



## F4T®

The F4T® 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.

Watlow's F4T is available through Watlow **SELECT®**, a program that enables you to quickly identify, configure and receive your thermal products faster and easier than ever before. With **SELECT**, you use a variety of tools to guide your decision, configure products for an exact fit and quickly receive your order. Visit [www.watlow.com/select](http://www.watlow.com/select) to learn more

### 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

#### Email and text alerts

- Notifies users of an event that has occurred such as specific profile or step within a profile, alarm condition, limit condition or analog input error

#### 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/IP™, Modbus® TCP (Ethernet) 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

#### SERIES F4S/F4D/F4P backward compatible

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



## F4T

### 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/IP™
- Ethernet Over 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
- Multi-language options
  - English, German, French, Italian, Spanish, Japanese, Korean and Chinese
- USB wired or wireless mouse user interface
  - Use in hazardous location, dirty environments or applications with gloves

### 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:  $\pm 0.1\%$  of span,  $\pm 1^\circ\text{C}$  at the calibrated ambient temperature and rated line voltage
  - Types R, S, B:  $\pm 0.2\%$
  - Type T below  $-50^\circ\text{C}$ :  $\pm 0.2\%$
- Calibration ambient temperature at  $77^\circ\text{F} \pm 5^\circ\text{F}$  ( $25^\circ\text{C} \pm 3^\circ\text{C}$ )
- Accuracy span:  $1000^\circ\text{F}$  ( $540^\circ\text{C}$ ) min.
- Temperature stability: Typical  $\pm 0.1^\circ\text{F}/^\circ\text{F}$  ( $\pm 0.1^\circ\text{C}/^\circ\text{C}$ ) rise in ambient max.

### Configuration Diagnostics

- Indicates if modules present match the expected configuration settings

### 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  $\pm 5\%$
- Low voltage option: 24 to 28VAC/VDC  $+10/-15\%$ , 50/60Hz  $\pm 5\%$
- Power consumption: 23 W, 54VA

#### User Interface

- 4.3 inch TFT PCAP color graphic touch screen
- LED backlife  $>50\text{K}$  hours
- 4 keys: Home, Main Menu, Back, Help
- Multiple languages
  - English, German, French, Italian, Spanish, Japanese, Korean and Chinese
- USB wired or wireless mouse functionality
  - Right click for 4 keys: Home, Main Menu, Back, Help



## F4T

### 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

### Agency Approvals

- UL®/EN 61010 Listed, File E185611 QUXX
- 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

- Modbus® TCP (Ethernet)
- 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



# Temperature and Process

## F4T

### 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

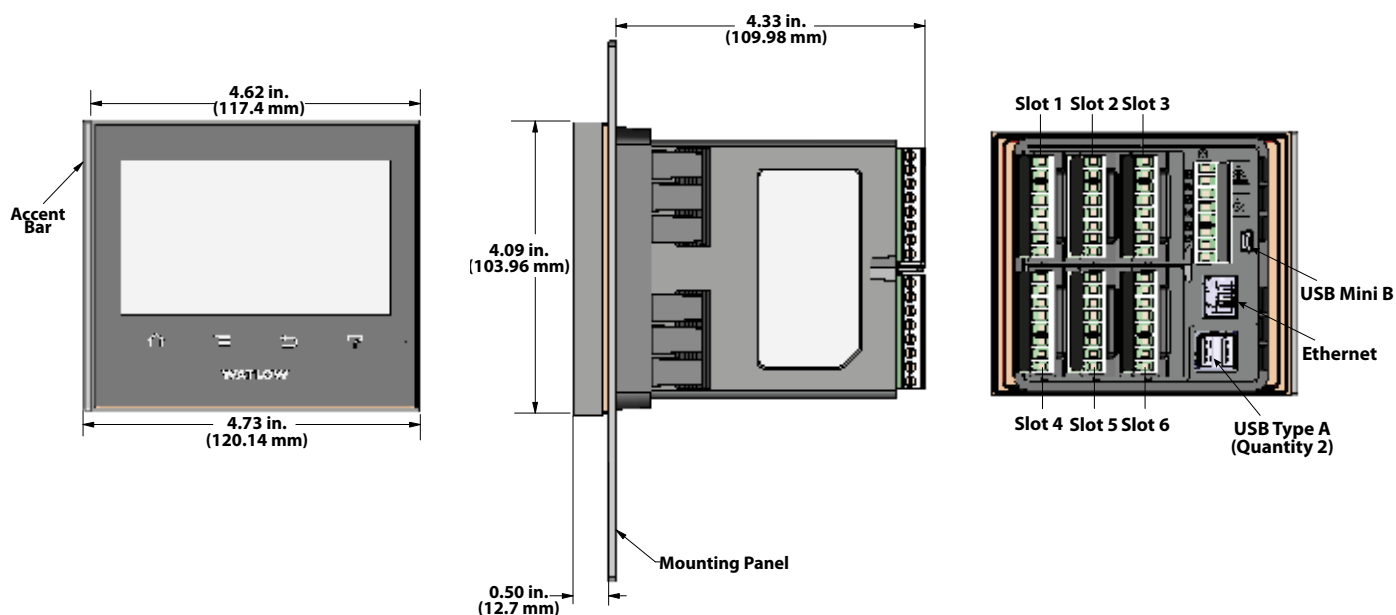
### Timers

- On pulse, delay, one shot or retentive

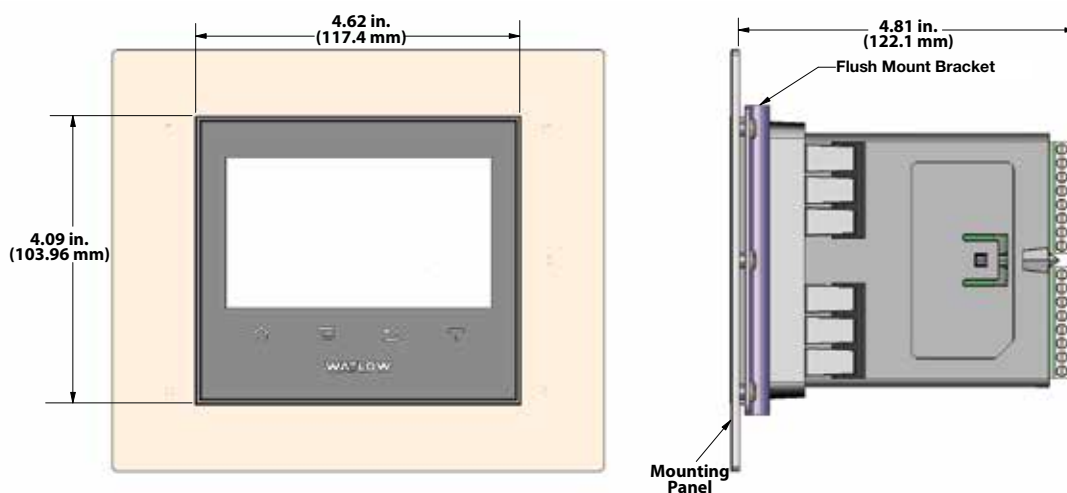
### Variable

- User value for digital or analog variable

## Panel Mount Dimensions



## Flush Mount Dimensions





## F4T

### F4T Base Ordering Information

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

#### Part Number

① ②	③	④	⑤	⑥	⑦	⑧ ⑨	⑩ ⑪	⑫
	Base Type	Application Type	Data Logging	Power Supply Connector & Voltage, Logo	Profiles & Function Blocks	Communication Options	Documentation, Accent Bar, Replacement Connector & Custom	Control Algorithms
F4	T							

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 entry <sup>①</sup>
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 Connector & Voltage, Logo			
	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					
	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
<b>Note:</b> Refer to page 9 "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.					

⑧ ⑨ Communication Options	
AA =	Modbus <sup>®</sup> TCP (Ethernet)
A3 =	EtherNet/IP <sup>™</sup> (w/Modbus <sup>®</sup> TCP)

⑩ ⑪ Documentation, Accent Bar, Replacement Connector & Custom					
	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 Algorithms		
	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
<b>Note:</b> Each control loop algorithm requires 1 universal or thermistor input from a flex module.		
<b>Note:</b> Each cascade loop algorithm requires 2 universal or thermistor inputs from flex modules.		

⑬ ⑭ ⑮ Populated Flex Modules	
AAA =	No populated flex modules
XXX =	Contact factory - Populated flex modules
<b>Note:</b> If AAA is selected you will need to order Flex Modules (FM) next to account for input and output hardware.	





# Temperature and Process

## F4T

### Flex Modules—High Density I/O Specifications

#### 4 Universal Inputs (Control Loops, Auxiliary Input)

- Thermocouple: Grounded or ungrounded sensors, greater than 20M $\Omega$  input impedance, 2k $\Omega$  source resistance max.
- RTD: 2-wire, platinum, 100 $\Omega$  and 1000 $\Omega$  at 32°F (0°C) calibration to DIN curve (0.00385 $\Omega/\Omega/^\circ\text{C}$ )
- Process: 0-20mA at 100 $\Omega$ , or 0-10VDC, 0-50mVDC at 20k $\Omega$  input impedance; scalable
- Potentiometer: 0 to 1,200 $\Omega$
- Inverse scaling

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

- 0 to 40k $\Omega$ , 0 to 20k $\Omega$ , 0 to 10k $\Omega$ , 0 to 5k $\Omega$
- 2.252k $\Omega$  and 10k $\Omega$  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  $\pm$ 15mV into a min. 4,000 $\Omega$  load with 2.5mV nominal resolution
- 0 to 20mA  $\pm$ 30 $\mu$ A into max. 400 $\Omega$  load with 5 $\mu$ A nominal resolution
- Temperature stability 100ppm/ $^\circ\text{C}$

#### 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

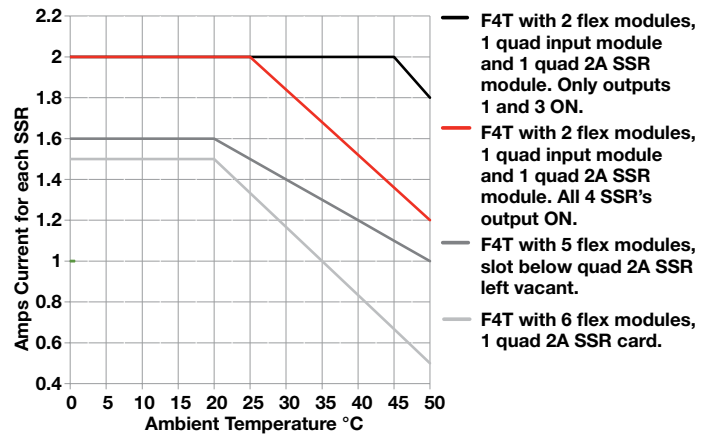
#### Two Solid State Relays

- 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

- 2 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 10k $\Omega$ , max. closed resistance 50 $\Omega$ , 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

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

#### Part Number

① ②	③	④	⑤	⑥ ⑦ ⑧	⑨	⑩	⑪ ⑫
	Module ID Type	Future Option	Input and Output Hardware	Future Options	Future Option	Custom Options and Connectors	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 10A <sup>①</sup>
L =	4 SSRs at 2A each. SSRs grouped in 2 pairs with each pair sharing a common

<sup>①</sup> **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 2 total of the K option FM module types (4 total SSR, 10A).

