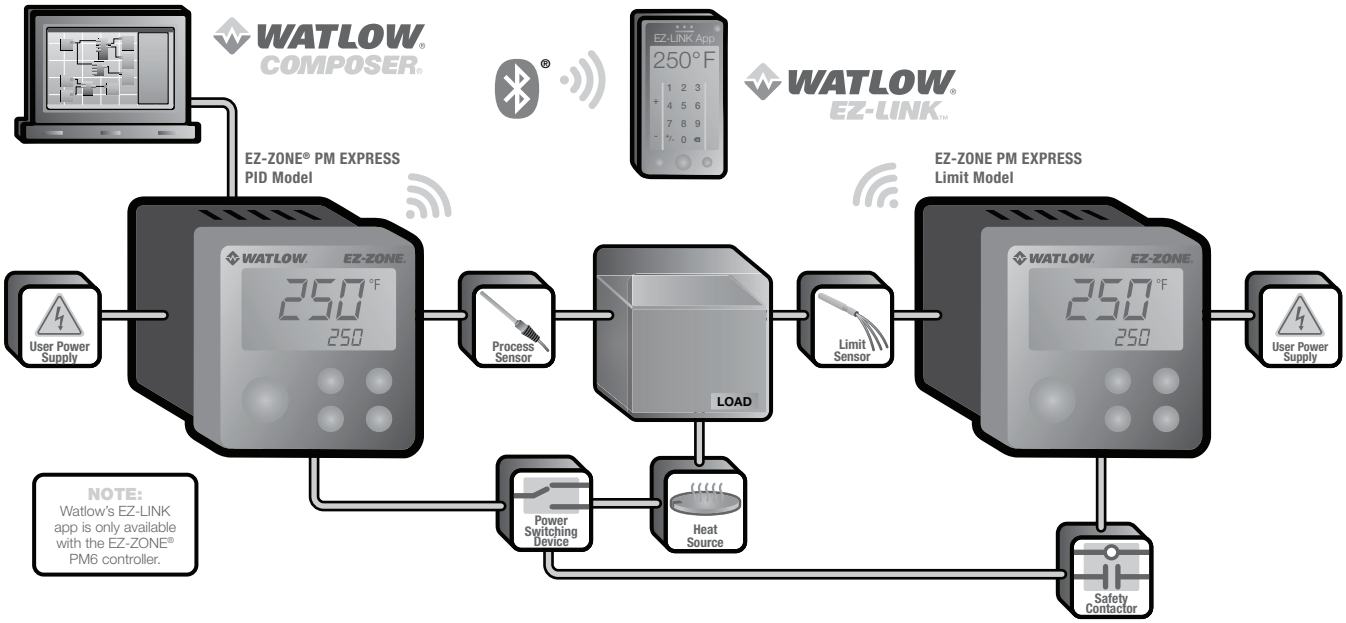
- Switched dc = 22 to 32VDC @ 30mA
- Open collector = 30VDC max. @ 100mA max. current sink
- Solid state relay (SSR), Form A, 0.5A @ 24VAC min., 264VAC max., opto-isolated, without contact suppression
- Electromechanical relay, Form C, 24 to 240VAC or 30VDC max., 5A resistive load, 100,000 cycles at 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

## EZ-ZONE PM Express

**Operator Interface**

- Dual 4 digit, 7 segment LED displays
- Typical display update rate 1Hz
- Advance, infinity (RESET), up and down keys plus an A/M-KEY for control or EZ-KEY(S) for limit (not available in 1/32 DIN)
- Infinity key is also labeled RESET on limit control models
- A/M-KEY on 1/16 DIN package automatically programmed as an auto/manual transfer mode function on PID models
- EZ1-KEY on 1/8 and 1/4 DIN packages automatically programmed as an auto/manual transfer mode function on PID models

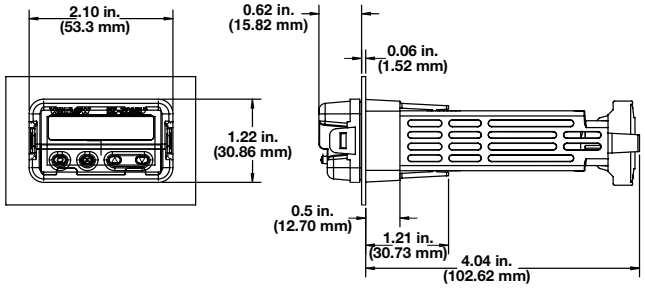
### Typical Block Diagrams



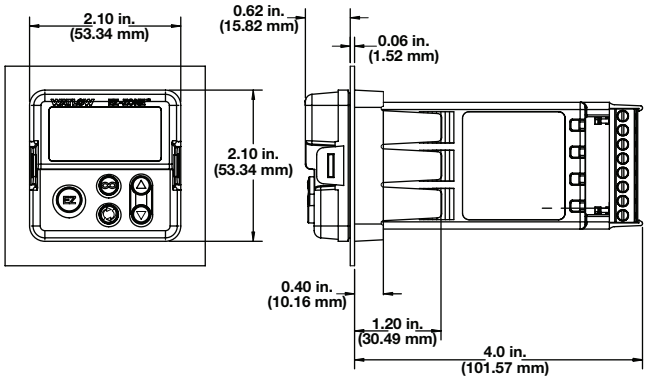
# EZ-ZONE PM Express

## Dimensional Drawings

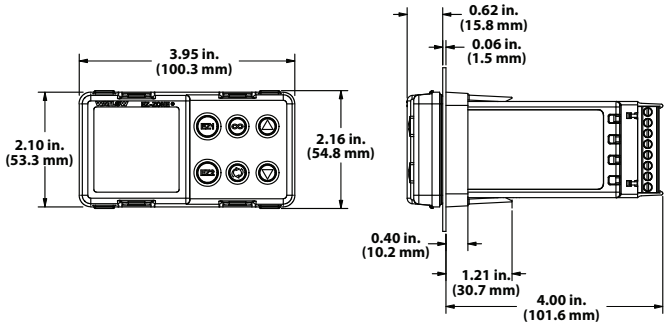
### EZ-ZONE PM 1/32 DIN



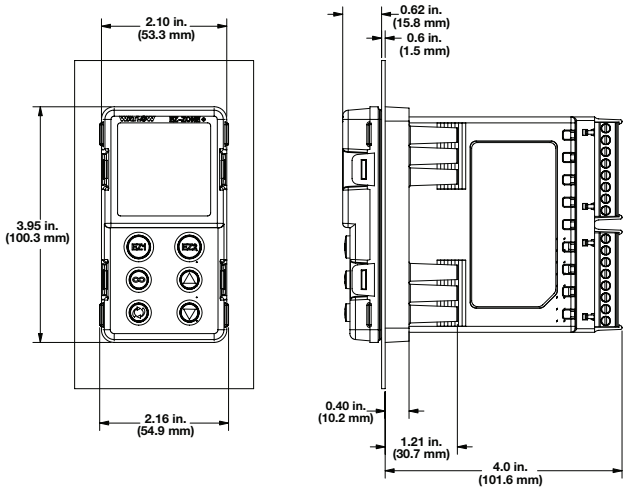

### EZ-ZONE PM 1/16 DIN



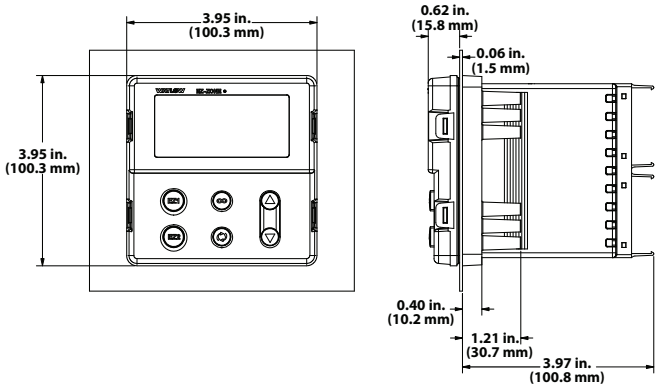

### EZ-ZONE PM 1/8 DIN Horizontal




### EZ-ZONE PM 1/8 DIN Vertical




### EZ-ZONE PM 1/4 DIN



# EZ-ZONE PM Express

## Ordering Information

**Universal Sensor Input, Standard Bus Communications, Dual Line Red over Green Seven-Segment Displays**

**Part Number**

| ① ② | ③ | ④ | ⑤ | ⑥ ⑦ | | ⑧ | ⑨ ⑩ ⑪ | ⑫ | ⑬ ⑭ |
|---|---|---|---|---|---|---|---|---|---|
| | Package Size | Primary Function | Power Supply | Output 1 and 2 Hardware Options | - | Comm. Options | Future Options | Menu Type | Add'l Options |
| PM | | | | | - | | AAA | B | |

| ③ | Package Size |
|---|---|
| 3 = | 1/32 DIN |
| 6 = | 1/16 DIN |
| 8 = | 1/8 DIN vertical |
| 9 = | 1/8 DIN horizontal |
| 4 = | 1/4 DIN |

| ④ | Primary Function |
|---|---|
| C = | PID controller with universal input |
| L = | Limit controller with universal input (only valid Output 1 and 2 selections = AJ, CJ or EJ) |
| S = | Custom PID firmware |
| D = | Custom limit firmware |

| ⑤ | Power Supply |
|---|---|
| 1 = | 100 to 240VAC |
| 3 = | 20 to 28VAC or 12 to 40VDC |

| ⑥ ⑦ | Output 1 and 2 Hardware Options | |
|---|---|---|
| | Output 1 | Output 2 |
| AJ = | None | Mechanical relay 5A, Form A |
| 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 |

*Not available with the 1/32 DIN (PM3) package size

| ⑧ | Communications Options |
|---|---|
| **Standard bus always included** | |
| A = | None |
| B = | Bluetooth® (1/16 DIN models only)* |
| ***Note:** Bluetooth® not available in all countries, consult factory. | |

| ⑫ | Menu Type |
|---|---|
| B = | PM Express with English manual |

| ⑬ ⑭ | Additional Options |
|---|---|
| AA = | Standard EZ-ZONE PM face plate |
| AB = | EZ-ZONE logo, no Watlow name |
| AC = | No logo, no Watlow name |
| AG = | Conformal coating |
| 12 = | Class 1, Div. 2 (not available with mechanical relay Output types E, H or J) |

## SERIES EHG® SL10

The SERIES EHG® SL10 integrated, multi-function controller is a key component to a powerful system that includes a heater, an adjustable set point temperature controller, a high/low temperature alert, a power switching device and a high temperature safety limit. Its agency recognized controller/safety limit meets UL® 1998 and CE 60730 requirements.

An optional display/communications module can be easily added in the field to provide a digital display indication, an adjustment of set point, RS-485 Modbus® communications and other Human Machine Interface (HMI) features. As a scalable system, only what is needed can be purchased.

The EHG SL10 controllers' easy to install, compact design, inherent reliability and integrated limit functions offer unmatched value. It is designed for easy integration with Watlow heaters to simplify engineering, reduce component count for new equipment and decrease ownership cost. For original equipment manufacturers (OEMs), the EHG SL10 controller's CE, Semi-S2 compliance and UL® recognition reduces time and costs associated with global agency testing and validation. U.S. Patent Number 8,044,329.

### Features and Benefits

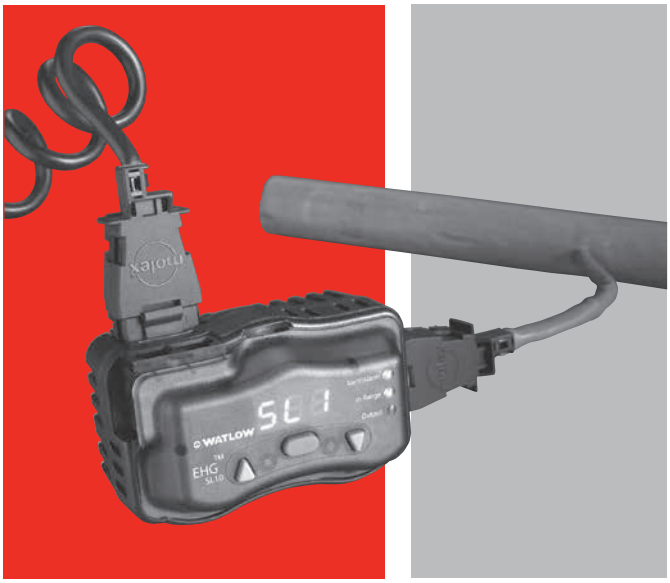
**Process controller and safety limit in one package**
- Meets UL® 1998 and CE 60730 requirements
- Eliminates the need for a thermal fuse on a heater
- Eliminates replacement of heater when fuse fails

**Optional display/communications module**
- Allows easy upgrade on to base device
- Offers low cost field upgrade
- Provides easy, snap-on installation

**Accurate and flexible temperature process controller**
- Replaces problematic bi-metal thermostats with accurate electronic temperature process controller
- Allows easy change of process parameters

**Ambient operating temperature range 32 to 158°F (0 to 70°C)**
- Increases reliability when mounting in harsh temperature environments or in close proximity to heaters

**Integrated high/low temperature alert signal relay**
- Provides dry contact output to activate external alarm or process function
- Signals control status with three integrated LEDs
- Allows a signal of up to two amperes 30VAC/VDC, Form A to alert if process temperature is out of range limits




**Health check diagnostics**
- Monitors maximum heater process temperature, maximum ambient temperature and thermocouple operation
- Provides health check signal to inform operator that the process is working correctly

**Universal power supply**
- Allows an input of 85 to 264VAC, 50/60Hz
- Provides safe control of up to 2400 watts with 10 amperes switching in both controller and safety limit

**Can be switched from on-off and PID algorithm**
- Increases product life (on-off control is default)
- Offers selectable PID control algorithm for tighter temperature uniformity

**Universal ⅛ turn mounting bracket**
- Allows mounting to most surfaces
- Provides flexible mounting—either horizontally or vertically

### Typical Applications

**Semiconductor processing**
- Gas delivery lines
- Exhaust lines

**Life sciences**
- Laboratory equipment
- Medical equipment

**Foodservice equipment**
- Warming and serving equipment
- Food holding cabinets

**Packaging**
- Heat sealing bars
- Hot glue application equipment

# SERIES EHG SL10

*Technical Information*

## Specifications

### Operational

- Two, Type K thermocouple inputs - process temperature control and safety limit
- Process temperature output - 10A NO-ARC relay
- Safety limit alarm - 10A relay
- High/low temperature alert - 2A 30VAC/VDC, Form A (single pole, normally open contact)
- On-off temperature controller algorithm, upgraded via communications to PID algorithm (min. cycle time 30 seconds)

### Standard Molex® connectors

- Controllers are integral to the heater and are supplied by Watlow

### Power

- Isolated universal power supply 85 to 264VAC, 50/60Hz
- Up to 2400 W with 10A switching capability

### NO-ARC Relay

- 10A switching
- 4.5 million cycles

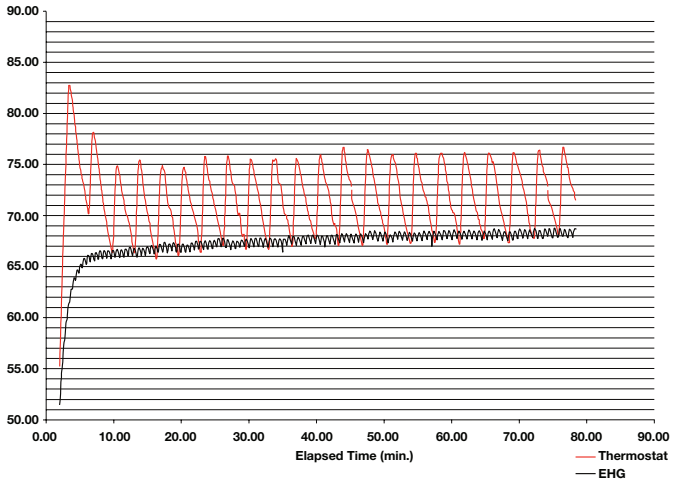
### Environmental

- Ambient operating temperature range 32 to 158°F (0 to 70°C)

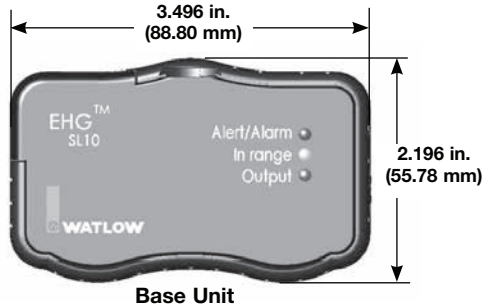
### Agency Approvals

- UL® 1998/ C-UL®
- CE 60730
- Semi-S2

**SERIES EHG Versus Thermostat (typical application)**




## Dimensions




Base Unit


Without Optional Module


With Optional Module

**Switching Device Comparison Chart**

| | T-Stat | Solid State Relay | Watlow NO-ARC Relay |
|---|---|---|---|
| Amperage at 77°F (25°C) | 10A | 10A | 10A |
| Amperage at 158°F (70°C) | 10A | De-rate significantly and add heat sink and air cooling | 10A |
| Output device life at 10A | Rated 100,000 at 158°F (70°C) | Greater than 10 million cycles at 77°F (25°C) | Greater than 4.5 million cycles at 158°F (70°C) |

# SERIES EHG SL10

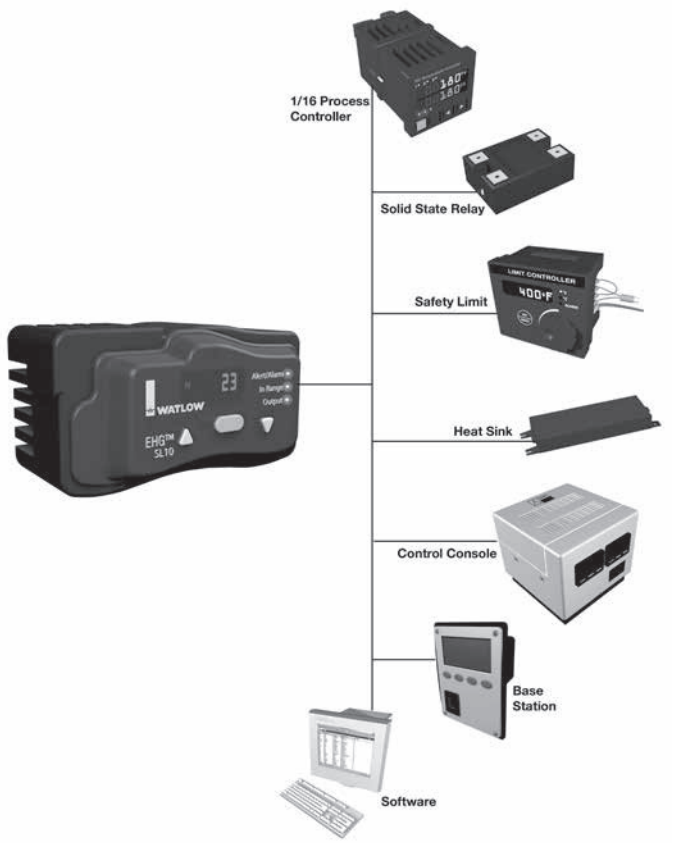
## *Technical Information (Continued)*

### EHG SL10 Software

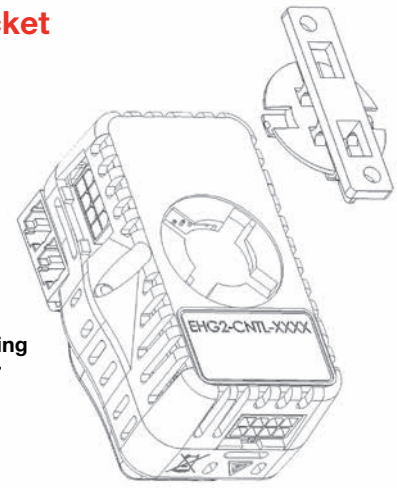
With the addition of an optional communication module, the EHG SL10 can be managed, monitored and manipulated via software. Change set points, label devices, change tuning parameters, check health status and much more all with the click of a key.



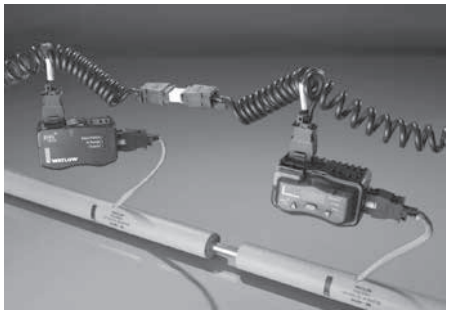
### Reduces System Complexity and Cost




### Mounting Bracket




**The EHG SL10 mounting enables the controller to be mounted in four angles.**



**The EHG SL10 can be "daisy-chained" for gas line and other assemblies.**

# SERIES EHG SL10

## *Technical Information (Continued)*

## Optional Upgrade Modules

These upgrade modules are easy to install. There is no need to reconfigure, rewire or reorder the base unit. A technician is not needed for the installation, resulting in a seamless, cost-efficient system that can be upgraded.

| | Diagnostics Memory Control Parameters | Ability to Change Temperature Parameters | Field Adjustable Set Point | 3-Digit 7-Segment LED Display Illuminated | Diagnostic LED's | User Interface Software | Modbus® RTU Communication | RS-485 |
|---|---|---|---|---|---|---|---|---|
| Base Unit  | ✓ | ✓ | | | ✓ | | | |
| Optional Display Module  | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| Optional Communication Module  | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| Optional Display and Communication Module  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

## Ordering Information

**Part Number**

| ① ② ③ ④ ⑤ ⑥ | ⑦ ⑧ ⑨ |
|---|---|
| | Base/ Module |
| 265 EG2 | |

| ⑦ ⑧ ⑨ | Base/Module |
|---|---|
| 001 = | Base unit |
| 007 = | Display module |
| 008 = | Communications module |
| 002 = | Display with communications module |
| 023 = | Base unit (extended temperature range) |
| 020 = | Display module (extended temperature range) |
| 022 = | Communications module (extended temperature range) |
| 021 = | Display with communications module (extended temperature range) |

**Additional cables for wiring parallel heater circuits (daisy-chaining) in gas line and other assemblies**

4800-0012 - Long cable
4800-0022 - Long terminating cable
4800-0011 - Short cable
4800-0021 - Short terminating cable

## Compatible Accessories

**Operator Interface Terminals (OIT)**

Silver Series EM touchscreen 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 terminal paired with Watlow controllers is the perfect solution for industrial processes or machine control applications. See page 335.

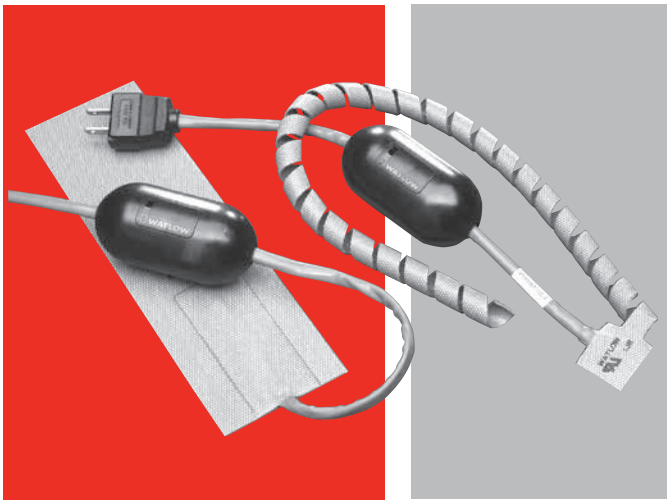
## SERIES EHG

Many applications requiring a fixed temperature set point rely on a mechanical thermostat for thermal control. Thermostats have proven, however, to be inadequate for many applications due to long-term reliability issues, such as 100,000 cycle rating and poor temperature control.

The SERIES EHG thermal solution includes a compact temperature control, thermocouple sensor and power switching device integrated into the heater's power cord. The SERIES EHG reduces system costs and lasts substantially longer than a conventional thermostat solution.

The evolution of miniature microprocessor technology and Watlow switching technology fostered development of a small, versatile temperature control and thermocouple sensor that is integrated with Watlow silicone rubber heater products. This device senses the temperature via input from a thermocouple strategically placed on the heater mat. The microprocessor is programmed prior to shipment with an application specific set point. This results in quick delivery of a custom, integrated system.

The small thermocouple mass provides superior response to changes in process temperature enabling higher watt density silicone rubber heater designs. These features offer an integrated custom set point temperature controller with superior life span, faster heat-up rates and improved accuracy. The SERIES EHG System has been tested to over four million cycles at rated amperage. Depending on the application, Watlow's power switching design can last up to 40 times longer than a conventional thermostat.



### Features and Benefits

**Long operational life**
- Improves system reliability

**Tight temperature control**
- Ensures process accuracy

**Small sensor footprint**
- Fits with almost any heater
- Responds quickly to temperature changes
- Controls high watt densities in low mass applications

**Reduced system cost**
- A single EHG control can be configured with multiple heaters

**Pre-wired, in line control**
- Simplifies installation
- Two wire power connection

**Durable housing with built-in strain relief**
- Protects electronics
- Low risk of mechanical damage

**Manufactured with proven Watlow components**
- Assures reliable system performance

# SERIES EHG

## *Technical Information*

## Specifications

### Operational

- SERIES EHG silicone rubber heater UL® recognized to 428°F (220°C) operating temperature
- Factory programmed fixed set point
- On-off control with 6°F (3°C) switching hysteresis
- Temperature band LED indicator ON between -68 and +68°F (–20 and +20°C) of set point

### Electrical

- Voltage rating: 120 or 240VAC – 30/+10%, 50/60Hz
- Silicone rubber heater watt densities up to 80 W/in$^2$ (12.5 W/cm$^2$) dependent on application temperature
- SERIES EHG system UL® recognized to 10A max.

### Sensor

- Type K thermocouple

### Mechanical

- Control dimensions 3.75 in. (95 mm) long by 1.75 in. (45 mm) diameter
- Heater per silicone rubber heater specifications

### Agencies

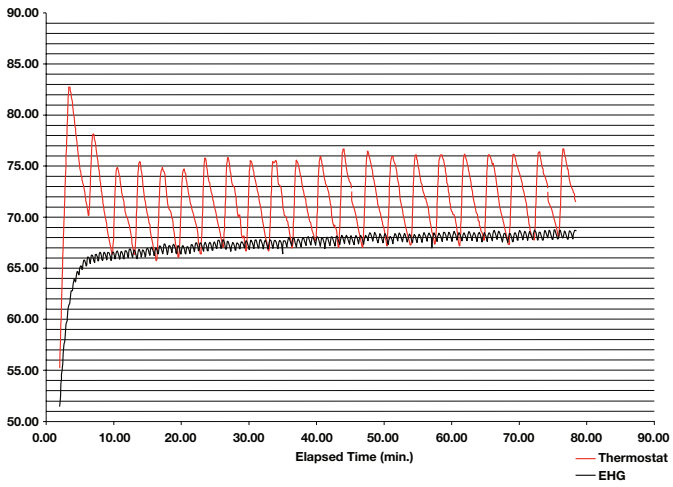
- Silicone rubber heater: UL® recognized File #E52951
- SERIES EHG control: TUV File DE 3-3068 to EN 61010-1:2001, UL® File E43684 to UL® 873 temperature indicating and regulating equipment

### Environmental

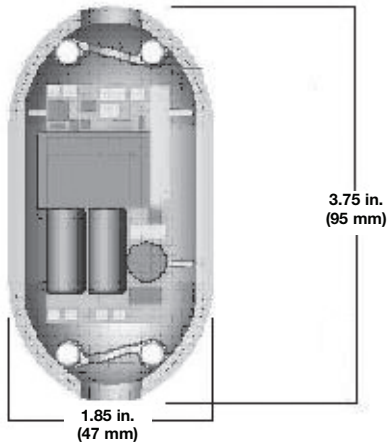
- Control operating temperature range 32 to 158°F (0 to 70°C)
- Control storage temperature range -40 to 158°F (–40 to 70°C)

Contact your Watlow representative for custom configurations.

## SERIES EHG Versus Thermostat (typical application)




## Dimensions




## Integrated SERIES EHG System Versus Integrated Thermostat System

| | Integrated EHG System | Integrated Thermostat System | SERIES EHG Benefit |
|---|---|---|---|
| Life comparison at rated amperage 10A load | Tested to greater than 4,000,000 cycles with | Rated 100,000 cycles | Longer product life of SERIES EHG system and high application reliability |
| Switch hysteresis | 6°F (3°C) | 15°F (8°C) | Provides superior process control |
| Improved response time reduces overshoot on start-up | 6°F (3°C) typical | 25°F (14°C) typical | Responds to temperature changes faster than a thermostat |
| Warranty | 2 years for material and workmanship | 1 year on material and workmanship | Warranty can be extended due to longer life cycle |
| Zero Cross Switching | SERIES EHG has zero cross switching | Random switching during sign wave cycle | Reduces the possibility of electrical mechanical interference (EMI) |

| Product | Control/ Limit Loops | Mounting | Fiber Optic Temp. Measure-ment | Profiling | Maximum Output | Communication Protocols | Page |
|---|---|---|---|---|---|---|---|
| **F4T with INTUITION®** | 4/4 | DIN-rail, Flush mount | – | ✓ | 12A | Standard bus, Modbus® TCP (Ethernet), Modbus® RTU, SCPI, USB Host (2), USB device | 253 |
| **EZ-ZONE® RM** | 152/192 | DIN-rail | – | ✓ | 15A | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 254 |
| **EZ-ZONE RMF** | 8/0 | DIN-rail | ✓ | – | – | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 255 |
| **EZ-ZONE RMZ** | 48/0 | DIN-rail | ✓ | – | – | EtherCAT® Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 255 |
| **EZ-ZONE ST** | 1/1 | DIN-rail | – | ✓ | 75A | Standard bus, Modbus® RTU | 256 |
| **EZ-ZONE PM** | 2/1 | 1/32, 1/16, 1/8, 1/4 DIN front panel | – | ✓ | 15A | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 257 |
| **EZ-ZONE PM Express** | 1/1 | 1/32, 1/16 DIN front panel | – | – | 15A | Standard bus | 258 |
| **SERIES CV** | 1/0 | DIN-rail, Front panel, chassis | – | – | 8A | N/A | 259 |
| **SERIES CF** | 1/0 | DIN-rail, Front panel, chassis | – | – | 8A | N/A | 262 |
| **SERIES EHG® SL10** | 1/1 | In-line/ Sub panel | – | – | 10A | Modbus® RTU | 265 |
| **SERIES EHG** | 1/0 | In-line | – | – | 10A | N/A | 266 |

**Note:** The specifications in the table above are best available values in each category. Not all combinations of these values are available in a single model number.

## F4T with INTUITION®

The F4T with INTUITION® temperature process controller offers a wide range of field removable I/O modules for maximum design flexibility. Configurations can be custom tailored to meet the scaling needs of a tremendous range of equipment and applications while providing exactly the hardware types required for compatibility. The F4T controller also features a 4.3 inch, color, graphical touch panel. Combining power, flexibility and functionality, this new controller offers unmatched versatility, and its best-in-class ease of use could very well make user manuals a thing of the past.

### Features and Benefits

**4.3-inch, color touch panel with high-resolution, graphical user-interface**

- Shortens learning curve and reduces operator errors
- Allows channels, profiles, alarms, inputs and outputs to be personalized with user defined names

**Temperature PID, data logger, trend chart, over/under-temperature limit, power switching, math, logic, timers and counters combined into an integrated system**

- Lowers ownership costs
- Eliminates the need for separate discrete components
- Reduces complexity
- Simplifies design, ordering and installation
- Saves money

**Robust algorithms for temperature, cascade, altitude, humidity and compressor**

- Improves process control
- Offers one to four channels of control
- Provides multiple PID sets
- Enables TRU-TUNE®+ adaptive control algorithm
- Offers 40 ramp and soak profiles with real-time clock and battery backup

**COMPOSER® graphical configuration PC software**

- Speeds up and simplifies commissioning
- Archives and documents controller setup
- Connects with controller easily via Ethernet

**Many communications options available including Ethernet Modbus® TCP and SCPI and EIA-232/485 Modbus® RTU**

- Offers two USB host ports and one device port
- Simplifies file transfers
- Connects easily

**Batch Processing with Bar Code Data Entry**

- Easily collects and manages data records
- Inputs information from bar code scan for fast and easy data entry
- Offers foolproof processing via smart profile to part linkage
- Provides data security through password and data log encrypted file options
- Improves manufacturing robustness via reminder screens ensuring all data is entered during processing
- Helps ensure compliance with growing regulations and minimizes warranty exposure
- Eliminates part processing skips or walk arounds due to improved quality control
- Produces formatted data record report for easy receipt or record management uses

**Modular design**

- Adapts quickly to evolving requirements
- Offers numerous types of field pluggable modules for maximum flexibility and easiest compatibility
- Features scalable and modular firmware functions
- Delivers scalable input/output quantities from 1 to 36

**For detailed product and ordering information, see the full F4T product section located on pages 189 through 199.**

# EZ-ZONE® RM

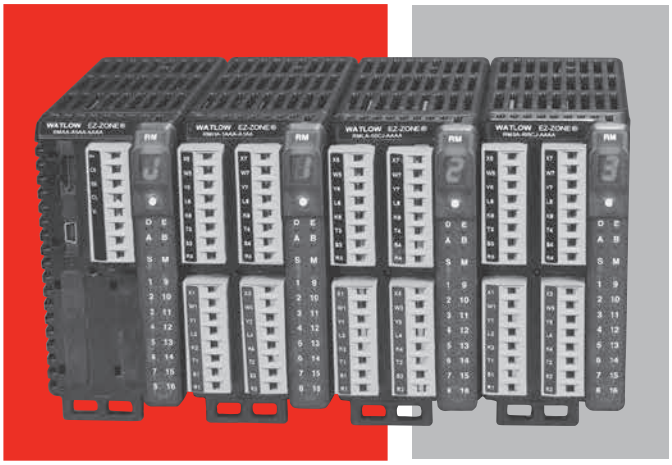
The EZ-ZONE® RM controller simplifies thermal system management. The EZ-ZONE RM controller family is comprised of six module types: an integrated on-off or PID control, monitoring and over/under temperature limit module, a high-density on-off or PID control module, a high-density limit only module, an 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.

**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

**For detailed product and ordering information, see the full EZ-ZONE RM product section located on pages 200 through 219.**

# EZ-ZONE® RMZ/RMF

By combining advances in fluorescent temperature sensing with the power of the proven EZ-ZONE® RM control system, Watlow® developed a best-in-class fiber optic temperature measurement and control system that will provide industry-leading performance for your specific application. By integrating fiber optic sensing capabilities into the EZ-ZONE RM control system, users will save space, improve performance with faster response times while simplifying their control system.

Watlow's EZ-ZONE RMZ and EZ-ZONE RMF make the system adaptable to all system requirements. Both are compatible with all other modules within the EZ-ZONE RM family and self-discover all existing modules within the system making a seamless integration into your temperature control/logic system.

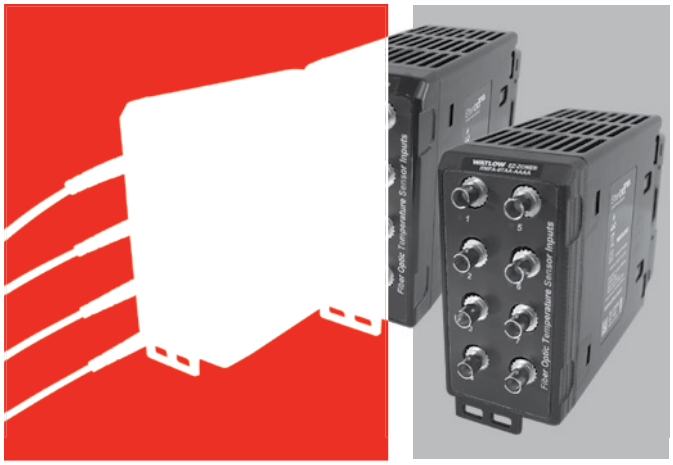
## EZ-ZONE RMZ Offers Fiber Optic Sensing Capabilities and EtherCAT® Communications

The EZ-ZONE RMZ integrates fiber optics, PID temperature control and EtherCAT® communications into a single package. It features multi-channel control, hosting up to four channels of fiber optic inputs as well as supporting up to 44 additional control loops from other EZ-ZONE RM modules. These modules support a wide array of capabilities including I/O, logic, current measurement, power switching and more.

## EZ-ZONE RMF Offers Additional Fiber Optic Inputs for Expansion Opportunities

The EZ-ZONE RMF module is a dedicated fiber optic input module integrating the advanced control technology of the EZ-ZONE system with one to eight channels of fiber optic temperature sensing.

The EZ-ZONE RMF can also serve as additional inputs to the EZ-ZONE RMZ enabling extensive expansion opportunities for future system needs. The EZ-ZONE RMF is ideal either as an expansion module or configured with built-in temperature control loops (outputs via EZ-ZONE RME module). The EZ-ZONE RMF can be used independently when only sensing is required.



## Benefits of Watlow's high-performance fluorescence-based temperature measurement system include:

- Compact integrated fiber optic sensing with temperature control
- Easily expands to increase number of zones as your system needs increase
- Integrates seamlessly with the temperature control system avoiding additional analog signal processing
- Faster temperature sampling rates with high resolution
- Minimizes installed footprint due to the small form factor and DIN-rail mounting
- Highly accurate fluorescent signal processing electronics
- Offers highly reliable LED light source designed to run at low currents for maximum life
- Up to 48 loops of input and control with all EZ-ZONE RM temperature control features
  - Temperature / limit loops
  - Current measurement
  - Power switching
  - Logic

**For detailed product and ordering information, see the full RMZ/RMF product section located on pages 220 through 221.**

# EZ-ZONE ST

The EZ-ZONE ST integrated solid state controller from Watlow offers a complete thermal system control solution in a single package. Features include a PID temperature controller connected to a high-amperage solid state relay with the option of adding a properly sized heat sink, an over- and under-temperature limit, a power shut-down contactor and digital communications in one complete and professionally engineered product.

Because the system is modular and scalable, a user only pays for what is needed. Stacking the EZ-ZONE ST integrated controller into multiple configurations enables flexibility to standardize the product platform to solve a wide range of application needs.

This integrated controller also includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.

## Features and Benefits

**Back panel or DIN-rail mount**
- Provides several mounting options

**Compact package**
- Reduces panel size

**Touch-safe package**
- Complies with IP2X increasing user safety

**±0.1 percent temperature accuracy**
- Provides efficient and accurate temperature control

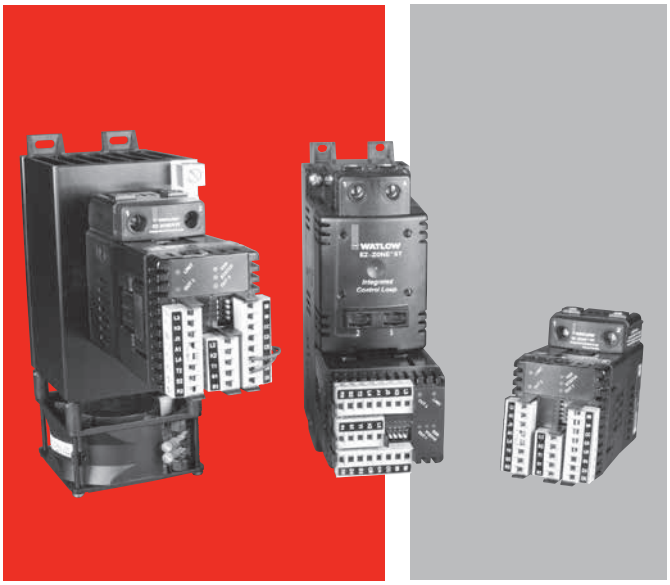
**200KA SCCR with proper fusing**
- Minimizes damage in the event of a short circuit

**Agency approvals: UL®, CSA, CE, RoHS, W.E.E.E.**
- Meets applications requiring agency approvals

**Three-year warranty**
- Ensures Watlow's reliability and product support

**Off-the-shelf designed system solution**
- Improves system reliability and termination reduction
- Reduces installation cost
- Eliminates incompatibility headaches often encountered with using many different components and brands

**Profile capability**
- Includes ramp and soak with four files and 40 total steps



**Ability to communicate with programmable logic controller (PLC), personal computer (PC) or operator interface terminal (OIT)**
- Optional EIA-485 Modbus® RTU
- RUI/communications gateway with optional EIA-232/485 Modbus® RTU, EtherNet/IP™/TCP Modbus®, DeviceNet™ or PROFIBUS DP. Refer to page 341 for further information.

**Solid state relay output**
- Allows faster cycling, more precise control, increased heater life and improves energy efficiency
- Ability to handle up to 75 amperes
- Uses either zero-cross or phase angle control modes for flexibility to control resistive loads such as Nichrome®, tungsten or quartz lamps
- Utilizes phase angle control mode to prevent load failure or blowing fuses for tungsten or quartz loads

**PID temperature control**
- Allows single input/dual output
- Allows standard PID or adaptive TRU-TUNE+ tuning algorithms for demanding controllability requirements

**Optional temperature limit**
- Increases safety in over- and under-temperature conditions

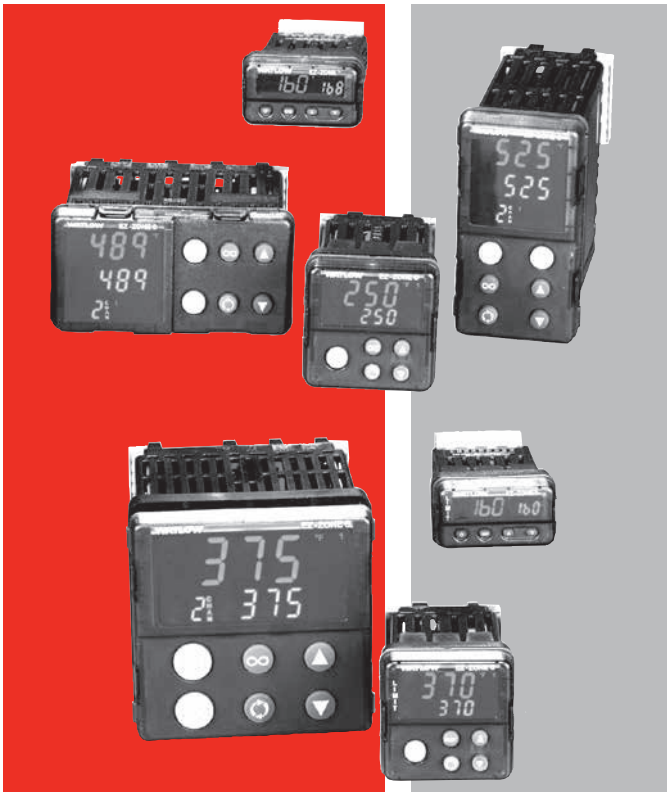
**Optional definite purpose mechanical contactor**
- Enables circuit safety shut down driven by limit control or PID alarm output signal

**For detailed product and ordering information, see the full EZ-ZONE ST product section located on pages 222 through 228.**

# EZ-ZONE PM

The EZ-ZONE PM panel mount controller offers control options that reduce system complexity and thermal loop ownership cost. It can be ordered as a PID controller, an over/under limit controller or its functions can be combined into an integrated controller. An option to integrate a high amperage power controller output with a high-performance PID controller and an over/under limit controller in one space-saving, panel mount package is also available. Many communications options are offered to support connectivity needs.

Because the EZ-ZONE PM controller is highly scalable, pay only for what is needed. This controller is available in 1/32, 1/16, 1/8 and 1/4 DIN panel mount packages. The EZ-ZONE PM controller is easy to use and is ideal for PID, over/under limit or integrated controller needs.



## Features and Benefits

**Integrated PID and limit controller**
- Reduces wiring time and termination complexity compared with connecting discrete products
- Decreases required panel space
- Lowers installation costs
- Increases user and equipment safety for over/under temperature conditions

**High amperage power control output**
- Drives 15 ampere resistive loads directly
- Reduces component count
- Decreases cost of ownership

**Current monitoring**
- Detects heater current flow and provides alarm indication of a failed output device or heater load
- Drives output on open or shorted heater

**Serial communication capabilities**
- Provides a wide range of protocol choices including Modbus® RTU, EtherNet/IP™, Modbus® TCP, PROFIBUS DP, DeviceNet™ and J1939 CAN bus
- Supports network connectivity to a PC or PLC

**Dual-channel controller**
- Provides two PID controllers in one space-saving package

**Enhanced control options**
- Easily handles complex process problems such as cascade, ratio, differential, square-root, motorized valve control without slidewire feedback, wet-bulb/dry-bulb, compressor control and peltier loads

**Countdown timer option**
- Provides batch process control
- Supports set point change during countdown

**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

**Advanced PID control algorithm**
- Offers TRU-TUNE®+ adaptive control to provide tighter control for demanding applications
- Provides auto-tune for fast, efficient startup

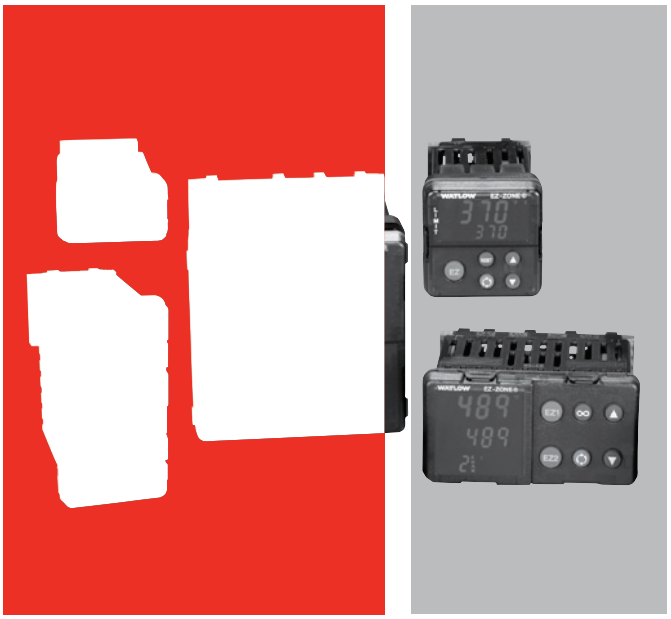
**For detailed product and ordering information, see the full EZ-ZONE PM product section located on pages 229 through 238.**

## EZ-ZONE PM Express

The EZ-ZONE PM Express panel mount controller is an industry-leading PID controller that allows optimal performance utilizing simple control and menu functionality without complex features. It is ideal for basic applications and usage levels.

The EZ-ZONE PM Express is the next generation controller to follow the legacy of Watlow's SERIES 93, SERIES 935 AND SERIES SD controllers that offer easy-to-use features to perform many basic applications. The EZ-ZONE PM Express includes one universal input and an option for up to two outputs and is available in 1/32, 1/16 ,1/8 and 1/4 DIN panel mount packages. It can be ordered as a PID process controller or as a dedicated over and under-temperature limit controller.

The EZ-ZONE PM Express is a valuable addition to the EZ-ZONE PM controller family which also includes the EZ-ZONE PM integrated controller and the EZ-ZONE PM standard version.



### Features and Benefits

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

**PID auto-tune**
- Provides auto-tune for fast, efficient startup

**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

**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

**Front panel removable**
- Saves time and labor for replacements and troubleshooting

**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

**P3T armor sealing system**
- Complies with NEMA 4X, IP65 specifications
- Allows controller to be cleaned and washed
- Certified UL® 50 independent to NEMA 4X specification

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

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

**High-amperage power control output**
- Drives 15 ampere resistive loads direct
- Reduces component count
- Saves panel space and simplifies wiring
- Reduces cost of ownership

**For detailed product and ordering information, see the full EZ-ZONE PM Express product section located on pages 239 through 243.**

## SERIES CV

Watlow's family of microprocessor-based temperature controllers offers an economical solution for applications that require simple, on/off control. Controllers are available in a broad range of packaging options, allowing selection of the best version for a specific application. They are available with an operator interface and can be ordered in a 1/8 DIN square panel mount or DIN-rail mount configuration.

The SERIES CV temperature controller incorporates a microprocessor design that delivers the repeatability, accuracy and performance advantages you can count on from Watlow's basic temperature controllers.

The SERIES CV controller includes an operator interface for viewing and set point selection. A red, four-character, seven segment LED displays the set point to show process options. The set point selection is made with a continuous turn, rotary encoder. Operating range temperature values are user definable as specified in the product configuration part number.

SERIES CV controllers are UL® and C-UL® listed and carry CSA and CE approvals. Watlow's temperature 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

**Heat or cool operation**
- Provides application flexibility

**Fahrenheit or Celsius operation with indication**
- Offers application flexibility

**Agency approvals**
- Meets certification requirements/compliance

**Microprocessor based technology**
- Ensures accurate repeatable control

# SERIES CV

## Specifications

### On-Off Controller
- Microprocessor based, on-off control mode
- Nominal switching hysteresis, typically 3°F (1.7°C)
- Input filter time: 1 second

### Operator Interface
- Four digit, seven segment LED displays, 0.28 in. (7 mm) high
- °F or °C indicator LED
- Load indicator LED
- Continuous turn, velocity sensitive rotary encoder for set point adjustment
- Front panel key push for set point or push for show process options

### 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 or 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)
- 125 µA 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 degree 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 degree 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
### Switched dc (non-isolated)
- Supply voltage max.: 24VDC into an infinite load
- Supply voltage min.: 5VDC at 10mA
- Min. load impedance: 500Ω

### 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

### Agency Approvals
- UL® 60730-1 Recognized Temperature Controller and Indicator on potted models
- UL® 50 IP65 - tactile key models
- UL® 197 Reviewed for Use in Cooking Appliances
- UL® 873
- ANSI Z21.23 Gas Appliance Thermostat Approval
- Temperature Control and Indicator CSA 22.2 No. 24

### Terminals
- 0.25 in. (6.3 mm) quick connect, push on terminal or removable screw style terminal block

### 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 |
|---|---|---|---|
| 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 CV

## Ordering Information

- **On-off controller, rotary set point adjustment, four character, seven segment display**

**Part Number**

| ① ② | ③ Power Supply | ④ Package | ⑤ Sensor Type and Scale | ⑥ Control Type | ⑦ ⑧ ⑨ ⑩ Low Set Point Operating Range Value | ⑪ ⑫ ⑬ ⑭ High Set Point Operating Range Value | ⑮ Overlay/ Customs Options |
|---|---|---|---|---|---|---|---|
| CV | | | | | | | |

| ③ | Power Supply |
|---|---|
| B = | 120VAC, switched dc output |
| C = | 120VAC, 8A relay output |
| D = | 230 to 240VAC, switched dc output |
| E = | 230 to 240VAC, 8A relay output |
| F = | 24VAC, switched dc output |
| G = | 24VAC, 8A relay output |

| ④ | Package |
|---|---|
| 1 = | Panel mount square 1/8 DIN - spade terminals |
| 2 = | DIN-rail mount - spade terminals |
| 5 = | Panel mount square 1/8 DIN - 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 | Control Type |
|---|---|
| H = | Heat |
| C = | Cool |

| ⑦⑧⑨⑩ Low Set Point Operating Range Value |
|---|
| **Note:** A (-) is used in the left most digit of the set point operating ranges to indicate a negative temperature value. |

| ⑪⑫⑬⑭ High Set Point Operating Range Value |
|---|
| **Note:** A (-) is used in the left most digit of the set point operating ranges to indicate a negative temperature value. |

| ⑮ | Overlay/Customs Options |
|---|---|
| A = | Standard with Watlow logo |
| B = | Push to show process with Watlow logo |
| C = | Push to adjust set point with Watlow logo |
| D = | Show process push to adjust set point with Watlow logo |
| 1 = | Standard without Watlow logo |
| 2 = | Push to show process without Watlow logo |
| 3 = | Push to adjust set point without Watlow logo |
| 4 = | Show process push to adjust set point without Watlow logo |

## SERIES CF

Watlow's family of microprocessor-based temperature controllers offers an economical solution for applications that require simple, on-off control. Controllers are available in a broad range of packaging options, allowing selection of the best version for a specific application. They are available with or without an indicating display and can be ordered in a 1/8 DIN square panel mount, DIN-rail mount or open board design configuration.

