Limits and Scanners

Product	Maximum Limit Loops	Maximum Monitor Channels	Mounting	Agency Approvals	Communication Protocols	Page
F4T with INTUITION®	6	24	DIN-rail, Flush mount	UL® listed, CSA, CE, RoHS, W.E.E.E., FM	Standard bus, Modbus® TCP (Ethernet), Modbus® RTU, SCPI, USB Host (2), USB device	**299**
EZ-ZONE® RM High-Density Limit	192	192	DIN-rail	UL®, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200	Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU	**300**
EZ-ZONE RM High-Density Scanner	0	256	DIN-rail	UL®, CSA, CE, RoHS, W.E.E.E., SEMI F47-0200	Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU	**302**
EZ-ZONE PM Limit	1	1	$1/32$, $1/16$, $1/8$, $1/4$ DIN front panel	UL®, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200	Standard bus, EtherNet/IP™, DeviceNet™, PROFIBUS DP, Modbus® TCP, Modbus® RTU	**304**
EZ-ZONE PM Express Limit	1	1	$1/32$, $1/16$, $1/8$, $1/4$ DIN front panel	UL®, CSA, CE, RoHS, W.E.E.E., FM, SEMI F47-0200	Standard bus	**310**
SERIES LV	1	1	DIN-rail, Front panel, chassis	UL®, CSA, CE, ANSI Z21.23, RoHS, W.E.E.E., FM	N/A	**314**
SERIES LF	1	1	DIN-rail, Front panel, chassis	UL®, CSA, CE, ANSI Z21.23, RoHS, W.E.E.E., FM	N/A	**317**
SERIES LS	1	1	Potted case with mounting screws	UL®/EN 60730-1, 2, 9, UL® 1998, CE, W.E.E.E., RoHS	N/A	**320**
TLM SERIES	8	8	DIN-rail, chassis	UL®, C-UL®, CE, FM	N/A	**322**

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

F4T with INTUITION®

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

Features and Benefits

4.3-inch, color touch panel with high-resolution, graphical user-interface
- Shortens learning curve and reduces operator errors
- Allows channels, profiles, alarms, inputs and outputs to be personalized with user defined names

Temperature PID, data logger, trend chart, over/under-temperature limit, power switching, math, logic, timers and counters combined into an integrated system
- Lowers ownership costs
- Eliminates the need for separate discrete components
- Reduces complexity
- Simplifies design, ordering and installation
- Saves money

Robust algorithms for temperature, cascade, altitude, humidity and compressor
- Improves process control
- Offers one to four channels of control
- Provides multiple PID sets
- Enables TRU-TUNE®+ adaptive control algorithm
- Offers 40 ramp and soak profiles with real-time clock and battery backup

COMPOSER® graphical configuration PC software
- Speeds up and simplifies commissioning
- Archives and documents controller setup
- Connects with controller easily via Ethernet

Many communications options available including Ethernet Modbus® TCP and SCPI and EIA-232/485 Modbus® RTU
- Offers two USB host ports and one device port
- Simplifies file transfers
- Connects easily

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

Agency certifications include UL®, FM, CE, RoHS, W.E.E.E., NEMA 4X/IP65
- Ensures high quality and reliability
- Verifies performance in installations worldwide

SERIES F4S/F4D/F4P backward compatible
- Provides easy retrofit with minimum pain and disruption
- Ensures proper fit in existing SERIES F4 panel cutout

Off-the-shelf solution
- Provides cost-effective "make versus buy"
- Offers preconfigured touch-panel screens
- Assures quicker time to market

For detailed product and ordering information, see the full F4T product section located on pages 211 through 221.

EZ-ZONE® RM High-Density Limit

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

Features and Benefits

1 to 128 loop limit controller
- Eliminates compatibility issues often encountered with using many different discrete components and brands
- Saves engineering time and labor costs while shortening project schedules
- Allows a common limit controller platform across many design applications

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

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

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

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

High-Density Limit Module Specifications (RML)

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

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

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

Additional Communication Option
- EIA-485, Modbus® RTU

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

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

EZ-ZONE RM High-Density Limit

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

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

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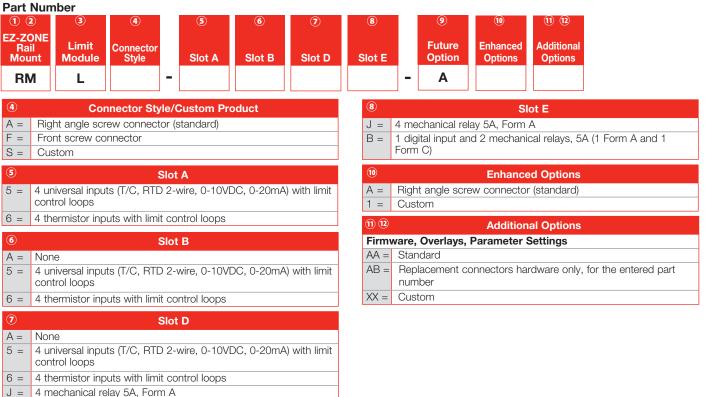- Max. low state 2V