⑥ ⑦ ⑧	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

⑪ ⑫	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

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

#### Universal Input

- Thermocouple: Grounded or ungrounded sensors, greater than 20M $\Omega$  input impedance, 2k $\Omega$  source resistance max.
- RTD: 2- or 3-wire, platinum, 100 $\Omega$  and 1000 $\Omega$  at 32°F (0°C) calibration to DIN curve (0.00385 $\Omega$ /°C)
- Process: 0-20mA at 100 $\Omega$ , or 0-10VDC, 0-50mVDC at 20k $\Omega$  input impedance; scalable
- Potentiometer: 0 to 1,200 $\Omega$
- Inverse scaling

#### Thermistor Input

- 0 to 40k $\Omega$ , 0 to 20k $\Omega$ , 0 to 10k $\Omega$ , 0 to 5k $\Omega$
- 2.252k $\Omega$  and 10k $\Omega$  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 20M $\Omega$  input impedance, 2k $\Omega$  source resistance max.
- RTD: 2-wire, platinum, 100 $\Omega$  and 1000 $\Omega$  at 32°F (0°C) calibration to DIN curve (0.00385 $\Omega$ /°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 10k $\Omega$ , max. closed resistance 50 $\Omega$ , 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, 100 $\Omega$  input impedance
- Response time: 1 second max., accuracy  $\pm$ 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  $\pm$ 15mV into a min. 1,000 $\Omega$  load with 2.5mV nominal resolution
- 0 to 20mA  $\pm$ 30 $\mu$ A into max. 800 $\Omega$  load with 5 $\mu$ A nominal resolution
- Temperature stability 100ppm/°C





## F4T

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

#### Part Number

<b>① ②</b>	<b>③</b>	<b>④</b>	<b>⑤</b>	<b>⑥ ⑦</b>	<b>⑧</b>	<b>⑨</b>	<b>⑩</b>	<b>⑪ ⑫</b>
	Module ID Type	Future Option	Input Hardware	Output Hardware Options	Future Option	Future Option	Custom Options and Connectors	Custom Options- Firmware, Overlay, Preset Parameters, Locked Code
<b>FM</b>	<b>M</b>	<b>A</b>			<b>A</b>	<b>A</b>		

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.	

⑥ ⑦ 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

⑪ ⑫ 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



# Temperature and Process



## F4T

### F4T Flex Module—Limit Ordering Information

#### Part Number

<b>1 2</b>	<b>3</b>	<b>4</b>	<b>5 6 7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11 12</b>
	Module ID Type	Future Option	Input and Output Hardware	Future Option	Future Option	Custom Options and Connectors	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

5 6 7 Input and Output Hardware Options				
	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

11 12 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

### F4T Flex Modules—Communication Ordering Information

#### Part Number

① ②	③	④	⑤	⑥ ⑦ ⑧	⑨	⑩	⑪ ⑫
FM	Module ID Type <b>C</b>	Future Option <b>A</b>	Comm. Option <b>2</b>	Future Options <b>AAA</b>	Future Option <b>A</b>	Custom Options and Connectors	Custom Options- Firmware, Overlay, Preset Parameters, Locked Code

③	Module ID Type
C =	Communications

④	Future Option
A =	Future option

⑤	Communications Option
2 =	Modbus® RTU 232/485
<b>Note:</b> EIA-232/485 Modbus® RTU flex module, if used, must occupy F4T slot 6 location.	

⑥ ⑦ ⑧	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

⑪ ⑫	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 suppression - 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

1720-6742	Installation and Troubleshooting User's Guide
1680-2414	Setup and Operations User Guide
1440-3329	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



# Temperature and Process

## EZ-ZONE® RM

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

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

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

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

### Benefits of using an integrated controller solution:

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



## Features and Benefits

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

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

### Advanced PID control algorithm

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

### Communication capabilities

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

### USB port

- Provides data log retrieval

### SPLIT-RAIL control

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

### AUTO CLONE

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

### SENSOR GUARD

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



## EZ-ZONE RM

### Additional Key Functions

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

### Common Specifications (Applies to all models)

#### Line Voltage/Power

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

#### Environment

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

#### Functional Operating Range for RMC, RMH, RML and RMS

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

### Agency Approvals

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

### Serial Communications

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

### Implicit Messaging

Number of data members accessible through implicit messaging

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

### User Interface

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

### Maximum System Configuration

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

### Mounting

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

### Wiring Termination—Touch-Safe Terminals

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



# Temperature and Process

## 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 1 or 2 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 4 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
- 1 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

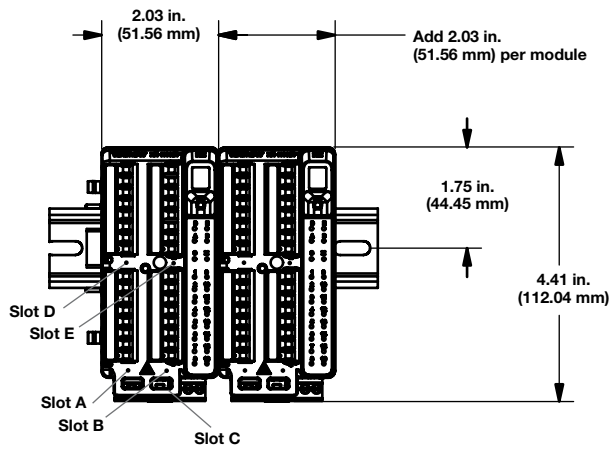
	Control Module	High-Density Control Module	High-Density Limit Module	Expansion Module	High-Density Scanner Module
Number of modules per system	1 to 16	1 to 16	1 to 16	1 to 16	1 to 16
Number of PID loops per module	1 to 4	4, 8, 12 or 16	0	0	0
Number of limit loops per module	1 to 4	0	4, 8 or 12	0	0
Number 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



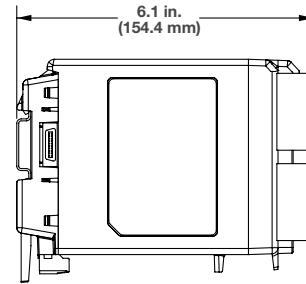


## EZ-ZONE RM

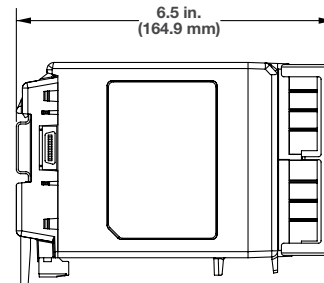
### Dimensional Drawings



### Front-Screw Connectors

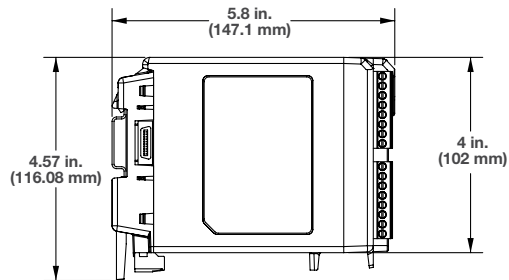


### Ring Terminal Connectors



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





## 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 1 to 4 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

- $\pm 0.1\%$  of span,  $\pm 1^\circ\text{C}$ ; see user manual for details

#### Universal Input

- Thermocouple, grounded or ungrounded sensors
- $>20\text{M}\Omega$  input impedance
- Max. of  $2\text{k}\Omega$  source resistance
- RTD 2- or 3-wire, platinum,  $100\Omega$  and  $1000\Omega$  @  $32^\circ\text{F}$  ( $0^\circ\text{C}$ ) calibration to DIN curve ( $0.00385\Omega/\Omega/^\circ\text{C}$ )
- Process, 0-20mA @  $100\Omega$ , or 0-10VDC @  $20\text{k}\Omega$  input impedance; scalable, 0-50mV
- Potentiometer: 0 to  $1,200\Omega$
- Inverse scaling
- Current: Input range is 0 to 50mA,  $100\Omega$  input impedance  
Response time: 1 second max., accuracy  $\pm 1\text{mA}$  typical

#### Thermistor Input

- 0 to  $40\text{k}\Omega$ , 0 to  $20\text{k}\Omega$ , 0 to  $10\text{k}\Omega$ , 0 to  $5\text{k}\Omega$
- $2.252\text{k}\Omega$  and  $10\text{k}\Omega$  base at  $77^\circ\text{F}$  ( $25^\circ\text{C}$ )

#### 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  $10\text{k}\Omega$ , max. closed resistance  $50\Omega$

#### 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  $50^\circ\text{F}$  ( $10^\circ\text{C}$ ) to 0.5A at  $149^\circ\text{F}$  ( $65^\circ\text{C}$ ), 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 @  $122^\circ\text{F}$  ( $50^\circ\text{C}$ ), 85 to 264VAC, no VDC, resistive load, 2 million cycles at rated load
- Universal process/retransmit, output range selectable:
  - 0 to 10VDC  $\pm 15\text{mV}$  into a min.  $1,000\Omega$  load with 2.5mV nominal resolution
  - 0 to 20mA  $\pm 30\mu\text{A}$  into max.  $800\Omega$  load with  $5\mu\text{A}$  nominal resolution
  - Temperature stability is 100ppm/ $^\circ\text{C}$



## 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/ Custom Product	⑬ Enhanced Options	⑭ 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 <b>(R/S applies to all loops in module)</b>
4 =	Ramp/Soak control with thermistor input <b>(R/S applies to all loops in module)</b>
5 =	Limit with universal input <b>(only valid Output 1 and 2, options will be B, F, L)</b>
6 =	Limit with thermistor input <b>(only valid Output 1 and 2, options will be B, F, L)</b>
7 =	Current transformer input <b>(not valid Output 1 and 2, options are A, B, N, P, R, S, T)</b>
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 <b>(only valid Output 3 and 4, options will be B, F, L)</b>
6 =	Limit with thermistor input <b>(only valid Output 3 and 4, options will be B, F, L)</b>
7 =	Current transformer input <b>(not valid Output 3 and 4, options are N, P, R, S)</b>
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 <b>(only valid Output 5 and 6, options will be B, F, L)</b>
6 =	Limit with thermistor input <b>(only valid Output 5 and 6, options will be B, F, L)</b>
7 =	Current transformer input <b>(not valid Output 5 and 6, options are N, P, R, S)</b>
R =	Auxiliary 2nd input (universal input)
P =	Auxiliary 2nd input (thermistor input)

(Ordering information continued on next page.)