The SERIES CF temperature controller incorporates a microprocessor design that delivers the repeatability, accuracy and performance advantages you can count on from Watlow's basic temperature controllers. Fixed set points are available and an indicating display is an option. Operating set point temperature values can be specified in the product configuration part number.

SERIES CF controllers are UL® and C-UL® listed and carry CSA and CE approvals. Watlow's temperature 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

**Heat or cool operation**
- Provides application flexibility

**Fahrenheit or Celsius operation with indication**
- Offers application flexibility

**Agency approvals**
- Meets certification requirements/compliance

**Microprocessor based technology**
- Ensures accurate repeatable control

# SERIES CF

## Specifications

### On-Off Controller
- Microprocessor based, on-off control mode
- Nominal switching hysteresis, typically 3°F (1.7°C)
- Input filter time: 1 second

### Operator Interface
- 4-digit, 7-segment LED displays, 0.28 in. (7 mm) high non-condensing, 15-minute warm-up
- °F or °C indicator LED

### 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 or 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)
- 125 µA 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 degree 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 degree 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
### Switched dc (non-isolated)
- Supply voltage max.: 24VDC into an infinite load
- Supply voltage min.: 5VDC at 10mA
- Min. load impedance: 500Ω

### 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

### Agency Approvals
- UL® 60730-1 Recognized Temperature Controller and Indicator on potted models
- UL® 197 Reviewed for Use in Cooking Appliances
- UL® 873
- ANSI Z21.23 Gas Appliance Thermostat Approval
- Temperature Control and Indicator CSA 22.2 No. 24

### Terminals
- 0.25 in. (6.3 mm) quick connect, push on terminal or removable screw style terminal block

### 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 CF

## Ordering Information

- **On-off controller, fixed set point, no user interface**

**Part Number**

| ① ② | ③ Power Supply | ④ Package | ⑤ Sensor Type and Scale | ⑥ Control Type | ⑦⑧⑨⑩ Fixed Set Point Temp. Value | ⑪⑫⑬⑭ | ⑮ Overlay/ Customs Options |
|---|---|---|---|---|---|---|---|
| CF | | | | | | AAAA | |

| ③ | Power Supply |
|---|---|
| B = | 120VAC, switched dc output |
| C = | 120VAC, 8A relay output |
| D = | 230 to 240VAC, switched dc output |
| E = | 230 to 240VAC, 8A relay output |
| F = | 24VAC, switched dc output |
| G = | 24VAC, 8A relay output |

| ④ | Package |
|---|---|
| 1 = | Panel mount square ⅛ DIN - spade terminals |
| 2 = | DIN-rail mount - spade terminals |
| 3 = | Open board, non potted - spade terminals |
| 4 = | Potted case - spade terminals |
| 5 = | Panel mount square ⅛ DIN - screw terminals |
| 6 = | DIN-rail mount - screw terminals |
| 7 = | Open board, 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°F) |
| M = | T/C Type T Fahrenheit (-454 to 750°F) |
| N = | T/C Type T Celsius (-270 to 400°F) |
| 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 | Control Type |
|---|---|
| H = | Heat |
| C = | Cool |

| ⑦⑧⑨⑩ | Fixed Set Point Temperature Value |
|---|---|
| **Note:** A (-) is used in the left most digit of the set point operating ranges to indicate a negative temperature value. | |

| ⑮ | Overlay/Customs Options |
|---|---|
| A = | Standard with Watlow logo |
| 1 = | Standard without Watlow logo |

## SERIES EHG® SL10

The SERIES EHG® SL10 integrated, multi-function controller is a key component to a powerful system that includes a heater, an adjustable set point temperature controller, a high/low temperature alert, a power switching device and a high temperature safety limit. Its agency recognized controller/safety limit meets UL® 1998 and CE 60730 requirements.

An optional display/communications module can be easily added in the field to provide a digital display indication, an adjustment of set point, RS-485 Modbus® communications and other Human Machine Interface (HMI) features. As a scalable system, only what is needed can be purchased.

The EHG SL10 controllers' easy to install, compact design, inherent reliability and integrated limit functions offer unmatched value. It is designed for easy integration with Watlow heaters to simplify engineering, reduce component count for new equipment and decrease ownership cost. For original equipment manufacturers (OEMs), the EHG SL10 controller's CE, Semi-S2 compliance and UL® recognition reduces time and costs associated with global agency testing and validation. U.S. Patent Number 8,044,329.

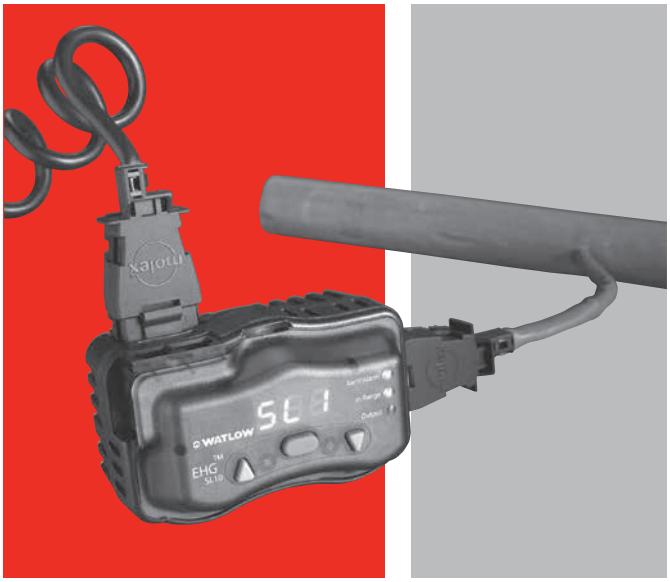
### Features and Benefits

**Process controller and safety limit in one package**
- Meets UL® 1998 and CE 60730 requirements
- Eliminates the need for a thermal fuse on a heater
- Eliminates replacement of heater when fuse fails

**Optional display/communications module**
- Allows easy upgrade on to base device
- Offers low cost field upgrade
- Provides easy, snap-on installation

**Accurate and flexible temperature process controller**
- Replaces problematic bi-metal thermostats with accurate electronic temperature process controller
- Allows easy change of process parameters

**Ambient operating temperature range 32 to 158°F (0 to 70°C)**
- Increases reliability when mounting in harsh temperature environments or in close proximity to heaters




**Integrated high/low temperature alert signal relay**
- Provides dry contact output to activate external alarm or process function
- Signals control status with three integrated LEDs
- Allows a signal of up to two amperes 30VAC/VDC, Form A to alert if process temperature is out of range limits

**Health check diagnostics**
- Monitors maximum heater process temperature, maximum ambient temperature and thermocouple operation
- Provides health check signal to inform operator that the process is working correctly

**Universal power supply**
- Allows an input of 85 to 264VAC, 50/60Hz
- Provides safe control of up to 2400 watts with 10 amperes switching in both controller and safety limit

**Can be switched from on-off and PID algorithm**
- Increases product life (on-off control is default)
- Offers selectable PID control algorithm for tighter temperature uniformity

**Universal ⅛ turn mounting bracket**
- Allows mounting to most surfaces
- Provides flexible mounting—either horizontally or vertically

**For detailed product and ordering information, see the full EHG SL10 product section located on pages 244 through 247.**

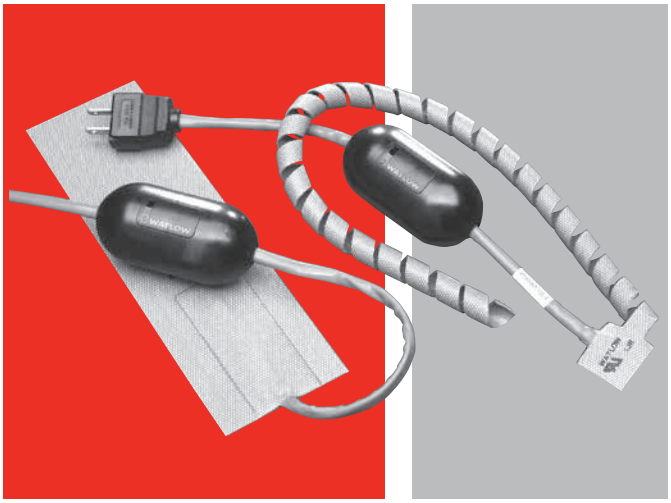
## SERIES EHG

Many applications requiring a fixed temperature set point rely on a mechanical thermostat for thermal control. Thermostats have proven, however, to be inadequate for many applications due to long-term reliability issues, such as 100,000 cycle rating and poor temperature control.

The SERIES EHG thermal solution includes a compact temperature control, thermocouple sensor and power switching device integrated into the heater's power cord. The SERIES EHG reduces system costs and lasts substantially longer than a conventional thermostat solution.

The evolution of miniature microprocessor technology and Watlow switching technology fostered development of a small, versatile temperature control and thermocouple sensor that is integrated with Watlow silicone rubber heater products. This device senses the temperature via input from a thermocouple strategically placed on the heater mat. The microprocessor is programmed prior to shipment with an application specific set point. This results in quick delivery of a custom, integrated system.

The small thermocouple mass provides superior response to changes in process temperature enabling higher watt density silicone rubber heater designs. These features offer an integrated custom set point temperature controller with superior life span, faster heat-up rates and improved accuracy. The SERIES EHG System has been tested to over four million cycles at rated amperage. Depending on the application, Watlow's power switching design can last up to 40 times longer than a conventional thermostat.



### Features and Benefits

**Long operational life**
- Improves system reliability

**Tight temperature control**
- Ensures process accuracy

**Small sensor footprint**
- Fits with almost any heater
- Responds quickly to temperature changes
- Controls high watt densities in low mass applications

**Reduced system cost**
- A single EHG control can be configured with multiple heaters

**Pre-wired, in line control**
- Simplifies installation
- Two wire power connection

**Durable housing with built-in strain relief**
- Protects electronics
- Low risk of mechanical damage

**Manufactured with proven Watlow components**
- Assures reliable system performance

**For detailed product and ordering information, see the full EHG product section located on pages 248 through 249.**

# Limits and Scanners

| Product | Maximum Limit Loops | Maximum Monitor Channels | Mounting | Agency Approvals | Communication Protocols | Page |
|---|---|---|---|---|---|---|
| **F4T with INTUITION®** | 6 | 24 | DIN-rail, Flush mount | UL® listed, CSA, CE, RoHS, W.E.E.E., FM | Standard bus, Modbus® TCP (Ethernet), Modbus® RTU, SCPI, USB Host (2), USB device | 269 |
| **EZ-ZONE® RM High-Density Limit** | 192 | 192 | DIN-rail | UL®, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 270 |
| **EZ-ZONE RM High-Density Scanner** | 0 | 256 | DIN-rail | UL®, CSA, CE, RoHS, W.E.E.E., SEMI F47-0200 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 272 |
| **EZ-ZONE PM Limit** | 1 | 1 | 1/32, 1/16, 1/8, 1/4 DIN front panel | UL®, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200 | Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU | 274 |
| **EZ-ZONE PM Express Limit** | 1 | 1 | 1/32, 1/16, 1/8, 1/4 DIN front panel | UL®, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200 | Standard bus | 280 |
| **SERIES LV** | 1 | 1 | DIN-rail, Front panel, chassis | UL®, CSA, CE, ANSI Z21.23, RoHS, W.E.E.E., FM | N/A | 284 |
| **SERIES LF** | 1 | 1 | DIN-rail, Front panel, chassis | UL®, CSA, CE, ANSI Z21.23, RoHS, W.E.E.E., FM | N/A | 287 |
| **SERIES LS** | 1 | 1 | Potted case with mounting screws | UL®/EN 60730-1, 2, 9, UL® 1998, CE, W.E.E.E., RoHS | N/A | 290 |

**Note:** The specifications in the table above are best available values in each category. Not all combinations of these values are available in a single model number.

## F4T with INTUITION®

The F4T with INTUITION® temperature process controller offers a wide range of field removable I/O modules for maximum design flexibility. Configurations can be custom tailored to meet the scaling needs of a tremendous range of equipment and applications while providing exactly the hardware types required for compatibility. The F4T controller also features a 4.3 inch, color, graphical touch panel. Combining power, flexibility and functionality, this new controller offers unmatched versatility, and its best-in-class ease of use could very well make user manuals a thing of the past.


### Features and Benefits

**4.3-inch, color touch panel with high-resolution, graphical user-interface**

- Shortens learning curve and reduces operator errors
- Allows channels, profiles, alarms, inputs and outputs to be personalized with user defined names

**Temperature PID, data logger, trend chart, over/under-temperature limit, power switching, math, logic, timers and counters combined into an integrated system**

- Lowers ownership costs
- Eliminates the need for separate discrete components
- Reduces complexity
- Simplifies design, ordering and installation
- Saves money

**Robust algorithms for temperature, cascade, altitude, humidity and compressor**

- Improves process control
- Offers one to four channels of control
- Provides multiple PID sets
- Enables TRU-TUNE®+ adaptive control algorithm
- Offers 40 ramp and soak profiles with real-time clock and battery backup

**COMPOSER® graphical configuration PC software**

- Speeds up and simplifies commissioning
- Archives and documents controller setup
- Connects with controller easily via Ethernet

**Many communications options available including Ethernet Modbus® TCP and SCPI and EIA-232/485 Modbus® RTU**

- Offers two USB host ports and one device port
- Simplifies file transfers
- Connects easily

**Batch Processing with Bar Code Data Entry**

- Easily collects and manages data records
- Inputs information from bar code scan for fast and easy data entry
- Offers foolproof processing via smart profile to part linkage
- Provides data security through password and data log encrypted file options
- Improves manufacturing robustness via reminder screens ensuring all data is entered during processing
- Helps ensure compliance with growing regulations and minimizes warranty exposure
- Eliminates part processing skips or walk arounds due to improved quality control
- Produces formatted data record report for easy receipt or record management uses

**Modular design**

- Adapts quickly to evolving requirements
- Offers numerous types of field pluggable modules for maximum flexibility and easiest compatibility
- Features scalable and modular firmware functions
- Delivers scalable input/output quantities from 1 to 36

**For detailed product and ordering information, see the full F4T product section located on pages 189 through 199.**

# EZ-ZONE® RM High-Density Limit

The EZ-ZONE® RM high-density limit module used in conjunction with the EZ-ZONE RM temperature control module and high-density control module offer agency approved over and under temperature limit function to ensure system safety. The EZ-ZONE RM high-density limit controls 4, 8, or 12 limit loops per module or up to 128 limit loops per system.

## Features and Benefits

**1 to 128 loop limit controller**

- Eliminates compatibility issues often encountered with using many different discrete components and brands
- Saves engineering time and labor costs while shortening project schedules
- Allows a common limit controller platform across many design applications

**Communications**

- Allows standard bus communications
- Ability to utilize EIA-485, Modbus® RTU options

**SPLIT-RAIL control**

- Minimizes the length and cost of wire runs and improves system reliability by locating inputs closer to sensors and outputs closer to loads

**SENSOR GUARD**

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

**AUTO CLONE**

- Saves time and reduces complexity by automatically configuring a new module with the same parameter settings as the replaced module


## 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

**Serial Communications**

- Isolated communications
- All modules ship with standard bus protocol for configuration and communication with all EZ-ZONE controllers

**Additional Communication Option**

- EIA-485, Modbus® RTU

**Calibration Accuracy**

- Calibration accuracy and sensor conformity: ±0.1% of span, ±1°C @ the calibrated ambient temperature and rated line voltage
  - Types R, S, B; 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.

**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

# EZ-ZONE RM High-Density Limit

## High-Density Limit Module Specifications (RML) *(Continued)*

### Thermistor Input

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

### Digital Input

- Update rate 10Hz
- DC voltage
- Max. input 36V at 3mA
- Min. high state 3V at 0.25mA
- Max. low state 2V

### Dry Contact Input

- Update rate 10Hz
- Min. open resistance 10kΩ
- Max. closed resistance 50Ω
- Max. short circuit 13mA

### 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

## 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**

| ①② 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 | ⑪⑫ Additional Options |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RM | L | | - | | | | | - | A | | |

| ④ | Connector Style/Custom Product |
|---|---|
| A = | Right angle screw connector (standard) |
| F = | Front screw connector |
| S = | Custom |

| ⑤ | Slot A |
|---|---|
| 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 |
| 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 |
| 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* |

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

| 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)* |

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

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

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

| ⑪⑫ | Additional Options |
|---|---|
| **Firmware, Overlays, Parameter Settings** | |
| AA = | Standard |
| AB = | Replacement connectors hardware only, for the entered part number |
| XX = | Custom |

# EZ-ZONE RM High-Density Scanner

The EZ-ZONE RM high-density scanner module can be used in conjunction with any EZ-ZONE RM family module as a monitor or to provide additional logic function to a system. The scanner module can also be used as a stand alone product for multiple inputs of monitoring applications. The EZ-ZONE RM high-density scanner module provides 4, 8, 12 or 16 loops of monitoring per module or up to 256 monitoring loops per system.

## Features and Benefits

**4 to 256 monitoring loops**
- Monitor only—thermocouple, RTD, process or thermistor inputs
- Data log via the EZ-ZONE RM control module
- Accept up to 12 digital inputs
- Activate up to 12 digital outputs

**Communications**
- Allows standard bus communications
- Ability to utilize EIA-485, Modbus® RTU options

**Add on Logic**
- Adds up to 116 points of logic to your system

## 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

**Serial Communications**
- Isolated communications
- All modules ship with standard bus protocol for configuration and communication with all EZ-ZONE controllers

**Additional Communication Option**
- EIA-485, Modbus® RTU

**Calibration Accuracy**
- Calibration accuracy and sensor conformity: ±0.1% of span, ±1°C @ the calibrated ambient temperature and rated line voltage
  - Types R, S, B; 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.


**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
- DC voltage
- Max. input 36V at 3mA
- Min. high state 3V at 0.25mA
- Max. low state 2V

**Dry Contact Input**
- Update rate 10Hz
- Min. open resistance 10kΩ
- Max. closed resistance 50Ω
- Max. short circuit 13mA

**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

## 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 |
| S = | Custom |

| ⑤ | Slot A |
|---|---|
| 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 |
| 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 |
| 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's at 2A each. SSr's grouped in 2-pairs with each pair sharing a common |

| ⑧ | Slot E |
|---|---|
| A = | None |
| 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's 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 |

## EZ-ZONE PM Limit

The EZ-ZONE PM panel mount limit controller from Watlow offers control options to reduce system complexity and the cost of thermal loop ownership. The EZ-ZONE PM limit controller provides high amperage power controller output and over/under limit control in one space saving, panel mount package.

Because the EZ-ZONE PM limit controller is scalable the customer only pays for what is needed. This controller is available in 1/32, 1/16, 1/8 and 1/4 DIN panel mount packages.

### Features and Benefits - Standard

**Configuration communications with software**
- Saves time and improves reliability of controller setup

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

**Memory for saving and restoring parameter settings**
- Reduces service calls and down time

**Agency approvals: UL® listed, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200**
- Ensures prompt product acceptance
- Reduces end product documentation costs

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

**Consistent termination labeling connection system**
- Simplifies switching between products
- Speeds up user's system documentation

**EZ-KEY**
- Enables simple, one-touch operation of user defined, repetitive activities

**Programmable menu system**
- Reduces setup time and increases operator efficiency

**Three-year warranty**
- Ensures product support and protection


### Features and Benefits - Optional

**High amperage power control output**
- Drives 5 amperes resistive loads direct
- Reduces component count
- Decreases ownership cost

**Serial communication capabilities**
- Provides a wide range of protocol choices including Modbus® RTU, EtherNet/IP™, Modbus® TCP, PROFIBUS DP and DeviceNet™
- Supports network connectivity to a PC or PLC

# EZ-ZONE PM Limit

## Specifications

### Controller
- Agency approved safety-shutdown over/under limit
- User-programmable alarms
- Control sampling rates: input = 10Hz, outputs = 10Hz

### Isolated Serial Communications
- EIA-232/485, Modbus® RTU
- EtherNet/IP™/Modbus® TCP
- DeviceNet™
- PROFIBUS DP

### 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, 3µA open sensor detection, 2kΩ source resistance max.
- RTD 2- or 3-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, 0-50mV at 20MΩ, 0-1000Ω potentionmeter; scalable; inverse scaling

### 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

### Accuracy
- Calibration accuracy and sensor conformity: ±0.1% of span, ±1°C @ the calibrated ambient temperature and rated line voltage
  - Types R, S, B; 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.

### Thermistor Input
- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)
- Linearization curves built-in

### Digital Inputs (DC Voltage)
- Max. input: 36V at 3mA
- Logic: min. high state 3V at 0.25mA, max. low state 2V

### Digital Inputs (Dry Contact)
- Logic: min. open resistance 10kΩ, max. closed resistance 50Ω
- Max. short circuit: 20mA

### 2 Digital I/O (ordered with power supply option)
- Update rate: 10Hz
- Input type: user-selectable, dc voltage or dry contact
- Output type: switched dc
- Output voltage: 24V
- Output 5: 24mA max. or drive one 3-pole DIN-A-MITE®
- Output 6: 10mA max.

### Output Hardware
- Switched dc: 22 to 32VDC @ 30mA max. per single output and 40mA max. total per paired outputs (1 & 2, 3 & 4)
- Open collector: 30VDC max. @ 100mA max.
- SSR, Form A, 24 to 240VAC, 1A at 50°F (10°C) to 0.5A at 149°F (65°C) resistive load, 264VAC max., opto-isolated, without contact suppression, 120/240VAC @ 20VA pilot duty
- Electromechanical relay, Form A, 24 to 240VAC or 30VDC max., 5A resistive load, 100,000 cycles at rated load, 120/240 @ 125VA or 24VAC @ 25VA pilot duty
- Electromechanical relay, Form C, 24 to 240VAC or 30VDC max., 5A resistive load, 100,000 cycles at rated load, 120/240 @ 125VA or 24VAC @ 25VA pilot duty
- Universal process output: range selectable; 0 to 10VDC ±15mV into a min. 1,000Ω load with 2.5mV nominal resolution; 0 to 20mA ±30µA into max. 800Ω load with 5µA nominal resolution; temperature stability 100ppm/°C

### Operator Interface
- Dual 4-digit, 7-segment LED displays
- Advance, RESET, up and down keys, plus 1 or 2 programmable EZ-KEY(s) depending on model size
- Typical display update rate: 1Hz

# EZ-ZONE PM Limit

### Line Voltage/Power

- High voltage option: 85 to 264VAC, 47 to 63Hz
- Low voltage option: 20 to 28VAC, +10/-15%; 50/60Hz, ±5% or 12 to 40VDC
- Max. power consumption: 10VA (1/32 and 1/16 DIN), 14VA (1/8 and 1/4 DIN)
- Data retention upon power failure via nonvolatile memory
- Compliant with SEMI F47-0200, Figure R1-1 voltage sag requirements @ 24VAC or higher

### Environment

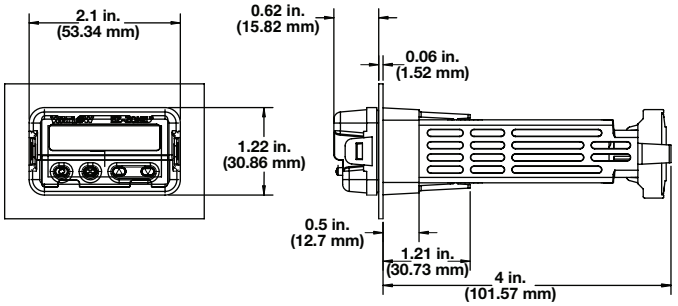
- Operating temperature: 0 to 149°F (-18 to 65°C)
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Relative humidity: 0 to 90%, non-condensing

### Agency Approvals

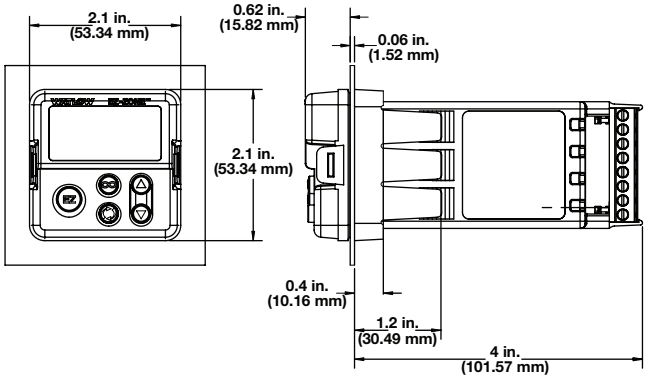
- cULus® UL/EN/CSA C22.2 No 61010-1 Listed, File E185611
- CSA C22.2 No. 24, File 158031
- UL® 50 4X indoor locations, NEMA 4X, IP66 front seal
- FM Class 3545
- CE, RoHS by design, W.E.E.E.
- EtherNet/IP™ and DeviceNet™ ODVA Conformance Tested

## Dimensional Drawings

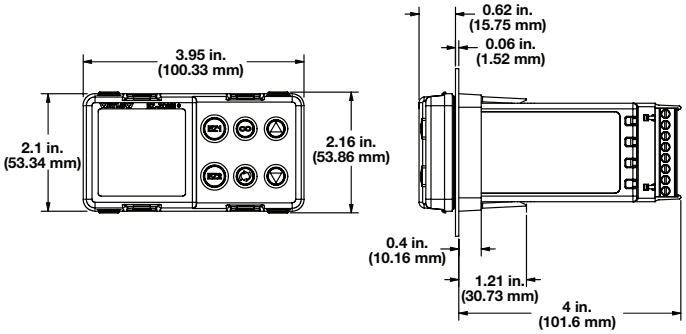
### EZ-ZONE PM 1/32 DIN




### EZ-ZONE PM 1/16 DIN



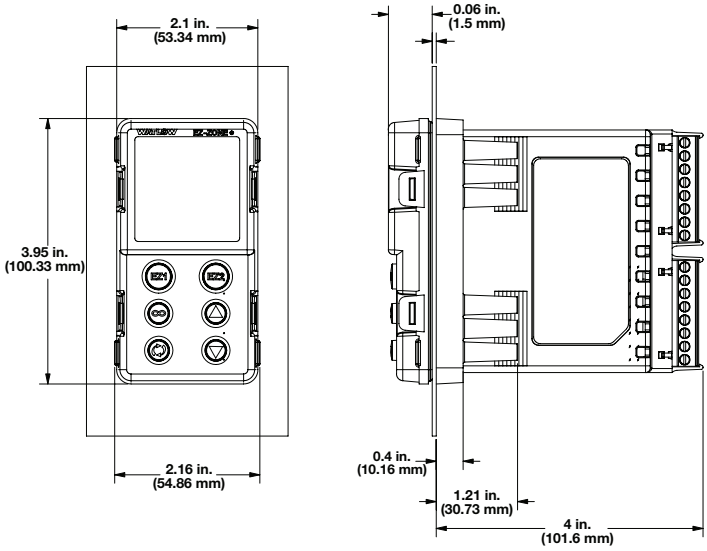

### EZ-ZONE PM 1/8 DIN - Horizontal



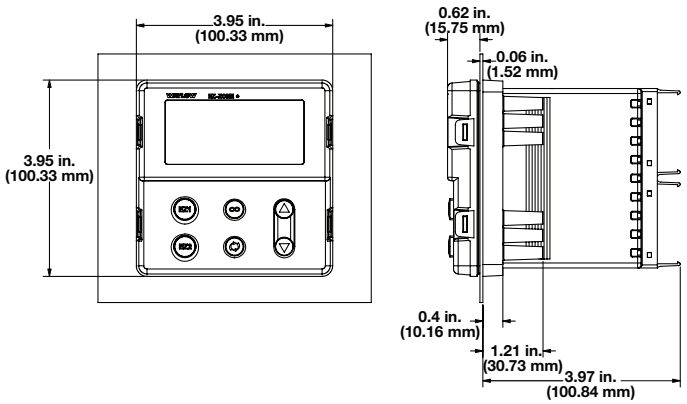
# EZ-ZONE PM Limit

## Dimensional Drawings *(Continued)*

### EZ-ZONE PM 1/8 DIN - Vertical




### EZ-ZONE PM 1/4 DIN




## EZ-ZONE Comparison Chart

| | PM 1/32 DIN | PM 1/16 DIN | PM 1/8 DIN | PM 1/4 DIN |
|---|---|---|---|---|
| **Number of Digital Inputs/Outputs (DIO)** | 0 to 2 | 0 to 2 | 0 to 2 | 0 to 2 |
| **Number of Outputs** | 1 to 4 | 1 to 6 | 1 to 6 | 1 to 6 |
| **Maximum Power Output** | 5A mechanical relay | 5A mechanical relay | 5A mechanical relay | 5A mechanical relay |
| **Standard Bus Communications** | Yes | Yes | Yes | Yes |
| **Field Bus Communications** | Modbus® RTU 485 | Modbus® RTU 232/485, EtherNet/IP™, Modbus® TCP, DeviceNet™, PROFIBUS DP | Modbus® RTU 232/485, EtherNet/IP™, Modbus® TCP, DeviceNet™, PROFIBUS DP | Modbus® RTU 232/485, EtherNet/IP™, Modbus® TCP, DeviceNet™, PROFIBUS DP |

# EZ-ZONE PM Limit

## Limit Model Ordering Information

**Universal Sensor Input, Standard Bus Communications, Red and Green Seven Segment Displays**

**Part Number**

| ① ② | ③ | ④ | ⑤ | ⑥ ⑦ | | ⑧ | ⑨ ⑩ ⑪ | ⑫ | ⑬ ⑭ |
|---|---|---|---|---|---|---|---|---|---|
| | Package Size | Primary Function | Power Supply, Digital I/O | Output 1 and 2 Hardware Options | | Comm. Options | Future Options | Isolated Input Options | Custom Options |
| PM | | | | | - | | AAA | | |

| ③ | Package Size |
|---|---|
| 3 = | 1/32 DIN |
| 6 = | 1/16 DIN |
| 8 = | 1/8 DIN vertical |
| 9 = | 1/8 DIN horizontal |
| 4 = | 1/4 DIN |

| ④ | Primary Function |
|---|---|
| L = | Limit controller with universal input |
| M = | Limit controller with thermistor input |
| D = | Custom firmware |

| ⑤ | Power Supply, Digital I/O |
|---|---|
| 1 = | 100 to 240VAC |
| 2 = | 100 to 240VAC plus 2 digital I/O points |
| 3 = | 20 to 28VAC or 12 to 40VDC |
| 4 = | 20 to 28VAC or 12 to 40VDC plus 2 digital I/O points |

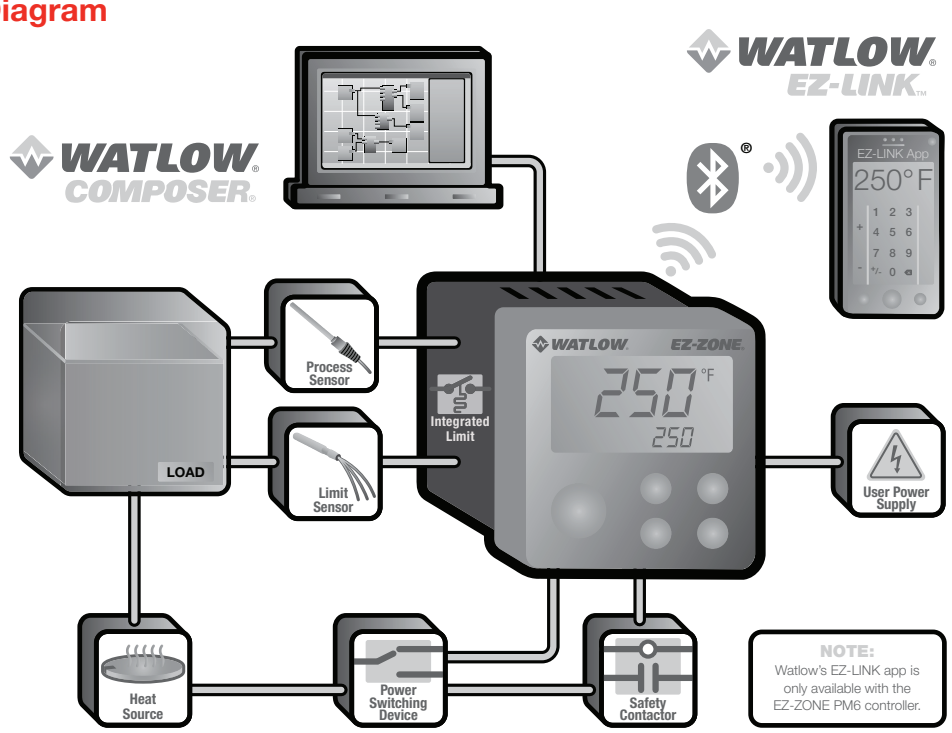
| ⑥ ⑦ | Output 1 and 2 Hardware Options | |
|---|---|---|
| | Output 1 | Output 2 |
| AJ = | None | Mechanical relay 5A, Form A |
| CJ = | Switched dc/open collector | Mechanical relay 5A, Form A |
| EJ = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |

| ⑧ | Communication Options, Standard Bus Always Included |
|---|---|
| A = | None |
| B = | Bluetooth® (1/16 DIN models only)* |
| E = | EIA-485 Modbus® RTU & Bluetooth® (1/16 DIN models only)* |
| 1 = | EIA-485 Modbus® RTU |
| ***Note:** Bluetooth® not available in all countries, contact factory. | |

| ⑫ | Isolated Input Options |
|---|---|
| A = | None |
| D = | Isolated input 1 |

| ⑬ ⑭ | Custom Options |
|---|---|
| **Firmware, Overlays, Parameter Settings** | |
| AA = | Standard EZ-ZONE PM face plate |
| AB = | EZ-ZONE logo and no Watlow name |
| AC = | No logo and no Watlow name |
| AG = | Conformal coating |

## Typical Block Diagram



# EZ-ZONE PM Limit

## Enhanced Limit Model Ordering Information

**Universal Sensor Input, Configuration Communications, Red Green Seven Segment Displays**

**Part Number**

| ① ② | ③ | ④ | ⑤ | ⑥ ⑦ | | ⑧ | ⑨ | ⑩ ⑪ | ⑫ | ⑬ ⑭ |
|---|---|---|---|---|---|---|---|---|---|---|
| PM | Package Size | Primary Function | Power Supply, Digital I/O | Output 1 & 2 Hardware | - | Comm. Options or Add'l Digital I/O | A | Output 3 and 4 Hardware Options | Isolated Input Options | Custom Options |

| ③ | Package Size |
|---|---|
| 6 = | 1/16 DIN |
| 8 = | 1/8 DIN vertical |
| 9 = | 1/8 DIN horizontal |
| 4 = | 1/4 DIN |

| ④ | Primary Function |
|---|---|
| L = | Limit controller with universal input |
| M = | Limit controller with thermistor input |
| D = | Custom firmware |

| ⑤ | Power Supply, Digital I/O |
|---|---|
| 1 = | 100 to 240VAC |
| 2 = | 100 to 240VAC plus 2 digital I/O points |
| 3 = | 20 to 28VAC or 12 to 40VDC |
| 4 = | 20 to 28VAC or 12 to 40VDC plus 2 digital I/O points |

| ⑥ ⑦ | Output 1 | Output 2 |
|---|---|---|
| AJ = | None | Mechanical relay 5A, Form A |
| CJ = | Switched dc/open collector | Mechanical relay 5A, Form A |
| EJ = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |

| ⑧ | Communication Options or Additional Digital I/O |
|---|---|
| **Standard bus always included** | |
| A = | None |
| B = | Bluetooth® (1/16 DIN models only)* |
| E = | EIA-485 Modbus® RTU and Bluetooth® (1/16 DIN models only)* |
| F = | Modbus® RTU 232/485 and Bluetooth® (1/16 DIN models only)* |
| G = | EtherNet/IP™/Modbus® TCP and Bluetooth® (1/16 DIN models only)* |
| H = | DeviceNet™ and Bluetooth® (1/16 DIN models only)* |
| J = | PROFIBUS DP and Bluetooth® (1/16 DIN models only)* |
| 1 = | EIA-485 Modbus® RTU |
| 2 = | EIA-232/485 Modbus® RTU |
| 3 = | EtherNet/IP™/Modbus® TCP |
| 5 = | DeviceNet™ |
| 6 = | PROFIBUS DP |
| ***Note:** Bluetooth® not available in all countries, contact factory. | |

| ⑩ ⑪ | Output 3 | Output 4 |
|---|---|---|
| AA = | None | None |
| AJ = | None | Mechanical relay 5A, Form A |
| AK = | None | SSR Form A, 0.5A |
| CA = | Switched dc/open collector | None |
| 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 |
| 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 |
| KK = | SSR Form A, 0.5A | SSR Form A, 0.5A |
| 1/16 DIN Models: If communication options F, G, H, J or 2 thru 6 is ordered in previous digit, then Option AA must be ordered here. | | |

| ⑫ | Isolated Input Options |
|---|---|
| A = | None |
| D = | Isolated input 1 |

| ⑬ ⑭ | Custom Options |
|---|---|
| AA = | Standard EZ-ZONE PM face plate |
| AB = | EZ-ZONE logo and no Watlow name |
| AC = | No logo and no Watlow name |
| AG = | Conformal coating |

## EZ-ZONE PM Express Limit

The EZ-ZONE PM Express panel mount limit controller from Watlow is an industry leading limit controller that allows for optimal performance utilizing simple over/under limit control and menu functionality without complex features. The EZ-ZONE PM Express limit controller is ideally suited for basic applications and usage levels.

The EZ-ZONE PM Express limit controller is the next generation of controllers leveraging the strong legacy of Watlow's SERIES 94, SERIES 945 and SERIES SD limit controllers where easy-to-use features are needed for basic applications. It includes one universal input and the option for up to two outputs and is available in 1/32, 1/16, 1/8 and 1/4 DIN panel mount packages.

The EZ-ZONE PM Express limit is a great addition to the EZ-ZONE PM family which includes two other controller versions, the EZ-ZONE PM integrated controller and the EZ-ZONE PM temperature and process controller. This family provides an ideal platform to perform many applications.

### 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 encountered when using more advanced limit controllers and their unnecessary features
- Reduces user training costs and programming errors

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

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

**Agency approvals: UL® listed, CSA, CE, RoHS, W.E.E.E. FM, SEMI F47-0200**
- Ensures prompt product acceptance
- Reduces end-product documentation costs


**Front panel removable**
- Saves time and labor for replacements and troubleshooting

**P3T armor sealing system**
- Complies to NEMA 4X, IP65
- Allows controller to be cleaned and washed
- Certified UL® 50 independent to NEMA 4X specification

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

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

**Three-year warranty**
- Ensures product support and protection

**High-amperage power control output**
- Drives 5 ampere resistive loads direct
- Reduces component count
- Saves panel space and simplifies wiring
- Decreases ownership cost

# EZ-ZONE PM Express Limit

## 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) 14VA ($^1/_8$ and $^1/_4$ DIN) max. power consumption
- Data retention upon power failure via non-volatile memory
- Compliant with 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 front seal
- FM Class 3545
- CE, RoHS by design, W.E.E.E.

### 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, 3µA open sensor detection, 2kΩ source resistance max.
- RTD 2- or 3-wire, platinum, 100Ω @ 32°F (0°C) calibration to DIN curve (0.00385Ω/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: -328 to 2500°F (-200 to 1370°C)
Type T: -328 to 750°F (-200 to 400°C)
Type N: -328 to 2372°F (-200 to 1300°C)
Type S: -58 to 3214°F (-50 to 1767°C)
RTD (DIN): -328 to 1472°F (-200 to 800°C)
Process: -1999 to 9999 units

### Output Hardware

- Switched dc = 22 to 32VDC @ 30mA
- Switched dc/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, 5A, 24 to 240VAC or 30VDC max., resistive load, 100,000 cycles at rated load
- Electromechanical relay, Form A, 5A, 24 to 240VAC or 30VDC max., resistive load, 100,000 cycles at rated load
- NO-ARC relay, Form A, 15A, 24 to 240VAC, no VDC, resistive load, 2 million cycles at rated load
- Universal process, Output range selectable:
  0 to 10VDC into a min. 1,000Ω load
  4 to 20mA into max. 800Ω load

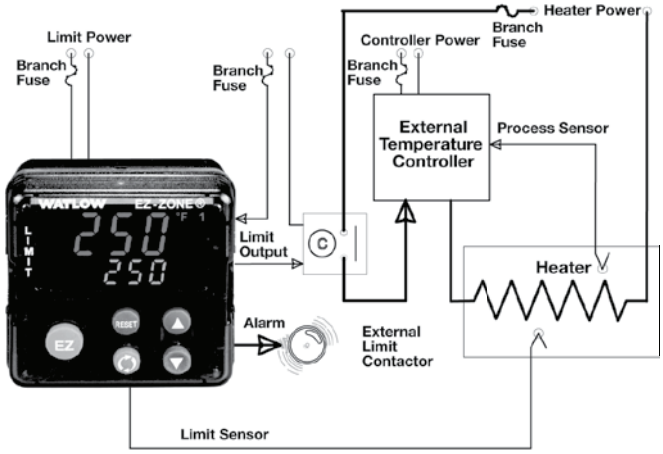
### Operator Interface

- Dual 4 digit, 7 segment LED displays
- Typical display update rate 1Hz
- Advance, RESET, up and down keys plus an EZ-KEY (not available in $^1/_{32}$ DIN)

# EZ-ZONE PM Express Limit

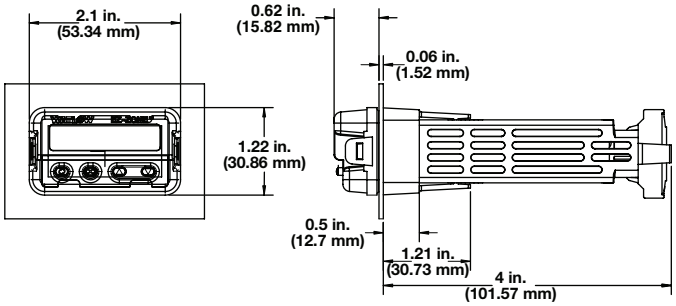
## Typical Block Diagrams

### EZ-ZONE PM EXPRESS Limit Model

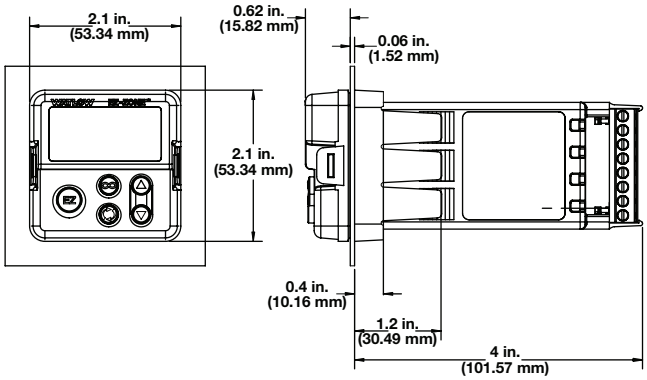



## Dimensional Drawings

### EZ-ZONE PM 1/32 DIN




### EZ-ZONE PM 1/16 DIN



# EZ-ZONE PM Express Limit

## Ordering Information

**All models include:**

- **Universal sensor input, standard bus configuration communications**
- **Dual line red over green seven segment displays**

**Part Number**

| ① ② | ③ | ④ | ⑤ | ⑥ ⑦ | | ⑧ ⑨ ⑩ ⑪ | ⑫ | ⑬ ⑭ |
|---|---|---|---|---|---|---|---|---|
| | Package Size | Primary Function | Power Supply | Output 1 & 2 Hardware | | Future Option | Menu Type | Additional Options |
| PM | | L | | | - | AAAA | B | |

| ③ | Package Size |
|---|---|
| 3 = | 1/32 DIN |
| 6 = | 1/16 DIN |
| 8 = | 1/8 DIN vertical (future option) |
| 9 = | 1/8 DIN horizontal (future option) |
| 4 = | 1/4 DIN (future option) |

| ④ | Primary Function |
|---|---|
| L = | Limit controller with universal input |

| ⑤ | Power Supply, Digital I/O |
|---|---|
| 1 = | 100 to 240VAC |
| 3 = | 20 to 28VAC or 12 to 40VDC |

| ⑥ ⑦ | Output 1 and 2 Hardware Options | |
|---|---|---|
| | Output 1 | Output 2 |
| AJ = | None | Mechanical relay 5A, Form A |
| CJ = | Switched dc/open collector | Mechanical relay 5A, Form A |
| EJ = | Mechanical relay 5A, Form C | Mechanical relay 5A, Form A |

| ⑫ | Menu Type |
|---|---|
| B = | PM EXPRESS with English manual |

| ⑬ ⑭ | Additional Options |
|---|---|
| AA = | Standard EZ-ZONE PM face plate |
| AB = | EZ-ZONE logo, no Watlow name |
| AC = | No logo, no Watlow name |
| AG = | Conformal coating |

## 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

- Four digit, seven 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, WEEE

### 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, four character, seven segment display, reset switch**

**Part Number**

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

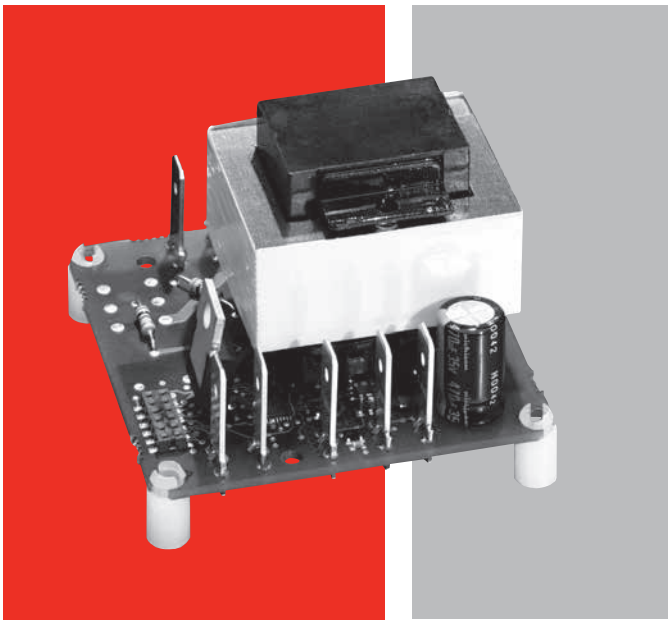
## SERIES LF

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 LS Safety Limit

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

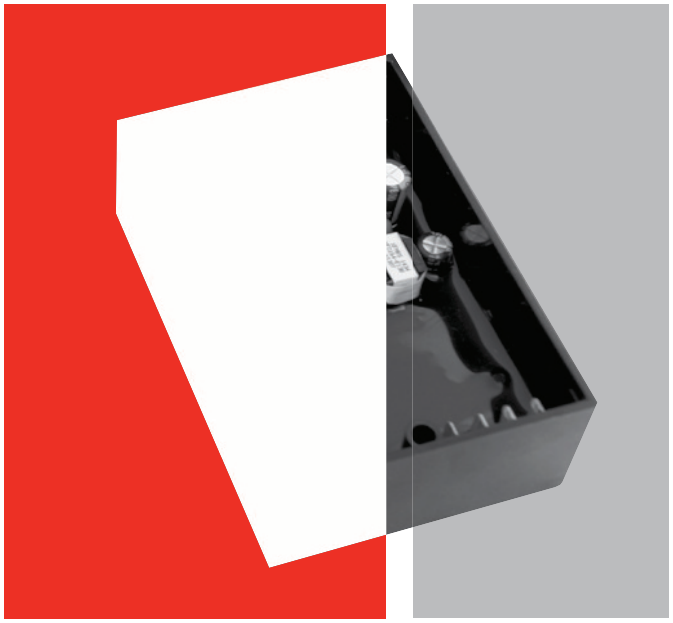
**High-limit operation**
- Provides application flexibility

**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 Safety Limit

## 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)

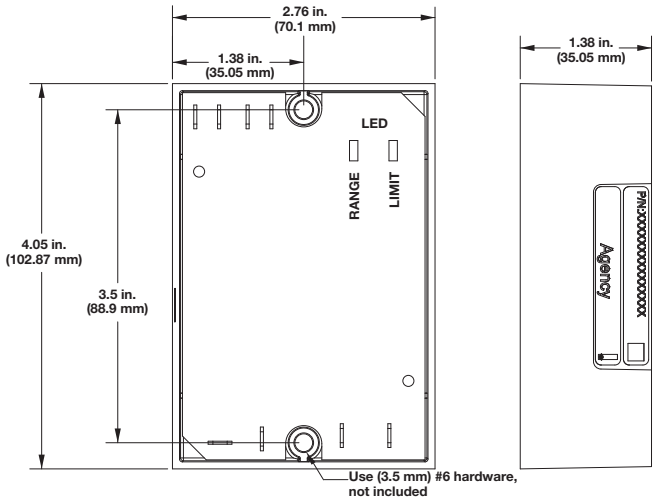
### Power

- 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 |

# Power Switching Devices



| Product | Maximum Output | Output Firing | Phase Configurations | Agency Approvals | Page |
|---|---|---|---|---|---|
| **ASPYRE®** | 700A | Zero Cross, Phase Angle, Half Cycle, Single Cycle, Delayed Triggering | 1 or 3 | C-UL®, CE, SCCR, RoHS, W.E.E.E. | 295 |
| **EZ-ZONE® ST** | 75A | Zero Cross, Phase Angle | 1 | UL®, CSA, CE, SCCR, RoHS, W.E.E.E. | 302 |
| **DIN-A-MITE® A** | 25A | Zero Cross | 1 | UL®, C-UL®, CE, SCCR, RoHS | 303 |
| **DIN-A-MITE B** | 40A | Zero Cross | 1 | UL®, C-UL®, CE, SCCR, RoHS | 306 |
| **DIN-A-MITE C** | 80A | Zero Cross, Phase Angle | 1 or 3 | UL®, C-UL®, CE, SCCR, RoHS | 309 |
| **DIN-A-MITE D** | 100A | Zero Cross | 1 | UL®, C-UL®, CE, SCCR, RoHS | 315 |
| **POWER SERIES™** | 250A | Zero Cross, Phase Angle | 1 or 3 | UL®, C-UL®, CE, SCCR | 318 |
| **E-SAFE® II** | 35A | Zero Cross | 1, 2 or 3 | UL®, C-UL®, CE, RoHS, W.E.E.E. | 323 |
| **SERIES CZR** | 42A | Zero Cross | 1 | UL®, CSA, CE, RoHS | 326 |
| **Solid State Relays (SSR)** | 75A | Zero Cross | 1 | UL®, CSA, RoHS | 329 |

**Note:** The specifications in the table above are best available values in each category. Not all combinations of these values are available in a single model number.