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

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

High-Density Limit Module Ordering Information

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

Part Number

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

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

⑤	Slot A
5 =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with limit control loops
6 =	4 thermistor inputs with limit control loops

⑥	Slot B
A =	None
5 =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with limit control loops
6 =	4 thermistor inputs with limit control loops

⑦	Slot D
A =	None
5 =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) with limit control loops
6 =	4 thermistor inputs with limit control loops
J =	4 mechanical relay 5A, Form A
C =	6 digital I/O*
* Reset limits via digital input, EZ key on RUI or communications commands	

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

⑩	Enhanced Options
A =	Right angle screw connector (standard)
1 =	Custom

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

EZ-ZONE RM High-Density Scanner

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

Features and Benefits

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

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

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

High-Density Scanner Module Specifications (RMS)

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

Line Voltage/Power
- Power consumption: 7 W, 14VA
- Any external power supply used should comply with a Class 2 or SELV rating
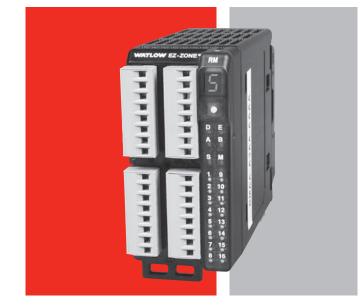
Serial Communications
- Isolated communications
- All modules ship with standard bus protocol for configuration and communication with all EZ-ZONE controllers

Additional Communication Option
- EIA-485, Modbus® RTU

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

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

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

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

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

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

EZ-ZONE RM High-Density Scanner

High-Density Scanner Module Ordering Information

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

Part Number

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

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

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

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

⑦	Slot D
A =	None
R =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) without control loops
P =	4 thermistor inputs without control loops
J =	4 mechanical relay 5A, Form A
C =	6 digital I/O

⑧	Slot E
A =	None
R =	4 universal inputs (T/C, RTD 2-wire, 0-10VDC, 0-20mA) without control loops
P =	4 thermistor inputs without control loops
J =	4 mechanical relay 5A, Form A
C =	6 digital I/O
B =	1 digital input and 2 mechanical relays, 4A

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

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

EZ-ZONE PM Limit

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

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

Features and Benefits - Standard

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

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

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

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

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

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

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

Programmable menu system
• Reduces setup time and increases operator efficiency

Three-year warranty
• Ensures product support and protection

Features and Benefits - Optional

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

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

EZ-ZONE PM Limit

Specifications

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

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

Wiring Termination—Touch-Safe Terminals
- Input, power and controller output terminals are touch safe, removable, 12 to 22 AWG

Universal Input
- Thermocouple, grounded or ungrounded sensors greater than 20MΩ input impedance, 3μA open sensor detection, 2kΩ source resistance max.
- RTD 2- or 3-wire, platinum, 100Ω and 1000Ω @ 32°F (0°C) calibration to DIN curve (0.00385Ω/Ω/°C)
- Process, 0-20mA @ 100Ω, or 0-10VDC @ 20kΩ, 0-50mV at 20MΩ, 0-1000Ω potentionmeter; scalable; inverse scaling

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

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

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

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

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

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

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

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

EZ-ZONE PM Limit

Line Voltage/Power
- High voltage option: 85 to 264VAC, 47 to 63Hz
- Low voltage option: 20 to 28VAC, +10/-15%; 50/60Hz, ±5% or 12 to 40VDC
- Max. power consumption: 10VA ($^1/_{32}$ and $^1/_{16}$ DIN), 14VA ($^1/_8$ and $^1/_4$ DIN)
- Data retention upon power failure via nonvolatile memory
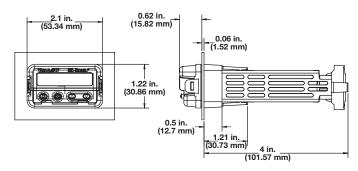- Compliant with SEMI F47-0200, Figure R1-1 voltage sag requirements @ 24VAC or higher