# Temperature and Process

## 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/ Custom Product	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 ( <b>only valid Output 7 and 8, options will be B, F, L</b> )
6 =	Limit with thermistor input ( <b>only valid Output 7 and 8, options will be B, F, L</b> )
7 =	Current transformer input ( <b>not valid Output 7 and 8, options are N, P, R, S</b> )
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 ( <b>valid option only if Input 4 selection = A</b> )	

⑫ Connector Style/Custom Product	
A =	Right angle screw connector (standard)
F =	Front screw connector (slots A, B, D and E only)
S =	Custom

⑬ Enhanced Options	
A =	Standard bus
1 =	Standard bus and Modbus® RTU 485 (selectable via dipswitch)

⑭ ⑮ Additional Options	
<b>Firmware, overlays, parameter settings</b>	
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

- $\pm 0.1\%$  of span,  $\pm 1^\circ\text{C}$ ; see user manual for details

#### Universal Input

- Thermocouple, grounded or ungrounded sensors
- $>20\text{M}\Omega$  input impedance
- Max. of  $2\text{k}\Omega$  source resistance
- RTD 2-wire, platinum,  $100\Omega$  and  $1000\Omega$  @  $32^\circ\text{F}$  ( $0^\circ\text{C}$ ) calibration to DIN curve ( $0.00385\Omega/\Omega/^\circ\text{C}$ )
- Process,  $0\text{-}20\text{mA}$  @  $100\Omega$ , or  $0\text{-}10\text{VDC}$  @  $20\text{k}\Omega$  input impedance; scalable,  $0\text{-}50\text{mV}$

#### Thermistor Input

- $0$  to  $40\text{k}\Omega$ ,  $0$  to  $20\text{k}\Omega$ ,  $0$  to  $10\text{k}\Omega$ ,  $0$  to  $5\text{k}\Omega$
- $2.252\text{k}\Omega$  and  $10\text{k}\Omega$  base at  $77^\circ\text{F}$  ( $25^\circ\text{C}$ )

#### 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  $10\text{k}\Omega$ , max. closed resistance  $50\Omega$

#### 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  $10\text{VDC}$  into a min.  $4\text{k}\Omega$  load
- $0$  to  $20\text{mA}$  into max.  $400\Omega$  load

#### Quad SSR

- 4 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



# Temperature and Process

## 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

① ② 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	⑪ ⑫ Additional Options
RM	H						A		

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

⑤ Slot A	
1 =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with control loops
2 =	4 thermistor inputs with control loops
4 =	4 high accuracy thermocouple inputs with control loops (defaults to Type K)

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
4 =	4 high accuracy thermocouple inputs with control loops (defaults to Type K)

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
4 =	4 high accuracy thermocouple inputs with control loops (defaults to Type K)
C =	6 digital I/O
F =	3 universal process/retransmit outputs
J =	4 mechanical relay 5A, Form A
L =	4 SSRs at 2A each; SSRs 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
4 =	4 high accuracy thermocouple inputs with control loops (defaults to Type K)
C =	6 digital I/O
F =	3 universal process/retransmit outputs
J =	4 mechanical relay 5A, Form A
L =	4 SSRs at 2A each; SSRs 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	
<b>Firmware, Overlays, Parameter Settings</b>	
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

- $\pm 0.1\%$  of span,  $\pm 1^\circ\text{C}$ ; see user manual for details

#### Universal Input

- Thermocouple, grounded or ungrounded sensors
- $>20\text{M}\Omega$  input impedance
- Max. of  $2\text{k}\Omega$  source resistance
- RTD 2-wire, platinum,  $100\Omega$  and  $1000\Omega$  @  $32^\circ\text{F}$  ( $0^\circ\text{C}$ ) calibration to DIN curve ( $0.00385\Omega/\Omega/^\circ\text{C}$ )
- Process,  $0\text{-}20\text{mA}$  @  $100\Omega$ , or  $0\text{-}10\text{VDC}$  @  $20\text{k}\Omega$  input impedance; scalable,  $0\text{-}50\text{mV}$

#### Thermistor Input

- $0$  to  $40\text{k}\Omega$ ,  $0$  to  $20\text{k}\Omega$ ,  $0$  to  $10\text{k}\Omega$ ,  $0$  to  $5\text{k}\Omega$
- $2.252\text{k}\Omega$  and  $10\text{k}\Omega$  base at  $77^\circ\text{F}$  ( $25^\circ\text{C}$ )

#### Digital Input

- Update rate  $10\text{Hz}$
- Max. input  $36\text{VDC}$  at  $3\text{mA}$
- Min. high state  $3\text{VDC}$  at  $0.25\text{mA}$

#### Dry Contact Input

- Update rate  $10\text{Hz}$
- Min. open resistance  $10\text{k}\Omega$ , max. closed resistance  $50\Omega$

#### Output Hardware

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



# Temperature and Process

## EZ-ZONE RM



### High-Density Limit Module Ordering Information

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

#### Part Number

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

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

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

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

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

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

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

⑪ ⑫ Additional Options	
<b>Firmware, Overlays, Parameter Settings</b>	
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 100k $\Omega$
- Max. closed resistance 50 $\Omega$

#### 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

- 2 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

- 4 electromechanical 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 (3 universal process/retransmit outputs)

- Output range selections: 0 to 10VDC into a min. 4K $\Omega$  load
- 0 to 20mA into max. 400 $\Omega$  load

#### Quad SSR

- 4 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



# Temperature and Process



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

④ Connector Style/Custom Product	
A =	Right angle screw connector (standard)
F =	Front screw connector (slots A, B, D and E only)
R =	Ring lug connector <b>(if ordered then slots B and E must be =A)</b>
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 <b>(if ordered, then slot B must be = A)</b>
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 1-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 SSRs grouped in 2-pairs with each pair sharing a common
T =	Quad inputs for external current transformers; can do either 1-phase or 3-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 <b>(if ordered, then slot E must be = A)</b>
L =	4 SSRs at 2 each SSRs grouped in 2-pairs with each pair sharing a common
T =	Quad inputs for external current transformers; can do either 1-phase or 3-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 1-phase or 3-phase system measurement for all hardware outputs ordered within the expansion module

⑩ Enhanced Options	
A =	Standard bus
1 =	Standard bus and Modbus® RTU 485

⑪ ⑫ Additional Options	
<b>Firmware, Overlays, Parameter Settings</b>	
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

- $\pm 0.1\%$  of span,  $\pm 1^\circ\text{C}$ . See user manual for details.

#### Universal Input

- Thermocouple, grounded or ungrounded sensors
- $>20\text{M}\Omega$  input impedance
- Max. of  $2\text{k}\Omega$  source resistance
- RTD 2-wire, platinum,  $100\Omega$  and  $1000\Omega$  @  $32^\circ\text{F}$  ( $0^\circ\text{C}$ ) calibration to DIN curve ( $0.00385\Omega/\Omega/^\circ\text{C}$ )
- Process,  $0\text{-}20\text{mA}$  @  $100\Omega$ , or  $0\text{-}10\text{VDC}$  @  $20\text{k}\Omega$  input impedance; scalable,  $0\text{-}50\text{mV}$

#### Thermistor Input

- $0$  to  $40\text{k}\Omega$ ,  $0$  to  $20\text{k}\Omega$ ,  $0$  to  $10\text{k}\Omega$ ,  $0$  to  $5\text{k}\Omega$
- $2.252\text{k}\Omega$  and  $10\text{k}\Omega$  base at  $77^\circ\text{F}$  ( $25^\circ\text{C}$ )

#### Digital Input

- Update rate  $10\text{Hz}$
- Max. input  $36\text{VDC}$  at  $3\text{mA}$
- Min. high state  $3\text{VDC}$  at  $0.25\text{mA}$

#### Dry Contact Input

- Update rate  $10\text{Hz}$
- Min. open resistance  $10\text{k}\Omega$ , max. closed resistance  $50\Omega$

#### Output Hardware

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



# Temperature and Process

## EZ-ZONE RM



### High-Density Scanner Module Ordering Information

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

#### Part Number

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

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

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

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

⑦ Slot D	
A =	None
4 =	4 high accuracy thermocouple inputs (defaults to Type K)
R =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) without control loops
P =	4 thermistor inputs without control loops
C =	6 digital I/O
F =	3 universal process/retransmit outputs
J =	4 mechanical relay 5A, Form A
L =	4 SSRs at 2A each; SSR's grouped in 2-pairs with each pair sharing a common

⑧ Slot E	
A =	None
4 =	4 high accuracy thermocouple inputs (defaults to Type K)
R =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) without control loops
P =	4 thermistor inputs without control loops
B =	1 digital input and 2 mechanical relays, 4A
C =	6 digital I/O
F =	3 universal process/retransmit outputs
J =	4 mechanical relay 5A, Form A
L =	4 SSRs 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	
<b>Firmware, Overlays, Parameter Settings</b>	
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, data logging 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.



# Temperature and Process



## 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 (4G 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.



## EZ-ZONE RM

### 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

### 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<sup>®</sup> TCP

#### Additional Communication Options

- EIA 232/485, Modbus<sup>®</sup> 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 standard with Modbus<sup>®</sup> TCP, standard bus over Ethernet, USB device, internal storage and SD card.

#### Part Number

① ② ③ ④ <b>EZ-ZONE Rail Mount</b>	⑤ <b>Additional Communication Protocols</b>	⑥ <b>Ultra High Density Thermocouple Input Card</b>	⑦ <b>Data Logging</b>	⑧ <b>Wireless Connectivity</b>	⑨ <b>Future Option</b>	⑩ <b>Future Option</b>	⑪ ⑫ <b>Additional Options</b>
<b>RMAP</b>	-				<b>A</b>	<b>A</b>	

⑤ Additional Communication Protocols	
A =	None
2 =	Modbus <sup>®</sup> RTU 232/485
5 =	DeviceNet <sup>™</sup> (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
D =	Data logging to 16G SD card

⑧ Wireless Connectivity	
A =	None
B =	Bluetooth <sup>®</sup> (future option)
W =	Wi-Fi (future option)

⑨ Future Option	
A =	Future option

⑩ Future Option	
A =	Future option

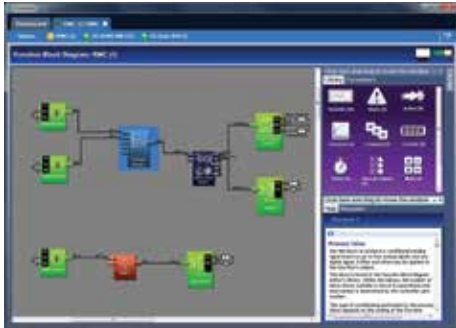
⑪ ⑫ Additional Options	
AA =	Standard
XX =	Custom/locked code application specific



## EZ-ZONE® RM

### Compatible Accessories

#### COMPOSER®



COMPOSER® 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](http://www.watlow.com).

#### 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](http://www.watlow.com).

#### 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.

#### Operator Interface Terminals (OIT)



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

#### Power Supplies

- 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	



# Temperature and Process

## 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

① ② ③ ④ EZ-ZONE Rail Mount	⑤ ⑥ Number of Control Loops	⑦ ⑧ Number of Optical Inputs	⑨ Wireless Comms.	⑩ Legacy Comms.	⑪ ⑫ Connector Style/Additional Options
RMZ4	-				



⑤ ⑥ 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™

⑪ ⑫ Connector Style/Additional Options	
AA =	Standard
12 =	Class 1, Div. 2
XX =	Custom

⑦ ⑧ 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

① ② ③ ④ EZ-ZONE Rail Mount	⑤ ⑥ Number of Fiber Optic/Temperature Control Loops	⑦ Future Option	⑧ Future Option	⑨ Future Option	⑩ Comms. Protocol	⑪ ⑫ Add'l Options
RMFA	-					



⑤ ⑥ 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.

⑪ ⑫ Additional Options	
AA =	Standard
12 =	Class 1, Div. 2
XX =	Custom



## EZ-ZONE® RMG

The EZ-ZONE® RMG controller with Adaptive Thermal Systems® (ATS™) technology is Watlow's controller for gas delivery applications. This rail-mounted controller is versatile regarding mounting within a semiconductor gas chamber and provides distributed control up to 12 amps from four outputs (up to three amps per circuit).