## Comparison Guide

| Initial Cost | 3 Year Cost① | Control Life | Heater Life | EMI Generation | Control | Response Rate | Options | Comments |
|---|---|---|---|---|---|---|---|---|
| **Electromechanical Relay and Contactor** | | | | | | | | |
| Low for low current | Highest | Limited electrical and mechanical | Shortest | Yes, coil and contacts | Poor | Slowest | None | To extend life the cycle time is normally extended to 30 seconds or more. |
| **Hybrid Power Switch** | | | | | | | | |
| Low | Medium | High | Good | Minimal | Good | Fast | None | Such as Watlow E-SAFE II and NO ARC relays. |
| **Mercury Displacement Relay (MDR)** | | | | | | | | |
| Low for low to medium current | Medium | High | Good | Yes, coil and contact | Fair to good | Medium to fast | None | Mercury is not desirable. Minimum cycle time is two seconds. Position sensitive. |
| **Solid State Relay (SSR) Fixed Time Base** | | | | | | | | |
| Medium | Medium | Extended | Extended | Minimal | Good | Fast | None | Excellent control with one second cycle time. Requires heatsink. |
| **Silicon Controlled Rectifier (SCR) Fixed Time Base** | | | | | | | | |
| Medium | Low | Extended | Extended | Minimal | Good | Fast | None | Excellent control with one second cycle time. |
| **SCR Burst Firing** | | | | | | | | |
| High | Low | Extended | Longest | Minimal | Excellent | Fastest | None | Fastest variable time base unit. |
| **SCR Phase-Angle Firing** | | | | | | | | |
| High | Low | Extended | Longest | High | Excellent | Fastest | Current limit | Required for tungsten elements, transformers, or for current limiting. |
| **Saturable Core Reactor** | | | | | | | | |
| Highest | Low | Extended | Longest | Minimal | Very good | Fast | Current limit | Cannot be turned full on or off, inefficient. |

① Includes heater replacement and lost production.

## ASPYRE®

Watlow's ASPYRE® power controller family is flexible and scalable, and available with a variety of options allowing one platform to be re-used across a wide range of applications, which can help save time and money. ASPYRE models available include sizes from 35 to 700 amps.

This power controller family features multiple advanced microprocessor-based firing and control mode algorithms. Combined with diagnostics and several communications options the product enables equipment and factory automation.

Controller firing modes include zero cross, burst firing, single cycle, delayed triggering and phase angle. These smart algorithms enable the product to easily control a wide base of heater loads including nichrome, moly, silicon carbide, tungsten quartz and infrared lamps and transformer-coupled loads.

ASPYRE offers a comprehensive list of modular options that deliver space and labor savings including controlled legs (1, 2 or 3), semiconductor fusing, load current measurement, amperage size and user interface.

### Features and Benefits

**Heater bakeout**
- Protects heater on start up
- Eliminates labor and time associated with checking for wet heaters

**Integrated semiconductor fusing, current transformer and user interface**
- Saves installation time and eases setup and commissioning
- Delivers a user-friendly, intuitive interface

**Industry-leading design and serviceability**
- Offers a robust SCR design to meet a rugged industrial environment's high quality and reliability needs
- Provides quick and easy access to maintain and service fuses and individual legs in minimal time
- Enables fast troubleshooting by providing helpful thermal system diagnostics

**Comprehensive power controller range**
- Provides wide range of options from simple single-phase to complex three-phase loads to 690V

**100KA short circuit current rating (SCCR)**
- Enables greater protection in the event of a short circuit


**c-UL® 508 Listed**
- Shortens project schedules, agency testing and expenses

**Control modes: contactor, voltage, current or power**
- Satisfies a wide range of demanding thermal applications

**Load firing modes: zero-cross, burst fire, phase angle, soft start, half-cycle, single-cycle, delayed triggering**
- Handles a wide range of load types including nichrome, medium and long waveform infrared lamps, moly (Kanthal® Super), transformers, silicon carbide, UV lamps and tungsten
- Protects and extends the life of connected loads

**Wide range of communication protocols**
- Enable factory and process automation with connectivity access to process and equipment data using Modbus® RTU, Modbus® TCP, EtherNet/IP™, Wi-Fi, Profibus, Profinet, USB device (configuration and data file transfers)

**Open heater and shorted SCR indication**
- Minimizes production downtime with easy to understand, intelligent, troubleshooting diagnostics

**Integrated USB and user interface for configuration**
- Easily and safely program configuration settings as the user interface can be powered through USB connection
- Eliminates a user from having to work in a high voltage hazard environment. High voltage to controller or system panel can be turned off while setting controller configuration

# ASPYRE

## Typical Applications

- Furnaces and ovens
- Autoclaves
- Kilns
- Heat treatment
- Glass industry
- Semiconductor
- Power generation
- Oil and gas
- HVAC
- Textiles
- Plastics
- Packaging
- Petrochemical
- Dryers and curing

## Specifications

**Power Bases**

- Single-phase, 1 controlled leg (2 SCRs)
- Three-phase, 2 controlled legs (4 SCRs)
- Three-phase, 3 controlled legs (6 SCRs)

**Load Amp Range**

- 35A to 700A @ 40°C ambient
- Amperage derating curve for other ambient temperatures

**SCR and Amperage Rating**

- Latching current 1A min.
- Power dissipation: approximate 1.25 to 1.5 watts per amp per controlled leg
- Leakage current: 15mA
- SCCR rating 100,000A up to 600VAC

**Line and Load Voltage Range**

- 24 to 480V
- 24 to 600V
- 24 to 690V
  Voltages -/+ 10% min./max.
  690VAC only available for 60A and greater models
- Isolation voltage 2500V

**Voltage frequency**

- 50 to 60Hz
- Automatically compensates for 47 to 70Hz

**Controller Operating Supply Voltage**

| Nominal Line Voltage (VAC) RMS | Max. Operating Range |
|---|---|
| 100/120VAC | 90 to 135VAC |
| 200/208/220/230/240VAC | 180 to 265VAC |
| 277VAC | 249 to 305VAC |
| 380/400/415/440/480VAC | 342 to 528VAC |
| 600VAC | 540 to 660VAC |
| 690VAC | 621 to 759VAC |

**Control Modes and Load Types**

- Voltage, voltage squared, current, current squared, power, open loop and external
  - All control modes available with any firing type combination
  - Normal resistive loads: nichrome, infrared lamps; medium and long waveform
  - Others: Moly (Kanthal® Super), transformers, silicon carbide, UV lamps, tungsten

**Digital Inputs 1 and 2**

- ON >=4VDC, OFF <= 1VDC
- 4-30VDC @ 5mA max.
- Digital input functions: enable, change to V feedback, local/remote set point enable, change firing between phase angle and default firing mode, ref 1 / 2 selection, log enable, bakeout enable
- A switched VDC control output can be connected to the digital input as an open loop control mode command signal

**Output Control Firing Types**

- Zero crossing
- Single cycle
- Burst firing with delayed triggering, safety ramp and peak current limit options
- Burst firing with soft start option (phase angle soft start switching over to burst firing)
- Phase angle with soft start option
  - 1-phase models will include phase angle firing
  - 2-phase models are not available with phase angle firing
  - 3-phase models from 60 to 500 amps will include phase angle firing
  - 3-phase models from 35 to 40 amp are not available with phase angle firing
  - All models capable of phase angle firing can include Current Limiting and Heater Bake out functions
  - Heater Bakeout and current limit functions require the Current Limit Loop option
  - Current Limit Loop can be ordered as an option in digit 10 of the part number
  - If a model does not have phase angle firing it cannot do Current Limiting, Heater Bakeout, Start Ramp, Safety Ramp or Delayed Triggering
- Half cycle with start ramp and peak current limit options

**Electromechanical Relay Output**

- Form C, 30VDC max. at 1A resistive load or 0.5A at 125VAC, 6000 cycles at 30VDC, 100,000 cycles at 120VAC

**Relay Functions**

- Alarm output options for heater open break, SCR short or current limit, heat sink/ambient over-temperature

**DC Power Supply for Digital Inputs and Potentiometer remote set point input**

- 10VDC @ 10mA max.

## ASPYRE

| Firing Type Combinations Available | 1 Phase, 1 Controlled Leg | 3 Phase, 2 Controlled Legs | 3 Phase, 3 Controlled Legs |
|---|---|---|---|
| Zero Crossing | X | X | X |
| Zero Crossing + Start Ramp | X | | X |
| Zero Crossing + Start Ramp + Soft Start | X | | X |
| Zero Crossing + Soft Start | X | X | X |
| Burst Firing | X | X | X |
| Burst Firing + Soft Start | X | X | X |
| Burst Firing + Start Ramp | X | | X |
| Burst Firing + Start Ramp + Soft Start | X | | X |
| Single Cycle | X | | |
| Single Cycle + Soft Start | X | | |
| Phase Angle | X | | X |
| Phase Angle + Soft Start | X | | X |
| Half Cycle | X | | |
| Half Cycle + Soft Start | X | | |
| Burst Firing + Delayed Triggering + Soft Start | X | | X |
| Burst Firing + Delayed Triggering | X | | X |
| Burst Firing + Delayed Triggering + Safety Ramp | X | | X |
| Burst Firing + Delayed Triggering + Safety Ramp + Soft Start | X | | X |
| Half Cycle + Safety Ramp | X | | |
| Half Cycle + Safety Ramp + Peak Current Limit | X | | |

**Analog Inputs 1 and 2**
- Voltage
  - 0-10VDC
  - 15KΩ impedance
- Current
  - 4-20mA, 0-20mADC
  - 100Ω impedance
- Potentiometer
  - 10KΩ min.

**Analog Output 1**
- 0 to 20mA or 4 to 20mA into 500Ω max. load with 50µA nominal resolution
- 0 to 10VDC into a 500Ω min. load with 50mV nominal resolution

**Analog Output Functions**
- Retransmit: Load voltage, current, power or measured input

(**Note:** If using both Analog Retransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1-5) an external power supply will be required. Watlow power supply part number: 0847-0299-0000 Descriptions: AC/DC power supply converter for 90-263VAC to 24VDC, 1.30A, 31W.)

**Fusing**
- Integrated semiconductor fuse
- Refer to amperage chart for $I^2T$ fuse values

**Diagnostics Annunciation Messages**
- Heater break (open), SCR short circuit (closed), current limit, thermal switch, SD card error, comms watchdog error, bakeout in process, aux. voltage too low or high, voltage line loss

**Operator Interface**
- 0.96 in. white OLED display with 128 x 64 pixel resolution
- L/R, F UP and DOWN arrow keys
- 4 discrete LED indicators for local/remote mode, enable, communications and alarm

**Connectivity**
- EIA 485, Modbus® RTU
- Modbus® TCP Ethernet
- EtherNet/IP™
- Wi-Fi
- USB 2.0 device connection
- PROFIBUS DP
- PROFINET

(**Note:** If using both Analog Retransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1-5) an external power supply will be required. Watlow power supply part number: 0847-0299-0000 Descriptions: AC/DC power supply converter for 90-263VAC to 24VDC, 1.30A, 31W.)

**Configuration**
- PC software tool and RS485, USB port, or on-board keypad and LED display

**Integrated Data Logging**
- Storage: 16 GB SD memory card
- .CSV file type
- User programmable logging intervals 1 to 255 seconds
- Up to 10 parameters selectable by user: line frequency, output voltage (RMS), output current (RMS), output power (average), status, commands, set point, current limit set point (RMS), load resistance, input voltage (RMS)

**Real Time Clock and Battery Back-up**
- Typical battery life: 5 years at 77°F (25°C)
- CR2032 field replaceable battery

**Cooling mode**
- Forced air (fan)
- 24VDC, 120 or 240VAC, 17 watts per fan used

**Control Terminals**
- Terminals are touch safe, removable, 12 to 22 AWG

**Line and Load Terminals**
- Compatible with crimp lug terminals or busbar
- Refer to user manual for wire size, compression and torque requirements

# ASPYRE

### Mounting
- Panel mounting with screws
- Must be mounted with heat sink fins in vertical orientation

### Environment
- 0 to 40°C without derating
- 5 to 90% RH (relative humidity), non-condensing
- Up to 2000 meters above sea level max.
- Over 1000 meters of altitude reduce the nominal current by 2% for each 100 meters
- Storage temperature -25 to 70°C max.

### Agency Approval and Regulatory
- cULus 508 Listed File E73741
- cUL® Listed to C22.2 No. 14
- CE EMC Directive 2014-30-EU, EN 60947-4-3 Class A Emissions
- CE Safety Directive 2014-35-EU, EN 60947-4-1, -4-3
- IP20 with all covers in place
- RoHS 2011-65-EU
- W.E.E.E 2012-19-EU
- 690VAC units not covered by UL®

### Accessories
- Free Watlow ASPYRE configuration software on the Watlow website at http://www.watlow.com/en/resources-and-support/Technical-Library/Software-and-Demos
- 6 ft USB 2.0 to micro USB device cable 0219-0480-0000
- Fuses - see table in next column

### Fuses

| ASPYRE Model Number | Qty. Used Per Unit | Fuse Part Number | | |
|---|---|---|---|---|
| | | Watlow | Cooper Bussmann® | Siba |
| **DT_ _ _ - 035 ...** | 1 to 3* | 17-8050 | FWP-50A14Fa | |
| **DT_ _ _ - 040 ...** | | | | |
| **DT_ _ _ - 060 ...** | | 0808-0363-0160 | | 20 559 20.160 |
| **DT_ _ _ - 090 ...** | | | | |
| **DT_ _ _ - 120 ...** | | 0808-0363-0180 | | 20 559 20.180 |
| **DT_ _ _ - 150 ...** | | 0808-0363-0200 | | 20 559 20.200 |
| **DT_ _ _ - 180 ...** | | 0808-0363-0250 | | 20 559 20.250 |
| **DT_ _ _ - 210 ...** | | 0808-0363-0315 | | 20 559 20.315 |
| **DT1_ _ - 300 ...** | 1 | 0808-0362-0000 | 350FM | |
| **DT1_ _ - 400 ...** | 1 | 0808-0358-0000 | 550FMM | |
| **DT1_ _ - 500 ...** | 1 | 0808-0359-0000 | 700FMM | |
| **DT1_ _ - 600 ...** | 4 | 0808-0363-0250 | | 20 559 20.250 |
| **DT1_ _ - 700 ...** | 4 | | | |
| **DT2_ _ - 300 ...** | 3 | 0808-0357-0000 | 450FMM | |
| **DT2_ _ - 400 ...** | 3 | 0808-0358-0000 | 550FMM | |
| **DT2_ _ - 450 ...** | 6 | 0808-0360-0000 | 315FM | |
| **DT2_ _ - 500 ...** | 6 | | | |
| **DT2_ _ - 600 ...** | 4 | 0808-0357-0000 | 450FMM | |
| **DT2_ _ - 700 ...** | 4 | | | |
| **DT3_ _ - 300 ...** | 3 | | | |
| **DT3_ _ - 350 ...** | 3 | 0808-0358-0000 | 550FMM | |
| **DT3_ _ - 400 ...** | 3 | | | |
| **DT3_ _ - 450 ...** | 3 | 0808-0359-0000 | 700FMM | |
| **DT3_ _ - 500 ...** | 3 | | | |

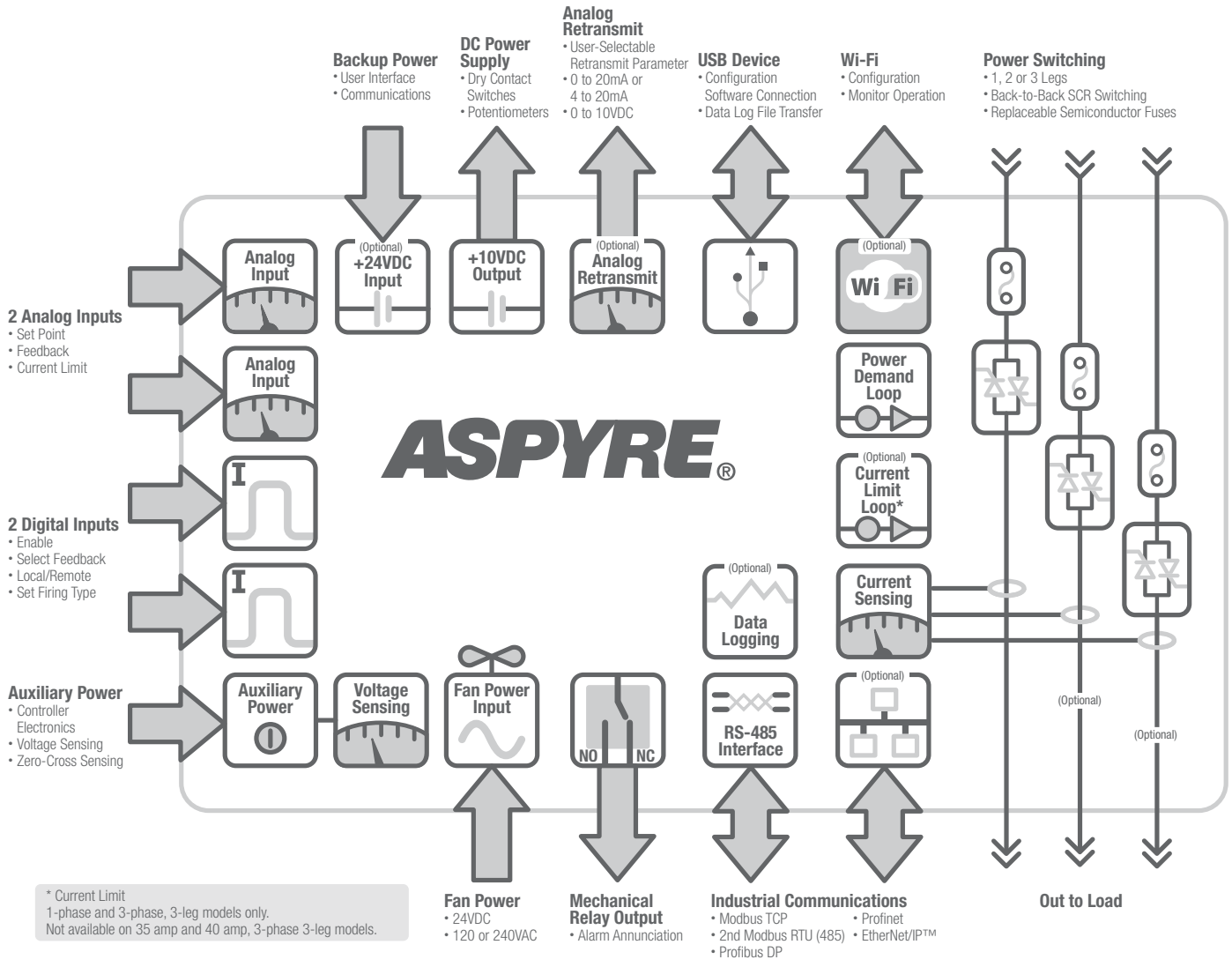
* One fuse per switched leg.

## Amperage Rating Chart

| Number of Controlled Legs | Current (A) | Repetitive Peak Reverse Voltage (Uimp) (480V) | (600V) | Maximum Peak One Cycle (10msec.) (A) | Fuse $I^2T$ Value Suggested $A^2s$ (at 500V) tp = 10msec |
|---|---|---|---|---|---|
| 1, 2 or 3 | 35 | 1200 | 1600 | 540 | 1260 |
| 1, 2 or 3 | 40 | 1200 | 1600 | 700 | 1260 |
| 1, 2 or 3 | 60 | 1200 | 1600 | 1900 | 10780 |
| 1, 2 or 3 | 90 | 1200 | 1600 | 1900 | 10780 |
| 1, 2 or 3 | 120 | 1200 | 1600 | 1900 | 14280 |
| 1, 2 or 3 | 150 | 1200 | 1600 | 5000 | 17500 |
| 1, 2 or 3 | 180 | 1200 | 1600 | 5000 | 30800 |
| 1, 2 or 3 | 210 | 1200 | 1600 | 5000 | 53900 |
| 1 or 2 | 300 | 1200 | 1600 | 7800 | 73500 |
| 3 | 300 | 1200 | 1600 | 5250 | 73500 |
| 3 | 350 | 1200 | 1600 | 7800 | 150500 |
| 1 | 400 | 1200 | 1600 | 7800 | 150500 |
| 2 | 400 | 1200 | 1600 | 7800 | 149000 |
| 3 | 400 | 1200 | 1600 | 8000 | 150500 |
| 2 | 450 | 1200 | 1600 | 7800 | 215600 |
| 3 | 450 | 1200 | 1600 | 17800 | 294000 |
| 1 or 3 | 500 | 1200 | 1600 | 17800 | 294000 |
| 2 | 500 | 1200 | 1600 | 8000 | 215600 |
| 1 | 600 | 1200 | 1600 | 17800 | 246400 |
| 2 | 600 | 1200 | 1600 | 17800 | 294000 |
| 1 | 700 | 1200 | 1600 | 17800 | 246400 |
| 2 | 700 | 1200 | 1600 | 17800 | 294000 |

# ASPYRE

## I/O Functional Block Diagram



# ASPYRE

## Dimensions and Shipping Weight

| Current and Voltages | 1-Phase, 1 Controlled Leg | 3-Phase, 2 Controlled Legs | 3-Phase, 3 Controlled Legs |
|---|---|---|---|
| **35 and 40A**<br>**480 and 600VAC** |  <br>4.77 in. H x 2.84 in. W x 7.28 in. D - 2.6 lbs |  <br>4.77 in. H x 4.25 in. W x 7.28 in. D - 4 lbs |  <br>4.77 in. H x 5.67 in. W x 7.28 in. D - 5.5 lbs |
| **60, 90, 120, 150, 180 and 210A**<br>**480 and 600VAC** |  <br>10.6 in. (60A) or 10.79 in. (90-210A) H x 3.66 in. W x 6.7 in. D - 9 lbs |  <br>10.6 in. (60A) or 10.79 in. (90-210A) H x 7.36 in. W x 6.7 in. D - 18 lbs |  <br>10.6 in. (60A) or 10.79 in. (90-210A) H x 11.1 in. W x 6.7 in. D - 27 lbs |
| **60, 90, 120, 150, 180 and 210A**<br>**690VAC** |  <br>17.33 in. H x 5.40 in. W x 10.63 in. D - 23 lbs |  <br>60-90A = 17.33 in. H x 5.40 in. W x 10.63 in. D - 23 lbs<br>120-210A = 17.33 in H x 10.32 in. W x 10.63 in. D - 40 lbs | |
| **1 and 2 leg:**<br>**300, 400, 500, 600 and 700A**<br><br>**3 leg:**<br>**300, 350, 400, 450 and 500A**<br>**480, 600 and 690VAC** |  <br>20.47 in. H x 5.4 in. W x 10.63 in. D - 33 lbs |  <br>20.47 in. H x 10.32 in. W x 10.63 in. D - 63 lbs | |

# ASPYRE

## Ordering Information

**Base model includes: -** power control loop for open loop, voltage, current or power control, two analog inputs (0-10VDC, 4-20mA selectable), two digital inputs, semiconductor fusing and current transformers for each leg, mechanical relay heater break alarm, RS-485 Modbus® communications, pixel OLED user interface and keypad, 10VDC auxiliary power supply

**Part Number**

| ①② Model | ③ Phase | ④⑤ Max. Line & Load Voltage | | ⑥⑦⑧ Amperage | ⑨ Nominal Voltage Supplied to SCR | ⑩ Additional Options | | ⑪ Cooling Fan Voltage | ⑫ Add'l Wired Comms. | ⑬ Wireless Comm. & Data Logging | ⑭⑮ Custom Options- Firmware Overlay, Preset Parameters and Locked Code |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DT | | | - | | | | - | | | | |

| ③ | Phase |
|---|---|
| 1 = | 1-phase, 1 controlled leg |
| 2 = | 3-phase, 2 controlled leg |
| 3 = | 3-phase, 3 controlled leg |

| ④⑤ | Maximum Line and Load Voltage |
|---|---|
| 48= | 480VAC |
| 60= | 600VAC |
| 69= | 690VAC - Only available for 60A and greater models |

| ⑥⑦⑧ | Amperage |
|---|---|
| 035 = | 35A |
| 040 = | 40A |
| 060 = | 60A |
| 090 = | 90A |
| 120 = | 120A |
| 150 = | 150A |
| 180 = | 180A |
| 210 = | 210A |
| 300 = | 300A |
| 350 = | 350A - Not available for 1-phase, 1 leg or 3-phase, 2 leg models |
| 400 = | 400A |
| 450 = | 450A - Not available for 1-phase, 1 leg models |
| 500 = | 500A |
| 600 = | 600A - Not available for 3-phase, 3 controlled leg models |
| 700 = | 700A - Not available for 3-phase, 3 controlled leg models |

| ⑨ | Nominal Voltage Supplied to SCR | |
|---|---|---|
| | Nominal | Maximum Operating Range |
| 1 = | 100 or 120VAC | 90-135V |
| 2 = | 200, 208, 220, 230 or 240VAC | 180-265V |
| 3 = | 277VAC | 249-305V |
| 4 = | 380, 400, 415, 440 or 480VAC | 342-528V |
| 5 = | 600VAC | 540-660V |
| 6 = | 690VAC* | 621-759V |

*690VAC only available for 60A and greater models.

| ⑩ | Additional Options | |
|---|---|---|
| | Current Limit Loop | Analog Retransmit Output 1 |
| A = | Yes | Yes |
| B = | No | No |
| C = | Yes | No |
| D = | No | Yes |

**Note 1:** Current limit loop only available with 1-phase and 3-phase, 3-leg models (DT**1** and DT**3**). Exception: Current limit not available with the 35A and 40A, 3-phase, 3-leg models (DT**3**xx-**035**xx-xxxxx and DT**3**xx-**040**xx-xxxxx).
**Note 2:** If using both Analog Retransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1-5) an external power supply will be required. Watlow power supply part number: 0847-0299-0000. Descriptions: AC/DC power supply converter for 90-263VAC to 24VDC, 1.30A, 31W.

| ⑪ | Cooling Fan Voltage |
|---|---|
| 0 = | No fan - option only valid for models ≤60A |
| 1 = | 120VAC* |
| 2 = | 240VAC* |
| 3 = | 24VDC* |

*Fan voltage required on models ≥90A, not valid option for models ≤60A.

| ⑫ | Additional Wired Communication (Modbus® RTU-485 Comes Standard in all Models) | | | | | |
|---|---|---|---|---|---|---|
| | No Add'l Comms. | Modbus® TCP | 2nd Mobus® RTU 485 | Profibus DP | Profinet | EtherNet/ IP™ |
| 0 = | X | | | | | |
| 1 = | | X | | | | |
| 2 = | | | X | | | |
| 3 = | | | | X | | |
| 4 = | | | | | X | |
| 5 = | | | | | | X |

**Note 1:** All additional communication options include auxiliary 24VDC backup power supply for communications.
**Note 2:** If using both Analog Retransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1-5) an external power supply will be required. Watlow power supply part number: 0847-0299-0000. Descriptions: AC/DC power supply converter for 90-263VAC to 24VDC, 1.30A, 31W.

| ⑬ | Wireless Communications & Data Logging | |
|---|---|---|
| | Wi-Fi | *Data Logging With Battery Back-Up and Real Time Clock |
| A = | | |
| B = | X | |
| C = | | X |
| D = | X | X |

*40A and lower models do not include battery back-up or real time clock.

| ⑭⑮ Custom Options - Firmware Overlay, Preset Parameters and Locked Code | |
|---|---|
| AA= | Standard with user manual documentation |
| AB= | Standard without user manual documentation |
| RC= | Replacement connector hardware only - for configuration entered above |
| XX= | Contact factory - custom firmware, preset parameters, locked code |

## EZ-ZONE® ST

The EZ-ZONE® ST integrated solid state controller from Watlow®, offers a complete thermal system control solution in a single package. Features include a PID temperature controller connected to a high-amperage solid state relay with the option of adding a properly sized heat sink, an over- and under-temperature limit, a power shut-down contactor and digital communications in one complete and professionally engineered product.

Because the system is modular and scalable, a user only pays for what is needed. Stacking the EZ-ZONE ST integrated controller into multiple configurations enables flexibility to standardize the product platform to solve a wide range of application needs.

This integrated controller also includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.

### Features and Benefits

**Back panel or DIN-rail mount**
- Provides several mounting options

**Compact package**
- Reduces panel size

**Touch-safe package**
- Complies with IP2X increasing user safety

**±0.1 percent temperature accuracy**
- Provides efficient and accurate temperature control

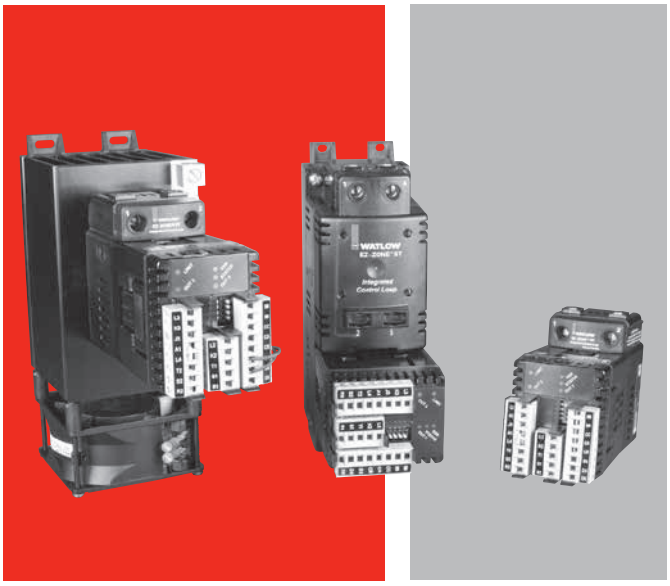
**200KA SCCR with proper fusing**
- Minimizes damage in the event of a short circuit

**Agency approvals: UL®, CSA, CE, RoHS, W.E.E.E.**
- Meets applications requiring agency approvals

**Three-year warranty**
- Ensures Watlow's reliability and product support

**Off-the-shelf designed system solution**
- Improves system reliability and termination reduction
- Reduces installation cost
- Eliminates incompatibility headaches often encountered with using many different components and brands

**Profile capability**
- Includes ramp and soak with four files and 40 total steps



**Ability to communicate with programmable logic controller (PLC), personal computer (PC) or operator interface terminal (OIT)**
- Optional EIA-485 Modbus® RTU
- RUI/communications gateway with optional EIA-232/485 Modbus® RTU, EtherNet/IP™/TCP Modbus®, DeviceNet™ or PROFIBUS DP. Refer to page 341 for further information.

**Solid state relay output**
- Allows faster cycling, more precise control, increased heater life and improves energy efficiency
- Ability to handle up to 75 amperes
- Uses either zero-cross or phase angle control modes for flexibility to control resistive loads such as Nichrome®, tungsten or quartz lamps
- Utilizes phase angle control mode to prevent load failure or blowing fuses for tungsten or quartz loads

**PID temperature control**
- Allows single input/dual output
- Allows standard PID or adaptive TRU-TUNE+ tuning algorithms for demanding controllability requirements

**Optional temperature limit**
- Increases safety in over- and under-temperature condition

**Optional definite purpose mechanical contactor**
- Enables circuit safety shut down driven by limit control or PID alarm output signal

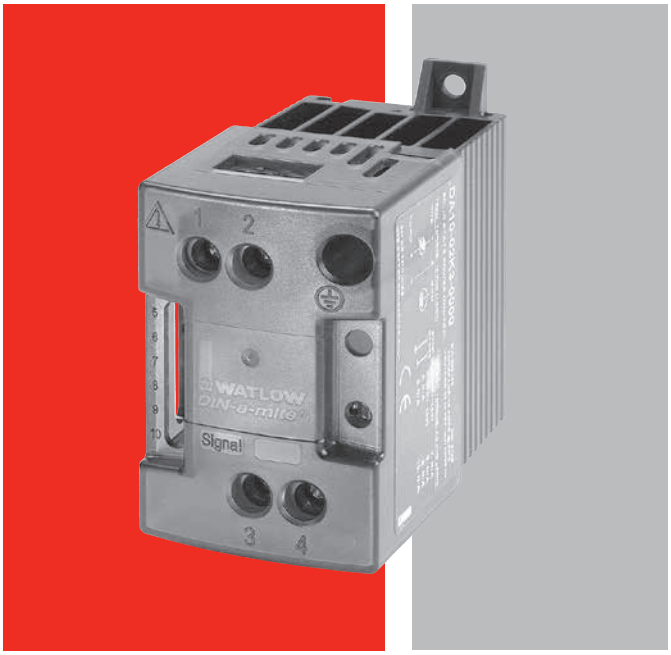
**For detailed product and ordering information, see the full EZ-ZONE ST product section located on pages 222 through 228.**

## DIN-A-MITE® A

The DIN-A-MITE® A power controller provides a low-cost, highly compact and versatile solid state option for controlling electric heat. This controller is designed and manufactured with the quality features expected from Watlow. DIN-rail and panel mounting is standard on every controller. There is no need to worry about mercury, the DIN-A-MITE controller is mercury free.

Features include single-phase zero cross switching up to 25 amperes at 600VAC (see rating curve). A unique integrated design removes the guesswork associated with selecting a proper heat sink and adequate terminations for the application.

Variable time-base, 4-20mA process control and VAC/VDC input contactor versions are available. All options are model number dependent and factory configurable. This power controller also includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.




### Features and Benefits

**200KA SCCR with proper fusing**
- Minimizes damage in the event of a short circuit

**DIN-rail and panel mounting**
- Provides versatility and quick, low-cost installation

**Compact size**
- Reduces panel space and cost

**Touch-safe terminals**
- Increases safety for installer and user

**Mercury free**
- Assures environmental safety

**Faster switching with solid state**
- Saves energy and extends heater life

**UL® 508 listed, C-UL®, RoHS and CE with filter**
- Meets applications requiring agency approval
- Reduces end product documentation cost

**Back-to-back SCR design**
- Ensures a rugged design

# DIN-A-MITE A

## Specifications

### Operator Interface
- Control input
- Input indication LED

### Amperage
- Single-phase, see the output rating curve
- Max. $I^2t$ for fusing: $4000A^2sec$
- Latching current: 400mA max.
- Holding current: 200mA max.
- Power dissipation is 1.2 watts per ampere switched
- 200KA SCCR, Type 1 and 2 approved with the recommended fusing; see user manual

### Line Voltage
- 24 to 660VAC model number dependent; see ordering information
- Off-state leakage: 1mA at 77°F (25°C) max.
- 50/60Hz independent

### Control Mode, Zero Cross
- Control option C: VDC input, contactor output
- Control option K: VAC input, contactor output
- To increase service life on contactor models, the cycle time should be less than three seconds
- Control option F: 4 to 20mA DC input, variable time-base control output (3 cycles on, 3 cycles off at 50% power)

### Control Input
- AC contactor: 24VAC ±10%, 120VAC +10/-25%, 240VAC +10/-25% @ 25mA max.
- DC contactor: 4.5 to 32VDC: max. current @ 4.5VDC is 8mA
- Loop powered linear current 4 to 20mA DC: loop-powered, control option F0 only (requires current source with 6.2VDC available, no more than three DIN-A-MITE inputs can be connected in series)

### Agency Approvals
- CE with proper filter:
  204/108/EC Electromagnetic Compatibility Directive
  EN 61326-1: Industrial Immunity Class A Emissions
  2006/95/EC Low Voltage Directive
  EN 50178 Safety Requirements
  Installation category III, pollution degree 2
- c UL us LISTED UL® 508 listed and C-UL® File E73741
- 2011/65/EU RoHS 2

### Control Input Terminals
- Compression: will accept 24 to 16 AWG (0.2 to 1.5 $mm^2$) wire

### Line and Load Terminals
- Compression: will accept 18 to 8 AWG (0.8 to 8.4 $mm^2$) wire

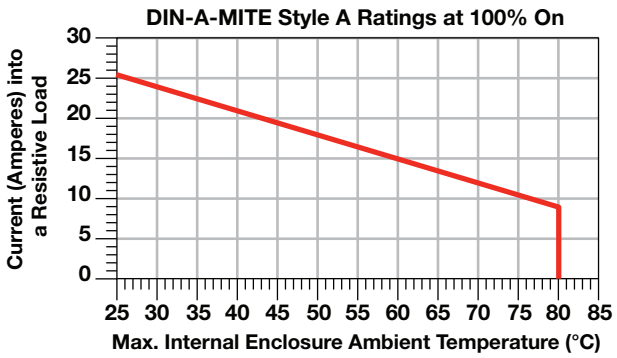
### Operating Environment
- -4 to 176°F (-20 to 80°C); see the output rating curve chart for your application
- 0 to 90% RH (relative humidity), non-condensing
- Insulation tested to 3,000 meters
- Units are suitable for “Pollution degree 2”

### Mounting
Options include DIN-rail or standard back panel mounting
- DIN EN 50022, 35 mm by 7.5 mm
- Mount cooling fins vertically

### Dimensions
- 3.7 in. (94 mm) high x 2.0 in. (50 mm) wide x 3.9 in. (98 mm) deep
- Weight: 0.71 lb (0.32kg)

**Specifications are subject to change without notice.**

## Output Rating Curve



# DIN-A-MITE A

## Ordering Information

**Part Number**

| ① | ② | ③ Phase | ④ Cooling & Current Rating | | ⑤ ⑥ Line & Load Voltage | ⑦ ⑧ Control | | ⑨ | ⑩ User Manual | ⑪ ⑫ Custom Options |
|---|---|---|---|---|---|---|---|---|---|---|
| D | A | 1 | 0 | - | | | - | 0 | | |

| ③ | Phase |
|---|---|
| 1 = | 1-phase, 1 controlled leg |

| ④ | Cooling and Current Rating (See rating curve) |
|---|---|
| 0 = | Natural convection current rating 18A @ 50°C |

| ⑤ ⑥ | Line and Load Voltage |
|---|---|
| 02 = | 24 to 48VAC |
| 24 = | 120 to 240VAC |
| 60 = | 277 to 600VAC |

| ⑦ ⑧ | Control |
|---|---|
| C0 = | 4.5 to 32VDC input, contactor output |
| F0 = | 4 to 20mA DC input, variable time-base output |
| K1 = | 22 to 26VAC input, contactor output |
| K2 = | 100 to 120VAC input, contactor output |
| K3 = | 200 to 240VAC input, contactor output |

| ⑩ | User Manual |
|---|---|
| 0 = | English |
| 1 = | German |
| 2 = | Spanish |
| 3 = | French |

| ⑪ ⑫ | Custom Options |
|---|---|
| 00 = | Standard part |
| XX = | Any letter or number, custom options |

## Recommended Fuses and Fuse Holders

**Semiconductor Fuses and Holders**

| Part Number | Description |
|---|---|
| **17-8025** | 25A fuse |
| **17-5110** | 10-25A holder |

**DFJ Combination Fuses and Holders**

| Part Number | Description |
|---|---|
| **0808-0325-0020** | 20A fuse |
| **0808-0325-0030** | 30A fuse |
| **0808-0326-1530** | 15-30A holder |

## DIN-A-MITE B

The DIN-A-MITE B power controller provides a low-cost, highly compact and versatile solid state option for controlling electric heat. This controller is designed and manufactured with the quality features expected from Watlow. DIN-rail and panel mounting are standard on every control. There is no need to worry about mercury, the DIN-A-MITE controller is mercury free.

Features include single-phase and three-phase zero cross switching up to 40 and 22 amperes, respectively, at 600VAC (see rating curve). A unique, integrated design removes the guesswork associated with selecting a proper heat sink and adequate terminations for the application.

Variable time-base, 4-20mA process control and VAC/VDC input contactor versions are available. A shorted output alarm option is also available. All options are model number dependent and factory configurable. This power controller includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.


### Features and Benefits

**200KA SCCR with proper fusing**
- Minimizes damage in the event of a short circuit

**DIN-rail and panel mounting**
- Provides versatility and quick, low-cost installation

**Compact size**
- Reduces panel space and cost

**Touch-safe terminals**
- Increases safety for installer and user

**Single- and three-phase power**
- Permits use in a variety of applications

**Mercury free**
- Assures environmental safety

**Faster switching with solid state**
- Saves energy and extends heater life

**UL® 508 listed, C-UL®, RoHS and CE with filter**
- Meets applications requiring agency approval
- Reduces end product documentation cost

**Back-to-back SCR design**
- Ensures a rugged design

**Shorted output alarm (optional)**
- Simplifies troubleshooting and reduces downtime

# DIN-A-MITE B

## Specifications

### Operator Interface
- Control input and indication light
- Alarm output and indication light

### Amperage Rating
- See the output rating curve
- Max. surge current for 16.6ms, 380A peak
- Max. $I^2t$ for fusing is 4,000$A^2s$
- Latching current: 400mA max.
- Holding current: 200mA max.
- Off-state leakage 1mA at 77°F (25°C) max.
- Power dissipation = 1.2 watts per ampere per leg switched
- 200KA SCCR, Type 1 and 2 approved with the recommended fusing; see user manual

### Line Voltage
- 24 to 660VAC model number dependent; see ordering information

### Control Mode, Zero Cross
- Control option C: VDC input, contactor output
- Control option K: VAC input, contactor output
- To increase service life on contactor models, the cycle time should be less than three seconds
- Control option F: 4 to 20mA DC input, variable time-base control output

### Control Input
- AC contactor: 24VAC ±10%, 120VAC +10/-25%, 240VAC +10/-25% @ 25mA max. per controlled leg
- DC contactor: 4.5 to 32VDC: max. current @ 4.5VDC is 6mA per leg. Add 2mA per LED used to the total current
- Linear current: 4 to 20mA DC: loop-powered, control option F0 only (requires current source with 6.2VDC available, no more than three DIN-A-MITE inputs connected in series)

### Alarm

#### Shorted SCR Alarm Option
- Alarm state when the input command signal off and a 10A or more load current is detected by the current transformer (two turns required for 5A and three turns for 2.5A)

#### Alarm Output
- Energizes on alarm, non-latching
- Triac 24 to 240VAC, external supply with a current rating of 300mA @ 77°F (25°C), 200mA @ 122°F (50°C), 100mA @ 176°F (80°C) and a holding current of 200 µA with a latching current of 5mA typical

### Agency Approvals
- CE with proper filter:
  204/108/EC Electromagnetic Compatibility Directive
  EN 61326-1: Industrial Immunity Class A Emissions
  2006/95/EC Low Voltage Directive
  EN 50178 Safety Requirements
  Installation category III, pollution degree 2
- c UL us LISTED UL® 508 listed and C-UL® File E73741
- 2011/65/EU RoHS 2

### Control Input Terminals
- Compression: will accept 24 to 16 AWG (0.2 to 1.5 $mm^2$) wire

### Line and Load Terminals
- Compression: will accept 18 to 8 AWG (0.8 to 8.4 $mm^2$) wire

### Operating Environment
- See the output rating curve
- 0 to 90% RH (relative humidity), non-condensing
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Operating temperature: -4 to 176°F (-20 to 80°C)
- Insulation tested to 3,000 meters

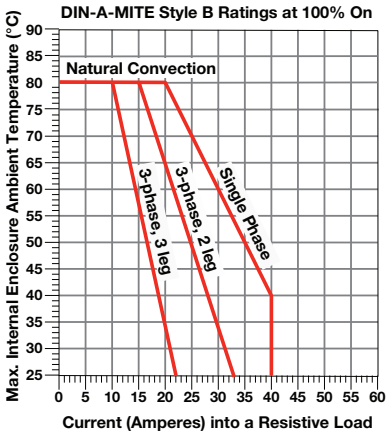
### DIN-rail Mount
- DIN EN 50022, 35 mm by 7.5 mm

### Back-Panel Mount
- Four mounting holes No. 6 to No. 8 (M3 to M4) fastener

### Dimensions
- 3.7 in. (94 mm) high x 3.3 in. (83 mm) wide x 4.9 in. (124 mm) deep
- Weight: 1.5 lb (0.68kg)

**Specifications are subject to change without notice.**

## Output Rating Curve




## Current Rating Table

| Phase | Cooling | Current at 122°F (50°C) |
|---|---|---|
| 1 | 0 | 35A |
| 2, 8 | 0 | 25A |
| 3, 9 | 0 | 17A |

# DIN-A-MITE B

## Ordering Information

**Part Number**

| ① | ② | ③ | ④ | | ⑤ ⑥ | ⑦ ⑧ | | ⑨ | ⑩ | ⑪ ⑫ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Phase | Cooling & Current Rating | - | Line & Load Voltage | Control | - | Alarm | User Manual | Custom Options |
| D | B | | | - | | | - | | | |

| ③ | Phase |
|---|---|
| 1 = | 1-phase, 1 controlled leg |
| 2 = | 3-phase, 2 controlled legs |
| 3 = | 3-phase, 3 controlled legs |
| 8 = | 2 independent zones (control options C or K) |
| 9 = | 3 independent zones (control options C or K) |

| ④ | Cooling and Current Rating (See rating curve) |
|---|---|
| 0 = | Natural convection |

| ⑤ ⑥ | Line and Load Voltage |
|---|---|
| 02 = | 24 to 48VAC |
| 24 = | 120 to 240VAC |
| 60 = | 277 to 600VAC |

| ⑦ ⑧ | Control |
|---|---|
| C0 = | 4.5 to 32VDC input, contactor output |
| F0 = | 4 to 20mA DC input, variable time-base output |
| K1 = | 22 to 26VAC input, contactor output |
| K2 = | 100 to 120VAC input, contactor output |
| K3 = | 200 to 240VAC input, contactor output |

| ⑨ | Alarm |
|---|---|
| 0 = | No alarm |
| S = | Shorted SCR alarm |

| ⑩ | User Manual |
|---|---|
| 0 = | English |
| 1 = | German |
| 2 = | Spanish |
| 3 = | French |

| ⑪ ⑫ | Custom Options |
|---|---|
| 00 = | Standard part |
| XX = | Any letter or number, custom options |

## Recommended DIN-rail Mount Fuses and Fuse Holders

### Semiconductor Fuses and Holders

| Part Number | Description |
|---|---|
| **17-8020** | 20A fuse |
| **17-8025** | 25A fuse |
| **17-8030** | 32A fuse |
| **17-8040** | 40A fuse |
| **17-8050** | 50A fuse |
| **17-5110** | 10-25A holder |
| **17-5114** | 32-50A holder |

### DFJ Combination Fuses and Holders

| Part Number | Description |
|---|---|
| **0808-0325-0020** | 20A fuse |
| **0808-0325-0030** | 30A fuse |
| **0808-0325-0040** | 40A fuse |
| **0808-0325-0050** | 50A fuse |
| **0808-0326-1530** | 15-30A holder |
| **0808-0326-3560** | 35-60A holder |

## DIN-A-MITE C

The DIN-A-MITE C silicon controlled rectifier (SCR) power controller provides a low cost, compact and versatile solid state option for controlling electric heat. This controller is designed and manufactured with the quality features expected from Watlow. DIN-rail/panel mount and through-wall mount versions are available.

Features include single-phase, three-phase/two leg, and three-phase/three leg, 24-600VAC operation. Current switching capabilities range from 30 to 80A depending on the model ordered.

Variable time-base, linear voltage and current process control or VAC/VDC input contactor versions are available. Single-phase, phase angle firing and current limiting are also available. All options are model number dependent and factory configurable. This power controller includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.