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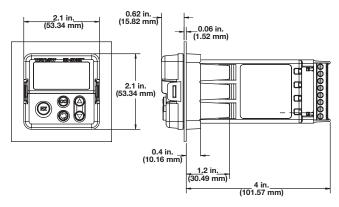- Relative humidity: 0 to 90%, non-condensing

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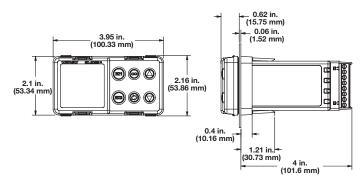- EtherNet/IP™ and DeviceNet™ ODVA Conformance Tested

Dimensional Drawings
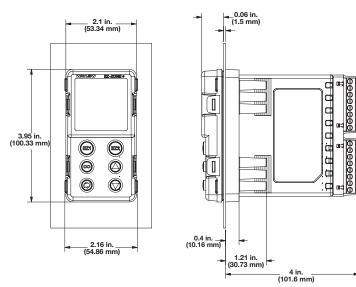
EZ-ZONE PM $^1/_{32}$ DIN

EZ-ZONE PM $^1/_{16}$ DIN

EZ-ZONE PM $^1/_8$ DIN - Horizontal

WATLOW

EZ-ZONE PM Limit

Dimensional Drawings *(Continued)*

EZ-ZONE PM $^1/_8$ DIN - Vertical

EZ-ZONE PM $^1/_4$ DIN

EZ-ZONE Comparison Chart

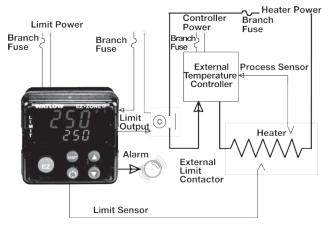|	PM $^1/_{32}$ DIN	PM $^1/_{16}$ DIN	PM $^1/_8$ DIN	PM $^1/_4$ DIN
Number of Digital Inputs/Outputs (DIO)	0 to 2	0 to 2	0 to 2	0 to 2
Number of Outputs	1 to 4	1 to 6	1 to 6	1 to 6
Maximum Power Output	5A mechanical relay	5A mechanical relay	5A mechanical relay	5A mechanical relay
Standard Bus Communications	Yes	Yes	Yes	Yes
Field Bus Communications	Modbus® RTU 485	Modbus® RTU 232/485, EtherNet/IP™, Modbus® TCP, DeviceNet™, PROFIBUS DP	Modbus® RTU 232/485, EtherNet/IP™, Modbus® TCP, DeviceNet™, PROFIBUS DP	Modbus® RTU 232/485, EtherNet/IP™, Modbus® TCP, DeviceNet™, PROFIBUS DP

EZ-ZONE PM Limit

Limit Model Ordering Information

- **Universal sensor input, configuration communications**
- **Red green seven segment displays**

Part Number

① ②	③	④	⑤	⑥ ⑦	⑧	⑨ ⑩ ⑪	⑫	⑬ ⑭
	Package Size	Primary Function	Power Supply, Digital I/O	Output 1 & 2 Hardware	Additional Communication Options		Isolated Input Options	Custom Options
PM					**-**	**AAA**		

③	Package Size
3 =	$^1/_{32}$ DIN
6 =	$^1/_{16}$ DIN
8 =	$^1/_8$ DIN vertical
9 =	$^1/_8$ DIN horizontal
4 =	$^1/_4$ DIN

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

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

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

⑧	Additional Communication Options, Standard Bus Always Included
A =	None
1 =	EIA-485 Modbus® RTU

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

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

Typical Block Diagram

EZ-ZONE PM Limit Model

EZ-ZONE PM Limit

Enhanced Limit Model Ordering Information
- **Universal sensor input, configuration communications**
- **Red green seven segment displays**

Part Number

① ②	③ Package Size	④ Primary Function	⑤ Power Supply, Digital I/O	⑥ ⑦ Output 1 & 2 Hardware	⑧ Additional Communication Options	⑨ Future Option	⑩ ⑪ Output 3 & 4 Hardware	⑫ Isolated Input Options	⑬ ⑭ Custom Options
PM					-	A			

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

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

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

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

⑧	Additional Communication Options, Standard Bus Always Included
A =	None
1 =	EIA-485 Modbus® RTU
2 =	EIA-232/485 Modbus® RTU
3 =	EtherNet/IP™/Modbus® TCP
5 =	DeviceNet™
6 =	PROFIBUS DP