Watlow's ATS technology provides detection of mis-wired heaters by offering a "ping" feature test system allowing users to obtain immediate feedback from soft power prior to turning on the main power. A small amount of power is applied, and the system is tested against the input data from the free software tool. If any data does not match, including ground fault detection, a fault condition occurs signaling the built-in global replay to shut down the system. This feedback prevents catastrophic conditions associated with overheated or cold spots within the gas line system.

### Features and Benefits

**Offers a combination of thermocouple inputs (up to 18 per printed circuit board assembly) and field effect transistor outputs (four three-amp outlets)**

- Allows users to mix and match inputs and outputs for maximum system flexibility

#### Built-in diagnostics

- Enables real-time data of line heating to master controller on tool

#### Plug and play

- Adapts directly with the EZ-ZONE RMZ EtherCAT® module

## EZ-ZONE RMUH

Configure this module as an ultra high-density input module for a total of 36 inputs, including limits and control loops.



### Specifications

#### Environment

- Unit ambient rating -18 to 65°C, 0 to 90% RH non-condensing, IP code (IP20)

#### EZ-ZONE RMG Card

- Ambient temperature rating (electronics) -18 to 65°C
- Heater current four channels at 3A, low voltage 20 to 40VDC, high voltage 85 to 336VDC

#### EZ-ZONE RMUH Card

- Ambient temperature rating (electronics) -18 to 65°C
- TC accuracy  $\pm 1.0^\circ\text{C}$  (pending qualification), limit relay 5A, 240VAC, RS485 standard bus, USB device

#### Communication Protocol via EZ-ZONE RMZ

- EtherCAT® ETG.5003.2060 compliant, Watlow standard bus, DeviceNET™



# Temperature and Process

## EZ-ZONE RMG

### Ordering Information - RMG

#### Part Number

① ② EZ-ZONE Rail-Mount	③ Gas Line Heater	④ Output Card Voltage Rating	⑤ ⑥ Control Card	⑦ ⑧ Limits	⑨ ⑩ Control Loops	⑪ ⑫ Outputs	⑬ Future Option	⑭ ⑮ Custom/Locked Firmware
<b>RM</b>	<b>G</b>						<b>A</b>	

④ Output Card Voltage Rating	
L =	Low voltage 20 to 40VDC +10%, -15%
H =	High voltage (rectified 100 to 240VAC) +10%, -15% (future option)

⑤ ⑥ Control Card	
AA=	No input card selected
##=	Any number 01 to 18 = number of thermocouple sensors

⑦ ⑧ Limits	
AA=	None
##=	01 to 18 number of sensors directed to supervisory global relay

⑨ ⑩ Control Loops	
AA=	None
##=	01 to 18 number of control loops

⑪ ⑫ Outputs	
AA=	None
##=	01 to 08 number of 3 amp outputs If > than 2 A007-3081-000X cards installed

⑬ Future Option	
A =	Standard

⑭ ⑮ Custom/Locked Firmware	
AA=	Standard
XX=	Custom = Any two letters of number for non-critical firmware or cosmetic options

### Ordering Information - RMUH

#### Part Number

① ② EZ-ZONE Rail-Mount	③ ④ Ultra High Density Input	⑤ ⑥ Inputs	⑦ ⑧ Limits	⑨ ⑩ Control Loops	⑪ ⑫ Custom/ Locked Firmware
<b>RM</b>	<b>UH</b>				

⑤ ⑥ Inputs	
##=	Any number 01 to 36 = number of thermocouple sensors

⑦ ⑧ Limits	
AA=	None
##=	01 to 36 number of sensors directed to supervisory global relay

⑨ ⑩ Control Loops	
AA=	None
##=	01 to 36 number of control loops

⑪ ⑫ Custom/Locked Firmware	
AA=	Standard
XX=	Custom = Any two letters of number for non-critical firmware or cosmetic options



## EZ-ZONE® RMT

Watlow's EZ-ZONE® RMT controller with Adaptive Thermal Systems® (ATS™) technology is a critical component in Watlow's STREAMLINE™ heating system for semiconductor gas delivery and exhaust applications.

While other line heating systems require a maze of wires associated with input, output and over-temperature protection, the line heating system with ATS technology streamlines the solution by offering closed loop control with integrated over-temperature safety protection for each heater with just two wires managed entirely by one EZ-ZONE RMT controller. The efficiency helps prevent system issues our customers may otherwise experience.

The need to integrate fewer controllers makes installation quicker and easier by cutting the required heater connections by two thirds. It also reduces costs and provides a more spatially-efficient system.



### Features and Benefits

#### Allows for direct wiring of 208VAC

- Offers commonly available line voltage

#### Provides built-in diagnostics of each zone

- Enables real-time data of line heating to master controller on tool

#### Removes complications and nuisance components by migrating functions from the heater to the controller

- Creates a clean, aesthetic loop with just two wires

#### Incorporates an improved fault detection system

- Provides connectivity to all zones to locate and fix system issues as quickly as possible

#### Intelligent design

- Allows for better diagnostics, reliability and product life expectancy
- Lowers total cost of ownership

#### Reduces the number of design iterations needed

- Provides a complete thermal system with significantly reduced lead times

#### Connects via EtherCAT®

- Alligns with industry-standard communications protocol



# Temperature and Process

## EZ-ZONE RMT

### Specifications

#### Voltage

- 208VAC ±10%

#### Ambient Ratings

- -18 to 65°C

#### Humidity

- 0 to 90% non-condensing

#### Altitude

- Maximum 2,000 meters

#### Installation Category II

- Pollution degree category 2
- No maintenance requirements or field serviceable parts apply to the EZ-ZONE RMT controller

#### Safety Relay

- 2 amps resistive, 24 - 240VAC or 30VDC, 125VA pilot duty 120/240VAC, 25VA at 24VAC

### Agency Directives

#### ISO 13849-1 Safety of Machinery

- Safety-related parts of control systems; Part 1: General principles for design (Category 2 and performance level C)

Third Edition, dated December 15, 2015

#### UL® 61010-1 Standard for Safety

- Electrical Equipment for measurement, control and laboratory use; Part 1: General requirements

Third Edition, Dated May 11, 2012

## Ordering Information

### Part Number

① ② EZ-ZONE Rail-Mount	③ Primary Product Function	④ Future Option	⑤ ⑥ Control/ Limit Loops	⑦ ⑧ Heater Technology	⑨ Future Option	⑩ Future Option	⑪ ⑫ Customization
RM	T	A			A	A	

③ Primary Product Function	
T =	TC heater sensor with integrated limit
④ Future Option	
A =	Standard product
⑤ ⑥ Control/Limit Loops	
06=	6 control loops (1 module card installed)
12=	12 control loops (2 module cards installed)
⑦ ⑧ Heater Technology	
CL=	Cloth heaters
SR=	Silicone rubber heaters
⑨ Future Option	
A =	Standard product
⑩ Future Option	
A =	Standard product
⑪ ⑫ Customization	
AA=	Standard product
XX=	Any two letters or number for custom non-critical options





## PM PLUS™

Watlow's PM PLUS™, the enhanced EZ-ZONE PM, is now more intuitive and features an enhanced interface for easier programming and readability with a SMOOTH-TOUCH™ keypad creating an industry leading user experience. The PM PLUS is backwards compatible with legacy EZ-ZONE PM controllers but offers many user upgrades including an intuitive menu flow allowing the controller to be easily configured. It also continues to offer the industry leading Bluetooth® connectivity with the EZ-LINK™ mobile app for remote access capability and full descriptions of parameters and error codes. The PM PLUS improves the user experience by reducing the complexity at the front of the control while eliminating the dependency of cables when configuring the product.

Like the original EZ-ZONE PM, the PM PLUS can be ordered as a PID controller, or an integrated controller with multiple functions combined into one.

Now Watlow's PM PLUS is available through Watlow **SELECT**®, a program that enables you to quickly identify, configure and receive your thermal products faster and easier than ever before. With **SELECT**, you use a variety of tools to guide your decision, configure products for an exact fit and quickly receive your order.

### Features and Benefits

#### Intuitive menu flow

- Reduces menu structure to a list of lists allowing the controller to be easily configured
- Offers easy to read characters and color coding making the display visible from many angles

#### SMOOTH TOUCH keypad

- Eliminates contamination points on the front of the controller
- Reduces wear of mechanical components
- Creates a better seal on front panel
- Cleans up easily

#### Bluetooth® compatible with EZ-LINK™ mobile app

- Provides full descriptions of parameters and error codes
- Allows remote access capabilities without the use of cables or converters
- Provides the ability to configure the product and save parameter sets

#### 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

#### Enhanced control options

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

#### Countdown timer option

- Provides batch process control
- Supports set point change during countdown

#### 10-point linearization curve

- Improves sensor accuracy

#### 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

#### Configuration communications with software

- Includes Watlow standard bus communications used by COMPOSER® or EZ-ZONE configurator software





## PM PLUS

### Features and Benefits (cont.)

#### Advanced PID control algorithm

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

#### 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

#### 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

#### Programmable function 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
- Auto-tune with TRU-TUNE+ adaptive control algorithm
- Control sampling rates: Input = 10Hz, outputs = 10Hz

#### Profile Ramp/Soak

- 4 profiles, 40 total steps
- Accuracy (typical):  $\pm 30$  PPM at 77°F (25°C) +30/-100 PPM at -4 to 149°F (-20 to 65°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 20M $\Omega$  input impedance, 3 $\mu$ A open sensor detection, 2k $\Omega$  source resistance max.
- RTD 2- or 3-wire, platinum, 100 $\Omega$  and 1000 $\Omega$  @ 32°F (0°C) calibration to DIN curve (0.00385  $\Omega/\Omega/^\circ\text{C}$ )
- Process, 0-20mA @ 100 $\Omega$ , or 0-10VDC @ 20k $\Omega$ , 0-50mV at 20M $\Omega$ , 0-1000 $\Omega$  potentiometer; 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:  $\pm 0.1\%$  of span,  $\pm 1^\circ\text{C}$  @ the calibrated ambient temperature and rated line voltage
- Types R, S, B; 0.2%
- Type T below  $-50^\circ\text{C}$ ; 0.2%
- Calibration ambient temperature @ 77°F  $\pm 5^\circ\text{F}$  (25°C  $\pm 3^\circ\text{C}$ )
- Accuracy span: 1000°F (540°C) min.
- Temperature stability:  $\pm 0.1^\circ\text{F}/^\circ\text{F}$  ( $\pm 0.1^\circ\text{C}/^\circ\text{C}$ ) rise in ambient max.