### Features and Benefits

**200KA SCCR with proper fusing**
- Minimizes damage in the event of a short circuit

**DIN-rail, panel and thru-wall mounting**
- Provides versatility and quick, low-cost installation

**Compact size**
- Reduces panel space and cost

**Touch-safe terminals**
- Increases safety for installer and user

**One- and three-phase power**
- Can be used in a variety of applications

**Open heater/shorted output alarm**
- Notifies the user in case of an open heater or shorted output

**Mercury free**
- Assures environmental safety

**Faster switching with solid state**
- Saves energy and extends heater life

**UL® 508 listed, C-UL®, RoHS and CE with filter**
- Meets applications requiring agency approval
- Reduces end product documentation cost

**System solution component**
- Provides single source thermal loop

**Back-to-back SCR design**
- Ensures a rugged design

# DIN-A-MITE C

## Specifications

### Operator Interface

- Control input and indication light
- Alarm output and indication light
- Current limit indication LED

### Amperage Rating

- See output rating curves on the next page
- Max. surge current for 16.6ms, 1,350A peak
- Max. $I^2t$ for fusing is 9100$A^2s$
- Latching current: 500mA max.
- Holding current: 200mA max.
- Fan current: 0.14A for 24VDC; 0.12A for 120VAC; 0.06A for 240VAC
- Off-state leakage 1mA at 77°F (25°C) max.
- Power dissipation: 1.2 watts per ampere per leg switched
- 200KA SCCR, Type 1 and 2 approved with the recommended fusing; see user manual

### Line Voltage

- 24 to 48VAC units: 20.4VAC min. to 53VAC max.
- 100 to 240VAC units: 48VAC min. to 265VAC max.
- 277 to 600VAC units: 85VAC min. to 660VAC max.
- 100 to 120VAC, 200 to 208VAC, 230 to 240VAC, 277VAC, 400VAC, 480VAC, 600VAC, +10/-15%, 50 to 60Hz independent ±5% (control options L, P and S)

### Alarms (Zero Cross Models Only)

#### Shorted SCR Alarm Option

- Alarm state when the input command signal is off and a 10A or more load current is detected by the current transformer (two turns required for 5A and three turns for 2.5A)

#### Open Heater Alarm Option (Control Option S Only)

- Alarm state when the input command signal is on and the load current detected by the current transformer is 20% less than customer adjusted set point

#### Alarm Output

- Energizes on alarm, non-latching
- Triac 24 to 240VAC, external supply with a current rating of 300mA @ 77°F (25°C), 200mA @ 122°F (50°C), 100mA @ 176°F (80°C) and a holding current of 200µA with a latching current of 5mA typical

### Agency Approvals

- CE with proper filter:
  204/108/EC electromagnetic compatibility directive
  EN 61326-1: industrial immunity Class A emissions not suitable for Class B environments
  Phase angle and phase angle with current limit (control options P and L) are not CE approved for conducted or radiated emissions
  2006/95/EC low voltage directive EN 50178 safety requirements installation category III, pollution degree 2
- UL® 50 Type 4X enclosure, Class 1, Div. 2 per ANSI/ISA 12.12.01. Through-wall heat sink models T4 File 184390
- c UL us LISTED UL® 508 listed and C-UL® File E73741
- Shock and vibration tested to IEC 60068-2-32
- Vibration tested to IEC 60068-2-6
- 2011/65/EU RoHS 2

### Control Input Terminals

- Compression: will accept 24 to 16 AWG (0.2 to 1.5 $mm^2$) wire
- Torque to 4.4 in. lb (0.5 Nm) max. with a 1/8 in. (3.5 mm) blade screwdriver

### Line and Load Terminals

- Compression: will accept 14 to 3 AWG (2.5 to 25 $mm^2$) wire
- Torque to 24 in. lb (2.7 Nm) max. with a 1/4 in. (6.4 mm) blade screwdriver, or a type 1A, #2 Pozi driver

### Operating Environment

- See the output rating curve chart on next page
- 0 to 90% RH (relative humidity), non-condensing
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Operating temperature: -29 to 176°F (-34 to 80°C)
- Insulation tested to 3,000 meters

### DIN-Rail Mount

- DIN EN 50022, 35 mm by 7.5 mm

### Back-Panel Mount

- Four mounting holes No. 6 to No. 8 (M3 to M4) fastener

### Through-Wall Mount

- See page 312 for through-wall panel cutout (**Note:** Mount cooling fins vertically.)

## Additional Specifications for Contactors and Proportional Controllers

### Control Mode, Zero-Cross

- Control option C: VDC input, contactor output
- Control option K: VAC input, contactor output
- To increase service life on contactor models, the cycle time should be less than three seconds
- Control option F: 4 to 20mA DC input, variable time-base control output

# DIN-A-MITE C

## Specifications *(Continued)*

### Control Input

- AC contactor: 24VAC ±10%, 120VAC +10/-25%, 240VAC +10/-25% @ 25mA max. per controlled leg
- DC contactor: 4.5 to 32VDC: max. current @ 4.5VDC is 6mA per leg, add 2mA per LED used to the total current
- Loop-powered linear current 4 to 20mA DC: loop-powered, control option F0 only, no more than three inputs connected in series

## Additional Specifications for Phase Angle, Phase Angle Current Limit and Single-Cycle Variable Time-Base

### Operation

- With control option S (single-cycle, variable time-base) the output is not on for more than one consecutive AC cycle below 50% power and not off for more than one consecutive AC cycle above 50% power
- Phase angle control, single-phase only

### Control Input

- 0 to 20mA, 4 to 20mA, 0 to 5VDC, 1 to 5VDC and 0 to 10VDC
- Input impedance 250Ω for 4mA to 20mA, 5kΩ for linear voltage input

### Output Voltage

- 100 to 120VAC, 200 to 208VAC, 230 to 240VAC, 277VAC, 400VAC, 480VAC and 600VAC, ±10%

### Linearity (Control Option S)

- ±5% input to output power over 0 to 100% of span between calibration points

### Linearity (Control Options P and L)

- ±5% input to output power, as referenced to a sinusoidal power curve, between calibration points

### Resolution

- Better than 0.1% of input span with respect to output change

### Soft Start (Control Options P and L)

Typically:

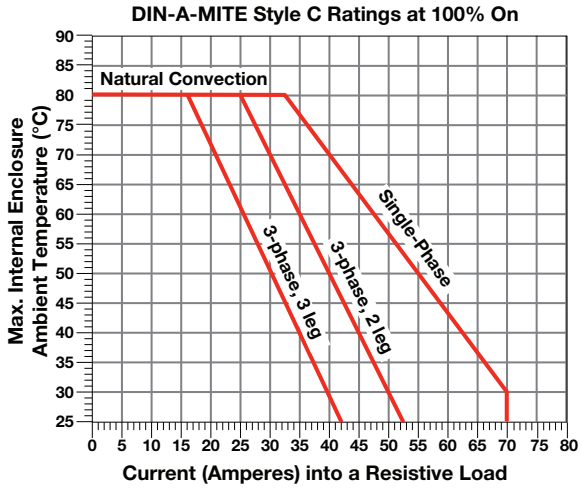
- 5 seconds soft start on power up
- Soft start on thermostat overtemperature
- Soft start on 1/2 cycle drop out detection
- 1 second soft start on set point change

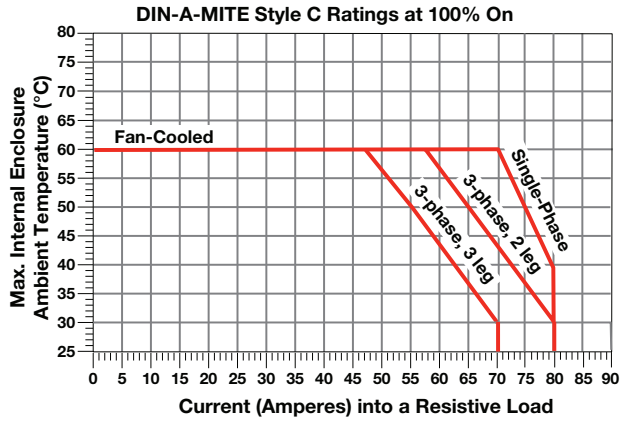
### Options

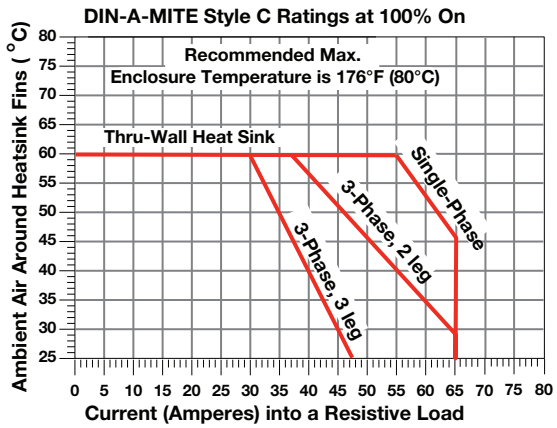
- Manual control kit (1kΩ potentiometer) 08-5362
- Alarm option is not available on control options P or L

**Specifications are subject to change without notice.**

## Output Rating Curves



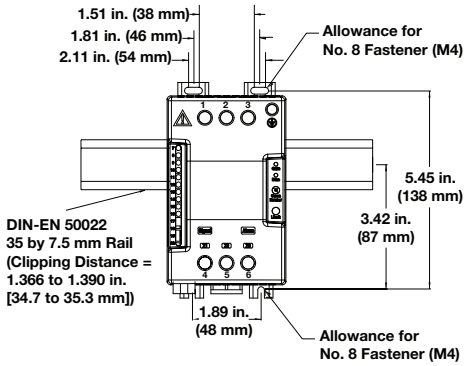



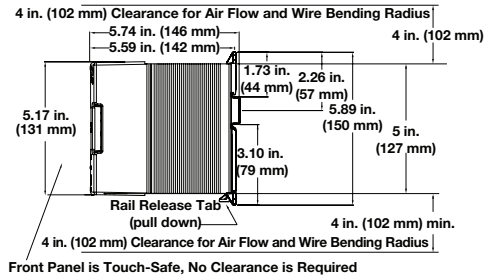
# DIN-A-MITE C

## Dimensions—Natural Convection, DIN-rail/Panel Mount

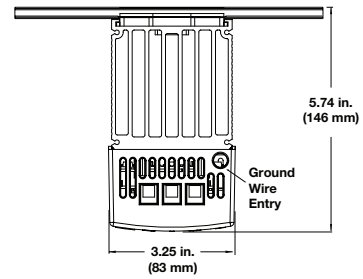
### Front




### Side

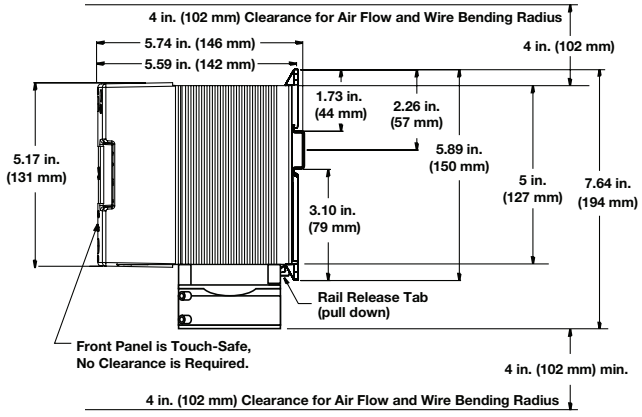



### Top



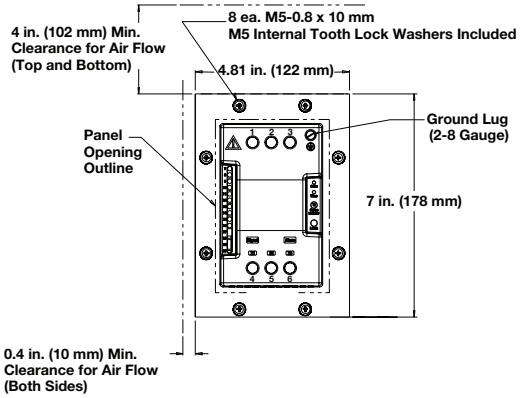

## Dimensions—Fan Cooled, DIN-rail/Panel Mount

### Side

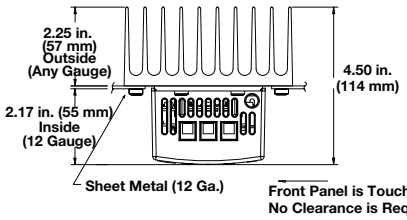



## Dimensions—Natural Convection, Through-Wall Mount①

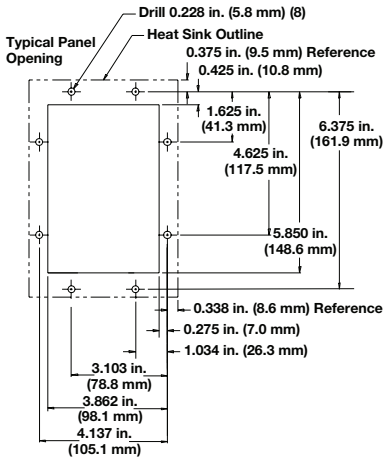
### Front




### Top




### Panel Cutout




① With the potential for high through-wall heat sink temperatures, application may require a touch-safe shield.

# DIN-A-MITE C

## Extended Heater and Power Controller Life with Variable Time-Base

With variable time-base control, the power controller automatically adjusts the time-base and output power with respect to the command signal. Accelerated life testing shows that variable time-base control significantly reduces expansion and contraction of the heater element. This extends heater and power controller life while improving process temperature control. This saves money on heaters, downtime and maintenance.

## Loop-Powered or Transformer Powered

### Loop-Powered

By using a temperature controller's 4-20mA process output signal as the power supply for the DIN-A-MITE input, the cost of the power controller can be reduced. With control option F0 the 4-20mA control signal simultaneously powers the DIN-A-MITE's internal electronics and provides the input command signal.

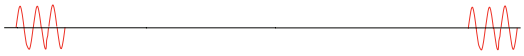
### Transformer-Powered

DIN-A-MITE controllers with single-cycle, variable time-base or phase angle outputs (control options L, P and S) detect the power line zero cross with a transformer that also powers their internal electronics. These units can be controlled manually with a potentiometer or automatically with a temperature controller using any of the control options: 4-20mA, linear voltage (0-5,1-5 and 0-10VDC).

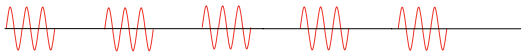
## Loop-Powered, Variable Time-Base Output

**Models: DC_ _ - _ _F0 - _ _ _ _**

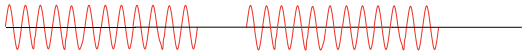
***20% Power Output:*** **3 AC cycles on, 12 cycles off**



***50% Power Output:*** **3 AC cycles on, 3 cycles off**



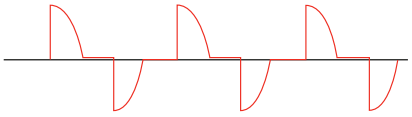
***80% Power Output:*** **12 AC cycles on, 3 cycles off**



With loop-powered, variable time-base control, the minimum on or off time is three cycles.

## Phase Angle Output

**Models: DC1_ - _ _ [L, P] _ - 0_ _ _**

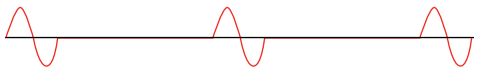


Phase angle control (control options L and P) is infinitely variable over the period of the AC sine wave. It provides a variable voltage and/or current output. The phase angle circuitry is transformer powered and accepts a linear voltage, current or potentionmeter input.

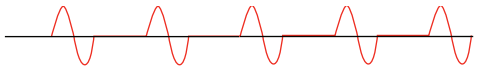
## Single-Cycle, Variable Time-Base Output

**Models: DC_ _ - _ _S_ - _ _ _ _**

***25% Power Output:*** **1 AC cycle on, 3 cycles off**



***50% Power Output:*** **1 AC cycle on, 1 cycle off**



With single-cycle, variable time-base control, at 50 percent power, the output is on for one cycle and off for one cycle. At 25 percent, it is on for one cycle and off for three cycles. Under 50 percent, the output is not on for more than one consecutive cycle; over 50 percent the output is not off for more than one consecutive cycle.

## Semiconductor Fuses for Applications through 600VAC

| Fuse Part Number | | |
|---|---|---|
| **Fuse Rating** | **Watlow** | **Cooper Bussman®** |
| 40A | **17-8040** | FWP-40A14F |
| 50A | **17-8050** | FWP-50A14F |
| 63A | **17-8063** | FWP-63A22F |
| 80A | **17-8080** | FWP-80A22F |
| 100A | **17-8100** | FWP-100A22F |

| Fuse Holder Part Number | | |
|---|---|---|
| **Fuse Rating** | **Watlow** | **Ferraz Shawmut** |
| 40A | **17-5114** | US141I |
| 50A | **17-5114** | US141I |
| 63A | **17-5122** | US221I |
| 80A | **17-5122** | US221I |
| 100A | **17-5122** | US221I |

## Combined Branch Protection and Semiconductor Fuses for Applications through 480VAC

| Fuse Part Number | | |
|---|---|---|
| **Fuse Rating 125% of Load** | **Watlow** | **Cooper Bussman®** |
| 20A | **0808-0325-0020** | DFJ-20 |
| 30A | **0808-0325-0030** | DFJ-30 |
| 40A | **0808-0325-0040** | DFJ-40 |
| 50A | **0808-0325-0050** | DFJ-50 |
| 63A | **0808-0325-0060** | DFJ-60 |
| 80A | **0808-0325-0080** | DFJ-80 |
| 100A | **0808-0325-0100** | DFJ-100 |

| Fuse Holder Part Number | | |
|---|---|---|
| **Fuse Rating** | **Watlow** | **Cooper Bussman®** |
| 20 and 30A | **0808-0326-1530** | CH30J1i |
| 40 to 63A | **0808-0326-3560** | CH60J1i |
| 80 and 100A | **0808-0326-7010** | J601001CR |

# DIN-A-MITE C

## Ordering Information

**Part Number**

| ① | ② | ③ | ④ | ⑤ ⑥ | ⑦ ⑧ | | ⑨ | ⑩ | ⑪ ⑫ |
|---|---|---|---|---|---|---|---|---|---|
| | | Phase | Cooling & Current Rating/Leg | Line & Load Voltage | Control | | Alarm | User Manual | Custom Options |
| D | C | | | | | - | | | |

| ③ | Phase |
|---|---|
| 1 = | 1-phase, 1 controlled leg |
| 2 = | 3-phase, 2 controlled legs |
| 3 = | 3-phase, 3 controlled legs (use with four wire wye) |
| 8 = | 2 independent zones (control options C, K) |
| 9 = | 3 independent zones (control options C, K) |

| ④ | Cooling and Current Rating Per Leg (See chart below) |
|---|---|
| 0 = | Natural convection standard DIN-rail or panel heat sink |
| 1 = | Fan cooled 120VAC standard DIN-rail or panel heat sink |
| 2 = | Fan cooled 240VAC standard DIN-rail or panel heat sink |
| 3 = | Fan cooled 24VDC standard DIN-rail or panel heat sink |
| T = | Natural convection through-wall or cabinet heat sink (NEMA 4X) |

| ⑤ ⑥ | Line and Load Voltage |
|---|---|
| 02 = | 24 to 48VAC (control options C, F, K) |
| 12 = | 100 to 120VAC (control options L, P, S) |
| 20 = | 200 to 208VAC (control options L, P, S) |
| 24 = | 100 to 240VAC (control options C, F, K); 230 to 240VAC (control options L, P, S) |
| 27 = | 277VAC (control options L, P, S) |
| 40 = | 400VAC (control options L, P, S) |
| 48 = | 480VAC (control options L, P, S) |
| 60 = | 277 to 600VAC (control options C, F, K); 600VAC (control options L, P, S) |

| ⑦ ⑧ | Control |
|---|---|
| C0 = | 4.5 to 32VDC input, contactor output |
| F0 = | 4 to 20mA DC input, variable time-base output |
| K1 = | 22 to 26VAC input, contactor output |
| K2 = | 100 to 120VAC input, contactor output |
| K3 = | 200 to 240VAC input, contactor output |
| L (0 to 5) = | Phase angle output with current limiting* (single-phase only) |
| P (0 to 5) = | Phase angle output* (single-phase only) |
| S (0 to 5) = | Single-cycle variable time-base output |
| | 0 = 4 to 20mA input |
| | 1 = 12 to 20mA input (option S only) |
| | 2 = 0 to 20mA input |
| | 3 = 0 to 5VDC input |
| | 4 = 1 to 5VDC input |
| | 5 = 0 to 10VDC input |
| *Not CE approved for conducted or radiated emissions. | |

| ⑨ | Alarm |
|---|---|
| 0 = | No alarm |
| S = | Shorted SCR alarm (not available with control options L or P) |
| H = | Open-heater and shorted-SCR alarm (control option S only) |

| ⑩ | User Manual |
|---|---|
| 0 = | English |
| 1 = | German |
| 2 = | Spanish |
| 3 = | French |

| ⑪ ⑫ | Custom Options |
|---|---|
| 00 = | Standard part |
| 1X = | 1-second soft start (control options P, L) |
| XX = | Any letter or number, custom options, labeling, etc. |

## DIN-A-MITE C Current Rating Table

| Phase | Cooling | Current at 122°F (50°C) |
|---|---|---|
| 1 | 0 | 55A |
| 1 | T | 60A |
| 1 | 1, 2, 3 | 75A |
| 2, 8 | 0 | 40A |
| 2, 8 | T | 46A |
| 2, 8 | 1, 2, 3 | 65A |
| 3, 9 | 0 | 30A |
| 3, 9 | T | 35A |
| 3, 9 | 1, 2, 3 | 55A |

## DIN-A-MITE D

The DIN-A-MITE D silicon controlled rectifier (SCR) power controller provides an inexpensive, versatile product for controlling heat in an efficient package. This controller is designed and manufactured with the quality features expected from Watlow. The mounting footprint matches that of the industry standard mercury displacement relay (MDR), but there is no need to worry about mercury, the DIN-A-MITE controller is mercury free.

The DIN-A-MITE Style D is capable of zero cross switching up to 100 amperes single-phase, at 600VAC at 86°F (30°C), depending on the model selected. Combining the input of two or three controllers allows control of three-phase loads. The controller is completely touch-safe and includes on-board, front-accessible, semiconductor fuses. Options include a current transformer for load current monitoring and a shorted output alarm. The controller is UL® 508, C-UL® and CE approved making it ideal for panels and cabinets that require agency approvals.

Variable time-base, 4-20mA process control and VAC/VDC input contactor options are available. All options are model number dependent and factory configurable. This power controller also includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.


### Features and Benefits

**200KA SCCR with proper fusing**
- Minimizes damage in the event of a short circuit

**Standard panel mount**
- Provides same mount as industry standard 100A MDR

**Compact size**
- Reduces panel space and cost

**Touch-safe terminals**
- Increases safety for installer and user

**Mercury free**
- Assures environmental safety

**Faster switching with solid state**
- Saves energy and extends heater life

**UL® 508 listed, C-UL®, RoHS and CE with filter**
- Meets applications requiring agency approval
- Reduces end product documentation

**Back-to-back SCR design**
- Ensures a rugged design

**On-board semiconductor fusing**
- Provides quick access with no extra mounting necessary

# DIN-A-MITE D

## Specifications

### Amperage
- See the Output Rating Curve below
- Max. surge current for 16.6ms, 1,800A peak
- Latching current: 500mA min.
- Holding current: 200mA min.
- Power dissipation is 1.4 watts per ampere switched including on-board fusing
- 200KA SCCR, Type 1 and 2 approved with the recommended fusing; see user manual

### Line Voltage
- 24 to 48VAC units: 20VAC min. to 53VAC max.
- 100 to 240VAC units: 48VAC min. to 265VAC max.
- 277 to 480VAC units: 85VAC min. to 528VAC max.
- 277 to 600VAC units: 85VAC min. to 660VAC max.
- 50/60Hz independent ±5%

### Control Mode, Zero Cross
- Control option C: VDC input, contactor output
- Control option K: VAC input, contactor output
- To increase service life, the cycle time should be less than three seconds
- Control option F: 4 to 20mA DC input, variable time-base control output

### Control Input
- AC contactor: 24VAC ±10%, 120VAC +10/-25%, 240VAC +10/-25% @ 25 mA max. per controlled leg
- DC Contactor: 4.5 to 32VDC: max. current @ 4.5VDC is 8mA per leg
- Linear current: 4 to 20mA DC, loop powered, input Type F0 option only, no more than three DIN-A-MITE inputs connected in series

### Shorted SCR Alarm Option
- Alarm state when the input command signal off and a 15A or more load current is detected by the current transformer

### Alarm Output
- Energizes on alarm, non-latching
- Triac 24 to 240VAC external supply with a current rating of 300mA @ 77°F (25°C)

### Current Sensing
- On-board current transformer (CT), typically 0.2VAC output signal per ampere sensed into 1,000Ω load

### Agency Approvals
- CE with proper filter:
  204/108/EC Electromagnetic Compatibility Directive
  EN 61326-1: Industrial Immunity Class A Emissions
  Not suitable for Class B emissions environment
  2006/95/EC Low Voltage Directive
  EN 50178 Safety Requirements
- c UL us LISTED UL® 508-listed and C-UL® File E73741

### Control Input Terminals
- Compression: will accept 26 to 12 AWG (0.13 to 3.3 $mm^2$) wire

### Line and Load Terminals
- Compression: will accept 6 to 2 AWG (13.3 to 33.6 $mm^2$) wire

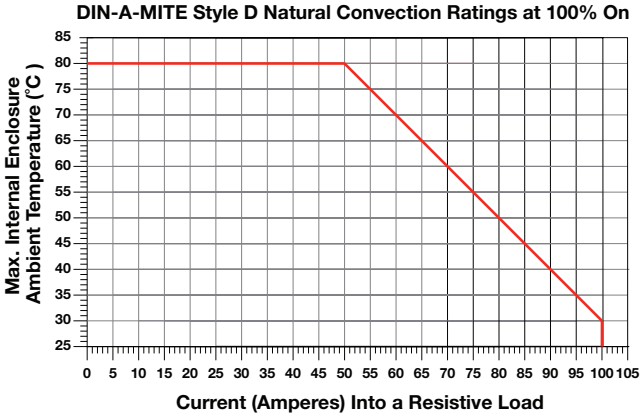
### Operating Environment
- Operating temperature range: -4 to 176°F (-20 to 80°C)
- 0 to 90% RH (relative humidity), non-condensing
- Vibration: 2 g, 10Hz to 150Hz, applied in any one of three axes
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Insulation tested to 3,000 meters
- Installation Category III, pollution degree 2

### Mounting
- Back-panel mounting; fits the same mounting pattern as a 100A, single-phase mercury displacement relay
- On-board semiconductor fusing

### Dimensions
- 7.3 in. (185 mm) high x 2.6 in. (66 mm) wide x 9.4 in. (239 mm) deep
- Weight: 6.5 lb (2.95kg)

**Specifications are subject to change without notice.**

## Output Rating Curve



# DIN-A-MITE D

## Ordering Information

**Part Number**

| ① | ② | ③ | ④ | | ⑤ ⑥ | ⑦ ⑧ | | ⑨ | ⑩ | ⑪ ⑫ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Phase | Cooling & Current Rating | | Line & Load Voltage | Control | | Current Sensing or Alarm | User Manual | Custom Options |
| D | D | 1 | 0 | - | | | - | | | |

| ③ | Phase |
|---|---|
| 1 = | 1-phase, 1 controlled leg |

| ④ | Cooling and Current Rating (See rating curve) |
|---|---|
| 0 = | Natural convection |

| ⑤ ⑥ | Line and Load Voltage |
|---|---|
| 02= | 24 to 48VAC |
| 24 = | 120 to 240VAC |
| 48 = | 277 to 480VAC |
| 60 = | 277 to 600VAC |

| ⑦ ⑧ | Control |
|---|---|
| C0 = | 4.5 to 32VDC input, contactor output |
| F0 = | 4 to 20mA DC input, variable time-base output |
| K1 = | 22 to 26VAC input, contactor output |
| K2 = | 100 to 120VAC input, contactor output |
| K3 = | 200 to 240VAC input, contactor output |

| ⑨ | Current Sensing or Alarm |
|---|---|
| 0 = | No alarm |
| 1 = | Load current transformer |
| S = | Shorted SCR alarm |

| ⑩ | User Manual |
|---|---|
| 0 = | English |
| 1 = | German |
| 2 = | Spanish |
| 3 = | French |

| ⑪ ⑫ | Custom Options |
|---|---|
| 00 = | Standard part |

## Replacement Semiconductor Fuse

| Watlow Part Number | Cooper Bussmann® Part Number |
|---|---|
| **0808-0096-0000** | 170N3437 |

## POWER SERIES™

Watlow has manufactured solid state power controllers for over fifty years. Watlow's POWER SERIES™ is a microprocessor-based product that features application flexibility unmatched by any other silicon controlled rectifier (SCR) power controller on the market today. Watlow's POWER SERIES controllers include single and three-phase models from 65 to 250 amperes. Field configurable phase-angle or zero-cross firing improves application flexibility on site where needed.

50/60Hz independent operation allows utilization almost everywhere in the world without special calibration considerations. Serial communication via Modbus® RTU allows setup and monitoring of load status from a computer station or control room.

On-board semiconductor fusing improves reliability by protecting the SCRs from heater short circuits. Plus, on-board heater bakeout and control diagnostics can help eliminate initial start up problems. All these benefits are in a touch-safe package that can be quickly and easily mounted in a control cabinet.

Watlow's POWER SERIES controllers are UL® and C-UL® listed, ensuring that they meet world safety and operational standards.


### Features and Benefits

**200KA short circuit current rating (SCCR)**
- Minimizes damage in the event of a short circuit

**Microprocessor-based technology**
- Extremely versatile and field configurable

**Snap-fit on a pre-mounted plate**
- Simplifies installation

**Models 65 through 250 amperes rating**
- Handles a wide range of loads

**UL® 508 listed, C-UL® and CE with filter**
- Meets applications requiring agency approval

**Adjustable soft start**
- Provides application flexibility

**Heater and control diagnostics capability**
- Monitors actual heater and controller performance

**Electrically touch-safe package**
- Enhances safety for installer and users

**Serial communications with Modbus® RTU protocol**
- Provides computer control and/or monitoring

**Multizone capability**
- Increases application flexibility and reduces panel space

# POWER SERIES

## Specifications

### Power Bases

- Single-phase, (2 SCRs)
- 3-phase, 2-leg control, (4 SCRs)
  Resistive load only, zero-cross firing only
- 3-phase, 3-leg control, (6 SCRs)
- 3-phase, 3-leg control, (6 SCRs) for 4-wire wye loads
- Multizone, two and three single-phase zones

### Output Control Options

- Zero-cross control, fixed time base
  - Time base one or four seconds with digital programmer
- Zero-cross control, variable time base
- Phase-angle control and phase-angle control with current limit (not for 3-phase, 2-leg models)
  - Soft start factory default four seconds upon power-up, and adjustable from 0.0 to 120 seconds
  - Soft start upon input signal change, output rate of change adjustable to limit max. rate of change from 0.1 to 100% per 0.1 second. Factory default 10%
- Current transformer included when required
- Line voltage compensated (variable time base and phase angle controllers only)
- Standby or non-operational mode

### Output Voltage and Current Rating

- 24 to 120VAC (+10%, -15%)
- 200 to 480VAC (+10%, -15%)
- 200 to 600VAC (+10%, -15%)
- 65 through 250A per pole, model dependent; see amperage chart on the POWER SERIES spec sheet on the Watlow web site
- Min. load 1A rms ac
- Max. leakage current 5mA
- 200KA SCCR, Type 2 approved with the recommended fusing; see user manual

### Alarms

- Single alarm relay
- Latching or non-latching
- Separate high and low values
- Alarm silencing (inhibit) on power up for alarm
- Alarm indication LEDs, shorted SCR, open heater, fuse
- Electromechanical relay, Form C contact, software configurable
  - Min. load current 10mA @ 5VDC
  - Rated resistive loads: 3A @ 250VAC or 30VDC max., inductive load rating 1.5A with a power factor ≥ 0.4 without contact suppression

### Heater Bakeout

- For single-phase (phase to neutral) and 3-phase 6 SCR models only (not for 3-phase, 2-leg models)
- Soft start with over current trip, runs until programmed bakeout time expires, then goes burst or phase-angle firing. Factory default of 24 hours
- Adjustable 0 - 9999 minutes with over-current trip
- Internal current transformer included

### Command Signal Input

### Analog

- Input signal: field selectable and scalable, 0 to 20mA or 0 to 10VDC
- Default input signal: 4 to 20mA
- Manual control input via digital programmer/display
- Voltage input impedance 11kΩ nominal
- Current input impedance 100Ω nominal

### Digital

- On-board digital programmer/display and optional serial communications

### Retransmit

- Field selectable and scalable, 0 to 20mA with 800Ω max. load or 0 to10VDC with 1KΩ min. load
- Default: 4 to 20mA
- Resolution:
  mA ranges = ±5µA
  VDC ranges = 2.5mV nominal
- Calibration accuracy:
  mA ranges = ±20µA
  VDC ranges = 10mV nominal
- Temperature stability: 100ppm/°C

### Digital Programmer/Display and Communications Capabilities

- Programming functions
  - Adjust input and output control type, alarms and soft start, heater bakeout and current limit prompts
- Monitoring functions
  - Display input and output values along with actual output current
- Data retention of digital programmer/display upon power failure via nonvolatile memory

### Serial Communications

- RS-232 for single drop control
- EIA-485 for single or multidrop control
  - 32 units maximum can be connected. With additional 485 repeater hardware, up to 247 units may be connected
- Isolated
- Modbus® RTU protocol
- 1200, 2400, 4800, 9600, 19200 baud rates

### Controller Power Supply

- Universal line voltage input range 100 to 240VAC (+10%, -15%) at 55VA max.
- 50/60Hz ± 5% line frequency independent
- Controller line voltage for electronic power supply can be run on separate line voltage

# POWER SERIES

## Specifications *(Continued)*

### Natural Convection and Fan Cooled Models

- Cabinet venting may be required
- See Amperage Chart with Ordering Information for available configurations

### Power Dissipation (Watts)

- Approximately 1.25 watts/ampere per controlled leg

### Isolation

- Command signal to load and line/load to ground 2200VAC min.
- On-board semiconductor fuses provide SCR protection

### Mounting

- Output Amperage Rating F35: back panel
- Other Output Amperage Ratings: removable mounting plate

### High Current Terminals

- Touch safe
- 3/8 in. (10 mm) Allen head compression terminals will accept 6 AWG to 350 MCM wire. Allen wrench adapter (included) for 3/8 in. (10 mm) socket, 6 point only
- Torque to 180 in.-lbs (20.3 Nm)
- Wire strip to 1 1/8 in. (30 mm)
- Requires 194°F (90°C) wire insulation rating on line and load terminals

### Controller Terminals

- Touch safe
- 1/8 in. (2.5 mm) blade screwdriver, accepts 12-22 AWG or 2 ea. 22-18 AWG wires
- Torque to 8 in.-lbs (0.9 Nm)
- Wire strip to 0.24 in. (6 mm)

### Operating Environment

- 122°F (50°C) base rating
  - 32 to 140°F (0 to 60°C) fan cooled
  - 32 to 149°F (0 to 65°C) natural convection cooled
- 0 to 90% RH, non-condensing
- Meets EN 50178, Pollution degree three

### Storage Temperature

- -40 to 185°F (-40 to 85°C)

### Shipping Weight

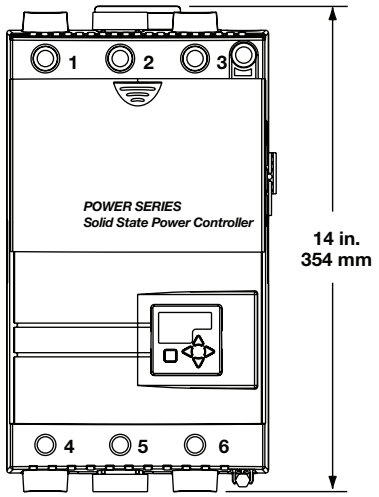
- Output Amperage Rating F35: 38 lbs (17.2 kg)
- Other Output Amperage Ratings: 23 lbs (10.3 kg)

### Agency Approvals

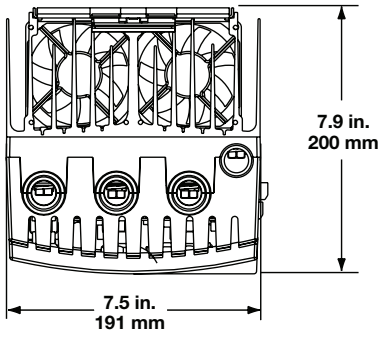
- UL® 508 listed, File #E73741, Vol. 3, Sec. 2
- C-UL® listed to C22.2 NO. 14
- CE 2014/30/EC (EN 61326-1), Class A with filter
  CE 2014/35/EC (EN 50178:1997)

## Dimensions (Output Amperage Ratings: N20, N25, N30, F20, F25 or F30)

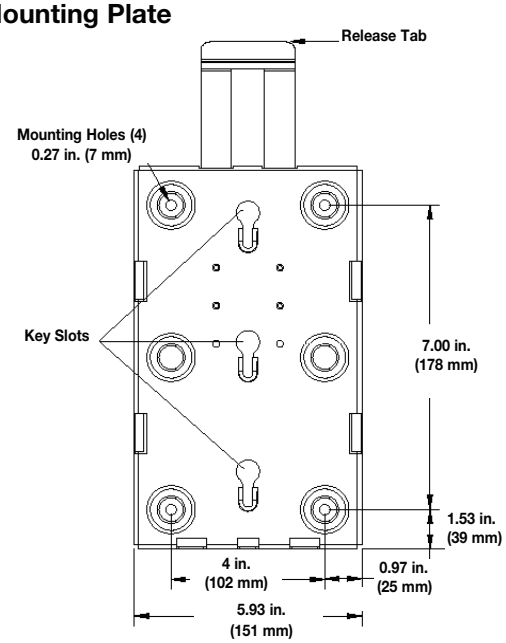
### Front View




### Top View

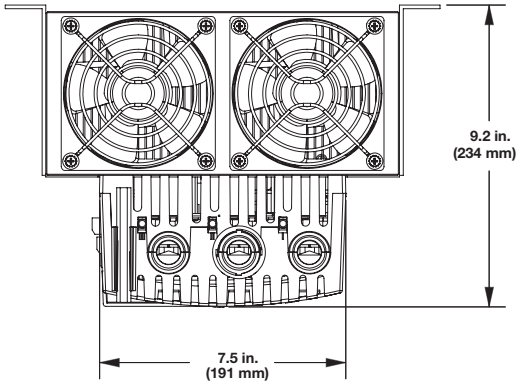



### Mounting Plate

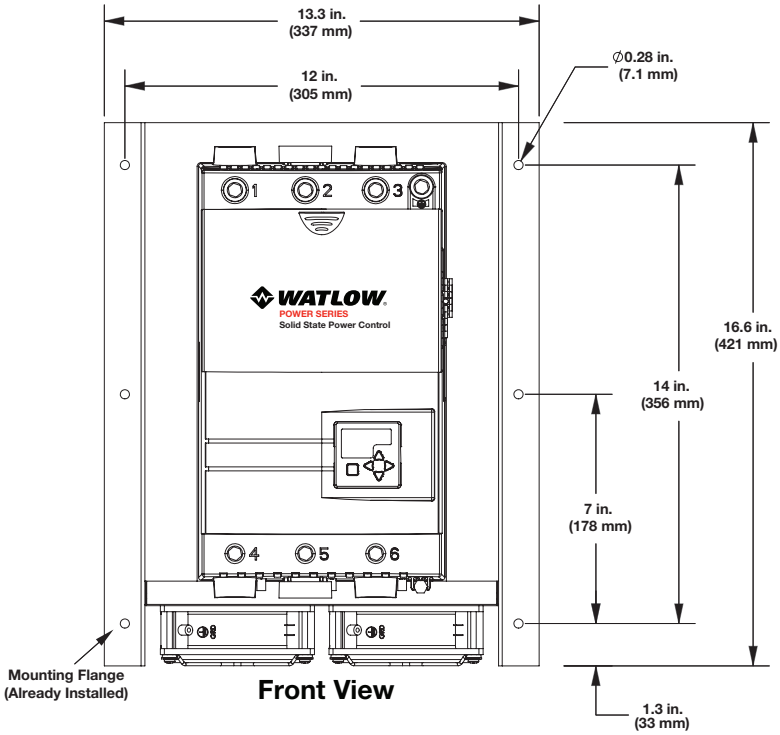


# POWER SERIES

## Dimensions (Output Amperage Rating: F35)




Bottom View




Front View

**Single-Phase Configuration**
This configuration can be purchased with any or all the features available on the POWER SERIES, based on customer preference. It is intended for resistive heaters, but can also be used on transformer connected loads in the phase angle firing mode.

**Three-Phase, Two Leg Configuration**
This configuration is intended for zero cross firing only into a stable resistive heater. Typically, a three-phase delta or ungrounded wye connected heater is used and only two of the three VAC line phases are switched. The third phase is a direct connection through a bussbar on board the POWER SERIES. Heater current monitoring and kVA options are available via the heater diagnostics option.

**Three-Phase, Three-Leg Configuration**
All POWER SERIES options are available with this configuration. It works well with phase angle firing into a three-phase, three-wire wye or delta connected heater. In this configuration, the more common applications are transformer connected loads with heaters requiring a soft start and/or current limiting.

The three-phase, four-wire configuration is intended for zero cross firing into a three-phase grounded wye/star heater. (This is a separate hardware option, model number dependent.)

**Single-Phase, Multizone Configuration**
This configuration is available in two and three single-phase zones and all the features of a single-phase unit are available. (Note that there is only one alarm relay and all zones in the controller must use the same control method.)

**Heater Diagnostics**
Heater diagnostics may include some or all of the features that require heater current monitoring, depending on the model selected. Heater current monitoring is only available with heater diagnostics installed on the controller. The features dependent on heater current monitoring are heater bakeout, current limiting, heater kVA monitoring, retransmit and heater monitoring alarms such as open heater, heater out of tolerance, load balance and shorted SCR detection/error. Heater diagnostics must also be installed if you need phase angle control with current limit.

# POWER SERIES

## Ordering Information

**Part Number**

| ① | ② Package Style | ③ Phase | ④ Heater Diagnostics | | ⑤⑥⑦ Output Amperage Rating | ⑧ Output Voltage Rating | | ⑨ Comm. | ⑩ Feedback/ Retransmit | ⑪⑫ Custom |
|---|---|---|---|---|---|---|---|---|---|---|
| P | C | | | - | | | - | | | |

| ② Package Style | |
|---|---|
| C = | 65 to 250A |

| ③ Phase | |
|---|---|
| 1 = | 1-phase |
| 2 = | 3-phase/2-leg control, (4 SCRs) |
| 3 = | 3-phase/3-leg control, (6 SCRs) |
| 4 = | 3-phase/4-wire, wye connected load |
| 8 = | 2 single-phase zones (specify 01 or 03 for custom) |
| 9 = | 3 single-phase zones (specify 01 or 03 for custom) |

| ④ Heater Diagnostics | |
|---|---|
| 0 = | None |
| 1 = | Heater diagnostics (Current limiting and heater bakeout are only available on single-phase and 3-phase, 3-leg controllers) |

| ⑤⑥⑦ Output Amperage Rating |
|---|
| See amperage chart below |

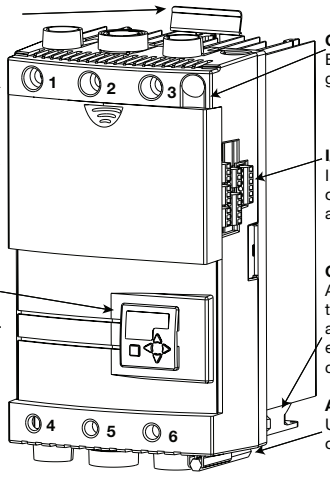
| ⑧ Output Voltage Rating | |
|---|---|
| A = | 24 to 120V |
| B = | 200 to 480V |
| C = | 200 to 600V |

| ⑨ Communications | |
|---|---|
| 0 = | None |
| 1 = | EIA/TIA-232/485 communications, opto-isolated, (field selectable) |

| ⑩ Feedback/Retransmit | |
|---|---|
| 0 = | None |
| 1 = | Load current feedback (0-10V or 0-20mA scalable retransmit output) (Must have heater diagnostics selected) |

| ⑪⑫ Custom | |
|---|---|
| 00 = | None |
| AA = | No Watlow logo with agency approval marks |
| AB-ZZ = | Custom, contact your Watlow representative for options |
| 01 = | Select for PC8 or PC9 using single-phase power supply, Watlow logo |
| 03 = | Select for PC8 or PC9 using multi-phase power supply, Watlow logo |

## POWER SERIES Features




## Amperage Chart—122°F (50°C)

| | Single-Phase | | 3-Phase, 2-Leg and 2 Single-Phase Zones | | 3-Phase, 3-Leg, 3 Single-Phase Zones and 4-Wire Model | |
|---|---|---|---|---|---|---|
| | Code | Amp | Code | Amp | Code | Amp |
| Non Fan Cooled | N20 | 100A | N20 | 80A | N20 | 65A |
| | N25 | 140A | N25 | 105A | N25 | 85A |
| | N30 | 165A | N30 | 120A | N30 | 105A |
| Fan Cooled | F20 | 125A | F20 | 120A | F20 | 90A |
| | F25 | 200A | F25 | 160A | F25 | 140A |
| | F30 | 250A | F30 | 185A | F30 | 155A |
| | N/A | N/A | F35 | 250A | F35 | 225A |

**Note:** For current ratings at other temperatures see the rating curves in the POWER SERIES User's Manual available at www.watlow.com.

## Replacement Fuses for Power Series

| Watlow Part Number | Description | Bussmann Part Number |
|---|---|---|
| **0808-0102-0100** | 100 amp @ 600VAC | 170M1317 |
| **0808-0102-0125** | 125 amp @ 600VAC | 170M1318 |
| **0808-0102-0160** | 160 amp @ 600VAC | 170M1319 |
| **0808-0102-0200** | 200 amp @ 600VAC | 170M1320 |
| **0808-0102-0250** | 250 amp @ 600VAC | 170M1321 |
| **0808-0102-0315** | 315 amp @ 600VAC | 170M1322 |

# E-SAFE® II

The E-SAFE® II hybrid power switch provides reliable and accurate power switching up to 35 amperes at 158°F (70°C). This mercury-free product is specifically designed to operate in the higher ambient temperatures of foodservice equipment applications.

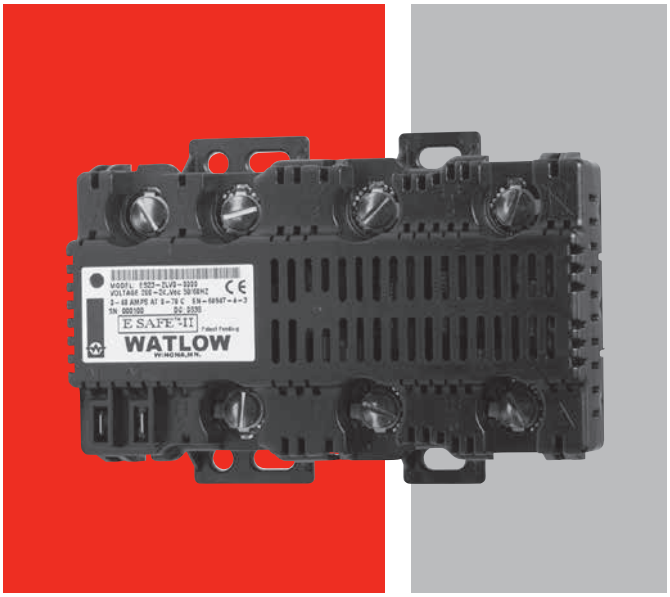
Utilization of mercury relays is being eliminated due to many regulations affecting its use in the United States and around the world. The E-SAFE II is the best performing product at the most economical price. Because of the product's unique design, there is no need to purchase costly heat sinks used with traditional solid state relays (SSRs). In addition, since this is a three-phase device, there is no need to wire multiple command signals. With a switching life of millions of cycles and an ambient rating of 158°F (70°C), with no heat sink required, this product is superior to typical SSRs.

The E-SAFE II hybrid power switch provides foodservice operators with longer contact life and higher performance than typical mechanical contactors used in equipment. By using Watlow's patent NO-ARC technology, the E-SAFE II can switch millions of cycles to increase the life of the product with reduced noise and increased temperature accuracy. E-SAFE II's inherent ability to operate at fast cycle times makes it an ideal complementary product for a time, proportional, integral derivative (PID) controller.

E-SAFE II is mercury free, RoHS compliant by design, CE approved and C-UL®/UL® recognized. The reliability of the product is protected by a two-year warranty.

## Typical Applications

- Griddles
- Convection ovens
- Steamers
- Toaster ovens
- Fryers
- Conveyor ovens
- Holding cabinets
- Dishwashers/warewashers




## Features and Benefits

**Mercury free**
- Improves safety by eliminating risk of toxic metals in proximity to food
- Adheres to federal and state regulations to phase out and ban mercury

**High ambient temperature rating of 158°F (70°C)**
- Specifically designed to operate in the higher ambient temperatures of foodservice applications

**NO-ARC hybrid power switch technology**
- Combines the current carrying capacity of mechanical contacts with the longevity of solid state technology
- Allows faster cycling times than mechanical contactors
- Delivers more precise temperature control, saves energy, extends heater life and decreases total cost of ownership

**Compact and touch-safe package**
- Fits in shallow foodservice cabinets
- Allows for horizontal or vertical mounting installations
- Increases safety for installer/operator
- Uses Ultem® enclosure material with a horizontal burn rating (HB) rating of 338°F (170°C) and a UL® flame retardant rating of 94 5VA

**RoHS compliant by design**
- Specifically designed to meet Asian and European requirements

**LED indicator light**
- Indicates command signal presence from controller
- Assists in troubleshooting

**Agency approvals**
- UL® recognition, C-UL® and CE
- W.E.E.E. compliant

# E-SAFE II

## Specifications

**Output voltage**
- 200/240VAC +10/-15%, 50/60Hz, 100/120VAC +10/-15%, 50/60Hz

**Output amperage**
- Up to 35A single, dual and three-phase

**Operating environment**
- 32 to 158°F (0 to 70°C) operating temperature
- 0 to 90% RH (relative humidity), non-condensing
- Operational life: four million switching cycles
- Installation category III, pollution degree 2

**Control mode**
- NO-ARC hybrid contactor

**Input command signal**
- 3 to 32VDC, 24VAC +20/-20%, off state ≤2.7VDC
- 100 to 240VAC +10/-15%, (85 to 264VAC)
  **Note:** On the 100 to 240VAC input models, do not use a RC snubber on the E-SAFE II relay input or the temperature control command signal output

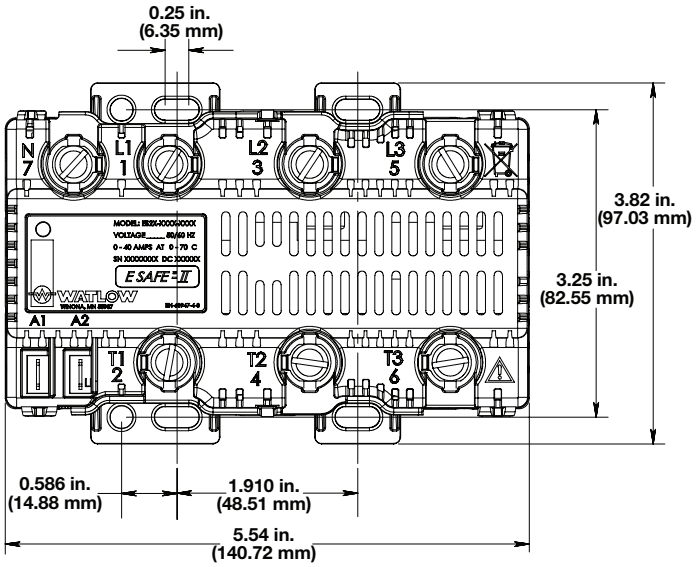
**LED indicator light**
- Built in LED assists in troubleshooting; LED “off” indicates relay(s) are open, LED “on” indicates relay(s) are closed.