⑩ ⑪	Output 3 and 4 Hardware Options	
	Output 3	**Output 4**
AA =	None	None
AJ =	None	Mechanical relay 5A, Form A
AK =	None	SSR Form A, 0.5A
CA =	Switched dc/open collector	None
CC =	Switched dc/open collector	Switched dc
CJ =	Switched dc/open collector	Mechanical relay 5A, Form A
CK =	Switched dc/open collector	SSR Form A, 0.5A
EA =	Mechanical relay 5A, Form C	None
EC =	Mechanical relay 5A, Form C	Switched dc
EJ =	Mechanical relay 5A, Form C	Mechanical relay 5A, Form A
EK =	Mechanical relay 5A, Form C	SSR Form A, 0.5A
FA =	Universal process	None
FC =	Universal process	Switched dc
FJ =	Universal process	Mechanical relay 5A, Form A
FK =	Universal process	SSR Form A, 0.5A
KK =	SSR Form A, 0.5A	SSR Form A, 0.5A

$1/16$ DIN Models: If communication options 2 thru 6 is ordered in previous digit, then Option AA must be ordered here.

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

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

EZ-ZONE PM Express Limit

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

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

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

Features and Benefits

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

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

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

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

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

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

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

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

Three-year warranty
- Ensures product support and protection

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

EZ-ZONE PM Express Limit

Specifications

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

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

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

Agency Approvals
- cULus® UL/EN/CSA C22.2 No 61010-1 Listed, File E185611
- CSA C22.2 No. 24, File 158031
- UL® 50 4X indoor locations, NEMA 4X, IP66 front seal
- FM Class 3545
- CE, RoHS by design, W.E.E.E.

Serial Communications
- Isolated communications
  - Standard bus configuration protocol

Wiring Termination—Touch-Safe Terminals
- Input, power and controller output terminals are touch safe, removable, 12 to 22 AWG

Universal Input
- Thermocouple, grounded or ungrounded sensors, greater than 20MΩ input impedance, 3μA open sensor detection, 2kΩ source resistance max.
- RTD 2- or 3-wire, platinum, 100Ω @ 32°F (0°C) calibration to DIN curve (0.00385Ω/Ω/°C)
- Process, 4-20mA @ 100Ω, or 0-10VDC @ 20kΩ input impedance; scalable

Functional Operating Range
Type J: -346 to 2192°F (-210 to 1200°C)
Type K: -328 to 2500°F (-200 to 1370°C)
Type T: -328 to 750°F (-200 to 400°C)
Type N: -328 to 2372°F (-200 to 1300°C)
Type S: -58 to 3214°F (-50 to 1767°C)
RTD (DIN): -328 to 1472°F (-200 to 800°C)
Process: -1999 to 9999 units

Output Hardware
- Switched dc = 22 to 32VDC @ 30mA
- Switched dc/open collector = 30VDC max. @ 100mA max. current sink
- Solid state relay (SSR), Form A, 0.5A @ 24VAC min., 264VAC max., opto-isolated, without contact suppression
- Electromechanical relay, Form C, 5A, 24 to 240VAC or 30VDC max., resistive load, 100,000 cycles at rated load
- Electromechanical relay, Form A, 5A, 24 to 240VAC or 30VDC max., resistive load, 100,000 cycles at rated load
- NO-ARC relay, Form A, 15A, 24 to 240VAC, no VDC, resistive load, 2 million cycles at rated load
- Universal process, Output range selectable:
  0 to 10VDC into a min. 1,000Ω load
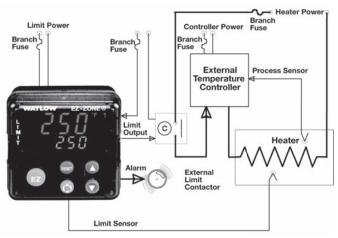 4 to 20mA into max. 800Ω load

Operator Interface
- Dual 4 digit, 7 segment LED displays
- Typical display update rate 1Hz
- Advance, RESET, up and down keys plus an EZ-KEY (not available in $1/32$ DIN)
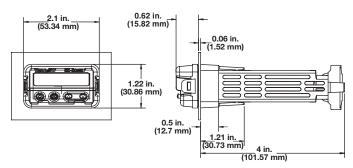
EZ-ZONE PM Express Limit
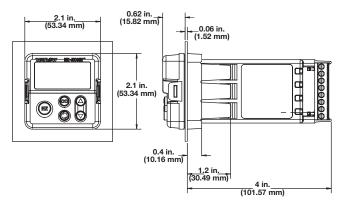
Typical Block Diagrams