#### Thermistor Input

- 0 to 40k $\Omega$ , 0 to 20k $\Omega$ , 0 to 10k $\Omega$ , 0 to 5k $\Omega$
- 2.252k $\Omega$  and 10k $\Omega$  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



## PM PLUS

### 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 10k $\Omega$ , max. closed resistance 50 $\Omega$
- 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<sup>®</sup>
- 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
- 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  $\pm$ 15mV into a min. 1,000 $\Omega$  load with 2.5mV nominal resolution; 0 to 20mA  $\pm$ 30 $\mu$ A into max. 800 $\Omega$  load with 5 $\mu$ A nominal resolution; temperature stability 100ppm/°C

### Operator Interface

- LCD display
- SMOOTH TOUCH keypad
- Programmable function key

### Line Voltage/Power

- High voltage option: 85 to 264VAC, 47 to 63Hz
- Low voltage option: 20 to 28VAC, +10/-15%; 50/60Hz,  $\pm$ 5% or 12 to 40VDC
- Max. power consumption: 10VA (1/32 and 1/16 DIN); 14VA

### 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<sup>®</sup> UL<sup>®</sup>/EN/CSA C22.2 No 61010-1 Listed, File E185611
- CSA C22.2 No. 24, File 158031 (1/32 and 1/16 DIN sizes)
- IP 67, IP 66 front seal
- UL<sup>®</sup> Type 4X front seal indoor locations
- cULus<sup>®</sup> 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<sup>™</sup> and DeviceNet<sup>™</sup> ODVA Conformance Tested displays



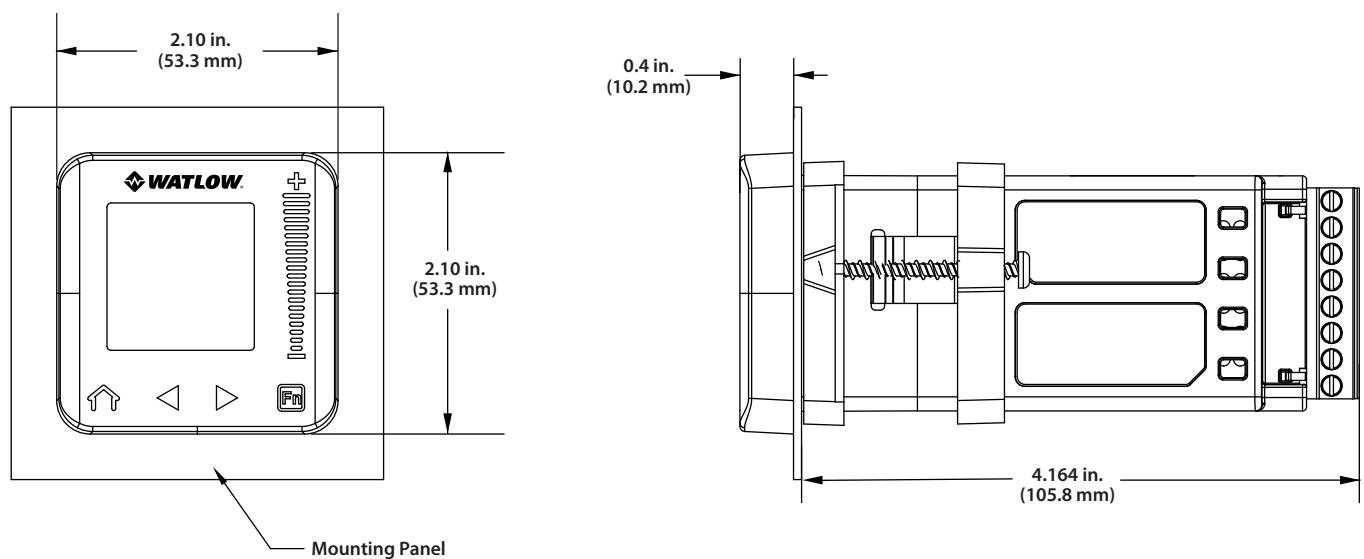
# Temperature and Process

## PM PLUS

### Comparison of Available Features

	EZ-ZONE PM6	PM PLUS
Display Type	7 segment LED	LCD
Keypad Interface Type	Elastomer	SMOOTH-TOUCH
Express Model Available	Yes	None
PID Loops	1	1
Profile Ramp/Soak	40 total steps	40 total steps
Profile Battery Backup and Real Time Clock	None	None
Number of Digital Inputs/Outputs	0 to 2	0 to 2
Number of Outputs	1 to 6	1 to 6
Integrated Safety Limits	Yes, 1	Yes, 1
Independent Safety Limit	Yes	None
Maximum Power	15A NO-ARC	15A NO-ARC
Current Measurement (Accepts 0-50mA Signal From External Current Transformer)	Yes	Yes
Standard Bus Communications	Yes	Yes
Bluetooth® Technology	Yes	Yes
Field Bus Communications (Modbus® RTU 232/485, EtherNet/IP™, Modbus® TCP, DeviceNet™, PROFIBUS DP, SAE J1939 CAN bus)	Yes	Yes
10-Point Calibration Offset	Yes	Yes
Ratio, Differential and Square-Root	Yes	Yes
Sensor Compensation Curves-Altitude (Pressure) and Vaisala RH	Yes	Yes
Motorized Valve Control (Without Feedback)	Yes	Yes
Wet Bulb/Dry Bulb	Yes	Yes
Countdown Timer	Yes	Yes

### Dimensional Drawing





## PM PLUS

### Typical Block Diagram





# Temperature and Process




## PM PLUS

### Compatible Accessories

More information is available on these products at [www.watlow.com](http://www.watlow.com)



Watlow's new EZ-LINK™ app allows users to easily setup, monitor and adjust Watlow EZ-ZONE PM and PM PLUS 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  for Android™ or  for iPhone®.



COMPOSER is Watlow's easy-to-use software for configuring and customizing controllers. Use it to optimize Watlow's F4T and EZ-ZONE PM, PM PLUS 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](http://www.watlow.com).



SpecView is designed for industrial users with features such as data logging, trending and support for bar code readers and touch screens. Errors are reduced, for any process, by creating application-specific screens.

The software provides a historical replay option, easy-to-use recipe features and remote access options, including LAN, Internet and modem.

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





## PM PLUS

### PM PLUS PID Model Configuration Code

#### Part Number

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

③ Package Size	
6 =	1/16 DIN

④ Primary Functions	
C =	PID controller with universal input
R =	PID controller with universal input and profiling ramp/soak
T =	PID controller with universal input and countdown timer
J =	PID controller with thermistor input
N =	PID controller with universal input and profiling ramp/soak
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	
<b>Standard bus always included</b>	
A =	None
B =	Bluetooth® (1/16 DIN models only)
E =	EIA-485 Modbus® RTU and Bluetooth® (1/16 DIN models only)*
1 =	EIA-485 Modbus® RTU
<b>Note:</b> Bluetooth® not available in all countries, contact factory.	

⑨ ⑩ ⑪ Future Options	
AAA =	Future options

⑫ Model Selection	
P =	PM PLUS standard (isolated input 1, input 2 is always isolated)
X =	Not an order option. Appears when Express menu selected.

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



## PM PLUS

### PM PLUS Integrated PID Controller Configuration Code

#### Part Number

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

③ Package Size	
6 =	1/16 DIN

④ Primary Functions	
C =	PID controller with universal input
R =	PID controller with universal input and profiling ramp/soak
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
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	
<b>Standard bus always included</b>	
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
7 =	SAE J1939 CAN bus

\*Note: Bluetooth® not available in all countries, contact factory.

⑨ Auxiliary Control Functions	
A =	None
R =	Auxiliary 2nd input (universal input)
P =	Auxiliary 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)

**Note:** 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.

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

**Note:** If communication options F, G, H, J, K or 2 thru 7 is ordered in previous digit, then Option AA must be ordered here.

⑫ Model Selection	
P =	PM PLUS standard (isolated input 1, input 2 is always isolated)
V =	PM PLUS enhanced firmware which includes compressor control, ratio, differential, square-root, motorized valve control without feedback (isolated input 1 and input 2)
X =	Not an order option. Appears when Express menu selected.

⑬ ⑭ Custom Options	
WP =	Watlow PM PLUS face plate
WN =	Watlow PM PLUS face plate no logo/no 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)





## PM LEGACY™

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

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

### Features and Benefits

#### Simplified menu

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

#### PID auto-tune

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

#### Standard bus communications

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

#### Factory Mutual (FM) approved over and under limit with auxiliary outputs

- Increases user and equipment safety for over and under-temperature conditions

#### Touch-safe package

- Increases installer and operator safety
- Complies with IP2X requirements

#### EZ-LINK™ mobile application for iPhone® and Android™

- Expedites controller setup with intuitive navigation
- Simplifies setting parameters with plain text names and descriptions
- Connects quickly and easily via Bluetooth® wireless communications

#### SMOOTH TOUCH™ keypad

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



#### Agency approvals: UL® listed, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200, Class 1, Div. 2 rating on selected models

- Assures prompt product acceptance
- Reduces end product documentation costs

#### P3T armor sealing system

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

#### Consistent Termination Labeling (CTL) connection system

- Simplifies switching between products
- Speeds up user's system documentation

#### Three-year warranty

- Demonstrates Watlow's reliability and product support

#### High-amperage power control output (1/16 DIN only)

- Drives 15 ampere resistive loads direct
- Reduces component count
- Saves panel space and simplifies wiring
- Reduces cost of ownership



# Temperature and Process

## PM LEGACY

### Specifications

#### Line Voltage/Power

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

#### Environment

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

#### Accuracy

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

#### Agency Approvals

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

#### Controller

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

#### Serial Communications

- Isolated communications
- Standard bus configuration protocol

#### Wiring Termination—Touch-Safe Terminals

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

#### Universal Input

- Thermocouple, grounded or ungrounded sensors, greater than 20M $\Omega$  input impedance, 2k $\Omega$  source resistance max.
  - Non-isolated to switched dc and process output
- RTD 2- or 3-wire, platinum, 100 $\Omega$  @ 0°C calibration to DIN curve (0.00385  $\Omega/\Omega/^\circ\text{C}$ )
- Process, 4-20mA @ 100 $\Omega$ , or 0-10VDC @ 20k $\Omega$  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  $\pm 15\text{mV}$  into a min. 1,000 $\Omega$  load with 2.5mV nominal resolution; 4 to 20mA  $\pm 30\mu\text{A}$  into max. 800 $\Omega$  load with 5 $\mu\text{A}$  nominal resolution; temperature stability 100ppm/°C