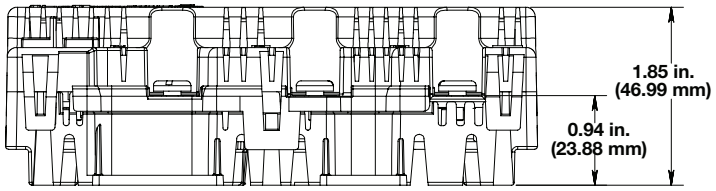
**Input command signal terminals**
- 1/4 in. fast on appliance

**Line and load terminals**
- No. 10 screw will accept ring or spade, 1/4 in. (6.35 mm) x 10-32

**Mounting**
- Back panel mount, horizontal or vertical mounting options

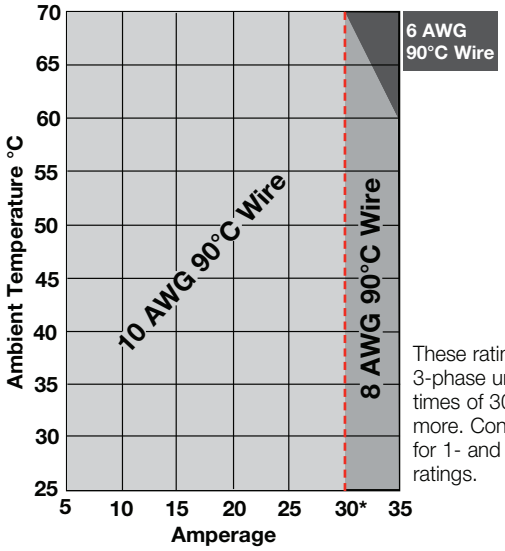
## Dimensional Drawings



# E-SAFE II

## Product Rating Curve




These ratings apply to 3-phase units with cycle times of 30 seconds or more. Consult the factory for 1- and 2-phase unit ratings.

**UL® Conditions of Acceptability**
Applications must be tested as described below for specific wire insulation or specific wire gauge sizes. Tests shall be performed in the end application under worst case operating conditions.

**Test Procedure**

A. Monitor temperatures of terminals, using thermocouples between the ring terminal and connectors L1, L2 or L3. The temperature must not exceed 203°F (95°C).
B. Monitor temperatures of wire insulation, using a thermocouple located three inches from the connector. The temperature must not exceed the insulation rating of the wire.

*30A is maximum rating when operating above 240VAC.
**Warning:** Thermocouples attached to terminals will be at load voltage potential, measurements need to be taken with isolated equipment or isolate the sensor from terminal with suitable insulation.

## Ordering Information

**Part Number**

| ①②③ | ④ Number of Poles | ⑤ Load Voltage | | ⑥⑦ Command Signal Voltage | ⑧ Future Option | | ⑨ Future Option | ⑩⑪⑫ Custom Options |
|---|---|---|---|---|---|---|---|---|
| ES2 | | - | | | 0 | - | 0 | |

| ④ | Number of Poles |
|---|---|
| 1 = | 1 pole |
| 2 = | 2 poles controlled |
| 3 = | 3 poles controlled |

| ⑤ | Load Voltage |
|---|---|
| 1 = | 100 to 120VAC |
| 2 = | 200 to 240VAC |
| 3 = | 230/277VAC (400/480VAC with wye/star, neutral connected to center required) |

| ⑥⑦ | Command Signal Voltage |
|---|---|
| LV = | Low voltage 3 to 24VDC or 24VAC |
| HV = | High voltage 100 to 240VAC +10/-15% (85 to 264VAC) |

| ⑩⑪⑫ | Custom Options |
|---|---|
| 000 = | Standard product |
| Any three letters or numbers = cosmetic options | |

## SERIES CZR


The SERIES CZR solid state relay provides a low-cost, highly-compact and versatile solid state option for controlling electric heat. With DIN-rail and back panel mounting standard on every controller, the CZR allows for simple and quick installation.

The extensive capabilities of the SERIES CZR include single-phase, 18 to 42 ampere zero-cross switching up to 600VAC (see output rating curve). Its unique integrated design removes the guesswork associated with selecting a proper heat sink and precise terminations for the application.

This controller holds many agency certifications and is ideal for applications that require UL®, CSA and CE approvals. The SERIES CZR is available in VAC/VDC input contactor versions and all configurations are model number dependent and factory selectable.

The SERIES CZR is protected by a two-year warranty.

### Features and Benefits

**DIN-rail or standard panel mount**
- Versatile, quick and low-cost installation

**Compact size**
- Reduces panel space and cost

**Touch-safe terminals**
- Increases installer and operator safety

**Mercury free**
- Environmentally safe

**Faster switching with solid state**
- Saves energy and extends heater life

**UL® 508 recognized, CSA LR700195 certified, CE 60950 and RoHS**
- Applications requiring agency approval

**Back-to-back SCR design**
- Offers rugged design for different application environments

# SERIES CZR

## Specifications

### Control Mode
- Zero-cross fired contactor output

### Operator Interface
- Command signal input
- Input signal indication LED

### Input Command Signal
- Input Type DC1
  - Turn on voltage 4VDC max., turn off voltage 1VDC min.
  - Input current: dc typically 10mA @ 4VDC,13mA @ 32VDC
- Input Type AC1
  - 90 to 140Vrms, must turn on at 90VAC, must turn off at 10VAC
  - Input current: 15mA typical @ 120VAC

### Output Voltage
- 24V; 24VAC min. to 280VAC max.
- 48V; 48VAC min. to 530VAC max.
- Off state leakage: 10mA at 77°F (25°C) max. for 24 through 480VAC models
- Holding current: 250mA max.

### Output Amperage
- See output rating curve. Ratings are into a resistive heater load.

### Output Amperage Rating

| Model | 18 | 24 | 34 | 42 |
|---|---|---|---|---|
| Max. Surge Current 16.6 mSec | 625 | 250 | 625 | 1000 |
| Max. $I^2t$ Fusing | 1620 | 260 | 1620 | 4150 |

### Agency Approvals
- Class II construction
- UL® 508 recognition, File #E73741 and CSA File LR 700195
- CE per 2006/95/EC Low Voltage Directive
- 2011/65/EU RoHS

### Output Terminals
- Compression type
- For 18A models:
  - Max. wire size 3.0 mm (10 AWG), torque to 0.6Nm (5.3 in. lbs)
- For 24 to 42A models:
  - Max. wire size 16.0 mm (6 AWG stranded) torque to 1.5-1.7Nm (13-15 in. lbs)

### Operating Environment
- Up to 176°F (80°C). See output rating curves for applications
- 0 to 90% RH (relative humidity), non-condensing
- Insulation tested to 3,000 meters
- Units are suitable for “pollution degree 2”
- Cycle time should be less than 3 seconds

### Mounting
Options include DIN-rail or standard back panel mounting.
- The DIN-rail specification: DIN EN 50022, 1.38 in. x 0.30 in. (35 mm x 7.5 mm)
- Min. clipping distance: 1.37 in. (34.8 mm)
- Max. clipping distance: 1.39 in. (35.3 mm)
- Mount cooling fins vertical

### Weight/Dimensions
- 9.2 oz (260g)
- 24 to 42A models: 3.95 in. (100 mm) high x 1.75 in. (45 mm) wide x 4.3 in. (109 mm) deep
- 18A models: 3.95 in. (100 mm) high x 0.89 in. (22.6 mm) wide x 3.9 in. (99 mm) deep

# SERIES CZR

## Ordering Information

**Part Number**

| ① | ② | ③④ | ⑤ | ⑥⑦ | ⑧ | ⑨⑩⑪ | ⑫ |
|---|---|---|---|---|---|---|---|
| | Control Mode | Output Amperage | | Output Voltage | | Input Type (Contactor) | |
| C | Z | | - A | | V | - | 0 |

| ② | Control Mode |
|---|---|
| Z = | Zero cross |

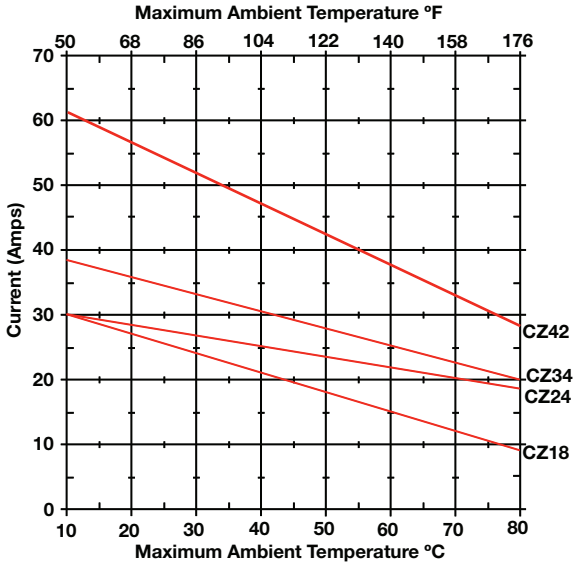
| ③④ | Output Amperage |
|---|---|
| 18 = | 18A |
| 24 = | 24A |
| 34 = | 34A |
| 42 = | 42A |

| ⑥⑦ | Output Voltage |
|---|---|
| 24 = | 24 to 280VAC |
| 48 = | 48 to 530VAC |

| ⑨⑩⑪ | Input Type (Contactor) |
|---|---|
| DC1= | 4 to 32VDC |
| AC1= | 90 to 140VAC |

**Note:** Do not use the AC1 input type with temperature controller outputs that include an AC snubber filter. This could cause the SERIES CZR to stay full on.

## Output Rating Curve

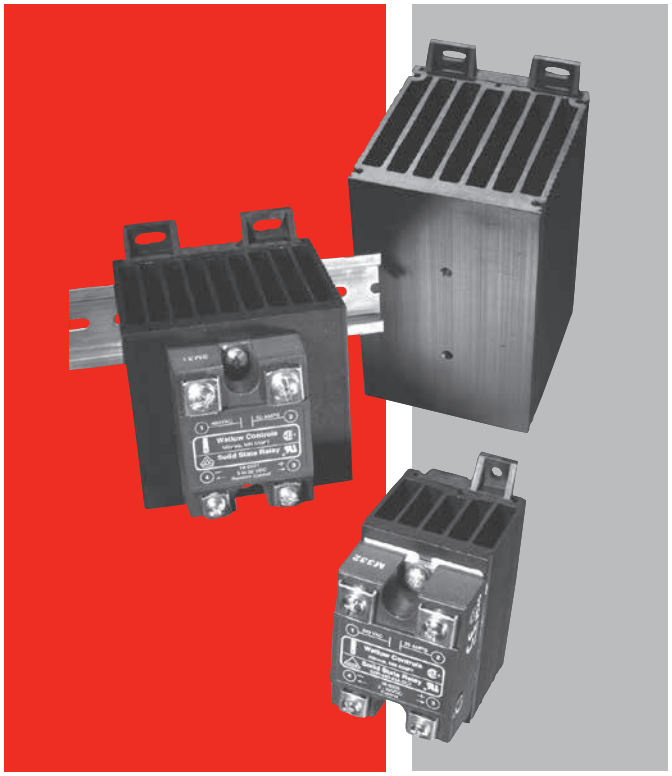


## Solid State Relays (SSR)

Watlow solid state relays (SSR) offer many of the advantages of solid state power controllers, yet at a lower cost. Watlow's extensive knowledge in power controller design has led to the development of a special fast cycle input card that enables a SSR to operate from a standard 4-20mA instrumentation command signal. Test results have shown that a zero cross SSR in combination with the fast cycle card promotes better temperature control and longer heater life than slow cycle relays. Through a time proportional cycle rate of one tenth of a second heater life will be extended.

Both low and high voltage models are available from 24 up to 530VAC. All ac output models include back-to-back Silicon Controlled Rectifiers (SCRs) for a more rugged design than the traditional triac based SSR. The internal design allows it to handle high currents and the harsh electrical environments of heavy industry. Watlow also offers a switched VDC model for dc heating applications.

Watlow can provide all the components necessary for trouble-free operation. This includes two standard convenience items: a thermal foil to ensure proper thermal transfer from the relay to the heat sink and belville washers that ensure the relay is mounted with sufficient pressure for good heat transfer. Matched semiconductor fuses and heat sinks are available to complete the power switching package.



### Features and Benefits

**Fast cycle card**
- Increases heater life
- Optimizes temperature control
- Allows for higher watt density heaters

**Zero cross firing**
- Results in minimal electrical noise

**Back-to-back SCR design**
- Withstands harsh or hostile industrial environments

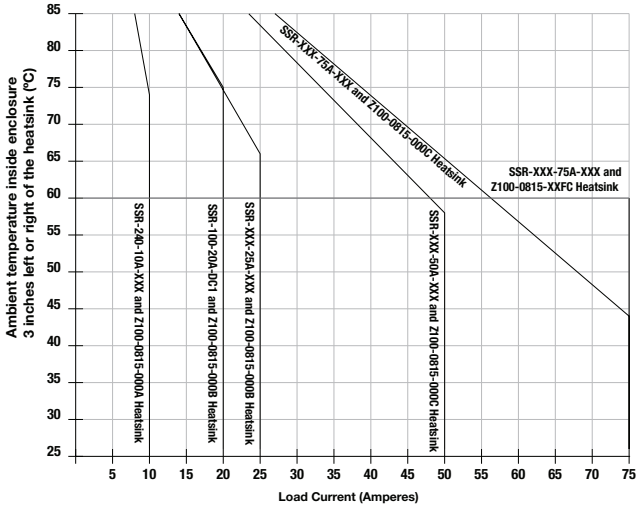
**UL® recognized File #E151484 and #E73741**
**CSA certified up to 600VAC, File #LR700195**
**VDE 60950 License #40021401, File #1995500**
**up to 480VAC, CE - EN 60950 and RoHS**
- Meets applications requiring agency approval

# Solid State Relays

## Specifications

| Specifications Standard To All SSRs: | |
|---|---|
| Dielectric Strength (Volts) | 4000 RMS |
| **Input, DC Control** | |
| Voltage range | 3-32VDC |
| Typical input current | 3.4 to 20mA |
| Turn on voltage (max.) | 3VDC |
| Turn off voltage (min.) | 1VDC |
| **Input, AC Control** | |
| Voltage range | 90-280VAC |
| Typical input current | 2mA (typical) @ 120VAC<br>4mA (typical) @ 240VAC |
| Turn on voltage (max.) | 90VAC |
| Turn off voltage (min.) | 10VAC |
| **AC Output (Max.)** | |
| Forward voltage drop | 1.5VAC and 2.1VDC |
| Min. holding current (mA) | 50mA |
| Turn on-off time (ms) | up to 10ms (max.) |
| Frequency range | 47 to 63Hz |

## Ambient Temperature Operating Curve




| 120/240VAC | | | | | | |
|---|---|---|---|---|---|---|
| **Model Number** | **SSR-240-10A-DC1** | **SSR-240-25A-DC1** | **SSR-240-50A-DC1** | **SSR-240-10A-AC1** | **SSR-240-25A-AC1** | **SSR-240-50A-AC1** |
| Current output | 10A | 25A | 50A | 10A | 25A | 50A |
| Nominal voltage | 120/240VAC | 120/240VAC | 120/240VAC | 120/240VAC | 120/240VAC | 120/240VAC |
| One cycle surge current | 120A | 250A | 625A | 120A | 250A | 625A |
| Max. $I^2t$ for fusing | $60A^2$ seconds | $260A^2$ seconds | $1,620A^2$ seconds | $60A^2$ seconds | $260A^2$ seconds | $1,620A^2$ seconds |
| Thermal resistance | 1.48° C/W | 1.05° C/W | 0.63° C/W | 1.48° C/W | 1.05° C/W | 0.31° C/W |
| Ambient operating temperature | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) |
| **Output (Max.)** | | | | | | |
| Voltage range | 48-280VAC | 48-280VAC | 48-280VAC | 48-280VAC | 48-280VAC | 48-280VAC |
| Over voltage rating | 600V (peak) | 600V (peak) | 600V (peak) | 600V (peak) | 600V (peak) | 600V (peak) |
| Off state leakage | 10mA | 10mA | 10mA | 10mA | 10mA | 10mA |

| 120/240VAC | | | Random Fired Models | | | 100VDC |
|---|---|---|---|---|---|---|
| **Model Number** | **SSR-240-75A-DC1** | **SSR-240-75A-AC1** | **SSR-480-50A-RND** | **SSR-480-75A-RND** | **SSR-240-10A-RND** | **SSR-100-20A-DC1** |
| Current output | 75A | 75A | 50A | 75A | 10A | 20A |
| Nominal voltage | 120/240VAC | 120/240VAC | 480VAC | 480VAC | 120/240VAC | 100VDC |
| One cycle surge current | 1000A | 1000A | 625A | 1000A | 120A | 42A (10ms) |
| Max. $I^2t$ for fusing | $6000A^2$ seconds | $6000A^2$ seconds | $1,620A^2$ seconds | $6000A^2$ seconds | $60A^2$ seconds | N/A |
| Thermal resistance | 0.31° C/W | 0.31° C/W | 0.63° C/W | 0.31° C/W | 1.48° C/W | 1.06° C/W |
| Ambient operating temperature | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -4 to 176°F (-20 to 80°C) |
| **Output (Max.)** | | | | | | |
| Voltage range | 48-280VAC | 48-280VAC | 80-530VAC | 80-530VAC | 48-280VAC | 0-100VDC |
| Over voltage rating | 600V (peak) | 600V (peak) | 1200V (peak) | 1200V (peak) | 600V (peak) | N/A |
| Off state leakage | 10mA | 10mA | 10mA | 10mA | 10mA | 0.3mA VDC |

| 480 VAC | | | | | | |
|---|---|---|---|---|---|---|
| **Model Number** | **SSR-480-25A-DC1** | **SSR-480-50A-DC1** | **SSR-480-75A-DC1** | **SSR-480-25A-AC1** | **SSR-480-50A-AC1** | **SSR-480-75A-AC1** |
| Current output | 25A | 50A | 75A | 25A | 50A | 75A |
| Nominal voltage | 480VAC | 480VAC | 480VAC | 480VAC | 480VAC | 480VAC |
| One cycle surge current | 250A | 625A | 1000A | 250A | 625A | 1000A |
| Max. $I^2t$ for fusing | $260A^2$ seconds | $1,620A^2$ seconds | $6,000A^2$ seconds | $260A^2$ seconds | $1,620A^2$ seconds | $6,000A^2$ seconds |
| Thermal resistance | 1.02° C/W | 0.63° C/W | 0.31° C/W | 1.02° C/W | 0.63° C/W | 0.31° C/W |
| Ambient operating temperature | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) | -40 to 176°F (-40 to 80°C) |
| **Output (Max.)** | | | | | | |
| Voltage range | 48-530VAC | 48-530VAC | 48-530VAC | 48-530VAC | 48-530VAC | 48-530VAC |
| Over voltage rating | 1200V (peak) | 1200V (peak) | 1200V (peak) | 1200V (peak) | 1200V (peak) | 1200V (peak) |
| Off state leakage | 10mA | 10mA | 10mA | 10mA | 10mA | 10mA |

# Solid State Relays

## Heater Life

Watlow has extensively tested electric heating elements with a variety of power switching devices. Results prove that the life of an electric element dramatically increases when the on-off cycle time that is used to time-proportion the heater is kept at less than one second. This reduces the thermal expansion and contraction of the element and improves heater life as much as 20 times. This very fast cycle time controls temperature much more accurately and allows the use of higher watt density heating elements.

## Fast Cycle Card

In order to obtain the very rapid cycling time required for longer heater life, accurate temperature control and higher watt densities, Watlow has developed a loop-powered firing card for SSRs. This card operates from a standard instrumentation signal of 4 to 20mA and controls solid state relays with a time proportional cycle rate of less than one second (4VAC cycles on and 4VAC cycles off at 50 percent power).

## Thermal Transfer

A thermal foil is provided with each solid state relay for mounting on the base of the relay to improve heat transfer. In addition, two belville washers are supplied to provide the proper pressure for this transfer of heat. Use two #8-32 screws 0.625 in. (16 mm) long to secure the relay to the heat sink.

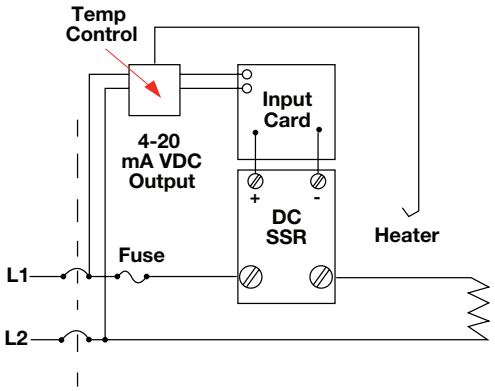
## Replacing Contactors or Mercury Displacement Relays (MDRs)

Improvements in heater life and control accuracy can be achieved with SSRs operated with rapid cycle times as compared to slower operating electromechanical relays or even MDRs. When replacing these types of relays with the SSR, it is important to consider two aspects:

1. **Heat**
   Solid state devices require a small voltage to turn on, which is consumed as heat (approx. 1.5 volts x amps = watts). This heat must be removed from the device and is usually accomplished by mounting the relay on a heat sink.
2. **Failure Mode**
   Solid state devices should last for many years when properly protected with voltage snubbers, mounted on appropriate heat sinks and when fused with semiconductor fuses against the high currents caused by electrical shorts. Watlow's SSRs include an internal voltage snubber. However, if the unit fails, the most probable condition will be a short. Mechanical relays also have a good probability of failing short. In all cases where uncontrolled full power can cause damage, it is recommended that a high limit temperature controller and contactor be used for protection.

## Wiring Diagrams

**Single-Phase Fast Cycle Input Card**



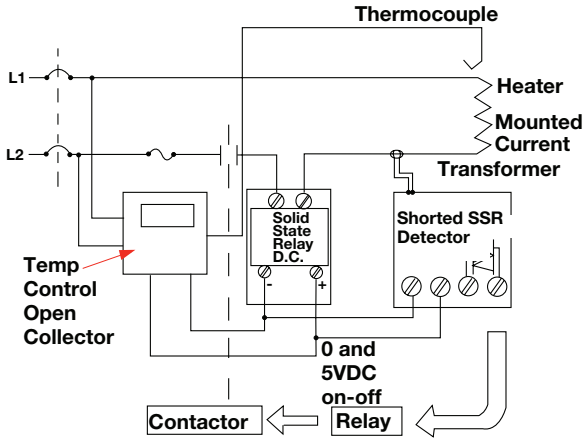

### Shorted SSR Alarm

The most prevalent concern when using solid state relays is the possibility of a relay failing in a shorted condition. With this in mind, Watlow has designed a cost effective "Shorted SSR Alarm."

The device monitors the output (current through the heater) and activates a triac (alarm) if there is no command signal from the temperature controller. The triac can be wired to a bell, or to a normally closed latching relay to remove power to the heater.

The shorted SSR alarm is not a substitute for an agency-approved high-temperature limit device.

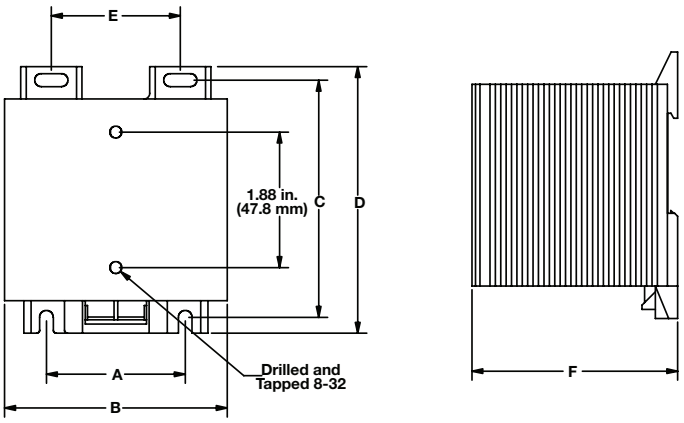
**Single-Phase Shorted SSR Detector**



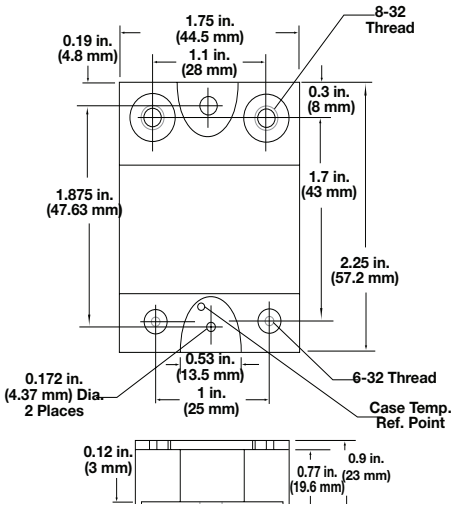

**Note:** Semiconductor power switching devices are not legal for over temperature limit or safety devices. For limit and safety devices you must have a positive mechanical break of all electrically hot legs simultaneously.

# Solid State Relays

## Dimensions - Heat Sink




## Dimensions - Solid State Relay




### Heat Sink Dimensions by Part Number

| Part Number | Descriptor | Dimensions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | | B | | C | | D | | E | | F | |
| | | in. | (mm) | in. | (mm) | in. | (mm) | in. | (mm) | in. | (mm) | in. | (mm) |
| **Z100-0815-000A** | 18A | N/A | | 1.8 | (46) | 3.25 | (82.6) | 3.7 | (94) | N/A | | 1.9 | (48) |
| **Z100-0815-000B** | 35A | 1.91 | (48.5) | 3.2 | (81) | 3.25 | (82.6) | 3.7 | (94) | 1.81 | (46) | 2.9 | (74) |
| **Z100-0815-000C** | 55A | 1.89 | (48) | 3.2 | (81) | 5.45 | (138.4) | 5.89 | (149.6) | 1.81 | (46) | 3.6 | (91) |
| **Z100-0815-XXFC*** | 75A | 1.89 | (48) | 3.2 | (81) | 5.45 | (138.4) | 7.16 | (181.9) | 1.81 | (46) | 3.6 | (91) |

*Fan cooled

## Ordering Information

**Part Number**

| ①②③ | | ④⑤⑥ | | ⑦⑧ | | ⑨ | | ⑩⑪⑫ |
|---|---|---|---|---|---|---|---|---|
| | | Voltage | | Current | | | | Control Voltage |
| SSR | - | | - | | | A | - | |

| ④⑤⑥ | Voltage |
|---|---|
| 100 = | 0 to 100VDC (20A model only) |
| 240 = | 24 to 240VAC |
| 480 = | 24 to 530VAC |

| ⑦⑧ | Current |
|---|---|
| 10 = | 10A |
| 20 = | 20A (100VDC model only) |
| 25 = | 25A |
| 40 = | 40A |
| 50 = | 50A |
| 75 = | 75A |

| ⑩⑪⑫ | Control Voltage |
|---|---|
| DC1 = | 3 to 32VDC (see specifications) |
| AC1 = | 90 to 280VAC |
| RND = | 3 to 32VDC (10, 50 and 75A models only) |
| **Note:** Relay will also include thermal foil, two belville washers and #8-32 screws for mounting to a heat sink. | |

| Heat Sinks (sold separately) | |
|---|---|
| Z100-0815-000A = | 18A or 2.2°C/watt |
| Z100-0815-000B = | 35A or 1.1°C/watt |
| Z100-0815-000C = | 55A or 0.6°C/watt |
| Z100-0815-12FC = | 75A or 0.16°C/watt (120VAC fan) |
| Z100-0815-24FC = | 75A or 0.16°C/watt (240VAC fan) |

| Fast Cycle Input Card and Shorted SSR Alarm Card | |
|---|---|
| For direct mounting on zero cross dc input solid state relay. | |
| RPC-5399-42-000 = | Fast cycle input card, 4 to 20mA input |
| RPC-5386-0000 = | Shorted SSR alarm card |

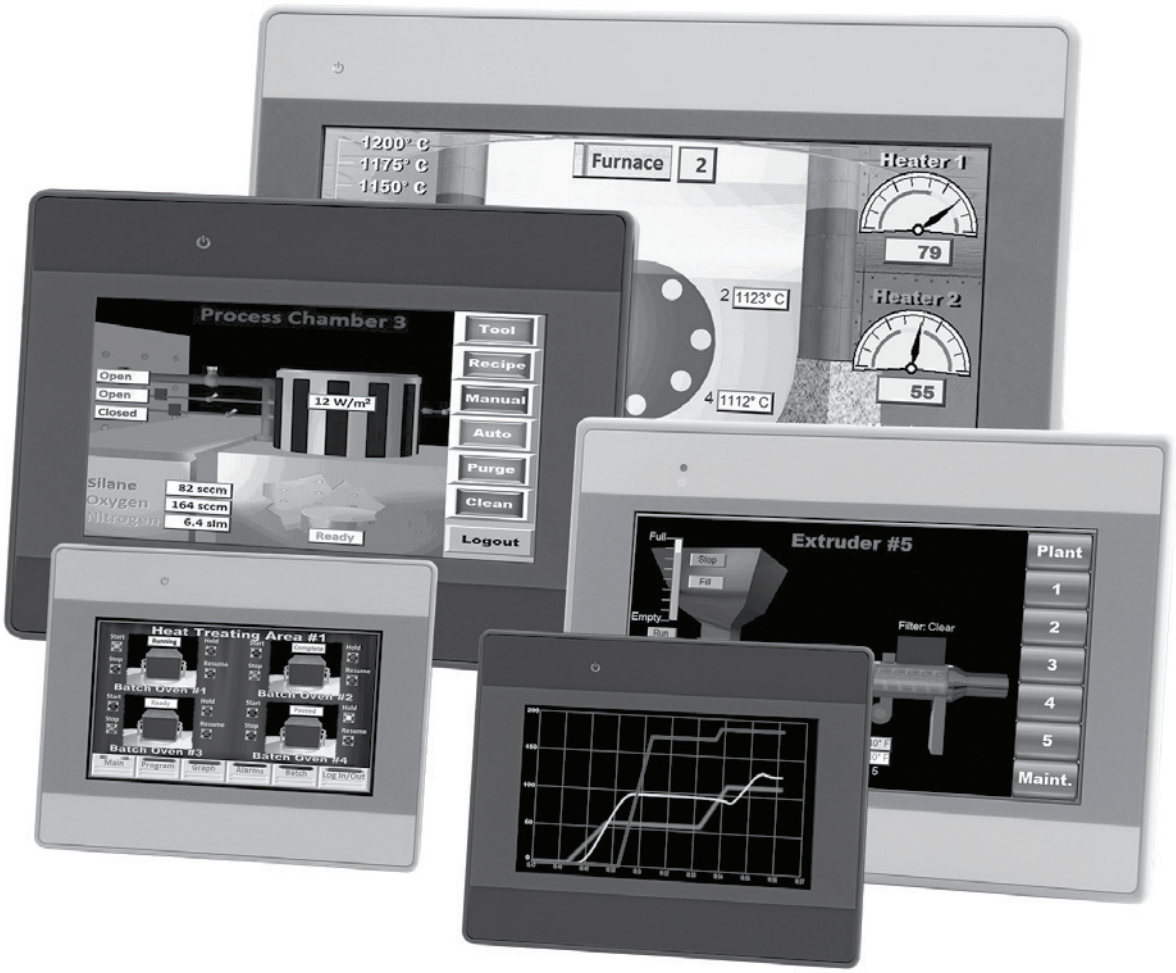
| Sub Cycle Fuses - $I^2T$ (sold separately) |
|---|
| Recommended and available with holders. |

# Operator Interfaces

| Product | Description | Communication Protocols | Display Height | Page |
|---|---|---|---|---|
| **Silver Series EM** | Rugged, email ready, touch screen operator interface terminal | Ethernet, Modbus® RTU, Modbus® TCP | 4.3, 7 or 10 in. (109, 178 or 254 mm) diagonal | 335 |
| **EZ-ZONE® RUI and Gateway** | Remote user interface and communications device | Standard Bus, Modbus® RTU, EtherNet/IP™, Modbus® TCP, DeviceNet™ and PROFIBUS DP | Upper: 0.40 in. (10 mm) Lower: 0.24 in. (6 mm) | 341 |

**Note:** The specifications in the table above are best available values in each category. Not all combinations of these values are available in a single model number.





## Silver Series EM

The Silver Series EM is a rugged, touch-screen operator interface terminal (OIT). Available in three sizes (4.3, 7 and 10 inch diagonal display sizes), the OIT's feature serial and Ethernet communications with multiple controllers, email messaging, universal serial bus (USB host), data logging, flexible password security and multiple languages. The small bezel size and two-inch depth make mounting in tight spots easy.

The Silver Series EM programming software, EZwarePlus, is easy to use and features a large variety of built-in screen objects that makes it powerful. When creating screens, the user can call upon extensive graphics libraries, import custom graphics and add numeric displays, entry fields, analog meters, bar graphs and trend graphs with just a few mouse clicks. Screen objects are highly customizable, and the user can create libraries of their own objects for repeat use. The online simulator, Ethernet and USB support make testing and downloading fast. The EZwarePlus screen editor is part of the EZwarePlus software suite and is available as a FREE download on www.watlow.com.

The Silver Series EM OIT paired with Watlow® controllers is the perfect solution for your industrial process or machine control application.

### Features and Benefits

**Bright, color, high resolution, graphic, touch screen, thin film transistor (TFT) display**
- Maximizes display space in the OIT footprint
- Allows application specific interface design
- Allows viewing from a distance and at an angle
- Highlights important process information with color and animation

**User selectable portrait or landscape operation**
- Fits in tight spots

**Ethernet, serial and USB host ports**
- Allows options for connecting to controllers
- Provides options for downloading projects
- Expands memory for additional recipe and data log storage
- Supports barcode readers, keyboard, mouse and printers
- Supports monitoring from a personal computer (PC) with free virtual network computing (VNC) client software

**Support for over 100 protocols, up to three simultaneously plus multiple protocols over Ethernet**
- Connects to a wide range of industrial controllers and devices
- Integrates a variety of devices to simplify complex operation tasks

**Data logging, display and trending**
- Helps operators monitor processes
- Reduces labor and increases accuracy by automating time-stamped data collection
- Stores captured data for future retrieval in multiple files
- Saves time by exporting data to Excel®-compatible comma separated value (.csv) files
- Improves process understanding by allowing live and historical data to be viewed on the OIT

**Alarm and event email notification, monitoring and recording**
- Reduces downtime by helping troubleshoot equipment and processes
- Simplifies troubleshooting by recording time and date-stamped alarm and event history
- Organizes and prioritizes alarms and events in up to 255 categories and four priority levels

**Recipe management**
- Reduces errors by automating process setting changes

**Offline and online simulation**
- Speeds up development by making it faster and easier to test projects
- Allows faster creation of fine-tuned interfaces by speeding up iterations

**Time or trigger-based data exchange**
- Simplifies integration by allowing the OIT to copy data from one controller or OIT to another

**Internal, piezoelectric buzzer**
- Provides audible alarms and key chirp

## Silver Series EM

### Features and Benefits *(Continued)*

**Two-year warranty**
- Provides product support and reliability

**Screen object password security with programmable hierarchy and multiple users**
- Prevents errors and tampering by allowing only authorized users to access restricted items on the screen
- Allows flexible hierarchies by letting the developer assign each screen object to any of 12 groups and grant each user access to any combination of groups
- Provides password protection for upload, download and access to local setup
- Supports up to 127 users

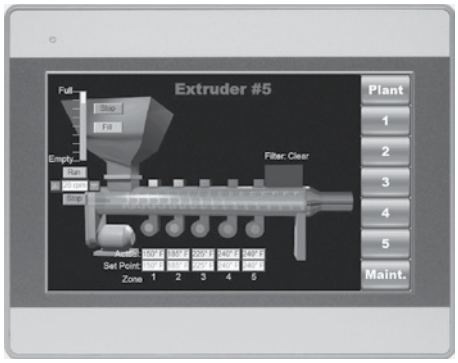
**Screen object invisibility and/or interlock control**
- Prevents errors by guiding operators

**Powerful, easy-to-use EZwarePlus programming software**
- Requires only a small investment in time to create a useful interface
- Provides the ability to learn additional features as needed
- Provides advanced interface features such as animation and pop-up windows
- Reduces development time by providing extensive graphical libraries and facilitating reuse with user-created libraries
- Simplifies development allowing import of common graphic formats: bitmaps, JPEGs and animated GIFs

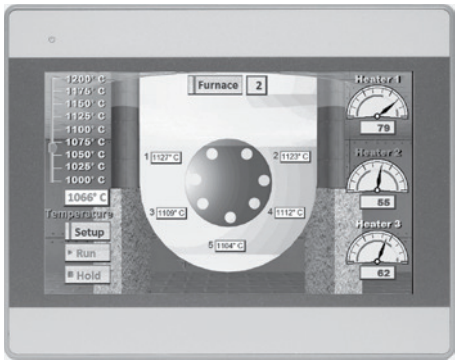
**User-programmable macros with math functions and support for floating point**
- Extends functionality
- Automates processes

**TrueType fonts with Unicode (international) characters and language switching feature**
- Makes screens easy to read by allowing bold, italic, underlined, scrolling and blinking text to direct operator's eyes
- Prevents errors by communicating with users in their native languages
- Reduces development and support by allowing inclusion of up to 24 user-selectable languages in a project

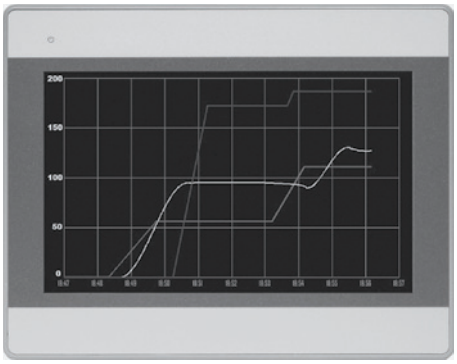
**UL®, NEMA 4, CE, RoHS,**
- Allows use in harsh industrial environments
- Assures prompt product acceptance




**Integrate multiple devices to simplify operation of complex systems.**




**Include the types of displays users understand such as gauges, sliders and bar graphs to make screens intuitive.**



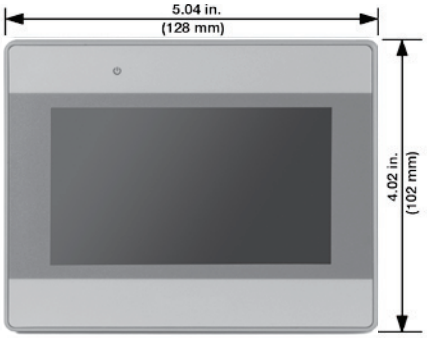
**Log and graph process data for quality records and better process control.**


**Create screens that guide work flow.**

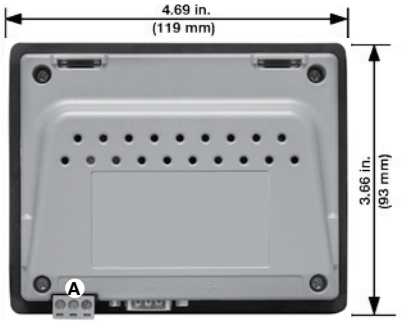
# Silver Series EM

## Dimension and Connection Diagrams

### Models TS00-0043-EM00/TS00-0043-EM0B




Front View

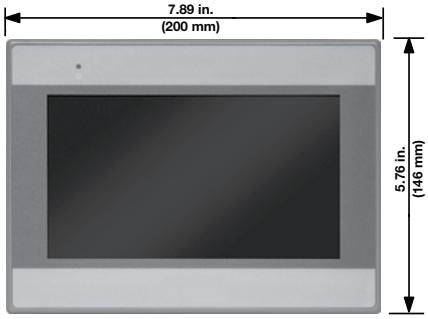



Rear View

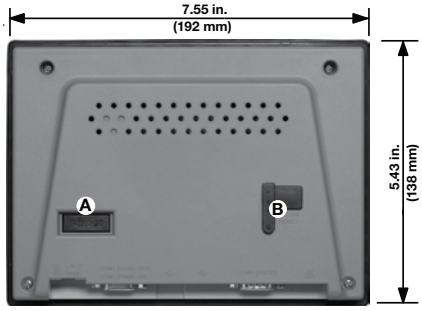
A Power connector
B Serial ports
C USB host port
D Ethernet port


Bottom View

### Model TS00-0070-EM00/TS00-0070-EM0B




Front View

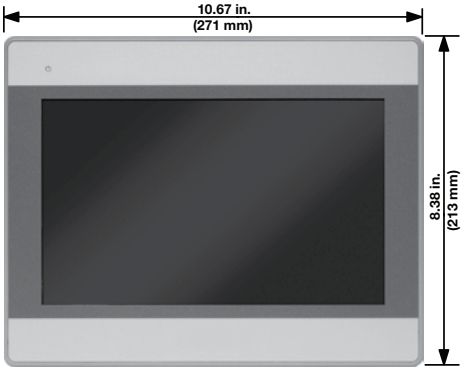



Rear View

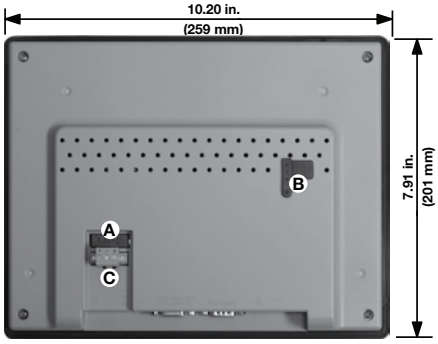
A Fuse
B Switches and reset button
C Power connector
D Serial ports
E USB host port
F Ethernet port


Bottom View

### Model TS00-0100-EM00




Front View




Rear View

A Fuse
B Switches and reset button
C Power connector
D Serial ports
E Ethernet port
F USB host port


Bottom View

## Silver Series EM

| | Model Number | | |
|---|---|---|---|
| **Feature** | **TS00-0043-EM00/TS00-0043-EM0B** | **TS00-0070-EM00/TS00-0070-EM0B** | **TS00-0100-EM00** |
| **Processor Type** | 600MHz, 32-bit, RISC, fanless | | |
| **Memory** | 128MB Flash, 128MB DRAM | | |
| **Ethernet Port** | 10/100 Base-T (RJ45) | | |
| **Serial Ports** | COM1: RS-232 or RS-485 (2-wire or 4-wire)<br>COM3: RS-485 (2-wire) | | |
| **USB Host (Type A) Version 2.0** | 1 each | | |
| **Real Time Clock** | Built-in | | |
| **Audible Alarm and Key Chirp** | Piezoelectric buzzer | | |
| **Display Type** | TFT LCD | | |
| **Resolution (Pixels)** | 480 x 272 | 800 x 480 | |
| **Colors** | 16 million | | 262 thousand |
| **LED Backlight Brightness** | 500 cd/m$^2$ | 350 cd/m$^2$ | 300 cd/m$^2$ |
| **Contrast Ratio** | 500:1 | | |
| **Viewing Angle** | Top: 50°, bottom, right, left: 70° | Top: 60°, bottom, right, left: 70° | Top: 45°, bottom, right, left: 65° |
| **Backlight Longevity** | 30,000 hours | | |
| **Touch-Screen Type** | 4-wire analog resistive | | |
| **Touch-Screen Resolution** | Continuous | | |
| **Touch-Screen Light Transmission** | Greater than 80% | | |
| **Touch-Screen Lifespan** | 1,000,000 activations min. | | |
| **Operating Temperature** | 32 to 122°F (0 to 50°C) | | |
| **Storage Temperature** | -4 to 140°F (-20 to 60°C) | | |
| **Relative Humidity** | 10 to 90% @ 40°C (non-condensing) | | |
| **Operating Shock Resistance** | 10 to 25Hz (X, Y, Z direction 2G, 30 min.) | | |
| **Environmental Ratings** | NEMA 4 (IP65) indoor only | | |
| **Agency** | CE, cULus, RoHS | Class 1, Division 2, CE, cULus, RoHS | CE, cULus, RoHS |
| **Enclosure** | Plastic molded | | |
| **Mounting** | Panel | | |
| **Dimensions Cutout (W x H)** | 4.69 x 3.66 in.<br>(119 x 93 mm) | 7.55 x 5.43 in.<br>(192 x 138 mm) | 10.20 x 7.91 in.<br>(259 x 201 mm) |
| **Dimensions Overall (W x H x D)** | 5.04 x 4.02 x 1.26 in.<br>(128 x 102 x 32 mm) | 7.88 x 5.76 x 1.34 in.<br>(200 x 146 x 34 mm) | 10.67 x 8.38 x 1.57 in.<br>(271 x 213 x 40 mm) |
| **Weight** | 0.55 lbs (0.25 kg) | 1.31 lbs (0.6 kg) | 2.9 lbs (1.3 kg) |
| **Input Power: Voltage** | 24VDC | | |
| **Input Power: Current** | 300mA max. | 350mA max. | 400mA max. |

## EZwarePlus Software System Requirements

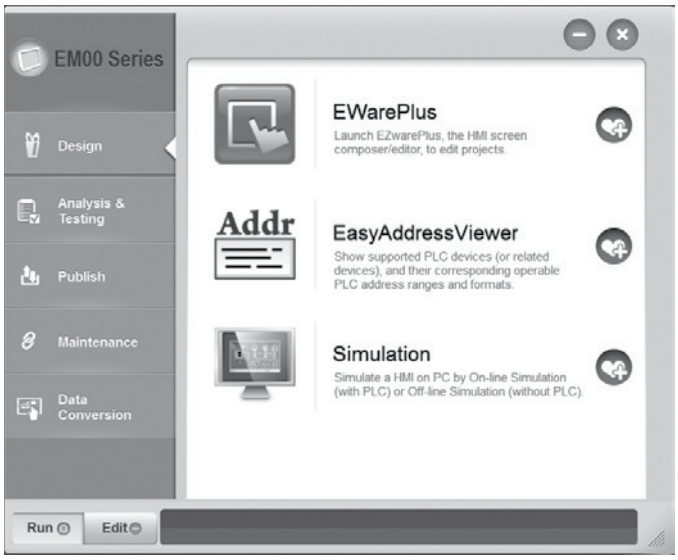
**Compatible Operating Systems:**

- Windows® 10, 8.1 and 7

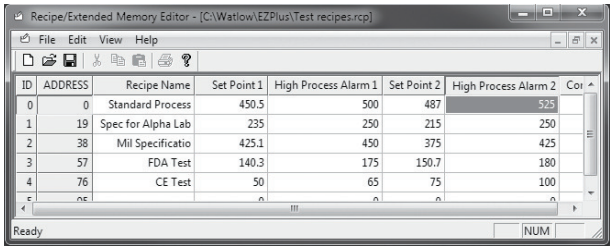
# Silver Series EM

## EZwarePlus Software Suite

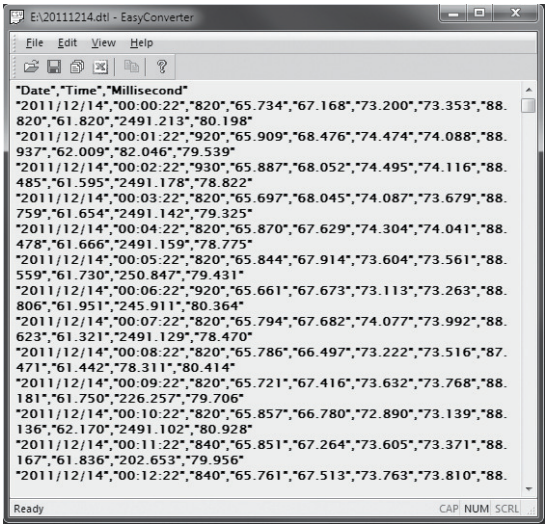
The EZwarePlus software suite includes EasyConverter, EZwarePlus screen editor. Utility Manager and Recipe Editor programs.