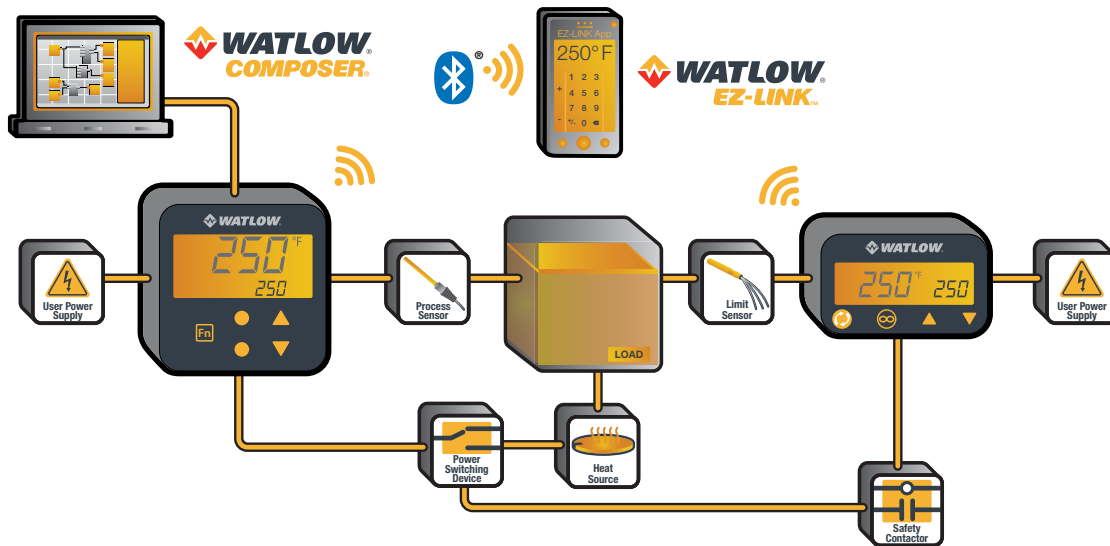
#### Operator Interface

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



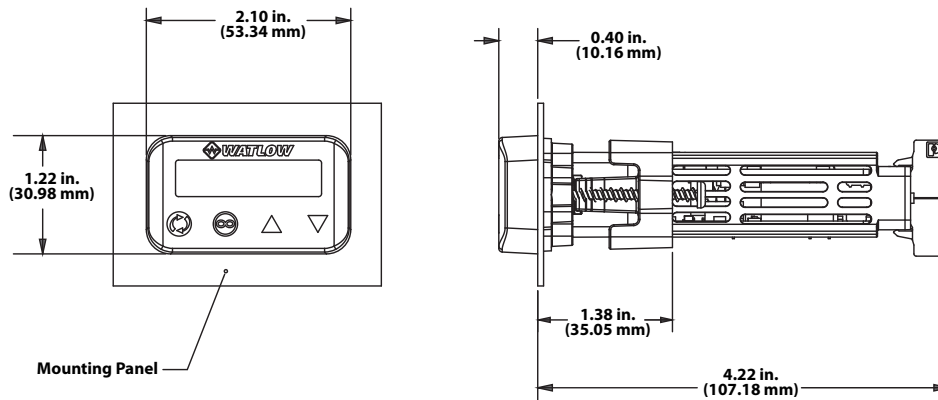
## PM LEGACY

### Typical Block Diagram

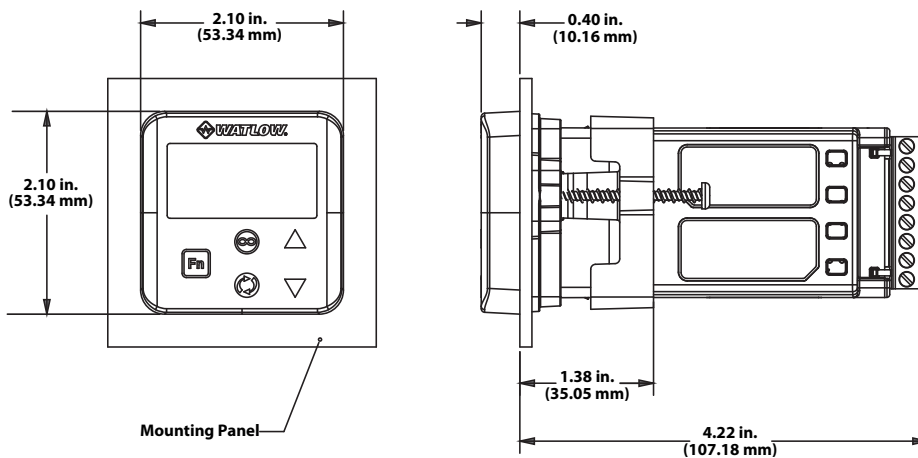


### Dimensional Drawings

#### PM LEGACY 1/32 DIN



#### PM LEGACY 1/16 DIN





# Temperature and Process

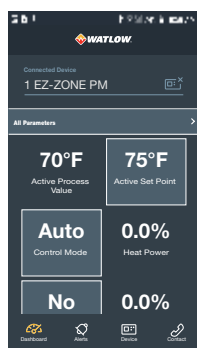
## PM LEGACY

### Comparison of Available Features

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

### Compatible Accessories

More information is available on these products at [www.watlow.com](http://www.watlow.com).



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App at for Android™ or for iPhone®.



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views simplify all aspects of commissioning new controllers including managing the inputs and outputs from pluggable flex modules, setting up functions such as control loops and alarms and creating and editing profiles. COMPOSER software is available for download at [www.watlow.com](http://www.watlow.com).

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## PM LEGACY

### PM LEGACY Control Configuration Information

#### Part Number

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

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

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

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

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

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

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

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

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



# Temperature and Process

## PM LEGACY

### PM LEGACY Limit Model Configuration Information

#### Part Number

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

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

④ Primary Functions	
L =	Limit controller with universal input
M =	Limit controller with thermistor input

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

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	
<b>Standard bus always included</b>	
A =	None
B =	Bluetooth®
E =	EIA-485 Modbus® RTU and Bluetooth® <b>(Not available on Express version)</b>
F =	Modbus® RTU 232/485 and Bluetooth® <b>(Not available on PM3 or Express version)</b>
G =	EtherNet/IP™/Modbus® TCP and Bluetooth® <b>(Not available on PM3 or Express version)</b>
H =	DeviceNet™ and Bluetooth® <b>(Not available on PM3 or Express version)</b>
J =	PROFIBUS DP and Bluetooth® <b>(Not available on PM3 or Express version)</b>
1 =	EIA-485 Modbus® RTU <b>(Not available on Express version)</b>
2 =	EIA-232/485 Modbus® RTU <b>(Not available on PM3 or Express version)</b>
3 =	EtherNet/IP™/Modbus® TCP <b>(Not available on PM3 or Express version)</b>
5 =	DeviceNet™ <b>(Not available on PM3 or Express version)</b>
6 =	PROFIBUS DP <b>(Not available on PM3 or Express version)</b>

**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

**Note:** Only available on 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 Model Selection	
G =	PM LEGACY Version <b>(Input 1 always isolated)</b>
H =	PM LEGACY EXPRESS Version <b>(Available in PM3 or PM6) (Input 1 always isolated)</b>

⑬ ⑭ Custom Options	
WP =	Watlow logo face plate
WN =	No logo/no name face plate
AG =	Conformal coating





## POWERGLIDE®

POWERGLIDE® is a unique embodiment of Watlow's Adaptive Thermal Systems® (ATS™) technology and combines temperature and power control into one ATS-enabled device ideal for semiconductor processing applications.

The process activities in a semiconductor chamber can cause the inner and outer zones of a two-zone aluminum nitride ceramic pedestal to change temperature, sometimes in different directions. Open loop or power ratio control is the current method of determining how much power to deliver to the outer zone based on the power of the inner zone, since there is typically no sensor in the hard-to-access outer zone. This causes the outer zone to react in the same manner as the inner zone when the boundary conditions change due to gas introduction, pedestal repositioning, plasma application or wafer placement. This parallel action might be opposite of what is needed to maintain proper temperature uniformity. This can cause significant temperature difference in the inner and outer zones resulting in poor thermal uniformity and reduction in yield. In addition, when the temperature delta between the zones becomes too large cracked pedestals and broken wafers are typical non-desired results.

Watlow's solution... POWERGLIDE, enabled with ATS technology, a next generation controller.

Watlow's new POWERGLIDE enables certain two-zone aluminum nitride ceramic pedestals to perform more efficiently. It runs closed loop and monitors temperature from both zones to improve uniformity, help prevent ceramic breakage, achieve higher temperatures and provide visibility to changing conditions.

With POWERGLIDE, users will gain total control of power quality. POWERGLIDE features Watlow's innovative ATS technology and incorporates power conversion, a technology platform that regulates power up and down rather than on and off. In addition, POWERGLIDE incorporates an algorithm that uses temperature co-efficient of resistance (TCR) to measure temperature and provide control, which is a technology platform that converts every heater zone into a sensor, as well as ceramic protection algorithms.

POWERGLIDE offers several communication protocols including EtherCAT®, which is optimized for the semiconductor manufacturing industry.



### Features and Benefits

#### **Built-in automatic calibration algorithm**

- Eliminates downtime associated with calibration

#### **High TCR heater materials based temperature control**

- Allows closed loop control for all zones

#### **Incorporates ceramic control algorithms**

- Maintains the limitations of the materials to protect the pedestal
- Provides programmable, state-based PID control

#### **EtherCAT® communications protocol**

- Ensures adherence to industry standard protocols





## POWERGLIDE

### Specifications

#### Line Voltage/Power

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

#### Environmental

- Operating temperature: 0 to 50°C
- Humidity: 5% to 95% RH non-condensing

#### Physical

- Dimensions: 9.0 in. L x 5.5 in. W x 4.0 in. T
- Weight: 6.15 lbs including heat sink
- Mounting: Can be paired with a second unit to share heat sink fan, 4 #8 screws to a back plate

#### Power Outputs

- Quantity: Two, 1 per zone pedestal
- Output voltage: 0-208V rectified AC
- Output current: 30A (peak), 25A steady state max.
- Interlock relay: 1, form A - 5A, 24V

#### Power Input

- Quantity: Two, 1 per zone, each zone isolated from the other
- Input voltage: 85 to 264VAC/DC

#### Electronics (Logic) Power

- 24VDC on DB9

#### Communications

- RS-485 on pair of DB9 with pass-through, Watlow standard bus protocol
- EtherCAT® supporting ETG.5003.2060
- USB device 2.0, Watlow standard bus protocol

#### Sensing Inputs

- 2 zones of thermocouple Type K for reference sensing
- Heater resistance 1 to 30 ohms via delivered I and V resolution 0.001 $\Omega$
- Heater measurement accuracy 0.01 ohms

### Algorithms

- Inner and outer set points via two separate, independent control loops
- Control PV sources: Heater filament temperature via Resistance, Reference TC, Wafer TC, chamber compensated filament temperature; can be changed while running
- Model based PID and rate control with 8 programmable control states
  - Power-up
  - Soft start
  - Rate control
  - PID control
  - Manual power
  - Remote power
  - Off
- 2 programmable transition conditions per state

### Pedestal Protection Algorithms

- Zone to zone temperature difference reduction and safety shutdown
- Zone to reference temperature difference reduction and safety shutdown
- Over-temp shutdown
- Drives interlock relay
- Over-current shutdown
- Shorted output protection

### Resistance to Temperature Methods

- Programmable base resistance and TCR
- 16 point offset table
- Auto-calibration to reference TC wafer (patent pending)

### Agency Directive

- UL®/EN 61010-1 Safety Requirements for measurement, control and laboratory equipment



## 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

**EZ-ZONE ST**  
75 ampere configuration



**EZ-ZONE ST**  
40 ampere full  
configuration with  
mechanical contactor



**EZ-ZONE ST**  
configuration with only  
the controller and SSR



#### 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,  $\pm 5\%$
- 24VAC/VDC, +10/-15%; 50/60Hz,  $\pm 5\%$
- 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:  $\pm 0.1\%$  of span,  $\pm 1^\circ\text{C}$  @ the calibrated ambient temperature and rated line voltage
  - Types R, S, B: 0.2%
  - Type T below  $-50^\circ\text{C}$ : 0.2%
- Calibration ambient temperature @  $77^\circ\text{F} \pm 5^\circ\text{F}$  ( $25^\circ\text{C} \pm 3^\circ\text{C}$ )
- Accuracy span:  $1000^\circ\text{F}$  ( $540^\circ\text{C}$ ) min.
- Temperature stability:  $\pm 0.1^\circ\text{F}/^\circ\text{F}$  ( $\pm 0.1^\circ\text{C}/^\circ\text{C}$ ) 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
- 2 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
  - $>20\text{M}\Omega$  input impedance
  - Max. of  $20\Omega$  source resistance
- RTD 2- or 3-wire, platinum,  $100\Omega$  and  $1000\Omega$  @  $0^\circ\text{C}$  calibration to DIN curve ( $0.00385\Omega/\Omega/^\circ\text{C}$ )
- Process, 0-20mA @  $100\Omega$ , or 0-10VDC @  $20\text{k}\Omega$  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: 500 $\Omega$
  - Max. closed resistance: 100 $\Omega$