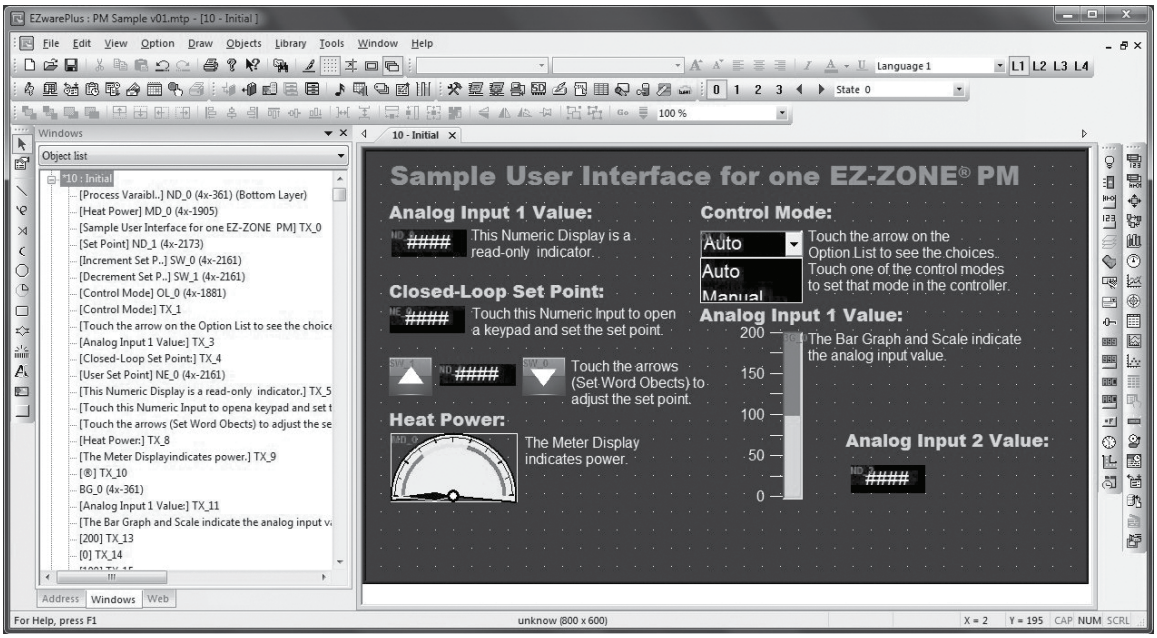

**Utility Manager uploads and downloads projects to and from the Silver Series EM OIT, opens compiled projects in simulation and launches the other EZwarePlus programs.**




**The Recipe Editor configures memory files for use with Silver Series EM OITs and allows offline creation of recipes.**



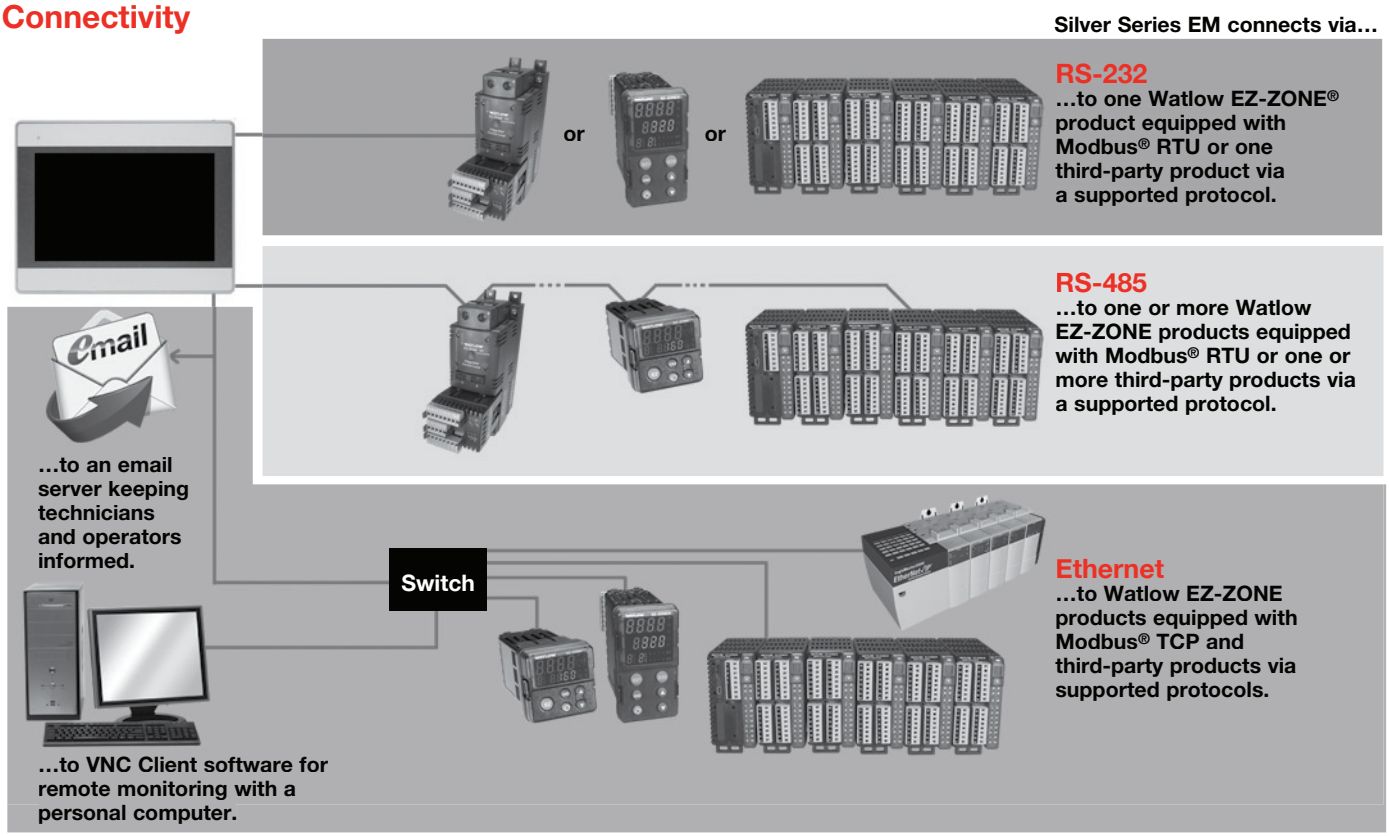

**EasyConverter converts log files saved by the Silver Series EM OIT to file formats used by popular Windows® software such as Microsoft® Excel®.**




**EZwarePlus provides a graphical screen designing environment with point-and-click access to features and drag-and-drop ease.**

# Silver Series EM

## Connectivity




## Ordering Information

| Part Number | Description |
|---|---|
| **TS00-0043-EM00** | 4.3 in. (480 x 272) color TFT LCD touch screen; two-tone, light gray bezel; USB host; two serial ports and Ethernet |
| **TS00-0043-EM0B** | 4.3 in. (480 x 272) color TFT LCD touch screen; two-tone, dark gray bezel; USB host; two serial ports and Ethernet |
| **TS00-0070-EM00** | 7 in. (800 x 480) color TFT LCD touch screen; two-tone, light gray bezel; USB host; two serial ports and Ethernet |
| **TS00-0070-EM0B** | 7 in. (800 x 480) color TFT LCD touch screen; two-tone, dark gray bezel; USB host; two serial ports and Ethernet |
| **TS00-0100-EM00** | 10 in. (800 x 480) color TFT LCD touch screen; two-tone, light gray bezel; USB host; two serial ports and Ethernet |

## Accessories

| Part Number | Description |
|---|---|
| **0601-0001-0000** | Controller support tools DVD-ROM with programming software and product manuals |
| **0830-0750-0000** | Power supply, Input: 85-264VAC, Output: 24VDC, 1.7A, 40W (not Class 2) |
| **0847-0299-0000** | Class 2 power supply, Input: 90-264VAC, Output: 24VDC, 1.3A, 31W |
| **0219-0388-0000** | TS00-0043-EM00 and TS00-0043-EM0B communication cable, 5-foot, COM1 (RS-485, 2-wire) to bare wires for Watlow EZ-ZONE® controller screw terminals |
| **0219-0374-0000** | TS00-0070-EM00, TS00-0070-EM0B or TS00-0100-EM00 communication cable, 5-foot, COM1 (RS-485, 2-wire) to bare wires for Watlow EZ-ZONE controller screw terminals |
| **0830-0782-0000** | Package of 5 ea. protective screen covers for the TS00-0043-EM00 and TS00-0043-EM0B |
| **0830-0753-0000** | Package of 5 ea. protective screen covers for the TS00-0070-EM00 and TS00-0070-EM0B |
| **0830-0754-0000** | Package of 3 ea. protective screen covers for the TS00-0100-EM00 |

# EZ-ZONE® RUI and Gateway

The EZ-ZONE® Remote User Interface (RUI and communications gateway) can be utilized as a communication gateway device to save cost, space and wiring when digital communications is being used with two or more EZ-ZONE controllers. The EZ-ZONE RUI can also serve as a display for showing all parameter values for up to 16 EZ-ZONE controllers, again saving cost, space and wiring expenses.



## Indicator Features and Benefits—Remote User Interface (RUI)

**Single user interface device or location to access multiple controllers**

- Easy accessibility to all controllers and all parameters from a central location by using one RUI display
- Reduces component material costs by using a single RUI to display multiple control zones
- Eliminates cost and complexity from bringing all controller related input and output wiring to the front panel

**Flexible use of a display interface**

- Can be used when needed during normal machine production, for OEM prototype design purposes or for remote troubleshooting scenarios
- Ability to use more than one RUI indicator to display additional data including temperature and current (ammeter) to improve user system interface

## Communications Gateway Features and Benefits

**A single RUI and gateway provides field bus access for up to 16 EZ-ZONE controllers**

- Lowers solution cost when field bus communications is required for multiple loops

**Expand communication protocols to all EZ-ZONE controllers**

- Ability to utilize multiple communication protocols for different user preferences. Flex between different communication protocols while still maintaining a reduced level of inventory

**Delivers multiple communication protocol options**

- Ability to connect EZ-ZONE controllers to communication networks utilizing
  - Modbus® RTU
  - DeviceNet™
  - Ethernet/IP™
  - Modbus® TCP
  - PROFIBUS DP

## Additional Features

**EZ-ZONE P3T armor sealing system**

- Complies with NEMA 4X, IP65 RUI
- Offers water and dust resistance, can be cleaned and washed down

**EZ-KEY (RUI)**

- Programmable EZ-Key is a functional key programmable by the user to perform simple one-touch operation of repetitive user activities

**Compact package**

- Reduces required panel size for 1/16 DIN
- Utilizes less depth behind panel allowing for mounting in tight spaces

**Touch-safe package**

- Complies with IP2X which increases safety for user

**Agency approvals: UL® Listed, CSA, CE, RoHS, W.E.E., SEMI F47-0200, Class 1, Div. 2 rating on selected models**

- Meets applications requiring agency approvals

**Three-year warranty**

- Provides product support and protection

# EZ-ZONE RUI and Gateway

## Specifications

### Line Voltage/Power
- Universal high voltage 100 to 240VAC, +10%/-15%; (85-264VAC), 50/60Hz, ±5%
- Low voltage 20 to 28VAC or 25 to 40VDC, 50/60Hz, ±5% for RUI only in short case version
- Low voltage 20 to 28VAC or 12 to 40VDC, 50/60Hz, ±5% for RUI and Gateway in long case version
- Data retention upon failure via nonvolatile memory

### Environment
- 0 to 149°F (-18 to 70°C) operating temperature
- -40 to 185°F (-40 to 85°C) storage temperature
- 0 to 90% RH, non-condensing

### Wiring Termination—Touch-Safe Terminals
- Terminals touch safe, removable, 12 to 22 AWG

### DIN Sizes
- 1/16 DIN

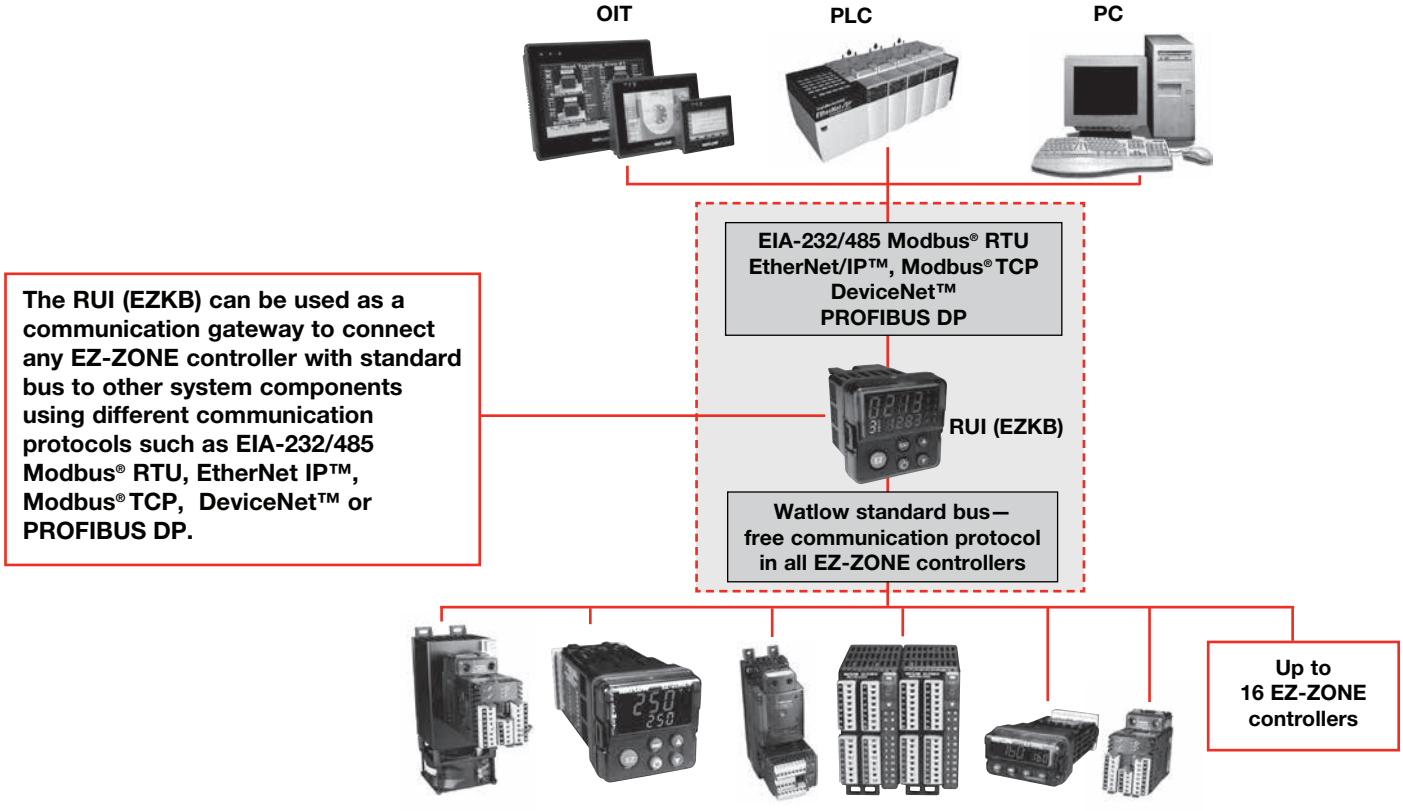
### Display Update Rate
- 1HZ

### Operator Interface
- Dual 4 digit, 7 segment LED displays
- Forward, backward, up and down keys plus a customer-programmable function key - EZ key

### Communication Options
- Standard bus - ships with all EZ-ZONE products
- EIA-235/485, Modbus® RTU
- EtherNet/IP™, Modbus® TCP, 10 BASE-T/ 100 BASE-TX
- DeviceNet™
- PROFIBUS DP

### Agency Approvals
- cULus® UL®/EN/CSA C22.2 No. 61010-1 listed, File E185611 for long case models
- cULus® UL®508/EN/CSA C22.2 No. 61010-1 listed, File E102269 for short case models
- CSA C22.2 No. 14 (short case) No. 24 (long case), File 158031
- UL® 50 4X indoor locations, NEMA 4X, IP65 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.
- SEMI F47-0200 when powered at 24V or greater

## RUI (EZKB) Utilized as a Communication Gateway Device

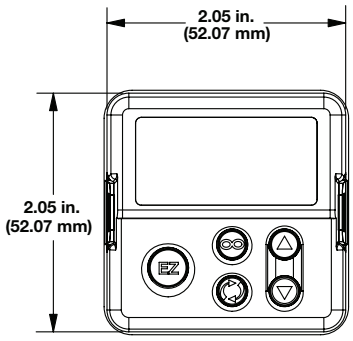



**The RUI (EZKB) can be used as a communication gateway to connect any EZ-ZONE controller with standard bus to other system components using different communication protocols such as EIA-232/485 Modbus® RTU, EtherNet IP™, Modbus® TCP, DeviceNet™ or PROFIBUS DP.**

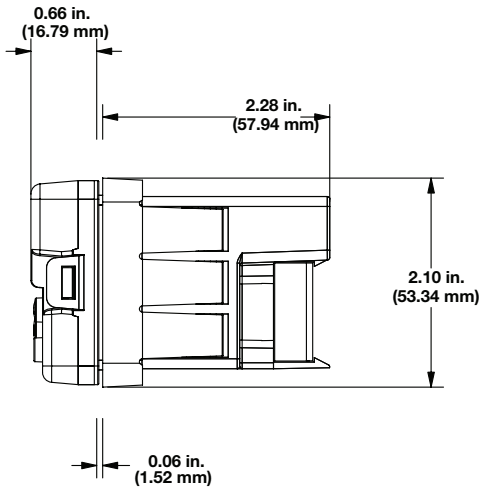
# EZ-ZONE RUI and Gateway

## Remote User Interface (RUI)—Dimensional Drawings

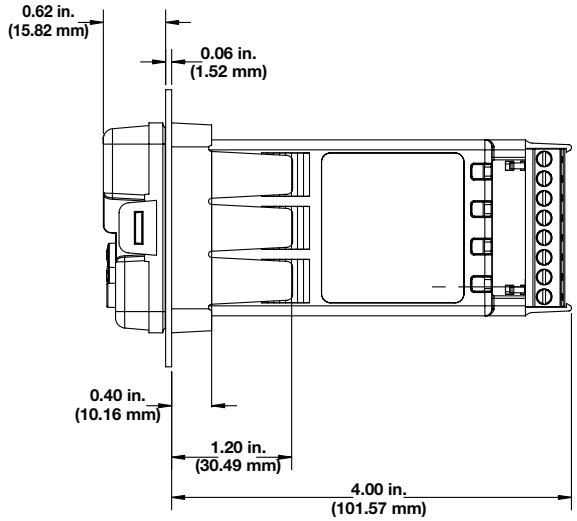
### Front View




### Short Case Version



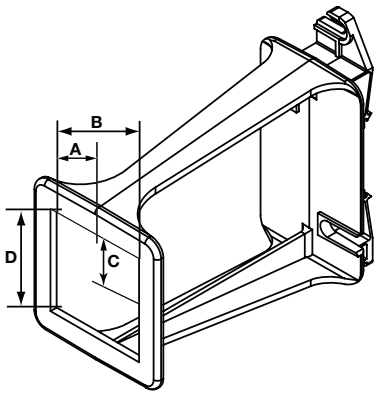

### Long Case Version




## Accessory—DIN-Rail Mounting Bracket

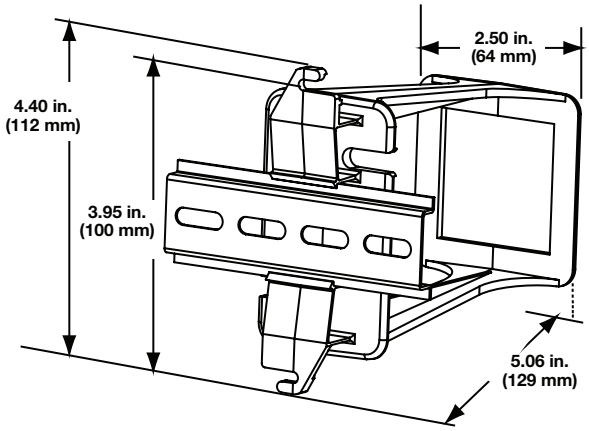
**Part Number: 0822-0586-P002**

### Front View




| Dim. A | Dim. B | Dim. C | Dim. D |
|---|---|---|---|
| 0.886 in. (23 mm) | 1.772 in. (45 mm) | 0.886 in. (23 mm) | 1.772 in. (45 mm) |

### Rear View



# EZ-ZONE RUI and Gateway

## Ordering Information

**Part Number**

| ① ② ③ | ④ Remote User Interface | | ⑤ Power Supply Voltage for RUI | ⑥ Comm. Gateway Options | ⑦ ⑧ Custom RUI | | ⑨ ⑩ Future Options | ⑪ ⑫ Custom Options |
|---|---|---|---|---|---|---|---|---|
| EZK | | - | | | | - | AA | |

| ④ | Remote User Interface (RUI) |
|---|---|
| B = | Basic 1/16 DIN |

| ⑤ | Power Supply Voltage for RUI |
|---|---|
| L = | Low voltage 24-28VAC/VDC |
| H = | Universal high voltage 100-240VAC/VDC |

| ⑥ | Communication Gateway Options* (Standard Bus Always Included) |
|---|---|
| A = | None |
| 2 = | EIA-232/485 Modbus® RTU |
| 3 = | EtherNet/IP™/Modbus® TCP |
| 5 = | DeviceNet™ |
| 6 = | PROFIBUS DP |
| * Options 2 through 6 require the long case dimensions | |

| ⑦ ⑧ | Custom RUI |
|---|---|
| AA = | None |
| XX = | Custom options, contact factory |

| ⑪ ⑫ | Custom Options |
|---|---|
| AA = | None |
| 12 = | Class 1, Div. 2 (only available with communication options 2, 3, 5 and 6) |

# Indicators

| Product | Mounting | Display Height | Page |
|---|---|---|---|
| **EZ-ZONE® PM** | 1/32, 1/16, 1/8, 1/4 DIN front panel | Upper/Left: 0.30 to 0.80 in. (8 to 20 mm)<br>Lower/Right: 0.22 to 0.50 in. (6 to 13 mm) | **347** |
| **EZ-ZONE RUI and Gateway** | 1/16 DIN front panel | Upper: 0.40 in. (10 mm)<br>Lower: 0.24 in. (6 mm) | **348** |
| **SERIES TM** | DIN-rail, front panel, chassis | 0.28 in. (7 mm) | **349** |

## EZ-ZONE® PM

The EZ-ZONE PM panel mount controller offers control options that reduce system complexity and thermal loop ownership cost. It can be ordered as a PID controller, an over/under limit controller or its functions can be combined into an integrated controller. An option to integrate a high amperage power controller output with a high-performance PID controller and an over/under limit controller in one space-saving, panel mount package is also available. Many communications options are offered to support connectivity needs.

Because the EZ-ZONE PM controller is highly scalable, pay only for what is needed. This controller is available in 1/32, 1/16, 1/8 and 1/4 DIN panel mount packages. The EZ-ZONE PM controller is easy to use and is ideal for PID, over/under limit or integrated controller needs.

### Features and Benefits

**Integrated PID and limit controller**
- Reduces wiring time and termination complexity compared with connecting discrete products
- Decreases required panel space
- Lowers installation costs
- Increases user and equipment safety for over/under temperature conditions

**High amperage power control output**
- Drives 15 ampere resistive loads directly
- Reduces component count
- Decreases cost of ownership

**Current monitoring**
- Detects heater current flow and provides alarm indication of a failed output device or heater load
- Drives output on open or shorted heater

**Serial communication capabilities**
- Provides a wide range of protocol choices including Modbus® RTU, EtherNet/IP™, Modbus® TCP, PROFIBUS DP, DeviceNet™ and J1939 CAN bus
- Supports network connectivity to a PC or PLC

**Dual-channel controller**
- Provides two PID controllers in one space-saving package

**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

**Advanced PID control algorithm**
- Offers TRU-TUNE®+ adaptive control to provide tighter control for demanding applications
- Provides auto-tune for fast, efficient startup

**Configuration communications with software**
- Includes Watlow standard bus communications used by COMPOSER® or EZ-ZONE configurator software
- Saves time and improves reliability of controller setup

**For detailed product and ordering information, see the full EZ-ZONE PM product section located on pages 229 through 238.**

# EZ-ZONE RUI and Gateway

The EZ-ZONE Remote User Interface (RUI and communications gateway) can be utilized as a communication gateway device to save cost, space and wiring when digital communications is being used with two or more EZ-ZONE controllers. The EZ-ZONE RUI can also serve as a display for showing all parameter values for up to 16 EZ-ZONE controllers, again saving cost, space and wiring expenses.



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**Flexible use of a display interface**

- Can be used when needed during normal machine production, for OEM prototype design purposes or for remote troubleshooting scenarios
- Ability to use more than one RUI indicator to display additional data including temperature and current (ammeter) to improve user system interface

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- Ability to utilize multiple communication protocols for different user preferences. Flex between different communication protocols while still maintaining a reduced level of inventory

**Delivers multiple communication protocol options**

- Ability to connect EZ-ZONE controllers to communication networks utilizing
  - Modbus® RTU
  - DeviceNet™
  - Ethernet/IP™
  - Modbus® TCP
  - PROFIBUS DP

## Additional Features

**EZ-ZONE P3T armor sealing system**

- Complies with NEMA 4X, IP65 RUI
- Offers water and dust resistance, can be cleaned and washed down

**EZ-KEY (RUI)**

- Programmable EZ-Key is a functional key programmable by the user to perform simple one-touch operation of repetitive user activities

**Compact package**

- Reduces required panel size for 1/16 DIN
- Utilizes less depth behind panel allowing for mounting in tight spaces

**Touch-safe package**

- Complies with IP2X which increases safety for user

**Agency approvals: UL® Listed, CSA, CE, RoHS, W.E.E.E., SEMI F47-0200, Class 1, Div. 2 rating on selected models**

- Meets applications requiring agency approvals

**For detailed product and ordering information, see the full EZ-ZONE RUI and Gateway product section located on pages 341 through 344.**

# SERIES TM

The SERIES TM temperature indicator from Watlow provides an economical solution for applications requiring temperature monitoring and display. Square 1/8 DIN panel mount and DIN-rail mount packaging options are available. A red, four-character, seven-segment LED display indicates the process value. The microprocessor-based design provides significant improvements in performance, repeatability and accuracy over analog indicators.

The indicators are UL® approved and include CE approvals. Panel mount indicators include NEMA 4X/IP65 seal protection. Watlow's SERIES TM temperature indicators include industry leading service and support and are backed by a three-year warranty.


## Features and Benefits

**Four character LED display**
- Improves accuracy

**Multiple mounting options**
- Minimizes installation time

**Fahrenheit or Celsius operation with indication**
- Offers application flexibility

**Agency approvals**
- Meets certification requirements/compliance

**Microprocessor-based technology**
- Ensures accurate repeatable indication

## Typical Applications

- Food preparation
- Industrial machinery
- Packaging
- Plastics processing

## Specifications

**Operator Interface**
- Four-digit, seven-segment LED displays, 7 mm (0.28 in.) high
- °F or °C indicator

**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

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

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

**Input Accuracy Span Range**

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

**Thermocouple Input Accuracy**
- 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

# SERIES TM

## Specifications *(Continued)*

### RTD Input Accuracy

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

### Indication Ranges

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

### Agency Approvals

- CE①, W.E.E.E., RoHS EU Directive (2002-95-EC)
- UL® 873 recognized temperature indicator, File # E43684
- UL® 197 reviewed for use in foodservice appliances
- Temperature indicator CSA 22.2 No. 24, File # 30586
- Front panel mount models with gasket
  - UL® 50 Type 4X indoor use only
  - NEMA 4X/IP65 approved

### Terminals

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

### 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

### 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 x 0.30 in. (35 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 1/8 DIN Panel | 2.85 in. (72.4 mm) | 2.85 in. (72.4 mm) | Behind panel 2.04 in. (51.7 mm) |

① See declaration of conformity.

## Ordering Information

**Indicator only, 4-character, 7-segment display**

**Part Number**

| ①② | ③ | ④ | ⑤ | ⑥ | ⑦⑧⑨⑩ | ⑪⑫⑬⑭ | ⑮ |
|---|---|---|---|---|---|---|---|
| | Power Supply | Package | Sensor Type & Scale | | | | Overlay/ Custom Options |
| TM | | | | A | AAAA | AAAA | |

| ③ | Power Supply |
|---|---|
| B = | 120VAC |
| D = | 230 to 240VAC |
| F = | 24VAC |

| ④ | Package |
|---|---|
| 1 = | Panel mount, 1/8 in. DIN square - spade terminals |
| 2 = | DIN-rail mount - spade terminals |
| 5 = | Panel mount, 1/8 in. DIN square - screw terminals |
| 6 = | DIN-rail mount - screw terminals |
| A = | NEMA 4X panel mount, - spade terminals |
| C = | NEMA 4X panel mount, - screw terminals |

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

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

# Data Loggers

| Product | Description | Supported Controllers | Operating Requirements | Page |
|---|---|---|---|---|
| **D4T 1/4 DIN Data Logger** | 1 to 24 channels 4.3 in. touch screen with data encrypted files and trend chart graphs | D4T and Flex Modules (FM) | None | 353 |
| **F4T With INTUITION®** | 1 to 24 channels 4.3 in. touch screen with data encrypted files and trend chart graphs | F4T and Flex Modules (FM) | None | 358 |
| **EZ-ZONE® RM System with Access Module** | Communications module with data logging ability | EZ-ZONE RM | None | 359 |
| **RMA PLUS Remote Access Module** | Communications module with data logging ability | EZ-ZONE RM, PM, EZK, ST, PM PLUS and POWERGLIDE™ | None | 360 |
| **SpecView HMI Software** | Human machine interface for Watlow controllers | See catalog page **362** | Windows® 10, 8.1, 8, 7, Vista, Server 2003, XP (Home and Professional), 2000, NT 4.0, ME, 98 and 95 | 361 |
| **Silver Series EM** | Rugged, touch screen operator interface terminal | EZ-ZONE and many others | EZwarePlus: Windows® 10, 8.1, 8, 7, Vista and XP | 366 |

# D4T 1/4 DIN Data Logger

The D4T with INTUITION® data logger offers a wide range of field removable I/O modules for maximum design flexibility. Configurations can be custom tailored to meet the scaling needs of a tremendous range of equipment and applications while providing exactly the hardware types required for compatibility. The D4T data logger also features a 4.3 inch, color, graphical touch panel. Combining power, flexibility and functionality, this new data logger offers unmatched versatility, and its best-in-class ease of use could very well make user manuals a thing of the past.

## Features and Benefits

**4.3-inch, color touch panel with high-resolution, graphical user-interface**

- Shortens learning curve and reduces operator errors
- Allows channels, alarms, inputs and outputs to be personalized with user defined names
- Intuitive screens layout and menu navigation
- Programmable to show information in multiple languages

**Data logging**

- Easily complies with regulatory standards with ability to choose encrypted, .CSV or both types of file formats for tamper proof record needs
- Enables security using lock-out security levels for different user groups
- Simplifies record keeping management with ability to archive records to the cloud or a connected PC network
- Flexibility to select which parameters to log from one to up to 128 points simultaneously
- Choose where you want to store the files—inside the controller, on a connected USB memory device, or to a connected PC anywhere in the world
- Record as fast as one time per 0.1 second or as slow as one time per hour

**1 to 24 channel data logger**

- Scalable channels, pay for only what you need
- Compatible with temperature, altitude, humidity, ac current and other 0-10VDC or 0-20mA process units
- Flexibility to meet diverse process applications
- Field expandable channels and I/O if application needs grow in the future

**Batch processing with bar code data entry**

- Easily collects and manages data records
- Inputs information from bar code scan for fast and easy data entry
- Provides data security through password and data log encrypted file options
- Improves manufacturing robustness via reminder screens ensuring all data is entered during processing
- Helps ensure compliance with growing regulations and minimizes warranty exposure
- Eliminates part processing skips or walk arounds due to improved quality control
- Produces formatted data record report for easy receipt or record management uses

**Trend Screens**

- Create up to four unique trend graph screens
- Graph any input sensor or process value

**COMPOSER® graphical configuration PC software**

- Speeds up and simplifies commissioning
- Archives and documents controller setup
- Connects with controller easily via Ethernet

**Many communications options available including Ethernet Modbus® TCP and SCPI and EIA-232/485 Modbus® RTU**

- Offers two USB host ports and one device port
- Simplifies methods to manually or automatically archive data log files to cloud or PC
- Easily connect and transfer data log or configuration set up files

# D4T 1/4 DIN Data Logger

## Features and Benefits (con't)

**Modular design**
- Adapts quickly to evolving requirements
- Offers numerous types of field pluggable modules for maximum flexibility and easiest compatibility
- Features scalable and modular firmware functions
- Delivers scalable input/output quantities from 1 to 24

**Agency certifications include UL®, FM, CE, RoHS, W.E.E.E., NEMA 4X/IP65**
- Ensures high quality and reliability
- Verifies performance in installations worldwide

**Off-the-shelf solution**
- Provides cost-effective "make versus buy"
- Offers preconfigured touch-panel screens
- Assures quicker time to market

## Key Features and Options

- Ethernet Modbus® TCP connectivity
- Multiple high-speed USB host ports
- Universal, thermistor and ac current measurement inputs
- Inputs and outputs expandable from 1 to 24
- Programmable timers, counters, math and logic
- Temperature, altitude, relative humidity and Vaisala® humidity compensation
- USB configuration port
- Configuration settings can be stored and recalled
- Removable modules and connectors
- Front-panel mount and flush mounting options
- Right angle and front-screw terminal options
- UL® listed, CSA, CE, RoHS, W.E.E.E., FM

## Common Specifications

**Line Voltage/Power**
- Data retention upon power failure via nonvolatile memory

**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

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

**Configuration Diagnostics**
- Indicates if modules present match the expected configuration settings

**USB Device Port (Coming soon, consult factory for availability.)**
- Version: USB 2.0 full-speed
- Connector: USB Mini Type B, 5 position
- Recognized as a mass storage device/serial communications
- Driver for Microsoft® Windows® 7 and Windows® 8

**USB Host Port**
- Total of 2 available
- Version: USB 2.0 hi-speed
- Connector: USB Type A, high-retention
- Flash drive must be FAT32 file system
- Max. current 0.5A/port

**System Configuration Requirements**
- D4T has 6 slots for flex modules (FM)
- EIA-232/485 Modbus® RTU flex module, if used, must occupy slot 6 location
- A maximum of two 10A SSR FM modules can be used in the F4T and each will require space for 2 slots. Valid in slots 1, 2, 4 or 5

**Wiring Termination—Touch-Safe Terminals**
- Right-angle and front-screw terminal blocks for input, output and power supply connections
- Input, output and power terminals: touch safe, removable, 12 to 30 AWG

## D4T Base Specifications

**Line Voltage/Power**
- High voltage option: 100 to 240VAC +10/-15%, 50/60Hz ±5%
- Low voltage option: 24 to 28VAC/VDC+10/-15%, 50/60Hz ±5%
- Power consumption: 23 W, 54VA

**Environment**
- NEMA 4X/IP65 front panel mount configuration only
- Operating temperature: 0 to 122°F (-18 to 50°C)
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Relative humidity: 0 to 90%, non-condensing

**User Interface**
- 4.3 inch TFT PCAP color graphic touch screen
- LED backlife >50K hours
- 4 keys: Home, Main Menu, Back, Help

# D4T 1/4 DIN Data Logger

**Agency Approvals**
- UL®/EN 61010 Listed, File E185611 QUYX
- UL® 508 Reviewed
- CSA CC.C#14, File 158031
- AMS 2750 E compliant: Analog input process values. Tip: Maximize field calibration accuracy and uniformity by using advanced F4T features such as Calibration Offset and Linearization Function Blocks. Refer to user manual for details.
- RoHS by design, China RoHS Level 2, W.E.E.E.
- CE
- Windows® Hardware Certification

**Inputs and Outputs**
- Input sampling: 10Hz
- Output update: 10Hz

**Communications**
- Ethernet Modbus® TCP
- EIA-232/485 Modbus® RTU
- Isolated communications

**Data Logging**
- User selectable parameters: Up to a maximum of 128 active parameters depending on configuration
- Logging interval: Programmable increments between 0.1 seconds and 60 minutes if logging to internal memory. Logging directly to USB; 1.0 seconds to 60 minutes
- File types: .CSV for standard data logging or proprietary format for encrypted data log option
- Storage: 80MB internal memory or to USB memory stick
- File transfer: Internal memory to USB host port or to Ethernet Modbus® TCP
- Transfer options: On demand by user or user programmable based on when a new data log file record is available. Utilizes TFTP and Samba protocols
- Record: Date and time stamped

**Batch Processing with Bar Code Data Entry Via USB Scanner**
- Compatible with many bar code types including Code 128, Code 39, Extended Code 39, Data Matrix, Interleaved 2 of 5, ISSN, SISAC, LOGMARS, QR, UCC/EAN-128 (GS1-128, UPC-A & E)
- Compatible with most USB scanner types such as Zebra DS4308, DS2208, LI2208 and LS2208
- USB port provides 500mA max. power supply for bar code scanner/base charging
- Display can show bar code fields up to a maximum length of 48 characters. Characters might wrap to 2 rows after 24 characters
- Program the bar code scanner to add an enter key (carriage return feed) at the end of each bar code data field sent to the F4T/D4T. Refer to USB scanner user manual.

**Trending**
- 4 user programmable charts
- 6 pens available per chart
- View analog sensors and process values

**Real Time Clock with Battery Backup**
- Accuracy (typical): +/-3ppm over -15 to 50°C
- Typical battery life: 10 years at 77°F (25°C)
- Field replaceable lithium battery

**Number of Function Blocks by Ordering Option**

| Function Block | Basic | Set 1 | Set 2 |
|---|---|---|---|
| **Alarm** | 6 | 8 | 14 |
| **Compare** | None | 4 | 16 |
| **Counter** | None | 4 | 16 |
| **Linearization** | 4 | 4 | 8 |
| **Logic** | None | 12 | 24 |
| **Math** | None | 12 | 24 |
| **Process Value** | 4 | 4 | 8 |
| **Special Output Function (including compressor)** | None | 2 | 4 |
| **Timer** | None | 6 | 16 |
| **Variable** | 4 | 12 | 24 |

**Compare**
- Greater than, less than, equal, not equal, greater than or equal, less than or equal

**Counters**
- Counts up or down, loads predetermined value on load signal

**Linearization**
- Interpolated or stepped

**Logic**
- And, nand, or, nor, equal, not equal, latch, flip-flop

**Math**
- Average, process scale, switch over, deviation scale, differential (subtract), ratio (divide), add, multiply, absolute difference, minimum, maximum, square root, sample and hold, pressure-to-altitude and dew point

**Process Value**
- Sensor backup, average, crossover, wet bulb-dry bulb, switch over, differential (subtract), ratio (divide), add, multiply, absolute difference, minimum, maximum, square root, altitude, Vaisala® relative humidity and pressure-to-altitude

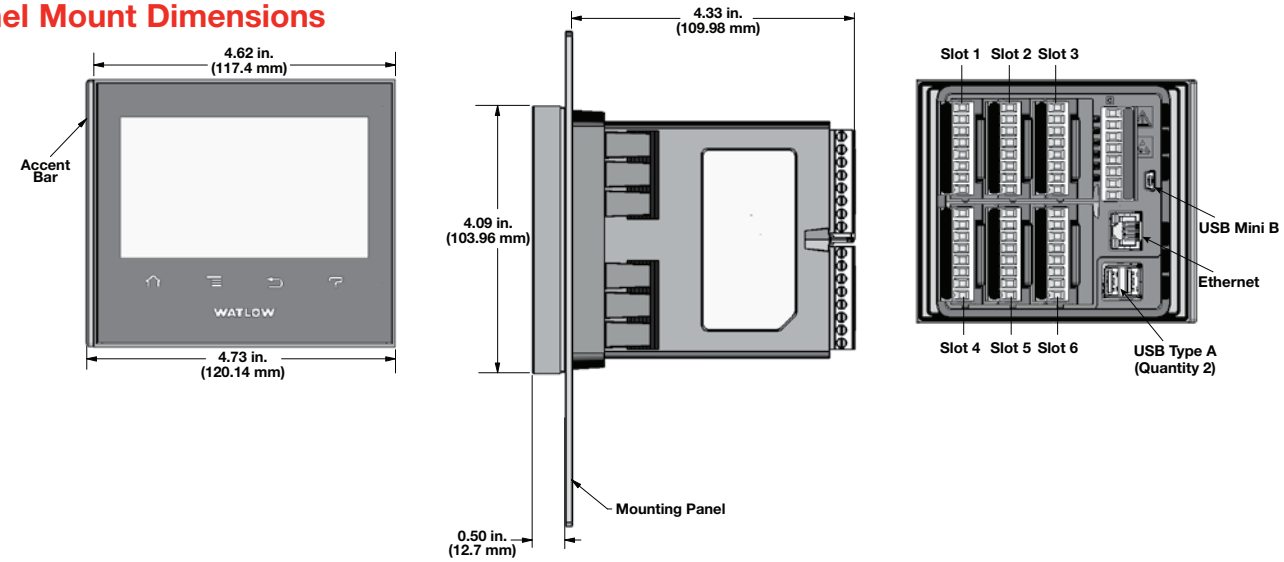
**Special Output Function**
- Compressor control (cool and/or dehumidify with single compressor), motorized valve, sequencer

**Timers**
- On pulse, delay, one shot or retentive

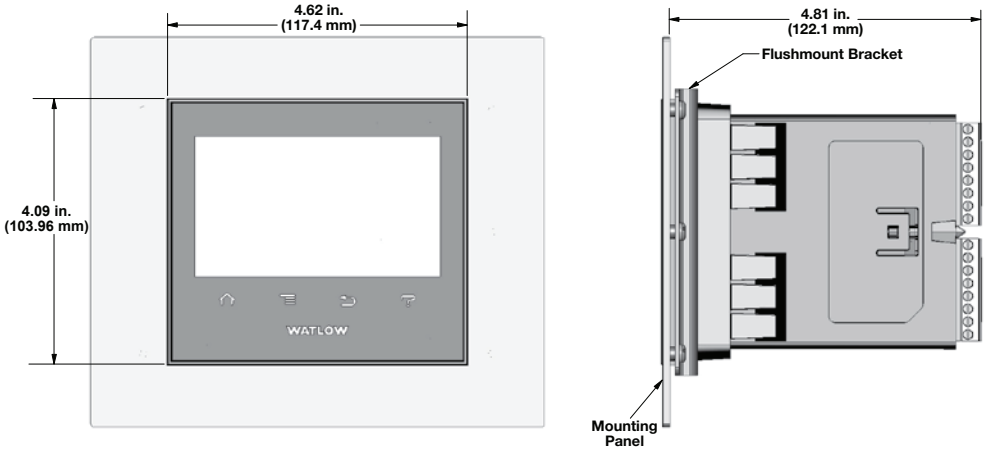
**Variable**
- User value for digital or analog variable

# D4T 1/4 DIN Data Logger

## Panel Mount Dimensions




## Flush Mount Dimensions



# D4T 1/4 DIN Data Logger

## Ordering Information

Base includes: 4.3 inch color graphical touch screen, standard bus communications, Ethernet Modbus® TCP and SCPI protocol.

**Part Number**

| ①② Model | ③ Base Type | ④ Appl. Type | ⑤ Data Logging & Trend Charts | ⑥ Pwr. Sup. Voltage, Conn. Style, Watlow Logo Screenprint | ⑦ Function Blocks | ⑧⑨ Future Options | ⑩⑪ Doc., Accent Bar, Replacement Conn. & Custom | ⑫ Add'l Options | ⑬⑭ Nbr. Logging Channels & Input Hardware Types | ⑮ Nbr. of Aux./Alarm Outputs, Digital Inputs & Hardware |
|---|---|---|---|---|---|---|---|---|---|---|
| D4 | T | | | | | AA | | 5 | | |

| ③ Base Type | |
|---|---|
| T = | Touch screen |

| ④ Application Type | |
|---|---|
| 1 = | Standard |

| ⑤ Data Logging and Trend Charts | |
|---|---|
| J = | Data logging |
| K = | Data logging with encrypted files |
| L = | Data logging with graphical trend charts |
| M = | Data logging with encrypted files, graphical trend charts and batch processing with bar code data entry |

| ⑥ Power Supply Voltage, Connector Style, Watlow Logo Screenprint | | | |
|---|---|---|---|
| | Power Supply | Power Supply Connector | Watlow Logo |
| 1 = | 100 to 240VAC | Right angle (standard) | Yes |
| 2 = | 100 to 240VAC | Right angle (standard) | No |
| 3 = | 100 to 240VAC | Front screw | Yes |
| 4 = | 100 to 240VAC | Front screw | No |
| 5 = | 24 to 28VAC or VDC | Right angle (standard) | Yes |
| 6 = | 24 to 28VAC or VDC | Right angle (standard) | No |
| 7 = | 24 to 28VAC or VDC | Front screw | Yes |
| 8 = | 24 to 28VAC or VDC | Front screw | No |

| ⑦ Function Blocks | | | |
|---|---|---|---|
| | Basic Set | Set 1 | Set 2 |
| A = | X | | |
| B = | | X | |
| C = | | | X |

| ⑧⑨ Future Options | |
|---|---|
| AA = | Future Options |

| ⑩⑪ Documentation, Accent Bar, Replacement Connectors & Custom | | | | | |
|---|---|---|---|---|---|
| | Documentation DVD/QSG | Decorated Brush Aluminum Accent Bar | | | |
| | | Gray | Blue | Red | None |
| 1A = | Yes | X | | | |
| 1B = | Yes | | X | | |
| 1C = | Yes | | | X | |
| 1D = | Yes | | | | X |
| 1E = | No | X | | | |
| 1F = | No | | X | | |
| 1G = | No | | | X | |
| 1H = | No | | | | X |
| 1J = | Replacement connectors only - for the model number entered | | | | |
| XX = | Contact factory, other custom-firmware, preset parameters, locked code, logo | | | | |

| ⑫ Additional Options | |
|---|---|
| 5 = | None |

| ⑬⑭ Number of Logging Channels & Input Hardware Types | |
|---|---|
| **Universal Input(s) (T/C, RTD 2- or 3-wire, 0-10VDC, 0-20mA)** | |
| U1 = | 1 channel |
| U2 = | 2 channels |
| U3 = | 3 channels |
| U4 = | 4 channels |
| U5 = | 5 channels |
| U6 = | 6 channels |
| **Thermistor Input(s)** | |
| T1 = | 1 channel |
| T2 = | 2 channels |
| T3 = | 3 channels |
| T4 = | 4 channels |
| T5 = | 5 channels |
| T6 = | 6 channels |
| **Universal Input(s) (T/C, RTD 2-wire, 0-10VDC, 0-20mA)** | |
| 04 = | 4 channels |
| 08 = | 8 channels |
| 12 = | 12 channels |
| 16 = | 16 channels |
| 20 = | 20 channels |
| 24 = | 24 channels |
| **Thermistor Input(s)** | |
| TA = | 4 channels |
| TB = | 8 channels |
| TC = | 12 channels |
| TD = | 16 channels |
| TE = | 20 channels |
| TF = | 24 channels |
| **Custom** | |
| XX = | Different channel quantity and combination options. Contact factory for assistance. |

| ⑮ Number of Auxiliary/Alarm Outputs, Digital Inputs & Hardware | |
|---|---|
| **Options below are not available with 6 or 24 channel input models** | |
| A = | None |
| **Single Output** | |
| C = | 1 switched dc/open collector |
| E = | 1 mechanical relay 5A, Form C output |
| F = | 1 universal process/retransmit |
| **Multiple Digital Inputs/Outputs** | |
| D = | 6 digital I/O |
| P = | 3 universal process/retransmit outputs |
| B = | 3 mechanical relay 5A, 2 Form C and 1 Form A (Form A shares a common with 1 Form C) |
| J = | 4 mechanical relay 5A, Form A |
| K = | 2 SSRs Form A, 0.5A |
| T *= | 2 SSRs at 10A |
| L = | 2 SSRs at 2A each, SSRs grouped in 2 pairs with each pair sharing a common |
| **Communications** | |
| M = | Modbus® RTU 232/485 |
| **Custom** | |
| X = | Different output quantity and combination options. Contact factory for assistance. |
| *Option "T" not available with digit 13 & 14, options U5, U6, T5, T6, 20, 24, TE and TF. | |

## F4T With INTUITION®

The F4T with INTUITION® temperature process controller offers a wide range of field removable I/O modules for maximum design flexibility. Configurations can be custom tailored to meet the scaling needs of a tremendous range of equipment and applications while providing exactly the hardware types required for compatibility. The F4T controller also features a 4.3 inch, color, graphical touch panel. Combining power, flexibility and functionality, this new controller offers unmatched versatility, and its best-in-class ease of use could very well make user manuals a thing of the past.

### Features and Benefits

**4.3-inch, color touch panel with high-resolution, graphical user-interface**

- Shortens learning curve and reduces operator errors
- Allows channels, profiles, alarms, inputs and outputs to be personalized with user defined names

**Temperature PID, data logger, trend chart, over/under-temperature limit, power switching, math, logic, timers and counters combined into an integrated system**

- Lowers ownership costs
- Eliminates the need for separate discrete components
- Reduces complexity
- Simplifies design, ordering and installation
- Saves money

**Robust algorithms for temperature, cascade, altitude, humidity and compressor**

- Improves process control
- Offers one to four channels of control
- Provides multiple PID sets
- Enables TRU-TUNE®+ adaptive control algorithm
- Offers 40 ramp and soak profiles with real-time clock and battery backup

**COMPOSER® graphical configuration PC software**

- Speeds up and simplifies commissioning
- Archives and documents controller setup
- Connects with controller easily via Ethernet

**Many communications options available including Ethernet Modbus® TCP and SCPI and EIA-232/485 Modbus® RTU**

- Offers two USB host ports and one device port
- Simplifies file transfers
- Connects easily

**Batch Processing with Bar Code Data Entry**

- Easily collects and manages data records
- Inputs information from bar code scan for fast and easy data entry
- Offers foolproof processing via smart profile to part linkage
- Provides data security through password and data log encrypted file options
- Improves manufacturing robustness via reminder screens ensuring all data is entered during processing
- Helps ensure compliance with growing regulations and minimizes warranty exposure
- Eliminates part processing skips or walk arounds due to improved quality control
- Produces formatted data record report for easy receipt or record management uses

**Modular design**

- Adapts quickly to evolving requirements
- Offers numerous types of field pluggable modules for maximum flexibility and easiest compatibility
- Features scalable and modular firmware functions
- Delivers scalable input/output quantities from 1 to 36

**Agency certifications include UL®, FM, CE, RoHS, W.E.E.E., NEMA 4X/IP65**

- Ensures high quality and reliability
- Verifies performance in installations worldwide

**For detailed product and ordering information, see the full F4T product section located on pages 189 through 199.**

## EZ-ZONE® RM System with Access Module

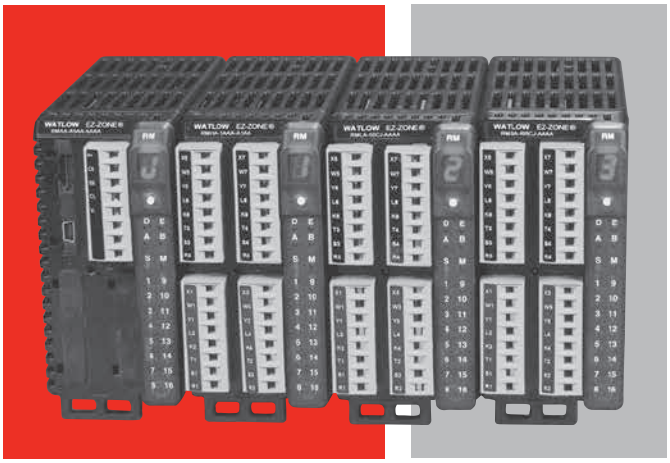
The EZ-ZONE® RM controller simplifies thermal system management. The EZ-ZONE RM controller family is comprised of six module types: an integrated on-off or PID control, monitoring and over/under temperature limit module, a high-density on-off or PID control module, a high-density limit only module, an 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.

**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**

- Enables 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

**For detailed product and ordering information, see the full EZ-ZONE RM product section located on pages 200 through 219.**

## RMA PLUS Remote Access Module

Watlow's new RMA PLUS remote access module supports Watlow's powerful EZ-ZONE® RM temperature controller family by communicating with and providing access to all EZ-ZONE RM modules in a system.

EZ-ZONE RMA users have had to spend more time than desired to connect their entire system. Now the RMA PLUS offers standard state-of-the-art connectivity from the device to the entire system. Real-time communication is possible via a built-in Ethernet switch or USB. Users can also connect to third-party and legacy devices because the RMA PLUS acts as a gateway between Modbus® TCP and Modbus® RTU.

The device comes standard with a built-in managed Ethernet switch with two Ethernet jacks. Up to three Modbus® TCP sessions, three Watbus over Ethernet sessions and one Watbus over USB session is available in a single device. Users can also log up to 16 gigabytes of data standard or upgrade to a maximum of 32 gigabytes. Configuration and data logs are available as Windows® files so they can be easily accessed. In addition, discovery and transfer speeds have gone from minutes with the legacy EZ-ZONE RMA to just seconds with the RMA PLUS.

Because the RMA PLUS is an essential component of the EZ-ZONE RM family, users receive all the benefits and support of working with Watlow®.

To view a comparison between the legacy EZ-ZONE RM Access Module and the new RMA Plus go to www.watlow.com/rmaplus.


### Features and Benefits

**Plug and play access to EZ-ZONE RM family**
- Integrates easily into existing systems

**Built-in Ethernet switch**
- Eliminates the need to provide a switch for small systems
- Offers port mirroring for troubleshooting
- Protects from broadcast and multicast storms

**Integrated USB connection**
- Provides easy connection from PC with no converter
- Ensures real-time communication from software packages

**Modbus® TCP and Modbus® RTU**
- Allows users to build tables based on individual needs
- Connects to third-party and legacy devices

**Data logging**
- Offers users the opportunity to log any data point in the system

**For detailed product and ordering information, see the full EZ-ZONE RM product section located on pages 200 through 219.**

## SpecView HMI Software

SpecView software is an easy-to-use Human Machine Interface (HMI) to Watlow controllers, including the F4T with INTUITION process controller and EZ-ZONE controllers as well as third-party products. Watlow's single point of support for hardware, software and application needs ensures knowledgeable and expedient responses to questions or concerns.

This competitively priced package includes field-proven features, many suggested by loyal users. Built-in support and auto-detect for Watlow controllers make setup quick and simple. SpecView is ideal for industrial applications with support for barcode readers and touch-screen operation.

To try before purchasing, download SpecView from the Watlow website and run in the time-limited demo mode.

### Features and Benefits

**Built-in support and auto-detect for controllers**
- Saves set-up time
- Eliminates the need to learn communications protocols
- Integrates devices from multiple vendors

**Watlow EZ-ZONE standard bus communications protocol**
- Communicates with any EZ-ZONE product without requiring purchase of a communications option

**Highly configurable trending/graphing**
- Simplifies monitoring and troubleshooting processes and machines
- Provides a permanent, unalterable record of results

**Flexible data logging and report generator**
- Helps users comply with regulatory requirements including AMS 2750D NADCAP
- Reduces labor and increases accuracy by automating data collection
- Simplifies record keeping by consolidating measurements, operator comments and other information into Excel® - compatible report formats
- Allows data to be grouped in user-defined batches
- Records operator actions

**Easy-to-build, customizable screens**
- Allows creation of application-specific screens, which can automate tasks, decrease training time and simplify monitoring and operation
- Highlights specific parameter values with user-set color dynamics and provides bar graphs for "at-a-glance" monitoring
- Limits access with passwords if desired


**Easy-to-use recipe manager**
- Saves snapshot of current parameter settings
- Eliminates operator error when setting machine parameters
- Reviews and edits complex programmer profiles

**Historical replay option**
- Helps troubleshoot processes by allowing review of recorded data

**Remote access option**
- Allows multiple, identical operator stations for convenient access
- Reduces downtime and increases utilization with monitoring and access over LAN, modem or Internet

### System Requirements

**Compatible Operating Systems:**
- Windows® 10, 8.1, 8, 7, Vista, Server 2003 and XP

**Minimum System:**
- Pentium® processor or equivalent AMD
- 1GB RAM (2GB or more recommended)
- 100MB hard disk space to install SpecView
- Additional disk space for data logging
- Instrument connection: serial port or Ethernet
- USB port for the key

**Ideal System:**
- Intel® Core™ i5 2.6Ghz processor or AMD equivalent
- 2GB RAM
- 500GB hard disk plus enough space for data logging

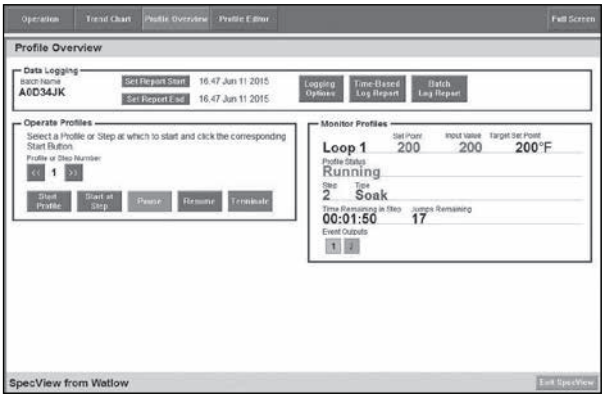
# SpecView HMI Software

## Supported Controllers and Protocols

| Controller | Controller's Communication Protocol | | |
|---|---|---|---|
| | Standard Bus | Modbus® RTU | Modbus® TCP |
| F4T with INTUITION | N/A | ✓ | ✓ |
| EZ-ZONE RM, PM and ST | ✓ | ✓ ① | ✓ ① |
| SERIES F4 Ramping | N/A | ✓ | N/A |
| SERIES 96, 97, SD | N/A | ✓ | N/A |
| POWER SERIES | N/A | ✓ | N/A |
| MICRODIN | N/A | ✓ | N/A |
| SERIES 986, 987, 988, 989 | N/A | ✓ | N/A |
| CLS200 (standard or ramp/soak) | N/A | ✓ | N/A |
| MLS300 (standard or ramp/soak) | N/A | ✓ | N/A |

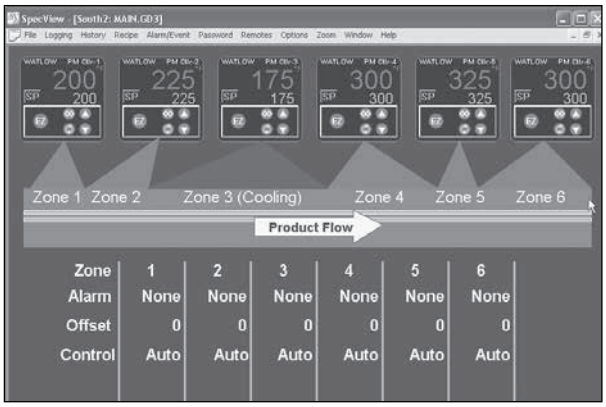
① Modbus® support for basic operation parameters is included. Automatic detection of EZ-ZONE instruments is not available via Modbus® so configurations must be set up manually. EZ-ZONE ST controllers versions 1 to 3 are supported via Modbus® with a RUI Gateway only.

## Application Examples

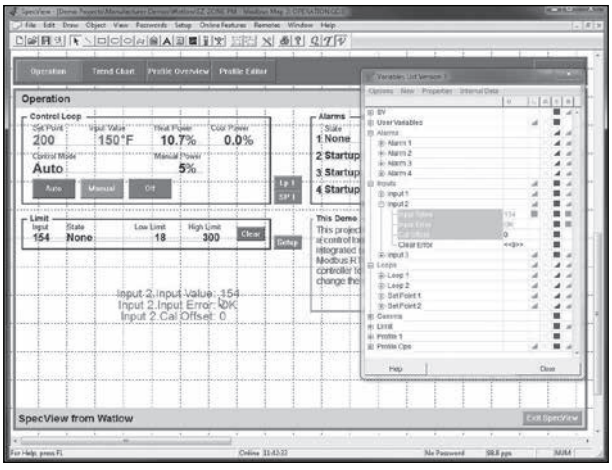



**Track and report batch-specific processing data.**


**Graph and log process data. Replay data that may have been missed while a user was away. For playback of data older than four hours get the historical replay option.**




**Create application-specific screens that depict process data so users can relate.**




**Make screens with drag-and-drop ease.**

# SpecView HMI Software

## Ordering Information - Standard

**Part Number**

| ①② | ③ | ④ | ⑤ | | ⑥ | ⑦ | ⑧⑨ | | ⑩ | ⑪ | ⑫ | ⑬ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Version | Ports | Historical Replay & Strategy Cont. | - | DDE and OPC | ActiveX Container | Remote Users | - | Special Watlow Drivers | Third Party Drivers | Update Plan | |
| SV | S | | | - | | | | - | | | | 0 |

| ③ Version | |
|---|---|
| S = | Standard |

| ④ Ports | |
|---|---|
| S = | Single |
| M = | Multiple |

| ⑤ Historical Replay and Strategy Controller | |
|---|---|
| 0 = | None |
| H = | Historical replay |
| S = | Strategy controller |
| B = | Both |

| ⑥ DDE and OPC | |
|---|---|
| 0 = | None |
| D = | DDE |
| C = | OPC client |
| B = | Both |

| ⑦ ActiveX Container | |
|---|---|
| 0 = | None |
| A = | ActiveX container |

| ⑧⑨ Remote Users | |
|---|---|
| 00 = | None |
| XX = | Number of simultaneous remote users (01 to 99) |

| ⑩ Special Watlow Drivers | |
|---|---|
| 0 = | None |
| 1 = | SERIES F4 programmer |

| ⑪ Third Party Drivers | |
|---|---|
| 0 = | None |
| 1 = | Allen-Bradley® DF1 |

**Note:** Special drivers for other third-party products (Honeywell, Eurotherm, Mitsubishi, Yokogawa and Marathon) are available directly from SpecView.

| ⑫ Update Plan | |
|---|---|
| 0 = | One year of free updates |
| 5 = | Five additional years of updates (six years total) |

## Ordering Information - Mini

**Part Number**

| ①② | ③ | ④ | ⑤ | | ⑥ | ⑦ | ⑧⑨ | | ⑩ | ⑪ | ⑫ | ⑬ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Version | Ports | Historical Replay & Strategy Cont. | - | DDE and OPC | ActiveX Container | Remote Users | - | Special Watlow Drivers | Third Party Drivers | Update Plan | |
| SV | M | | | - | | | | - | | | | 0 |

| ③ Version | |
|---|---|
| M = | Mini (limited to two instrument views) |

**Note:** The mini version is limited to two instrument views and may not be appropriate for use with some devices such as profiling and multi-loop controllers where a single device appears as multiple instruments in SpecView.

| ④ Ports | |
|---|---|
| S = | Single |
| M = | Multiple |

| ⑤ Historical Replay and Strategy Controller | |
|---|---|
| H = | Historical replay |
| B = | Historical replay and strategy controller |

| ⑥ DDE and OPC | |
|---|---|
| 0 = | None |
| D = | DDE |
| C = | OPC client |
| B = | Both |

| ⑦ ActiveX Container | |
|---|---|
| 0 = | None |
| A = | ActiveX container |

| ⑧⑨ Remote Users | |
|---|---|
| 00 = | None |
| XX = | Number of simultaneous remote users (01 to 99) |

| ⑩ Special Watlow Drivers | |
|---|---|
| 0 = | None |
| 1 = | SERIES F4 programmer |

| ⑪ Third Party Drivers | |
|---|---|
| 0 = | None |
| 1 = | Allen-Bradley® DF1 |

**Note:** Special drivers for other third-party products (Honeywell, Eurotherm, Mitsubishi, Yokogawa and Marathon) are available directly from SpecView.

| ⑫ Update Plan | |
|---|---|
| 0 = | One year of free updates |
| 5 = | Five additional years of updates (six years total) |

# SpecView HMI Software

## Ordering Information - Upgrade

**Part Number**

| ① ② | ③ | ④ | ⑤ | | ⑥ | ⑦ | ⑧ ⑨ | | ⑩ | ⑪ | ⑫ | ⑬ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Version | Ports | Historical Replay & Strategy Cont. | - | DDE and OPC | ActiveX Container | Remote Users | - | Special Watlow Drivers | Third Party Drivers | Extend or Restart Update Plan | |
| SV | | | | | | | | | | | | 0 |

| ③ | Version |
|---|---|
| U = | No version change; upgrade options only |
| N = | Upgrade mini to standard |

| ④ | Ports |
|---|---|
| 0 = | No upgrade |
| M = | Multiple |

| ⑤ | Historical Replay and Strategy Controller |
|---|---|
| 0 = | No upgrade |
| H = | Historical replay (already included with SpecView Mini) |
| S = | Strategy controller |
| B = | Both (do not order this option with SpecView Mini) |

| ⑥ | DDE and OPC |
|---|---|
| 0 = | No upgrade |
| D = | DDE |
| C = | OPC client |
| B = | Both |

**Note:** Your upgrade order must be accompanied by the Step 1 code from the Upgrade screen in SpecView. Use the upgrade order form available at www.watlow.com or upon request from Watlow or your authorized distributor.

| ⑦ | ActiveX Container |
|---|---|
| 0 = | No upgrade |
| A = | ActiveX container |

| ⑧ ⑨ | Remote Users |
|---|---|
| 00 = | No upgrade |
| XX = | Number of simultaneous remote users (01 to 99) |

| ⑩ | Special Watlow Drivers |
|---|---|
| 0 = | No upgrade |
| 1 = | SERIES F4 programmer |

| ⑪ | Third Party Drivers |
|---|---|
| 0 = | No upgrade |
| 1 = | Allen-Bradley® DF1 |

**Note:** Special drivers for other third-party products (Honeywell, Eurotherm, Mitsubishi, Yokogawa and Marathon) are available directly from SpecView.

| ⑫ | Extend or Restart Update Plan |
|---|---|
| 0 = | No additional updates |
| 2 = | Extend update plan by two years. **Note:** Valid only **prior** to expiration of the update plan. |
| 5 = | Extend update plan by five years. **Note:** Valid only **prior** to expiration of the update plan. |
| U = | Start a new two-year update plan. **Note:** Select this option to update SpecView after its update plan has expired. |
| A = | Start a new two-year update plan. **Note:** Valid one time only when upgrading from version 2.5 to version 3. |

# SpecView HMI Software

## How to Choose the Correct SpecView Options

| Order this option... | If you want to... |
|---|---|
| **Mini Version** | Operate a system with data from one or two simple instruments. This option includes historical replay and allows up to two instruments. Note that in some cases, devices such as profiling and multi-loop controllers are represented by more than one instrument, the mini version may not be appropriate. |
| **Standard Version** | Be free to expand configurations beyond the two instrument limit of the mini version. |
| **Single Port** | Communicate with instruments on only one serial communications port or only via Ethernet only. |
| **Multiple Port** | Communicate with instruments on more than one serial communications port and via Ethernet. |
| **Historical Replay** | Replay logged data on screens in trends, bar graphs and numeric fields. Without the option, replay is limited to the last four hours of data. |
| **Strategy Controller** | Configure SpecView to respond automatically to events such as specific parameter values with actions such as printing the screen, starting logging or download a recipe. Events can also be time or calendar based. Without the strategy controller option there is a two event limit. |
| **DDE** | Integrate SpecView with other Windows® programs. |
| **OPC Client** | Connect SpecView to instruments via a third-party OPC server. |
| **ActiveX Container** | Integrate third-party or customer-written ActiveX controls into SpecView. |
| **Remote Users** | Monitor instruments from multiple computers simultaneously. Order the number of remote users corresponding to the maximum number of additional computers needed to connect simultaneously. |
| **SERIES F4 Programmer Driver** | Use the computer to manage profiles: program profiles in the computer, save profiles on the computer, or download profiles that are saved on the computer to the SERIES F4. |
| **Allen-Bradley® DF1 Driver** | Connect to Allen-Bradley® PLCs (process logic controllers) that support the DF1 protocol |
| **Update Plan** | SpecView includes one year of free updates with an option for five additional years. The update period may be extended or restarted with field upgrade options. |

## Silver Series EM

The Silver Series EM is a rugged, touch-screen operator interface terminal (OIT). Available in three sizes (4.3, 7 and 10 inch diagonal display sizes), the OIT's feature serial and Ethernet communications with multiple controllers, email messaging, universal serial bus (USB host), data logging, flexible password security and multiple languages. The small bezel size and two-inch depth make mounting in tight spots easy.

The Silver Series EM programming software, EZwarePlus, is easy to use and features a large variety of built-in screen objects that makes it powerful. When creating screens, the user can call upon extensive graphics libraries, import custom graphics and add numeric displays, entry fields, analog meters, bar graphs and trend graphs with just a few mouse clicks. Screen objects are highly customizable, and the user can create libraries of their own objects for repeat use. The online simulator, Ethernet and USB support make testing and downloading fast. The EZwarePlus screen editor is part of the EZwarePlus software suite and is available as a FREE download on www.watlow.com.

The Silver Series EM OIT paired with Watlow controllers is the perfect solution for your industrial process or machine control application.

### Features and Benefits

**Bright, color, high resolution, graphic, touch screen, thin film transistor (TFT) display**

- Maximizes display space in the OIT footprint
- Allows application specific interface design
- Allows viewing from a distance and at an angle
- Highlights important process information with color and animation

**User selectable portrait or landscape operation**

- Fits in tight spots

**Ethernet, serial and USB host ports**

- Allows options for connecting to controllers
- Provides options for downloading projects
- Expands memory for additional recipe and data log storage
- Supports barcode readers, keyboard, mouse and printers
- Supports monitoring from a personal computer (PC) with free virtual network computing (VNC) client software

**Support for over 100 protocols, up to three simultaneously plus multiple protocols over Ethernet**

- Connects to a wide range of industrial controllers and devices
- Integrates a variety of devices to simplify complex operation tasks

**Data logging, display and trending**

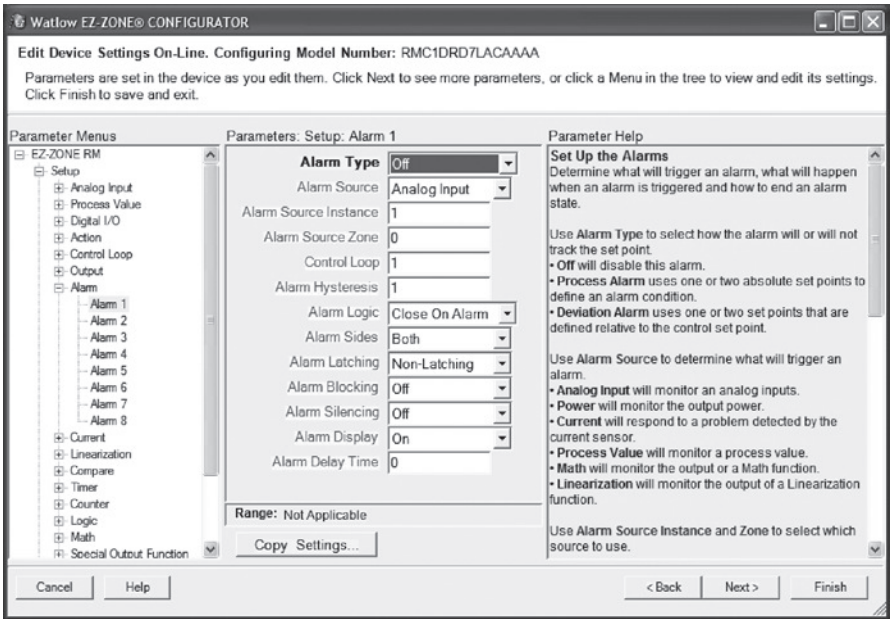
- Helps operators monitor processes
- Reduces labor and increases accuracy by automating time-stamped data collection
- Stores captured data for future retrieval in multiple files
- Saves time by exporting data to Excel®-compatible comma separated value (.csv) files
- Improves process understanding by allowing live and historical data to be viewed on the OIT

**For detailed product and ordering information, see the full Silver Series EM product section located on pages 335 through 340.**

# Software



| Product | Description | Supported Controllers | Operating Requirements | Page |
|---|---|---|---|---|
| **EZ-LINK™ Mobile APP** | Mobile app for configuring Watlow controllers | 1/16 DIN EZ-ZONE PM with Bluetooth® option | Apple iOS 10 or later Android 5 or later | 369 |
| **ASPYRE® Configurator** | Software for configurating ASPYRE power controllers | ASPYRE power controllers | Windows® 10, 8.1, or 7 | 371 |
| **COMPOSER® With INTUITION®** | Software for configuring Watlow controllers | F4T and EZ-ZONE RM | Windows® 10, 8.1, or 7 | 372 |
| **EZ-ZONE® Configurator** | Software for configuring EZ-ZONE products | EZ-ZONE controllers | Windows® 10, 8.1, or 7 | 374 |
| **EZ-ZONE LabVIEW™ Driver** | Virtual instruments (VIs)/driver to interface LabVIEW™ with EZ-ZONE products via standard bus | EZ-ZONE controllers | LabVIEW™ versions 8.6 and later | 376 |
| **EZ-ZONE GSD Editor** | Software for creating PROFIBUS GSD files for EZ-ZONE products | EZ-ZONE controllers | Windows® 8 and 7 | 377 |
| **EHG® SL10 Software** | Software for configuring and monitoring EHG SL10 controller | EHG SL10 | Windows® XP Professional | 378 |
| **SpecView HMI Software** | Human machine interface for Watlow® controllers | See catalog page 362 | Windows® 10, 8.1, 8, 7, Vista, Server 2003, XP (Home and Professional), 2000, NT 4.0, ME, 98 and 95 | 379 |
| **EZwarePlus** | Silver Series EM OITs | Silver Series EM OITs | Windows® 10, 8.1, or 7 | 380 |



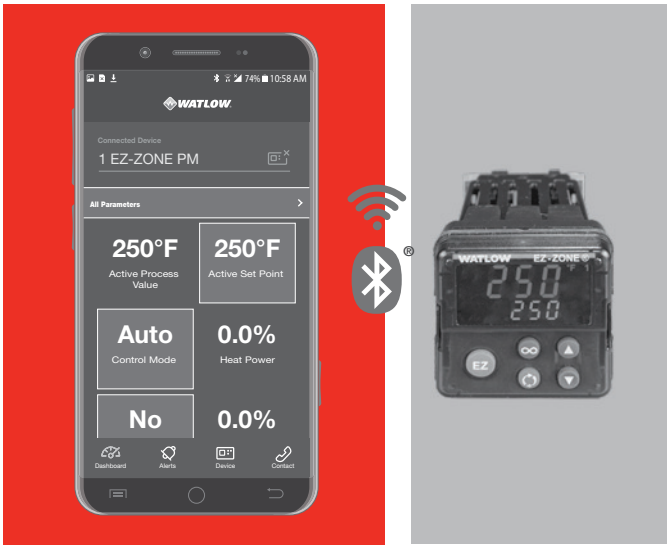
## EZ-LINK™ Mobile APP

Watlow's new EZ-LINK™ mobile app allows users to easily set up, monitor and adjust Watlow® EZ-ZONE® PM controllers via Bluetooth® wireless technology. The app is available free-of-charge from the app stores 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.

When connected to a controller, the app's dashboard view displays up to 20 parameters. Users can configure which parameters appear on the dashboard view with the controller's custom home page. The all parameters feature in the app allows users set up the controller's inputs, control settings, alarms, outputs and other features and functions.

In addition to controller setup, monitoring and adjusting, the EZ-LINK mobile app provides many benefits to the user including password protection, alarm and error indicators, connection to Watlow for feedback and support and accessing device information such as firmware version, part number and serial number.

The app works with all 1/16 DIN EZ-ZONE PM controllers and limits with Bluetooth® wireless technology. This option is approved for use in the U.S., Canada, Japan and the European Union, with more locations coming soon.




## Features and Benefits

**Remote access**

- Connect to controllers up to 70 feet (21.3 meters away)

**Ping feature**

- Identifies which controller is connected when several controllers are within range

**Password security**

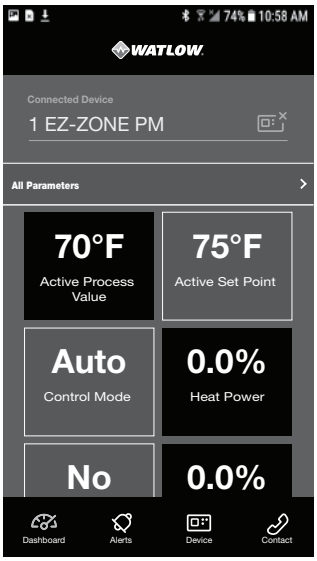
- Limits unauthorized access and unwanted changes

**Controller naming**

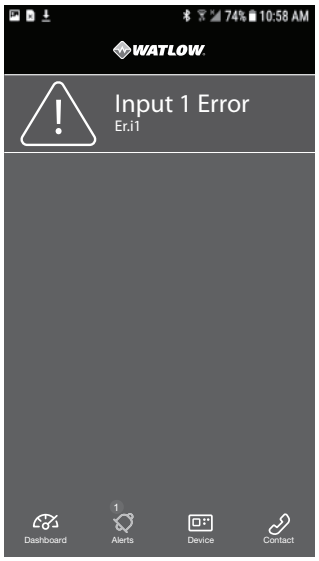
- Allows user to name the controller and easily find it again the next time

# EZ-LINK™ Mobile APP

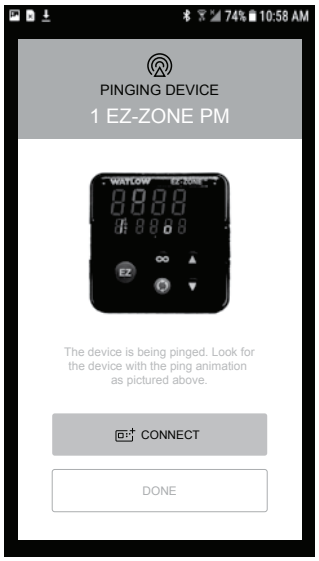
## Illustrated Features



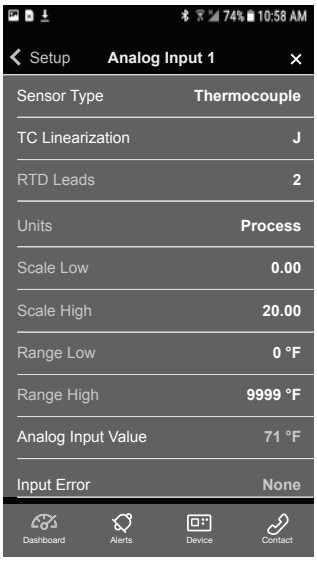

Provides access to controller's home page parameters



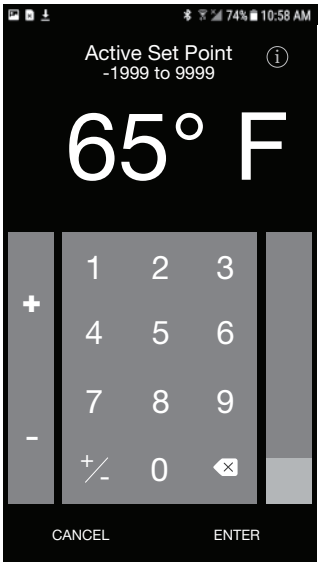

Decodes alarms, errors and messages



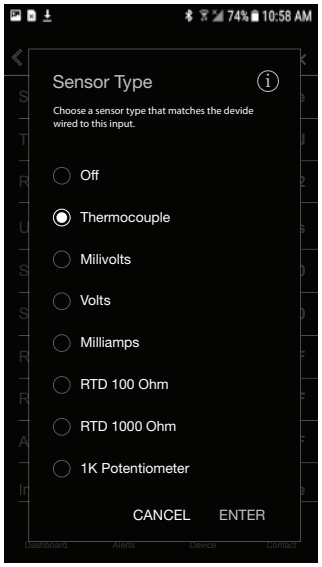

Pings controller display making it clear which controller is connected




Makes setting up controllers easy with readable text...




...intuitive operation




...and help for each parameter

## Compatibility

The EZ-LINK mobile application is compatible with all 1/16 DIN EZ-ZONE PM controllers and limits that have the Bluetooth® communications option.

## System Requirements

### Android™

- Compatible versions: 5, 6, 7 and 8

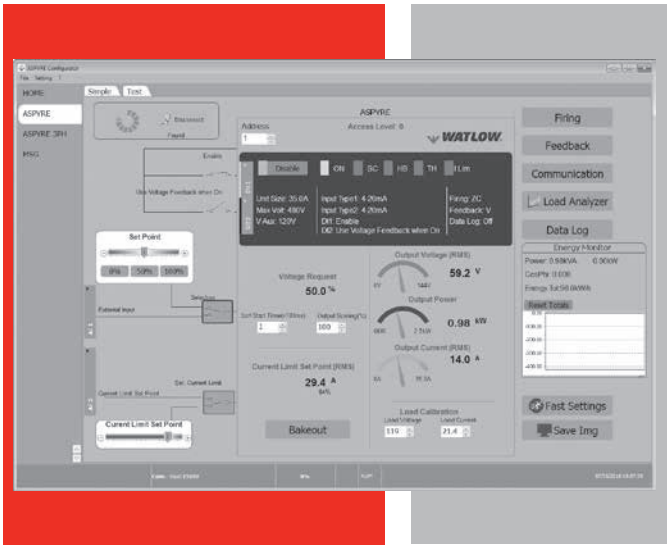
### Apple®

- Compatible versions: 10 and 11

### Supported devices

- Designed for phones, compatible with tablets

## ASPYRE® Configurator Software




ASPYRE® Configurator is Watlow's new, easy-to-use software for configuring and customizing ASPYRE power controllers. Use it to optimize Watlow's ASPYRE products for specific applications. Task-specific views simplify all aspects of commissioning new controllers including configuring the use of digital and analog inputs, setting options such as maximum voltage and maximum current, setting up features including feedback, firing mode and communication options and uploading, saving and downloading recipe files that include the complete configuration of a power controller.

ASPYRE Configurator software is included on the "Watlow Support Tools" DVD and available for download at www.watlow.com.

### System Requirements

- **Microprocessor:** 1 gigahertz (GHz) or faster, 32-bit or 64-bit
- **Memory:** 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit)
- **Disk Space:** 250 megabytes (MB)
- **Video:** 1400 x 1050 or higher
- **Operating System:** Microsoft® Windows® 10, 8.1 or 7
- **Port for controller communications:** USB 1.0 or EIA-485 half duplex (2-wire)

# COMPOSER® With INTUITION®

COMPOSER® with INTUITION® is Watlow's new, easy-to-use software for configuring and customizing controllers. Use it to optimize Watlow's F4T, D4T and EZ-ZONE® PM and 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 included on the "Watlow Support Tools" DVD and available for download at www.watlow.com.

## Features and Benefits

**Function block diagram with live data and error indication**

- Enables application-specific configuration of controllers
- Depicts the configuration visually making it easy to understand and explain to others
- Speeds up application testing and troubleshooting

**Multi-language support**

- Prevents errors by communicating with users in their own languages

**System image files contain complete configuration**

- Makes it fast and easy to duplicate settings from one system to another
- Simplifies sending configurations to remote sites
- Provides backup of settings to restore if settings are changed or controller is replaced

**Dashboard view**

- Makes it easy to connect to controllers
- Clearly indicates when there are configuration errors that need to be addressed
- Allows downloading configuration files without allowing access to setup and configuration views

**Opens and displays saved configuration image files**

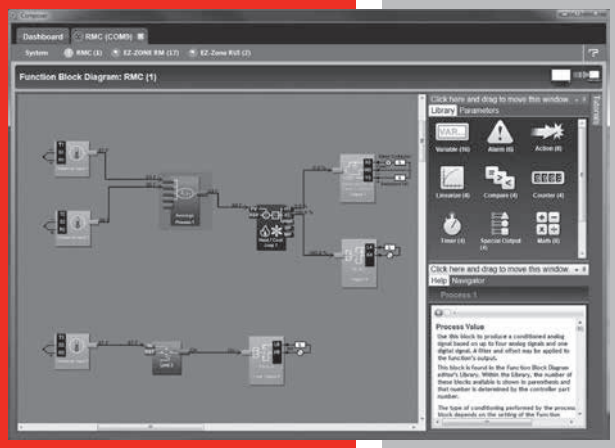
- Simplifies supporting remote users
- Makes it easy to inspect configuration files

**Configurable interface**

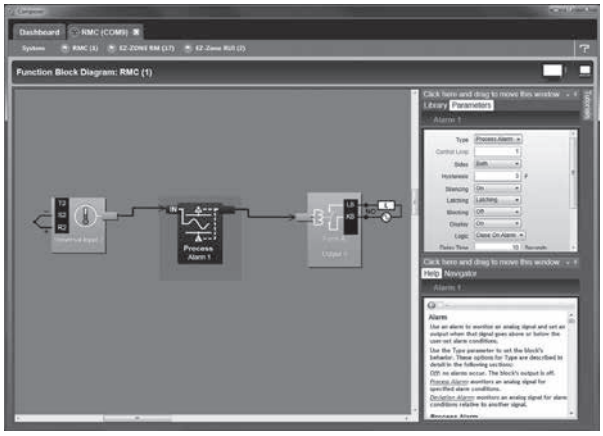
- Lets users adjust window sizes and positions to work efficiently

**Integrated video tutorials and help**

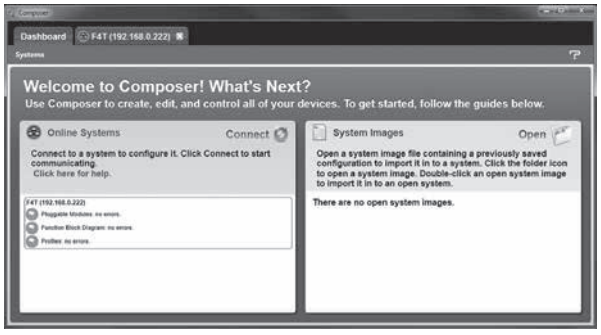
- Speed up commissioning by demonstrating configuration steps
- Simplifies access to function block and parameter descriptions
- Reduces configuration errors
- Helps the user take full advantage of available features




## Illustrations from COMPOSER




**Function block diagram makes it easy to visualize application solutions.**




**Dashboard makes it easy to connect, indicates configuration errors and allows downloading configuration files without allowing access to setup.**

# COMPOSER With INTUITION

## *Technical Data*

## Additional Features and Benefits for F4T

**Profile editor**

- Speeds up profile creation and editing
- Allows maintenance of profile list in controllers from a remote PC
- Makes it easy to move profiles from one controller to another
- Exports profiles to PC files for backup and portability

**Fast, reliable Ethernet support**

- Easily connects to one or more controllers
- Minimizes time to read and write configuration settings

**Pluggable flex module management**

- Simplifies configuration by clearly indicating which hardware is present
- Shortens commissioning by allowing user to configure controller for flex modules prior to installing them

**Security configuration**

- Allows OEMs and supervisors to limit permissions to specific features
- Controls access via COMPOSER and controller
- Prevents errors and reduces downtime by preventing undesired configuration changes

**Calibration view with on-screen instructions and automation**

- Reduces downtime by simplifying the calibration verification procedure

## Features by Supported Product

| Feature | F4T | D4T | EZ-ZONE RM | EZ-ZONE RUI | EZ-ZONE PM | EZ-ZONE ST |
|---|---|---|---|---|---|---|
| Connect via Ethernet | ✓ | ✓ | | | | |
| Connect via 485 | | | ✓ | ✓ | ✓ | ✓ |
| Function block diagram view | ✓ | ✓ | ✓ | | ✓ | |
| System overview | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Device details | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Save and import system images | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Network setup | ✓ | ✓ | ✓ | ✓ | ✓ | |
| View image files offline* | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Personalization view | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Password security setup | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Ramp and soak profile editing | ✓ | | | | | |
| Calibration unity | ✓ | ✓ | | | | |
| Pluggable modules view | ✓ | ✓ | | | | |

*Offline viewing of saved system images except profiles.

## Specifications

**Supported Products**

| Product | Minimum Version |
|---|---|
| F4T with INTUITION | 2.0 |
| D4T with INTUITION | 3 |
| EZ-ZONE PM | 15 |
| EZ-ZONE RM: RMC, RME, RMS, RMH, RML | 9 |
| EZ-ZONE RM: RMA | 5 |
| EZ-ZONE RUI | 6 |

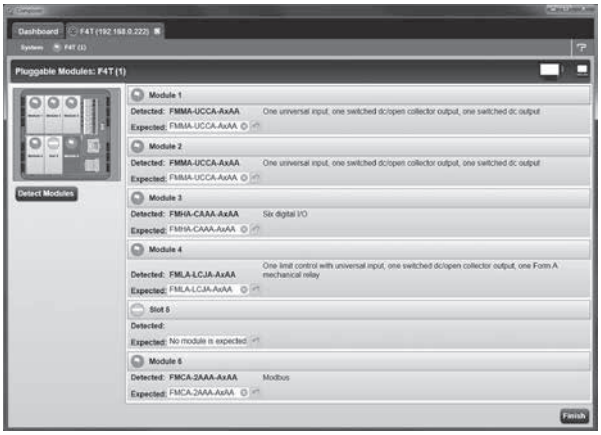
**Compatible Operating Systems**

- Windows® 10
- Windows® 8.1
- Windows® 7

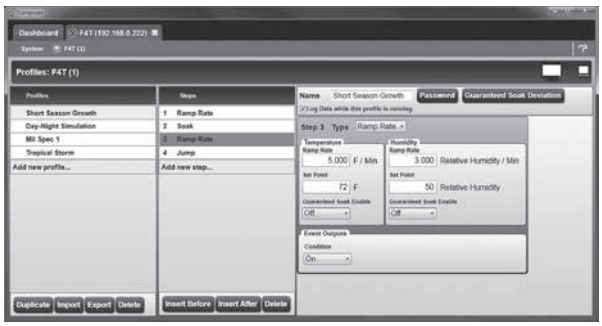
**Minimum System Requirements**

- Microprocessor: 1 gigahertz (GHz) or faster 32-bit or 64-bit
- Memory: 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit)
- Disk space: 250 megabytes (MB)
- Video: 1280 x 720 or higher
- Port for controller communications: Ethernet for F4T or EIA-485 half duplex (2-wire) for EZ-ZONE RM and PM

## Illustrations from COMPOSER for F4T




**Pluggable modules view simplifies configuration by showing hardware present.**




**Profile editor speeds up creating and editing profiles.**

# EZ-ZONE® Configurator

EZ-ZONE® Configurator software allows Watlow® EZ-ZONE products to be configured in one simple process. Its interface is flexible and easier to read than the basic remote user interface (RUI). It operates without requiring purchase of communications options as it uses the standard bus communications protocol that is included with all EZ-ZONE products.

The EZ-ZONE Configurator software is available as a free download at www.watlow.com.

## Features and Benefits

**Communicates with EZ-ZONE products via standard bus protocol**

- Works regardless of which communications option is purchased or even when no communication option is purchased

**Detects EZ-ZONE devices and reads up configuration**

- Allows easy access to any setting

**Presents pages and menus as they are in the controller's display, RUI and manuals**

- Enables the user to easily locate what they are looking for

**Wizard-style editor with menu explorer**

- Allows for easy examination of each menu
- Enables the user to skip directly to the parameters they want to work with

**On-screen parameter help**

- Reduces configuration errors
- Helps the user take full advantage of available features

**Copies parameter settings**

- Decreases configuration time especially for multi-loop controllers

**Saves configuration files on the computer with all the information required to set up a controller**

- Preserves settings to archive and recover or simplify setting up of another EZ-ZONE product
- Enables set up files to be emailed or accessed by users on a network or via the Internet


**View or modify configuration files saved during online editing sessions**

- Allows users to get a jump on setting up EZ-ZONE products
- Aids in supporting remote users

**Downloads saved configuration files**

- Simplifies configuration of EZ-ZONE products

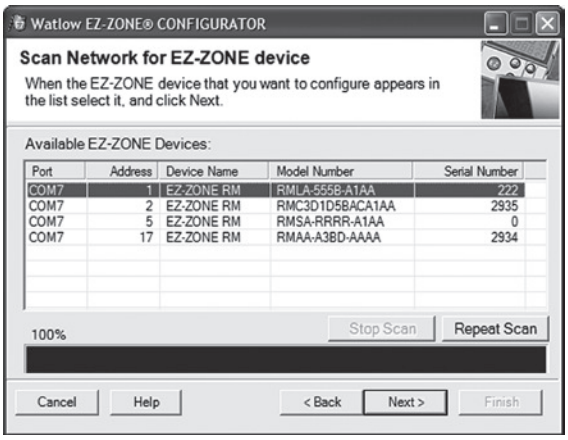
**Flexible and smart compatibility checking**

- Ensures configuration files are only loaded into devices that are similar enough to the original that the settings make sense

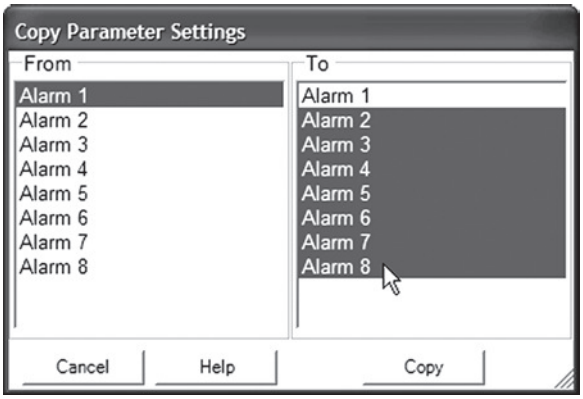
# EZ-ZONE Configurator

*Technical Data*

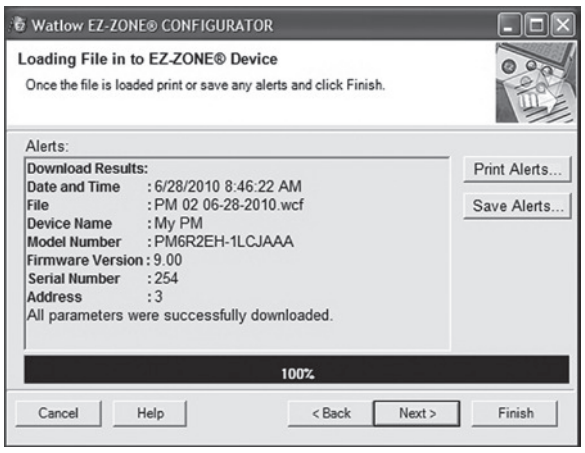
## Illustrated Features



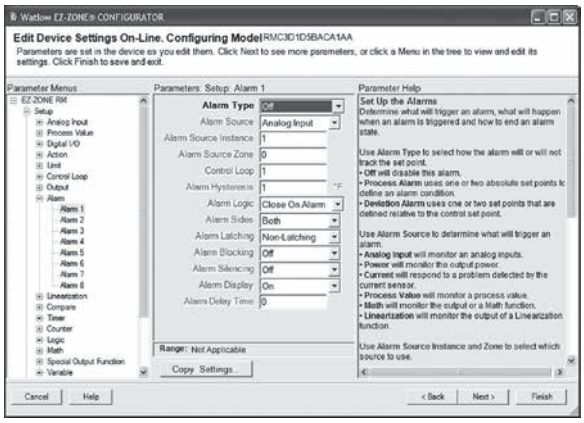

**Detects EZ-ZONE devices connected to the computer's communications ports.**




**Copy feature speeds up configuration.**




**Confirms that parameter downloads were successful and reports exceptions.**




**Menu explorer allows users to skip directly to desired parameter or browse each setting.**

## Compatibility

EZ-ZONE Configurator is compatible with all versions of EZ-ZONE products, but can be used to download configuration files only to products meeting the requirements listed below.

| Product | Minimum Firmware Version |
|---|---|
| EZ-ZONE RUI | 3.0 |
| EZ-ZONE ST | 4.0* |
| EZ-ZONE PM | 7.0 |
| EZ-ZONE PM Express | 1.0 |
| EZ-ZONE RM Control Module | 1.0 |
| EZ-ZONE RM Expansion Module | 1.0 |
| EZ-ZONE RM Access Module | 1.0 |
| EZ-ZONE RM High-Density Control Module | 5.0 |
| EZ-ZONE RM High-Density Limit Module | 5.0 |
| EZ-ZONE RM High-Density Scanner Module | 5.0 |

*Configuration files may be downloaded to EZ-ZONE ST controllers originally purchased with revision 4.0 or later only.

## System Requirements

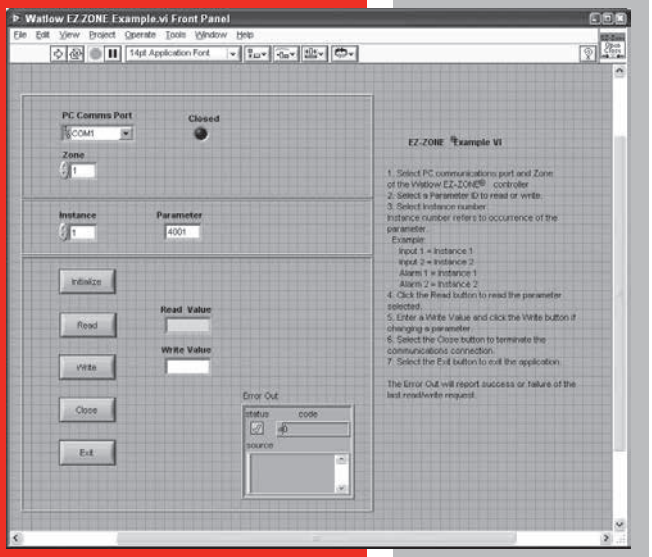
### Minimum Requirements

- 485 communications port: USB port and USB-to-485 converter, or serial COM port (232) and 232-to-485 converter
- Microprocessor: Pentium® IV or equivalent
- Memory: 128 MB RAM (256 MB recommended)
- Disk space: 140 MB (100 MB if Microsoft.NET Framework is already installed.)
- Video: 800 x 600 (1024 x 768 or higher recommended)

### Operating System Requirements

- Windows® 10
- Windows® 8.1
- Windows® 7

# EZ-ZONE LabVIEW™ Driver




This instrument driver for National Instruments' LabVIEW™ software communicates with Watlow's EZ-ZONE products via the standard bus communications protocol that is included with all EZ-ZONE products.

The LabVIEW™ instrument driver software package, created with LabVIEW™, simplifies development of applications such as test software. These instrument drivers include software functions called LabVIEW™ Virtual Instruments (VIs) that are used with LabVIEW™ to communicate with Watlow products such as the EZ-ZONE PM.

The EZ-ZONE LabVIEW™ instrument driver software is available as a free download from www.watlow.com.

## Features and Benefits

**Supports access to all EZ-ZONE parameters**

- Makes it easy for LabVIEW™ users to use EZ-ZONE products with their programs

**Compatible with any EZ-ZONE product configured to communicate via standard bus**

- Reduces cost by eliminating the need to purchase optional communications protocols

**Features Initialize, Read, Write and Close VIs**

- Speeds development of LabVIEW™ applications

**Includes a working example with detailed instructions**

- Shortens the learning curve associated with applying a new instrument

## Compatibility

The Watlow EZ-ZONE instrument driver is supported by LabVIEW™ versions 8.6 and later.

# EZ-ZONE GSD Editor

The EZ-ZONE GSD Editor software allows users to create custom general station description (GSD) files for configuring communications between EZ-ZONE products and other automation equipment supporting the PROFIBUS DP communications protocol.

The EZ-ZONE GSD software is available for download free of charge at www.watlow.com and on the Controller Support Tools DVD-ROM (part number 0601-0001-0000) included with the related Watlow controllers.

## Features and Benefits

**Creates and edits GSD files**

- Enables configuration of DP-V0 (cyclic) communication between EZ-ZONE devices and a PROFIBUS DP master such as a programmable logic controller (PLC)

**Allows users to select just the values they need**

- Optimizes PLC memory use by allowing cyclical messages to be configured with desired data only
- Speeds up network by eliminating the transmission of unnecessary data as with fixed, vendor-supplied GSD files

**Supports EZ-ZONE PM, RM Access Modules and RUI Gateways**

- Makes it easy for PROFIBUS DP users to use EZ-ZONE products in their applications

**Presents all the parameters found in supported EZ-ZONE device's menus**

- Maximizes flexibility in the design of applications

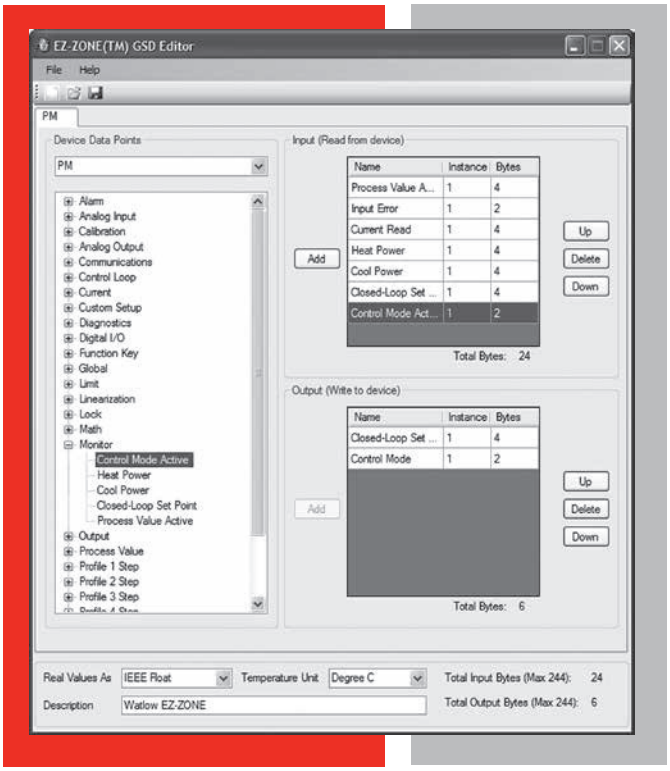
## System Requirements

**System Requirements:**

- Microprocessor: Pentium® IV or equivalent
- Memory: 128 MB RAM (256 MB recommended)
- Disk space: 140 MB (100 MB if Microsoft.NET Framework is already installed.)
- Video: 1024 x 768 or higher
- Microsoft® compatible pointing device (mouse or trackball)

**Operating System Recommended:**

- Windows® 8
- Windows® 7




## Compatibility

EZ-ZONE GSD Editor software can be used to create and edit GSD files for EZ-ZONE PM controllers with the PROFIBUS DP field communications option and EZ-ZONE ST and PM controllers and RM control systems when connected to an EZ-ZONE RM access module or EZ-ZONE RUI gateway with the PROFIBUS DP option.

# EHG® SL10 Software

The EHG® SL10 software allows the user to configure, monitor, log and chart data from Watlow's EHG SL10 integrated multi-function controllers. It provides an easy-to-use and centralized interface for multiple EHG SL10 controllers.

This software gives the user the ability to change set points, label devices and much more all with the click of a key.

The EHG SL10 software is available for download free of charge at www.watlow.com and on the Controller Support Tools DVD-ROM (part number 0601-0001-0000) included with the related Watlow controllers.