#### Current Measurement

- Accuracy: Typical  $\pm 1\text{A}$ , max. error  $\pm 3\text{A}$
- 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 Basic Remote User Interface EZKB (RUI)

#### Operator Interface

- Dual 4 digit, 7 segment LED displays
- Forward, backward, up and down keys plus a customer programmable function key - EZ key
- Typical display update rate: 1Hz

- Agency approved to IP65/NEMA 4X
- Standard bus (ships with all units). Options: EIA-232/485 Modbus® RTU, EtherNet/IP™/TCP Modbus® or DeviceNet™, PROFIBUS DP

#### Line Voltage/Power

- 100 to 240VAC, +10/-15%; (85-264VAC) 50/60Hz, ±5%
- 24VAC/VDC, +10/-15%; 50/60Hz, ±5%

### Specifications for Mechanical Contactor

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

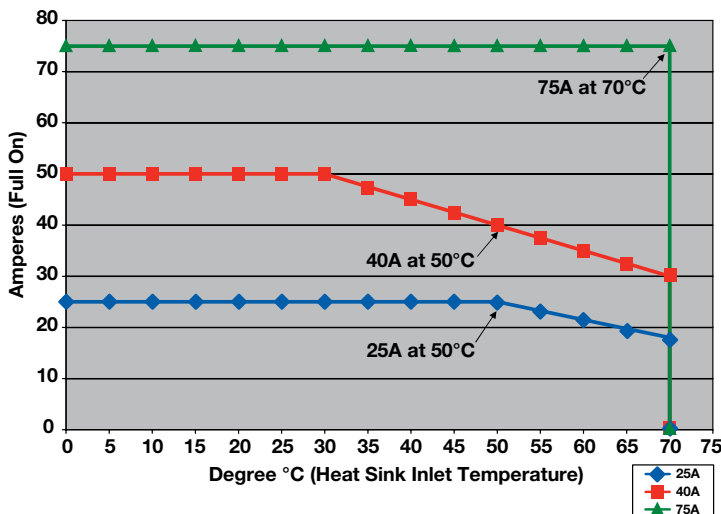
#### Contact Ratings

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 <sup>2</sup> t for fusing	1500A <sup>2</sup> s	3000A <sup>2</sup> s	7560A <sup>2</sup> s
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

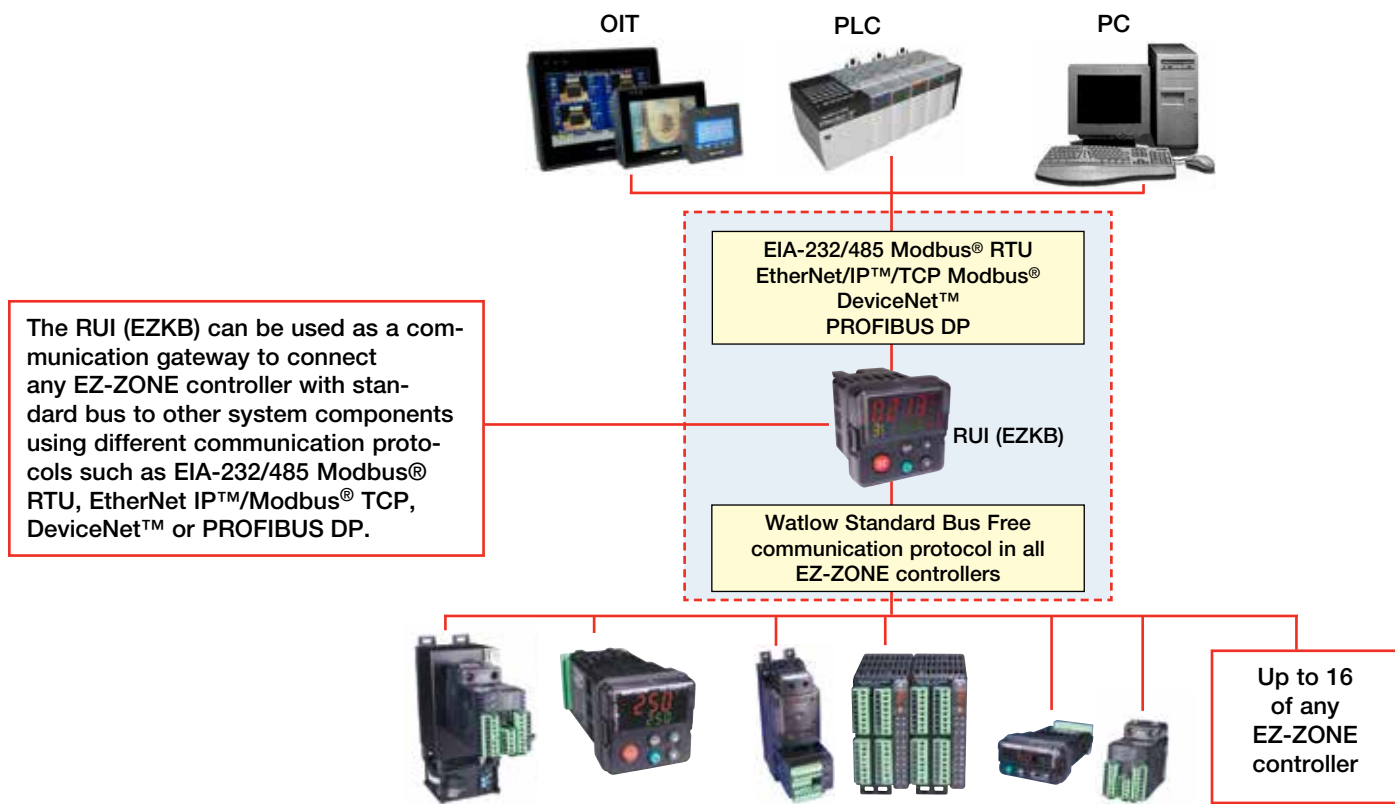
120/240VAC	
Output voltage range	100 to 240VAC
Over voltage rating	600Vpk
Input voltage range	2.7 to 10VDC
277/600VAC	
Output voltage range	260 to 600VAC
Over voltage range	1200Vpk
Input voltage range	2.8 to 10VDC



# Temperature and Process

## EZ-ZONE ST

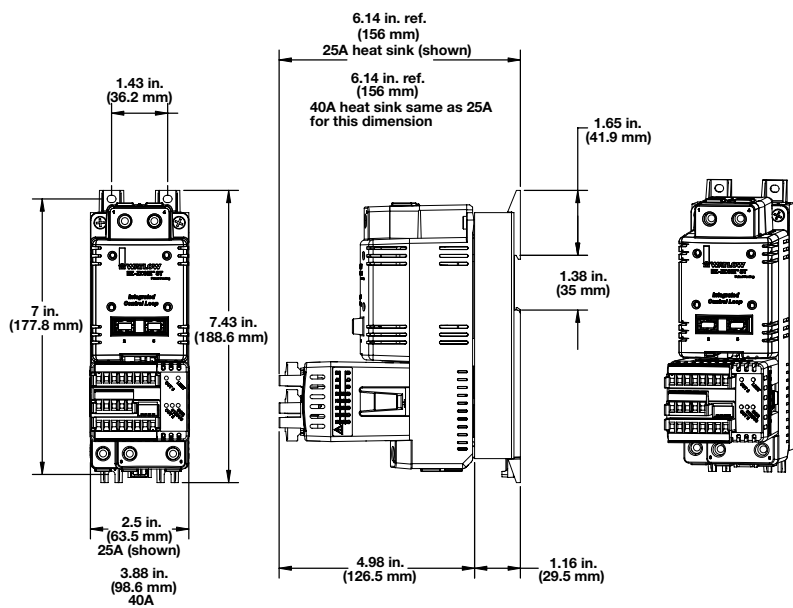
### RUI (EZKB) Utilized as a Communication Gateway Device



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<sup>®</sup> RTU, EtherNet IP<sup>™</sup>/Modbus<sup>®</sup> TCP, DeviceNet<sup>™</sup> or PROFIBUS DP.