## Features and Benefits

**Automatic network detection and configuration**

- Simplifies configuring multi-device networks by setting unique addresses in each device as they are added to the network
- Scans for new controllers added to the network

**Manual network configuration**

- Connects to and monitors existing controller networks

**User definable device names**

- Speeds up troubleshooting by allowing users to set names for networked controllers that correlate them with heater locations

**Monitor mode**

- Displays temperature, and color coded alarms and warnings for all networked controllers
- Centralizes monitor function and eliminates time spent checking alarm states at the heater

**Network state indicator**

- Simplifies and reduces errors when controlling many points
- Shows at a glance if any controller has a warning or alarm condition

**Charting**

- Improves system operation by allowing engineers and operators to see zone temperature trends in real time

**Data logging**

- Saves time and effort by eliminating the need to manually record temperatures
- Simplifies troubleshooting by providing a record of zone temperatures

**Configure mode**

- Simplifies and speeds up changing set points and other control parameters

**Password protected setup**

- Prevents unauthorized changes to alarm set points, tuning and control settings

**Recipe manager**

- Speeds up commissioning new devices by allowing saved recipes to be downloaded to multiple controllers
- Reduces data entry errors by saving known good settings

**Ping function blinks indicator on selected controller**

- Reduces errors by allowing technicians to confirm device identities

## Compatibility

EHG SL10 software can be used to configure EHG SL10 controllers when run on a computer connected to the controllers via an EIA-485 (also known as RS-485) network. For most computers a 485 converter is required.

## System Requirements

**Operating System**

- Windows® XP Professional

## SpecView HMI Software

SpecView software from Watlow® is an easy-to-use Human Machine Interface (HMI) to Watlow controllers, including the F4T with INTUITION process controller and EZ-ZONE controllers as well as third-party products. Watlow's single point of support for hardware, software and application needs ensures knowledgeable and expedient responses to questions or concerns.

This competitively priced package includes field-proven features, many suggested by loyal users. Built-in support and auto-detect for Watlow controllers make setup quick and simple. SpecView from Watlow is ideal for industrial applications with support for barcode readers and touch-screen operation.

To try before purchasing, download SpecView from the Watlow website and run in the time-limited demo mode.


### Features and Benefits

**Built-in support and auto-detect for controllers**

- Saves set-up time
- Eliminates the need to learn communications protocols
- Integrates devices from multiple vendors

**Watlow EZ-ZONE standard bus communications protocol**

- Communicates with any EZ-ZONE product without requiring purchase of a communications option

**Highly configurable trending/graphing**

- Simplifies monitoring and troubleshooting processes and machines
- Provides a permanent, unalterable record of results

**Flexible data logging and report generator**

- Helps users comply with regulatory requirements including AMS 2750D NADCAP
- Reduces labor and increases accuracy by automating data collection
- Simplifies record keeping by consolidating measurements, operator comments and other information into Excel® - compatible report formats
- Allows data to be grouped in user-defined batches
- Records operator actions

**Easy-to-build, customizable screens**

- Allows creation of application-specific screens, which can automate tasks, decrease training time and simplify monitoring and operation
- Highlights specific parameter values with user-set color dynamics and provides bar graphs for "at-a-glance" monitoring
- Limits access with passwords if desired

**Easy-to-use recipe manager**

- Saves snapshot of current parameter settings
- Eliminates operator error when setting machine parameters
- Reviews and edits complex programmer profiles

**Historical replay option**

- Helps troubleshoot processes by allowing review of recorded data

**Remote access option**

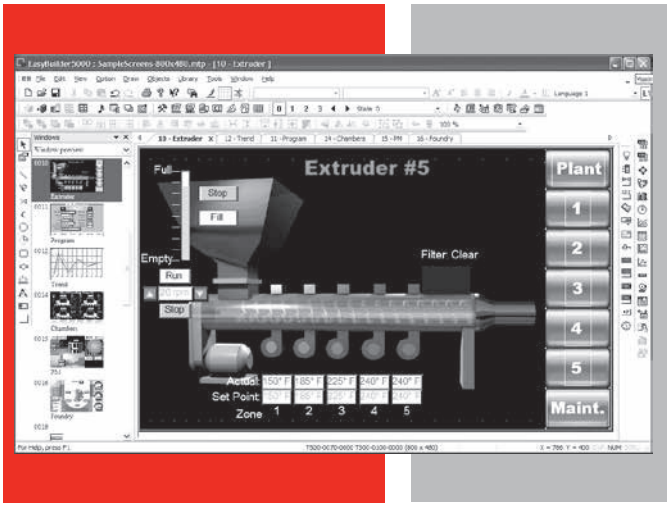
- Allows multiple, identical operator stations for convenient access
- Reduces downtime and increases utilization with monitoring and access over LAN, modem or Internet

**For detailed product and ordering information, see the full SpecView HMI Software product section located on pages 361 through 365.**

## EZwarePlus

The Silver Series EM programming software, EZwarePlus, is easy to use and features a large variety of built-in screen objects that make it powerful. When creating screens, the user can call upon extensive graphics libraries, import custom graphics and add numeric displays, entry fields, analog meters, bar graphs and trend graphs with just a few mouse clicks. Screen objects are highly customizable, and the user can create libraries of their own objects for repeat use. The online simulator, Ethernet and USB support, make testing and downloading fast.

The EZwarePlus software suite is available for download free of charge at www.watlow.com and on the Controller Support Tools DVD-ROM (part number 0601-0001-0000) included with the related Watlow controllers.




### Features and Benefits

**Powerful, easy-to-use EZwarePlus programing software**

- Requires only a small investment in time to create a useful interface
- Provides the ability to learn additional features as needed
- Provides advanced interface features such as animation and pop-up windows
- Reduces development time by providing extensive graphical libraries and facilitating reuse with user- created libraries

**Offline and online simulation**

- Speeds up development by making it faster and easier to test projects
- Allows faster creation of fine-tuned interfaces by speeding up iterations

**Upload and download password protection**

- Prevents users from altering projects
- Protects projects in OITs from accidental overwrite

**Extensive graphical libraries and user-created libraries**

- Reduces development time and facilitates reuse
- Simplifies development by allowing import of common graphic formats: bitmaps, JPEGs and animated GIFs

**Project manager**

- Simplifies managing projects for multiple applications

**Project compress/uncompress**

- Archives all necessary files in one compressed file
- Allows a single file to be saved or delivered as the project source

**User-programmable macros with math functions and support for floating point**

- Extends functionality
- Automates processes

**TrueType fonts with Unicode (international) characters and language switching feature**

- Makes screen content easy to read by allowing formatting such as bold, italics, underline, scrolling and blinking
- Prevents errors by communicating with users in their native languages
- Reduces development and support by allowing inclusion of up to 24 user-selectable languages in a project

**Tag library and address find and replace function**

- Simplifies project reuse with similar but not identical controllers

**Label library**

- Speeds up screen development by eliminating the need to enter the same text multiple times
- Enables on-the-fly language changes for up to 24 languages per project

**Library import and export functions**

- Reduces errors and speeds up development by eliminating tedious data entry when multiple projects interface with the same devices

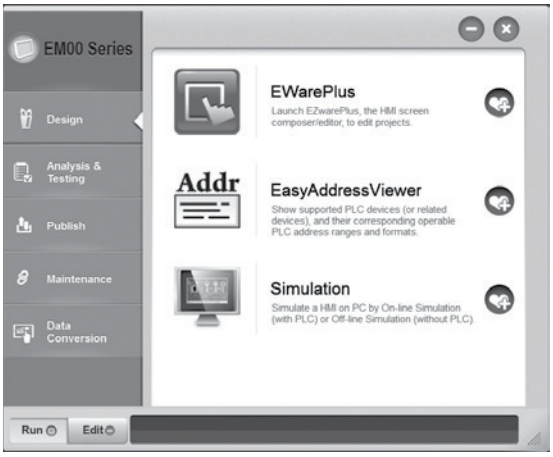
**Layers, grid, alignment, nudge, space-even and make-same-size tools**

- Speeds up creation of smart looking screens by automatically placing objects aligned on the screen
- Gives user precise control over object placement

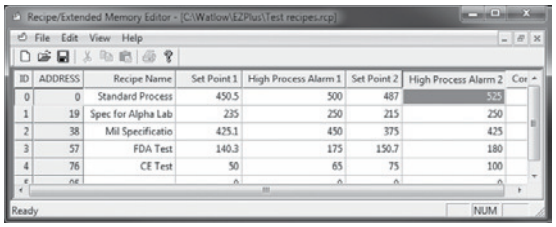
# EZwarePlus

## Software Suite

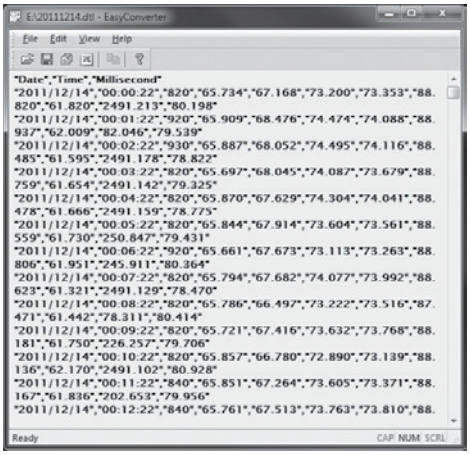
The EZwarePlus software suite includes EasyConverter, EZwarePlus screen editor, Utility Manager and Recipe Editor programs.



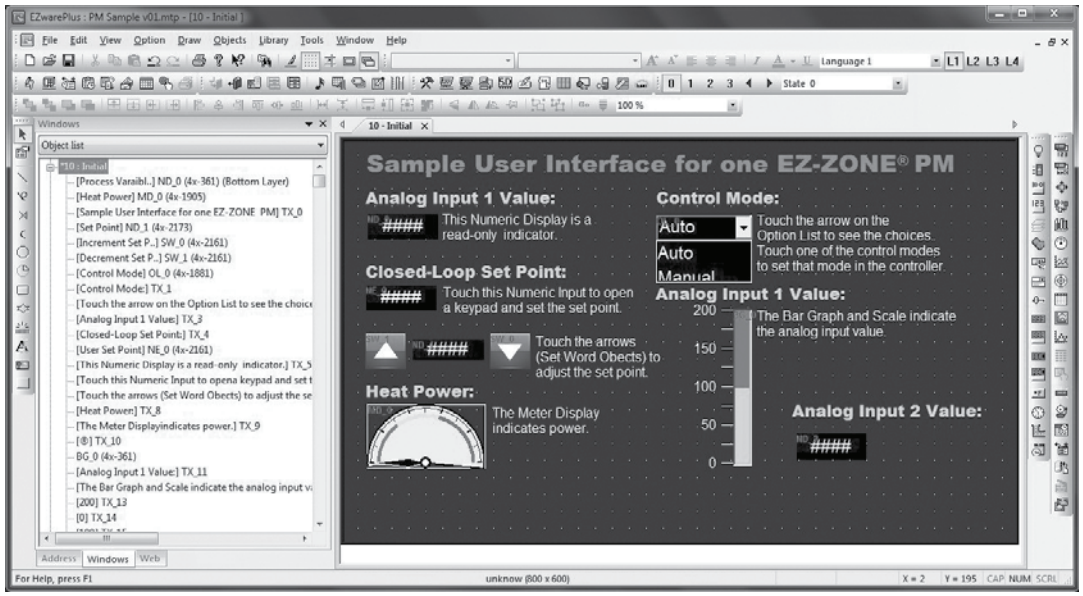

**Utility Manager uploads and downloads projects to and from the Silver Series EM °, opens compiled projects in simulation and launches the other EZwarePlus programs.**




**The Recipe Editor configures memory files for use with Silver Series EM OITs and allows offline creation of recipes.**




**EasyConverter converts log files saved by the Silver Series EM OIT to file formats used by popular Windows® software such as Microsoft® Excel®.**




**EZwarePlus provides a graphical screen designing environment with point-and-click access to features and drag-and-drop ease.**

## Compatibility

EZwarePlus software can be used to configure Silver Series EM operator interface terminals as interfaces for Watlow EZ-ZONE controllers and other automation devices.

**Note:** EZware-5000 is still available for programming older Silver Series OITs.

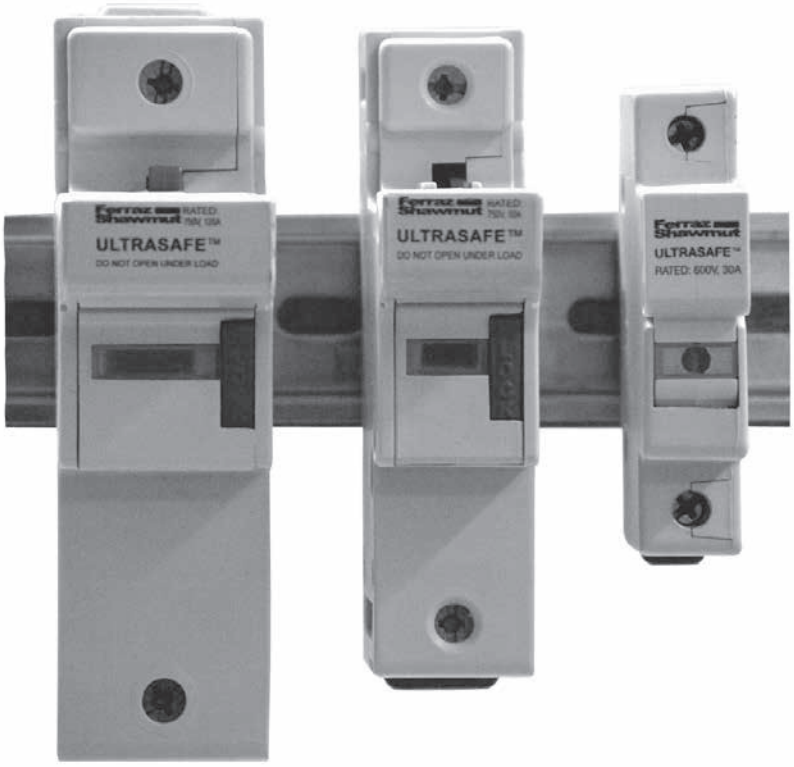
## System Requirements

### Operating System

- Windows® 10, 8.1 or 7

# Accessories

| Product | Description | Page |
|---|---|---|
| **EZ-ZONE® RUI and Gateway** | Remote user interface and communications device | 385 |
| **Communication Adapters** | Devices that bridge between serial networks | 386 |
| **Combined Branch and Semiconductor Fuses** | Provide required protection for short circuit current rating (SCCR) and meet electrical code for branch circuit protection | 388 |
| **Semiconductor Fuses** | Disconnect power from loads to protect people and property in case of a failure | 390 |
| **Current Transformers** | Detect and measure load currents | 391 |
| **Panel Mount Adapter Plates** | Provide convenient, cost saving way to replace large old controllers with new, modern smaller models in existing control panels | 392 |
| **Arc Suppression and EMI Filters** | Protect controller outputs and reduce noise emissions | 392 |
| **Power Supplies** | UL® Class 2 power supplies for controllers that require DC power | 393 |



## EZ-ZONE® RUI and Gateway

The EZ-ZONE® Remote User Interface (RUI and communications gateway) can be utilized as a communication gateway device to save cost, space and wiring when digital communications is being used with two or more EZ-ZONE controllers. The EZ-ZONE RUI can also serve as a display for showing all parameter values for up to 16 EZ-ZONE controllers, again saving cost, space and wiring expenses.



### Indicator Features and Benefits—Remote User Interface (RUI)

**Single user interface device or location to access multiple controllers**

- Easy accessibility to all controllers and all parameters from a central location by using one RUI display
- Reduces component material costs by using a single RUI to display multiple control zones
- Eliminates cost and complexity from bringing all controller related input and output wiring to the front panel

**Flexible use of a display interface**

- Can be used when needed during normal machine production, for OEM prototype design purposes or for remote troubleshooting scenarios
- Ability to use more than one RUI indicator to display additional data including temperature and current (ammeter) to improve user system interface

### Communications Gateway Features and Benefits

**A single RUI and gateway provides field bus access for up to 16 EZ-ZONE controllers**

- Lowers solution cost when field bus communications is required for multiple loops

**Expand communication protocols to all EZ-ZONE controllers**

- Ability to utilize multiple communication protocols for different user preferences. Flex between different communication protocols while still maintaining a reduced level of inventory

**Delivers multiple communication protocol options**

- Ability to connect EZ-ZONE controllers to communication networks utilizing
  - Modbus® RTU
  - DeviceNet™
  - Ethernet/IP™
  - Modbus® TCP
  - PROFIBUS DP

### Additional Features

**EZ-ZONE P3T armor sealing system**

- Complies with NEMA 4X, IP65 RUI
- Offers water and dust resistance, can be cleaned and washed down

**EZ-KEY (RUI)**

- Programmable EZ-Key is a functional key programmable by the user to perform simple one-touch operation of repetitive user activities

**Compact package**

- Reduces required panel size for 1/16 DIN
- Utilizes less depth behind panel allowing for mounting in tight spaces

**Touch-safe package**

- Complies with IP2X which increases safety for user

**Agency approvals: UL® listed, CSA, CE, RoHS, W.E.E.E., SEMI F47-0200, Class 1, Div. 2 rating on selected models**

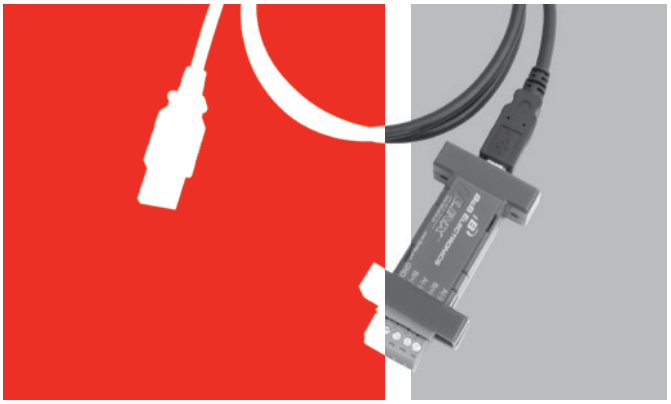
- Meets applications requiring agency approvals

**For detailed product and ordering information, see the full EZ-ZONE RUI and Gateway product section located on pages 341 through 344.**

## Communication Adapters

Laptop and personal computers generally include Universal Serial Bus (USB) ports that allow them to communicate with other devices such as printers and digital cameras and Ethernet ports that are typically connected to office networks. Industrial devices such as process and temperature controllers may have Ethernet interfaces orEIA-485 communication interfaces (also known as RS-485). Watlow® offers adapters that provide simple and reliable solutions to connecting these devices to computers.

These compact serial converters offer several features that make them ideal for use in applications in which Watlow controllers communicate with a computer via Modbus® or standard bus.



**0847-0326-0000**
**USB to 485,**
**Screw Terminals**


**0847-0400-0000**
**USB to Ethernet, RJ45**

### Features and Benefits

**Adds communication ports to computer**

- Supports using computer software with industrial products
- Eliminates the need to add a communication card to the computer

**USB connection to computer (0847-0326-0000)**

- Adds a communications port to a computer with USB
- Automatically configures on Windows® 10, 8, 8.1 and 7
- Eliminates need for external power supply
- Includes cable

**Screw terminals**

- Connects to standard 485 network wiring with no need for additional components

**USB to Ethernet (0847-0400-0000)**

- Provides additional local Ethernet network for communicating with controllers
- Eliminates need to connect controller to the office network or disconnect PC from the office network

# Communication Adapters

## Specifications

| Specification | 0847-0326-0000 | 0847-0400-0000 |
|---|---|---|
| Connection to computer | USB type A | USB type A |
| Computer interface | USB 1.0, 1.1 and 2.0 | USB 1.0, 1.1 and 2.0 |
| Connection to serial network | Removable terminal block | RJ-45 female |
| Serial network | Half duplex 485 (2-wire) | IEEE 802.3, 802.3u and 802.3ab (10BASE-T, 100BASE-TX and 1000BASE-T) compatible |
| Communication speed | 300 to 921K baud | 10/100/1000 Mbps (USB 3.0) |
| Echo jumper | No | Crossover detection and auto-correction (Auto MDIX) |
| Optical isolation: data-to-ground and computer-to-network | None | None |
| Port powered | Yes | Yes |
| Cable length | 39 in. (1 m) | 5.2 in. (132 mm) |
| Agency | CE, RoHS | CE, RoHS |
| Supported operating systems | Windows® 10, 8, 8.1 and 7 | Windows® 10, 8, 8.1 and 7 |
| Dimensions | 2.53 x 1.25 x 0.64 in. (64 x 32 x 16 mm) | 2.6 x 1.0 x 0.6 in. (67 x 26 x 15 mm) |
| Recommended applications | Computer with a USB port, communicating via Modbus® RTU or EZ-ZONE standard bus | Computer with a USB port, communicating via Modbus® TCP or standard bus over Ethernet (F4T) |

| Converters | Description |
|---|---|
| **0847-0326-0000** | USB to 485, screw terminals |
| **0847-0400-0000** | USB to Ethernet, RJ45 female |

## Combined Branch Protection and Semiconductor Fusing

To meet national and local electrical code requirements for branch circuit protection and to protect solid state power controllers, such as Watlow's DIN-A-MITE®, a DFJ fuse is recommended. Watlow offers fast-acting DFJ fuses and holders in amperage ratings covering the range of load currents appropriate for use with the entire DIN-A-MITE power controller and EZ-ZONE ST integrated controller families.

DFJ fuses protect personnel from injury, protect equipment from damage and are required to minimize damage in the event of a short circuit and achieve short circuit current ratings for Watlow DIN-A-MITE power controllers and EZ-ZONE ST controllers.


### Features and Benefits

**Combination semiconductor and branch circuit protection**

- Fulfills electrical code requirements for branch circuit protection
- Provides protection required for short circuit rating (SCCR) of Watlow products up to 200kA
- Protects valuable semiconductor-based power controllers from damage in the event of a shorted heater
- Simplifies cabinet design
- Reduces wiring time
- Reduces the number of components and cost

**DIN-rail mount**

- Ensures easy installation

**Lockout/tagout**

- Protects service personnel

**Open fuse indicator**

- Provides quick troubleshooting of blown fuses

# Combined Branch Protection and Semiconductor Fusing

## Fuse Selection Guide

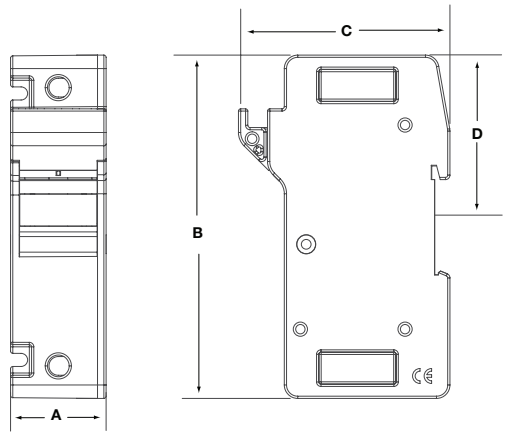
Use a DFJ fuse to protect both a branch circuit or power cable and the solid state power controller on the circuit with a single fuse.

1. Select a fuse with an amperage rating at least 125 percent of the connected load (or the next standard size above.)
2. Select a fuse with an $I^2t$ rating not greater than the $I^2t$ rating of the solid state power controller. See the specification sheet for the power controller to be protected for $I^2t$ specification. See DFJ fuse $I^2t$ below.
3. Use a Watlow recommended fuse. SCCR ratings for Watlow power controllers are only valid with Watlow recommended fuses and only up to 480VAC. For applications above 480VAC or products other than DIN-A-MITE or EZ-ZONE ST contact your Watlow representative.

| Fuse Amp Rating | $I^2T$ up to 480V ($A^2$ Sec) | Watlow Part Number | Bussman® Equivalent Fuse Part Number | Watlow Single Fuse Holder Part Number | Bussman® Holder Equivalent Part Number | Holder Dimensions (in.) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | A | B | C | D |
| 20 | 151 | **0808-0325-0020** | DFJ-20 | **0808-0326-1530** | CH30J1I | 1.28 | 4.59 | 2.80 | 2.30 |
| 30 | 414 | **0808-0325-0030** | DFJ-30 | **0808-0326-1530** | CH30J1I | 1.28 | 4.59 | 2.80 | 2.30 |
| 40 | 1080 | **0808-0325-0040** | DFJ-40 | **0808-0326-3560** | CH60J1I | 1.58 | 4.88 | 2.80 | 2.50 |
| 50 | 2268 | **0808-0325-0050** | DFJ-50 | **0808-0326-3560** | CH60J1I | 1.58 | 4.88 | 2.80 | 2.50 |
| 60 | 2909 | **0808-0325-0060** | DFJ-60 | **0808-0326-3560** | CH60J1I | 1.58 | 4.88 | 2.80 | 2.50 |
| 80 | 3521 | **0808-0325-0080** | DFJ-80 | **0808-0326-7010** | J60100-1CR | 1.95 | 6.28 | 2.28 | 1.5 |
| 100 | 7920 | **0808-0325-0100** | DFJ-100 | **0808-0326-7010** | J60100-1CR | 1.95 | 6.28 | 2.28 | 1.5 |

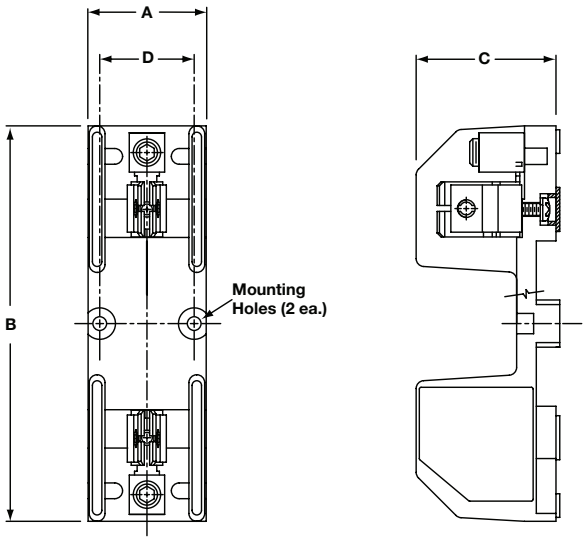
## Dimensional Drawings

### 15 to 30 and 35 to 60 Amp Fuse Holders




**Mounts on 35 mm DIN-rail (DIN EN 50022 35 x 7.5 mm)**

### 80 to 100 Amp Fuse Holder Panel Mount Only




**Mounting holes: 0.22 in. (5.5 mm) dia. hole with 0.50 in. (12.7 mm) dia. x 0.27 in. (6.9 mm) deep counter sink bore**

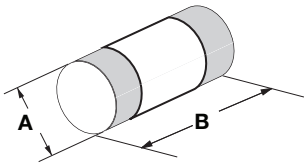
## Semiconductor Fuses

For protection of solid state power controllers, such as Watlow's DIN-A-MITE, a semiconductor fuse is recommended to protect the power controller and ensure long life. To safeguard power controllers, Watlow offers DIN-rail mount fuse holders and semiconductor fuses in various sizes to accommodate the entire DIN-A-MITE SCR power controller family and solid state relay products. These fuse holders feature lockout/tagout and open fuse indication.

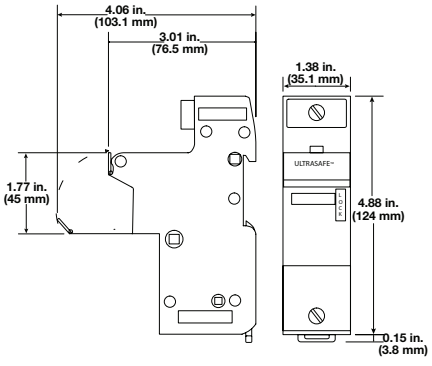

| Fuse | | | | | | Fuse Holder | |
|---|---|---|---|---|---|---|---|
| Amp Rating | $I^2T$ ($A^2Sec$) | Part Number | Dim. A mm | Dim. B mm | Weight gm | Part Number | Weight gm |
| 12 | 120 | **17-8012** | 10 | 38.1 | 9.2 | **17-5110** | 53.8 |
| 20 | 260 | **17-8020** | 10 | 38.1 | 9.2 | **17-5110** | 53.8 |
| 25 | 390 | **17-8025** | 10 | 38.1 | 9.2 | **17-5110** | 53.8 |
| 32 | 150 | **17-8030** | 14 | 50.8 | 21.0 | **17-5114** | 119.4 |
| 40 | 980 | **17-8040** | 14 | 50.8 | 21.0 | **17-5114** | 119.4 |
| 50 | 1800 | **17-8050** | 14 | 50.8 | 21.0 | **17-5114** | 119.4 |
| 63 | 2700 | **17-8063** | 22 | 58.0 | 53.1 | **17-5122** | 229.4 |
| 80 | 5100 | **17-8080** | 22 | 58.0 | 53.4 | **17-5122** | 229.4 |
| 100 | 10,000 | **17-8100** | 22 | 58.0 | 53.4 | **17-5122** | 229.4 |

**Note:** All fuses should be rated at 125 percent of connected load or the next standard fuse size above 125 percent. Due to special cases such as cooler ambient or lower amperage loads, the connected load should be the determining factor. The semiconductor fuse $I^2t$ rating must not exceed the SCR $I^2t$ rating. These fuses are classified as supplemental protection for semiconductor devices. They are not approved for branch circuit protection.

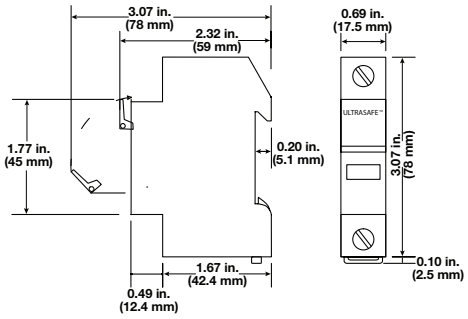
## Fuse and Fuse Holders



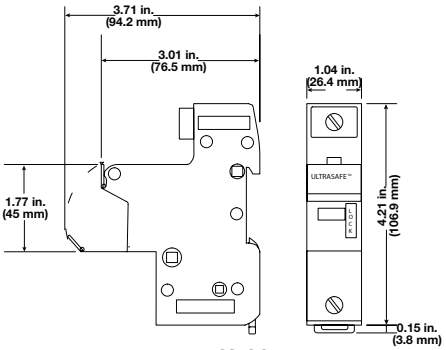

**Fuse**




**22 mm Holder**
**17-5122**




**10 mm Holder**
**17-5110**




**14 mm Holder**
**17-5114**

## Current Transformers

A current transformer (CT) provides a signal that is proportional to and isolated from the load that passes through it. The signal from the CT can be measured by a temperature or power controller. The value from that measurement may be used to trigger an alarm, detect an open heater or a shorted SSR, or to indicate the current. Choose the model that provides a measurable output for the planned load current.

To order, simply identify the desired part number. Contact your Watlow representative for availability.

| Part No. | Current Ratio |
|---|---|
| **Current Transformer** | |
| **16-0246** ① | 50 amp: 50mA |
| **16-0008** ② | 75 amp: 5 amp |
| **16-0044** | 100 amp: 5 amp |
| **16-0072** | 125 amp: 5 amp |
| **16-0008** | 150 amp: 5 amp |
| **16-0045** | 200 amp: 5 amp |
| **16-0073** | 300 amp: 5 amp |
| **0004-0286-0400** | 400 amp: 5 amp |
| **0004-0286-0500** | 500 amp: 5 amp |
| **0004-0286-0600** | 600 amp: 5 amp |
| **0004-0286-0800** | 800 amp: 5 amp |
| **0004-0286-1000** | 1000 amp: 5 amp |
| **Interstage Transformer** | |
| **16-0176** | 5 amp: 20mA |

**Note:** An interstage transformer (part no. 16-0176) is required with any current transformer rated 75 amps or above.

① Supercedes part numbers 16-0230,16-0231, 16-0232, 16-0233.
② Use 2-wire passes through the current transformer 16-0008 for 75 amp applications.

## Panel Mount Adapter Plates

Panel mount adapter plates provide a convenient, cost saving solution to modify existing control panels. Available in a variety of DIN sizes, adapter plates make changing out old, larger size temperature controllers with more sophisticated, compact controllers easy. Simply complete the build-a-part with the specifications you require.

### Ordering Information

**Part Number**

| ① ② ③ ④ | | ⑤ | ⑥ ⑦ ⑧ Adapter Plate & Config. | | ⑨ ⑩ ⑪ | ⑫ Finish |
|---|---|---|---|---|---|---|
| 0216 | - | 0 | | - | P00 | |

| ⑥ ⑦ ⑧ | Adapter Plate Size and Configuration |
|---|---|
| 920 = | 1/2 DIN to 1/4 DIN |
| 865 = | 1/4 DIN to 1/8 DIN |
| 866 = | 1/4 DIN to 1/16 DIN |
| 895 = | 1/4 DIN to 1/32 DIN |
| 867 = | 1/8 DIN to 1/16 DIN |
| 897* = | Vertical 1/8 DIN to horizontal 1/32 DIN |
| 899* = | Horizontal 1/8 DIN to horizontal 1/32 DIN |
| 900 = | 1/16 DIN to 1/32 DIN |
| * Available in black anodized only | |

| ⑫ | Finish |
|---|---|
| 2 = | Black anodize |
| 3 = | Stainless steel |

## Arc Suppression and EMI Filters

### Noise Suppression Devices

These devices protect controller outputs from damage that can be caused by voltage spikes from inductive loads.

| Part No. | Description |
|---|---|
| **0802-0273-0000** | MOV, 150VAC, 20 joule |
| **0802-0266-0000** | MOV, 275VAC, 15 joule |
| **0804-0147-0000** | Quencharc® (250VAC max.) |

### CE Filters for DIN-A-MITE Products

These filters are required for DIN-A-MITE power controllers to conform with CE conducted emissions standards.

| Part No. | Description | Stocked |
|---|---|---|
| **14-0019** | Single-phase, parallel connected filter | Yes |
| **14-0020** | Three-phase, parallel connected filter | Yes |

## Power Supplies


Watlow's series of Class 2, low-profile DIN rail-mount power supplies, only 2.2 inches deep, are ideal for shallow enclosure installations commonly used in building automation and security applications.

The DSP series supplies are available with nominal outputs from 20 to 28 volts and power levels ranging from 31 to 91 watts in three package sizes. Load regulation is less than 1 percent from no load to full load, with ripple and noise below 50 millivolts. To compensate for cable voltage drops, output voltage can be adjusted from the front panel and colored LED indicators immediately confirm the output status.

### Features and Benefits

**Low 2.2 inch profile**
- Fits into wall-mounted cabinets

**Wide range AC**
- Enables global use with no input selector switches

**Convection cooled**
- Eliminates the need for a system fan

**Class II double insulation**
- Offers impeccable protection

**DIN-rail or chassis mount**
- Adapts easily to different mounting configurations

**Adjustable voltage output**
- Fine tune output voltage from 24 to 28VDC

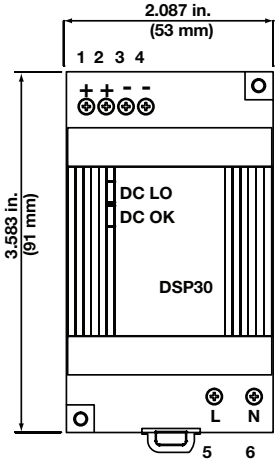
## Power Supplies

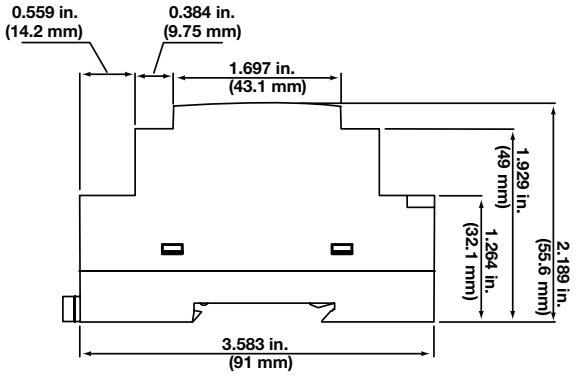
| Items/Model Number | DSP30 | DSP60 | DSP100 |
|---|---|---|---|
| **Watlow Part Number** | **0847-0299-0000** | **0847-0300-0000** | **0847-0301-0000** |
| **AC Input Voltage Range** | 90-264VAC, Class II double insulated (no ground connection required) | Same | Same |
| **Input Frequency** | 47-63Hz | Same | Same |
| **DC Input Voltage Range** | 120-370VDC | Same | Same |
| **Inrush current (115/230VAC)** | 25/50A | 30/60A | 30/60A |
| **Power Factor and Flicker** | Meets EN 61000-3-2, EN 61000-3-3 | Same | Same |
| **Output Voltage** | 24V | Same | Same |
| **Voltage Adjust** | 24-28V | Same | Same |
| **Current** | 1.30A | 2.50A | 4.20A |
| **Power** | 31.2 W | 60.0 W | 100.8 W |
| **Typical Efficiency** | 83% | 86% | 85% |
| **Hold Up Time (115VAC)** | 25ms | 12ms | 10ms |
| **UL® 1310 Class 2** | Yes | Yes | — |
| **Output Voltage Accuracy** | ±1% of nominal | Same | Same |
| **Line Regulation** | 1% | Same | Same |
| **Load Regulation** | 1% | Same | Same |
| **Ripple and Noise (20MHz BW) mV** | 50mV | Same | Same |
| **Overcurrent** | 110-160%, fold | Same | Same |
| **Protection (Type)** | Forward under short circuit (DSP100-24/C2 102-108) | Same | Same |
| **Overvoltage Protection (Volts)** | 120-145% | Same | Same |
| **Hold Up Time (115VAC input)** | See model selector | Same | Same |
| **LED Indicators** | Green LED = On, Red LED = DC output low | Same | Same |
| **Operating Temperature** | -25 to +71°C (derate linearly 2.5%/°C from 55 to 71°C) | Same | Same |
| **Temperature Coefficient** | ±0.02%/°C | Same | Same |
| **Operating Humidity** | 20 – 95% RH (non condensing) | Same | Same |
| **Cooling** | Convection | Same | Same |
| **Withstand Voltage** | Input to output 3kVAC for 1 min. | Same | Same |
| **Isolation Resistance** | >100M at 25°C & 70% RH, output to ground 500VDC | Same | Same |
| **Vibration (Operating)** | IEC 60068-2-6 (Mounting by rail: random wave, 10-500 Hz, 2G, ea. along X, Y, Z axes 10 min/cycle, 60 min.) | Same | Same |
| **Shock (Operating)** | IEC 60068-2-27 (Half sine wave, 4G, 22ms, 3 axes, 6 faces, 3 times for each face | Same | Same |
| **Safety Agency Approvals** | UL®1310 Class 2, UL®60950-1, EN 60950-1, CE | Same | Same |
| **Immunity** | EN 61000-4-2, -3, -4, -5, -6, -8 and -11 | Same | Same |
| **Conducted and Radiated EMI** | DSP10: EN 55022 Class B; DSP30-100: EN 55022 Class A | Same | Same |
| **Weight (Typ) g** | 200 | 250 | 320 |
| **Size (W x H x D) in.** | 2.09 x 3.58 x 2.19 | 2.8 x 3.58 x 2.19 | 3.54 x 3.58 x 2.19 |
| **Case Material** | Plastic | Same | Same |
| **Warranty Years** | 2 | Same | Same |

# Power Supplies

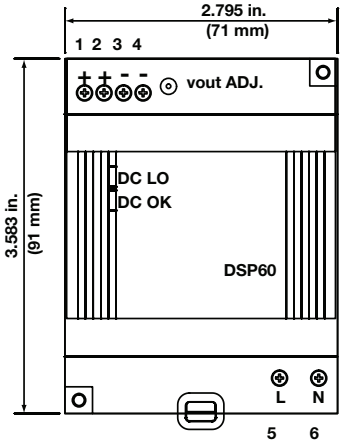
## Dimensional Drawings

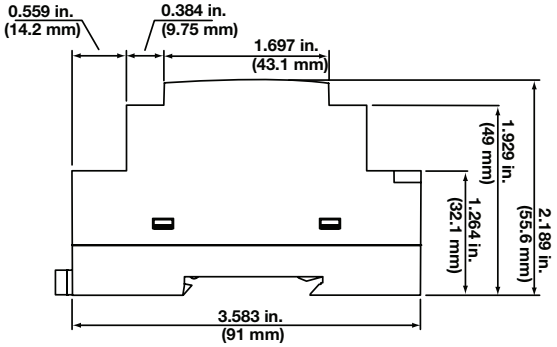
### DSP30



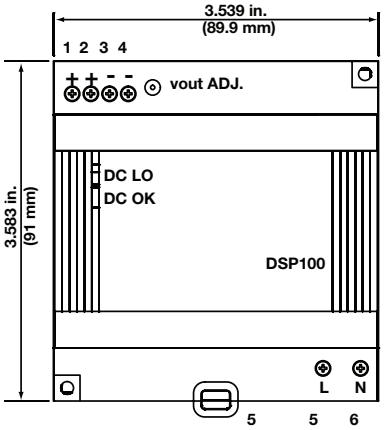



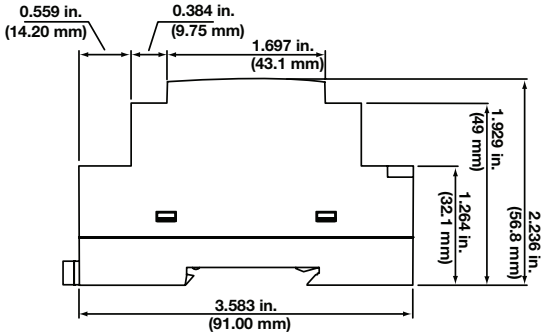

### DSP60




### DSP100



# Control Panels

| Product | Description | Supported Controllers | Operating Environment | Page |
|---|---|---|---|---|
| **Control Panels** | Control panels designed to link with Watlow immersion and circulation heaters | EZ-ZONE® controllers | 32 to 95°F (0 to 35°C) | 399 |

# Control Panels

Proper controller schematic and panel design goes a long way toward ensuring the trouble-free operation of a process system. Watlow® has supplied UL® 508 control panels for a variety of process control applications.

Watlow offers control panels that are shipped within 10 working days of order placement. These panels can drive up to 480VAC, three-phase, 120kW heating systems and are Type 4 rated enclosures that carry the c UL us mark. Component installation and wiring conform to applicable NEC and/or CEC standards.

## Performance Capabilities

### Amperage

- Up to 144 amperes

### Voltage

- 120/240VAC single phase
- 208/240/480VAC 3 phase

### Operating Environment

- 32 to 95°F (0 to 35°C)

## Features and Benefits

### Main Disconnect Switch

- Utilizes a rotary handle with interlocking door
- Helps assure maximum operator safety

### Safety Contactor

- Enables the definite purpose break of power
- Prevents abnormal condition failure utilizing an over temperature shutdown

### Enclosure

- Built with Type 4 steel enclosures with gray paint
- Designed with rugged construction suitable for industrial and commercial locations
- Suitable for indoor or outdoor installation in non-hazardous locations

### Branch Circuit Fusing

- Assures compliance with NEC and CEC electrical codes
- Increases SCCR rating
- Reduces risk of over-current related failures and hazards

### SCCR Rating

- Assures compliance with Article 409 of the NEC and UL® 508A


### UL® 508A Agency Certification

- c UL us assures compliance with appropriate United States and Canadian codes
- Assures prompt product acceptance
- Reduces end product documentation costs

### Customer Field Connections

- Dedicated terminals for supply, load and control interlock for fast and easy customer connection
- Dedicated terminals for sensor connection with matched alloys where applicable

## Supported Controllers and Devices

### Watlow EZ-ZONE® Integrated Controllers

- Three-year warranty assures Control Confidence™
- Allows integrated PID and limit control
- Decreases required panel space
- Enables use of laptop for programming setup
- Increases user and equipment safety for over and under temperature conditions
- Reduces the component count
- Utilizes TRU-TUNE® adaptive control

### Watlow DIN-A-MITE® Power Controllers

- One- and three-phase power permits use in a variety of applications
- Faster switching with solid state components. Better control saves energy and extends heater life.
- Back-to-back SCR design for increased durability
- Three-year warranty assures Control Confidence
- Accurate and tight set point control

### Pilot Devices

- High limit pilot light assures quick indication of limit condition
- Three position illuminated ON-OFF-SETUP selector switch assures rapid and accurate operator interface

### Documentation

- Complete wiring schematic and outline drawing
- Factory acceptance test
- I O & M manual

### Supports Communication through EZ-ZONE® or SpecView Using USB Cable and USB to Serial Device

- Standard external bus connection allows easy connection to laptop for programming
- A time-limited trial version of SpecView is available free of charge at www.watlow.com.

## Specifications

### Voltage

- 120/240 single phase
- 208/240/480 three phase
- 120 control circuit

### Amperage

- 144 amps max.
- 48 amps per branch circuit max.
- 3 branch circuits max.

### Interrupt Rating

- 50,000 SCCR min.

### Sensor Input

- ANSI Type J or K

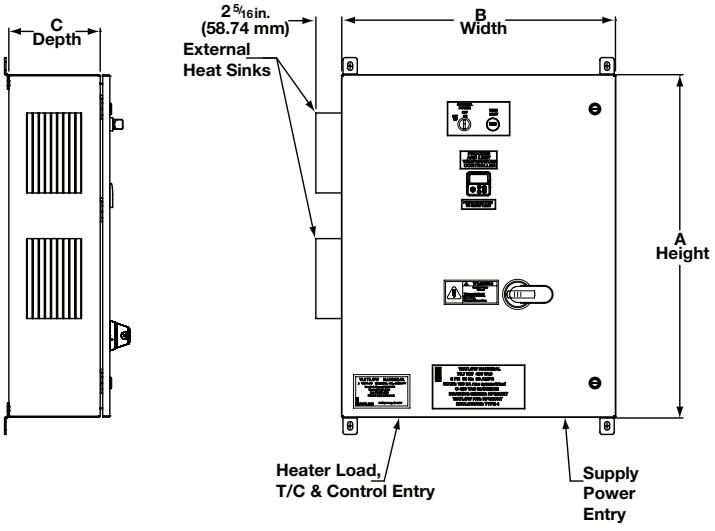
### Environmental

- Storage Temperature: 32° to 104°F (0° to 40°C)
- Relative Humidity: 10% to 90% (non-condensing)
- Ratings: Type 4
- Agency: UL® 508A

### Mechanical

- Conduit entry: designed for bottom entry of supply, load and control
- Enclosure wall: blank for customer installations of conduit
- Dimensions: see part number chart on following page

## Dimensional Drawing



# Standard Control Panels

## Ordering Information

**Part Number**

| ① ② Control Panel | ③④⑤⑥ Process and/or Hi-Limit Control | ⑦ Opt. Process & Hi-Limit Sensor | ⑧⑨⑩⑪ Part Number |
|---|---|---|---|
| CP | | | |

| ① ② | Control Panel |
|---|---|
| CP = | DIN-A-MITE C power controller |

| ③④⑤⑥ | Process and/or Hi-Limit Control |
|---|---|
| EZPR = | EZ-ZONE PM process controller only |
| EZPL = | EZ-ZONE PM process and hi-limit controller |

| ⑦ | Optional Process and Hi-Limit Sensors |
|---|---|
| J = | Type J Input |
| K = | Type K Input |

| ⑧⑨⑩⑪ | Part Number |
|---|---|
| See chart below for Part number | |

**Catalog part numbers include the following features:**

- Type 4 enclosure (carbon steel with gray paint)
- Control transformer
- Fused disconnect switch
- Control and load fusing (feed and branch circuit)
- Three position lighted selector switch (on, off, control power only)
- Pilot light (EZPL models only)
- High limit
- Through-wall bus communications input (standard bus with 485)
- Load power, remote interlock and sensor terminal blocks

**Part Number Chart (Choose part number for Ordering Information 8, 9, 10 and 11 above.)**

| Nominal Volts | Max. Heater kW | Phase | Circuits | Branch* Circuit Max. Amps | A x B x C ** Enclosure Size in. | Est. Shipping Weight (lbs) | Part Number |
|---|---|---|---|---|---|---|---|
| 208 | 8.6 | 3 | 1 | 24 | 16 x 16 x 8 | 110 | **2312** |
| 208 | 17.3 | 3 | 2 | 24 | 36 x 24 x 8 | 220 | **2322** |
| 208 | 25.9 | 3 | 3 | 24 | 36 x 30 x 8 | 290 | **2332** |
| 240 | 10.0 | 3 | 1 | 24 | 16 x 16 x 8 | 110 | **3312** |
| 240 | 19.9 | 3 | 2 | 24 | 36 x 24 x 8 | 220 | **3322** |
| 240 | 29.9 | 3 | 3 | 24 | 36 x 30 x 8 | 290 | **3332** |
| 480 | 19.9 | 3 | 1 | 24 | 16 x 16 x 8 | 110 | **4312** |
| 480 | 39.9 | 3 | 2 | 24 | 36 x 24 x 8 | 220 | **4322** |
| 480 | 59.8 | 3 | 3 | 24 | 36 x 30 x 8 | 290 | **4332** |
| 208 | 17.3 | 3 | 1 | 48 | 24 x 20 x 8 | 160 | **2314** |
| 208 | 34.5 | 3 | 2 | 48 | 36 x 36 x 8 | 330 | **2324** |
| 208 | 51.8 | 3 | 3 | 48 | 42 x 36 x 12 | 400 | **2334** |
| 240 | 19.9 | 3 | 1 | 48 | 24 x 20 x 8 | 160 | **3314** |
| 240 | 39.9 | 3 | 2 | 48 | 36 x 36 x 8 | 330 | **3324** |
| 240 | 59.8 | 3 | 3 | 48 | 42 x 36 x 12 | 400 | **3334** |
| 480 | 39.9 | 3 | 1 | 48 | 24 x 20 x 8 | 160 | **4314** |
| 480 | 79.7 | 3 | 2 | 48 | 36 x 36 x 8 | 330 | **4324** |
| 480 | 119.6 | 3 | 3 | 48 | 42 x 36 x 12 | 400 | **4334** |
| 120 | 2.9 | 1 | 1 | 24 | 16 x 16 x 8 | 110 | **1112** |
| 240 | 5.8 | 1 | 1 | 24 | 16 x 16 x 8 | 110 | **3112** |
| 240 | 11.5 | 1 | 2 | 24 | 36 x 24 x 8 | 220 | **3122** |
| 240 | 17.3 | 1 | 3 | 24 | 36 x 30 x 8 | 290 | **3132** |
| 120 | 5.8 | 1 | 1 | 48 | 24 x 20 x 8 | 160 | **1114** |
| 240 | 11.5 | 1 | 1 | 48 | 24 x 20 x 8 | 160 | **3114** |
| 240 | 23.0 | 1 | 2 | 48 | 36 x 24 x 8 | 230 | **3124** |
| 240 | 34.6 | 1 | 3 | 48 | 42 x 36 x 12 | 400 | **3134** |

* 24 amp circuits fused at 30 amps
48 amp circuits fused at 60 amps
Installation must comply to local electrical codes

** Add $2\frac{5}{16}$ inch to "C" dimension for external heat sink