Up to 16 of any EZ-ZONE controller

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

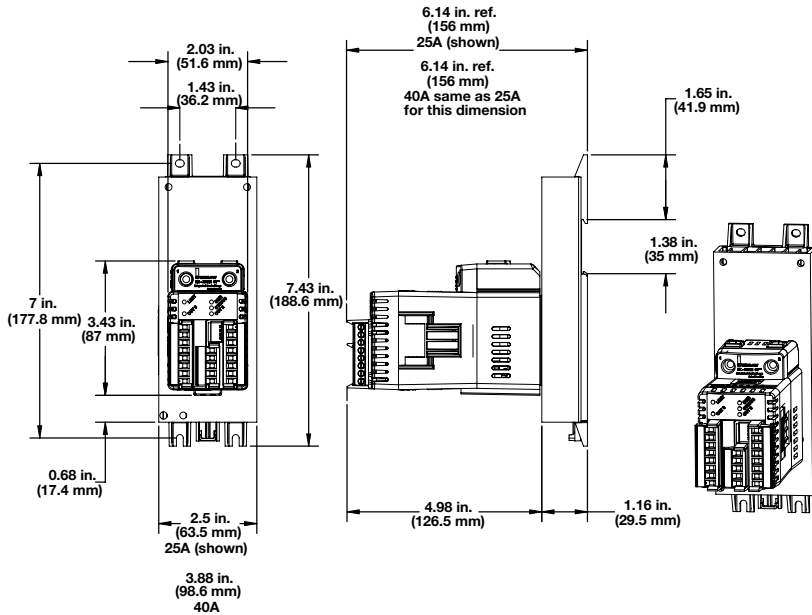


**Note:** EZ-ZONE ST must be mounted vertically (as shown) to meet amp/ambient performance curve.



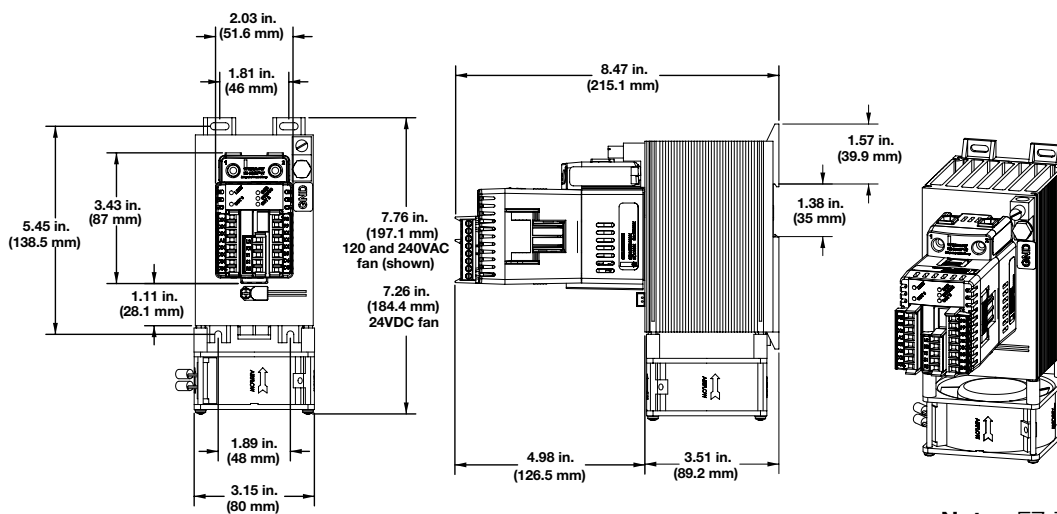
## EZ-ZONE ST

### 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 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.





# Temperature and Process

## EZ-ZONE ST

### 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

### Ordering Information

#### Part Number

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





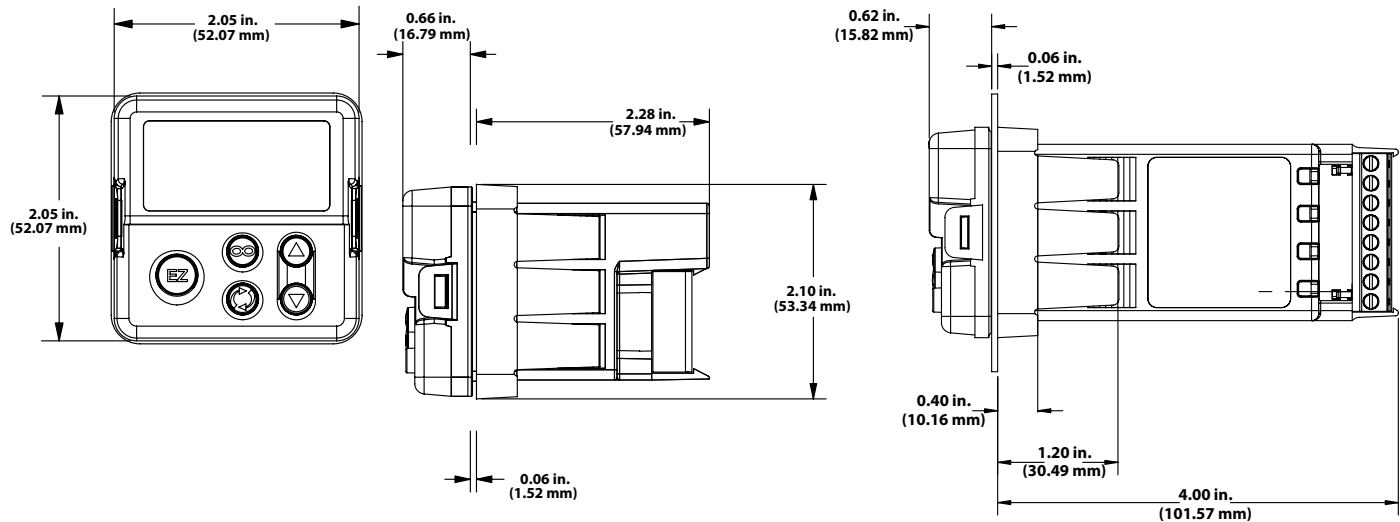
## EZ-ZONE ST

### Remote User Interface (RUI) – Dimensional Drawings

Front View

Short Case Version

Long Case Version



### Ordering Information

#### Part Number

① ② ③	④	⑤	⑥	⑦ ⑧	⑨ ⑩	⑪ ⑫
	Remote User Interface	Power Supply Voltage for RUI	Comm. Gateway Options	Custom RUI	Future Options	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
12 =	Custom options, contact factory

⑪ ⑫	Custom Options
AA =	None
XX =	Class 1, Div. 2 (only available with communication options 2, 3, 5 and 6)

### Compatible Accessories

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](http://www.watlow.com).



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

features and remote access options, including LAN, Internet and modem.

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





## 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 1/8 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

### 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

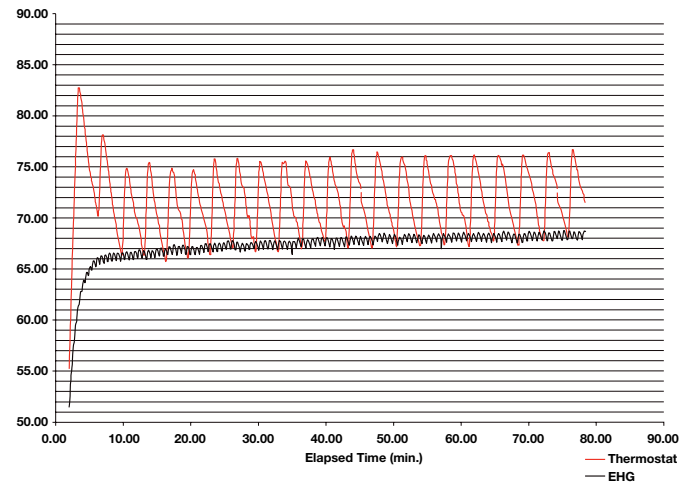
#### Environmental

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

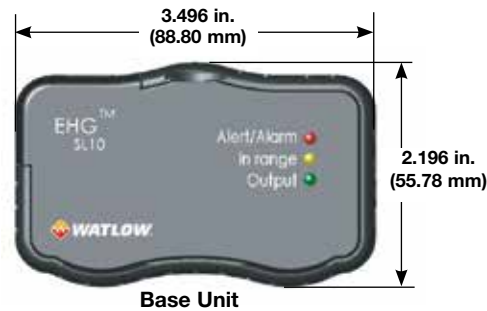
#### Agency Approvals

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

### SERIES EHG Versus Thermostat (typical application)



### Dimensions



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)



# Temperature and Process

## SERIES EHG SL10

### EHG SL10 Software

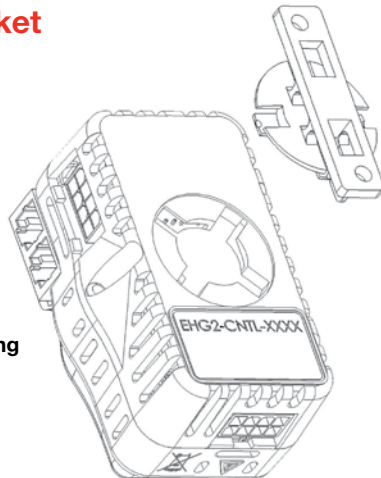
With the addition of an optional communication module, the EHG SL10 can be managed, monitored and manipulated via software. Change set points, label devices, change tuning parameters, check health status and much more all with the click of a key.



### 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

### 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 LEDs	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
<b>265 EG2</b>	Base/ Module

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.







## 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

### Typical Applications

- Semiconductor processing
- Aerospace composite repair
- Foodservice equipment
- Freeze protection
- Medical/Clinical/Analytical
- Telecommunications



## SERIES EHG

### Specifications

#### Operational

- SERIES EHG silicone rubber heater UL<sup>®</sup> 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<sup>2</sup> (12.5 W/cm<sup>2</sup>) dependent on application temperature
- SERIES EHG system UL<sup>®</sup> 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

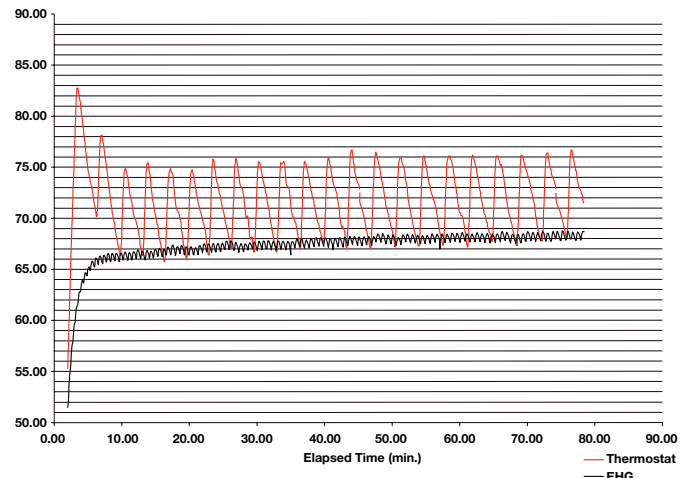
- Silicone rubber heater: UL<sup>®</sup> recognized File #E52951
- SERIES EHG control: TUV File DE 3-3068 to EN 61010-1:2001, UL<sup>®</sup> File E43684 to UL<sup>®</sup> 873 temperature indicating and regulating equipment

#### Environmental

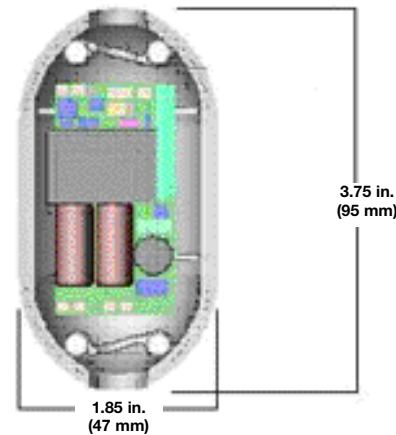
- Control operating temperature range 32 to 158°F (0 to 70°C)
- Control storage temperature range -40 to 158°F (-40 to 70°C)

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	Two years for material and workmanship	One 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)





## 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<sup>®</sup> and C-UL<sup>®</sup> 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 ½ DIN-panel	2.85 in. (72.4 mm)	2.85 in. (72.4 mm)	Behind panel 2.04 in. (51.7 mm)



# Temperature and Process

## SERIES CF

### Ordering Information

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

#### Part Number

<b>1 2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7 8 9 10</b>	<b>11 12 13 14</b>	<b>15</b>
	Power Supply	Package	Sensor Type and Scale	Control Type	Fixed Set Point Temp. Value		Overlay/Customs Options
<b>CF</b>						<b>AAAA</b>	

<b>3 Power Supply</b>	
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

<b>4 Package</b>	
1 =	Panel mount square ½ 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 ½ DIN - screw terminals
6 =	DIN-rail mount - screw terminals
7 =	Open board, non potted - screw terminals

<b>5 Sensor Type and Scale</b>	
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)

<b>6 Control Type</b>	
H =	Heat
C =	Cool

<b>7 8 9 10 Fixed Set Point Temperature Value</b>	
<b>Note:</b> A (-) is used in the left most digit of the set point operating ranges to indicate a negative temperature value.	

<b>15 Overlay/Customs Options</b>	
A =	Standard with Watlow logo
1 =	Standard without Watlow logo



## 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<sup>®</sup> and C-UL<sup>®</sup> 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



# Temperature and Process

## 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

- 4 digit, 7 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)



## SERIES CV

### Ordering Information

On-off controller, rotary set point adjustment, 4 character, 7 segment display

#### Part Number

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

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

⑦ ⑧ ⑨ ⑩ Low Set Point Operating Range Value	
<b>Note:</b> A (-) is used in the left most digit of the set point operating ranges to indicate a negative temperature value.	

⑪ ⑫ ⑬ ⑭ High Set Point Operating Range Value	
<b>Note:</b> 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