EZ-ZONE PM EXPRESS Limit Model

Dimensional Drawings

EZ-ZONE PM ¹⁄₃₂ DIN

EZ-ZONE PM ¹⁄₁₆ DIN

WATLOW

EZ-ZONE PM Express Limit

Ordering Information

All models include:
- Universal sensor input, standard bus configuration communications
- Dual line red over green seven segment displays

Part Number

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

③	**Package Size**
3 =	$^1/_{32}$ DIN
6 =	$^1/_{16}$ DIN
8 =	$^1/_8$ DIN vertical (future option)
9 =	$^1/_8$ DIN horizontal (future option)
4 =	$^1/_4$ DIN (future option)

④	**Primary Function**
L =	Limit controller with universal input

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

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

⑫	**Menu Type**
B =	PM EXPRESS with English manual

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

SERIES LV

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

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

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

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

Features and Benefits

Adjustable set points
- Offers control flexibility

Four character LED display
- Improves set point selection accuracy

Multiple mounting options
- Minimizes installation time

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

Fahrenheit or Celsius operation with indication
- Offers application flexibility

Sensor break protection
- Provides positive system shutdown

Agency approvals
- Meets certification requirements/compliance

Microprocessor based technology
- Ensures accurate, repeatable control

SERIES LV

Specifications

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

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

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

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

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

Input Accuracy Span Range

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

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

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

Allowable Operating Ranges

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

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

External Reset Switch
- Momentary, dry contact closure

Agency Approvals

SERIES LV (potted version only)
- UL® 991 recognized temperature limit for cooking industry
- UL® 60730-1

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

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

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

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

Limits and Scanners

SERIES LV

Specifications *(Continued)*

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

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

Ordering Information

• **Limit controller with 8A relay output, rotary set point adjustment, four character, seven segment display, reset switch**

Part Number

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

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

④	**Package**
1 =	Panel mount square ⅛ DIN - spade terminals
2 =	DIN-rail mount - spade terminals
5 =	Panel mount square ⅛ 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	**Limit Type**
U =	High limit manual reset
W =	High limit auto reset
Y =	Low limit manual reset
Z =	Low limit auto reset

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

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

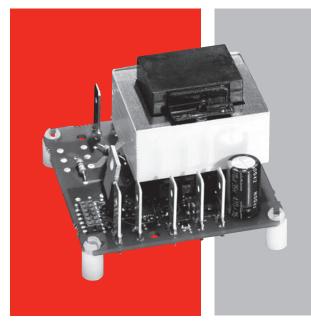| ⑮	**Overlay/Custom Options**
A =	Standard with Watlow logo
1 =	Standard without Watlow logo

WATLOW

SERIES LF

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

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

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

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

Features and Benefits

Fixed set points
• Provides tamper-proof operation

Multiple mounting options
• Minimizes installation time

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

Fahrenheit or Celsius operation with indication
• Offers application flexibility

Sensor break protection
• Provides positive system shutdown

Agency approvals
• Meets certification requirements/compliance

Microprocessor based technology
• Ensures accurate, repeatable control

Limits and Scanners

SERIES LF

Specifications

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

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

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

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

Input Accuracy Span Range

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

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

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

Allowable Operating Ranges

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

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

External Reset Switch
- Momentary, dry contact closure

Agency Approvals
SERIES LF (potted version only)
- UL® 991 recognized temperature limit for cooking industry
- UL® 60730-1

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

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

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

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

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

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

WATLOW

SERIES LF

Ordering Information

- Limit controller with 8A relay output, fixed set point

Part Number

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

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

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

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

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

⑦⑧⑨⑩	Fixed Set Point Temperature Value

Note: A (-) is used in the left most digit of the set point operating ranges to indicate a negative temperature value.

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

SERIES LS Safety Limit

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

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

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

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

Features and Benefits

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

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

High-limit operation
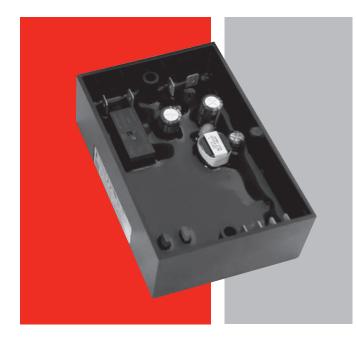- Provides application flexibility

Fahrenheit or Celsius operation
- Delivers application flexibility

Sensor break protection
- Offers positive system shutdown

Agency approvals
- Meets certification requirements/compliance

Microprocessor-based technology
- Ensures accurate, repeatable protection

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

Three-year warranty
- Ensures product support and reliability

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

WATLOW

SERIES LS Safety Limit

Specifications

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

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

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

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

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

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

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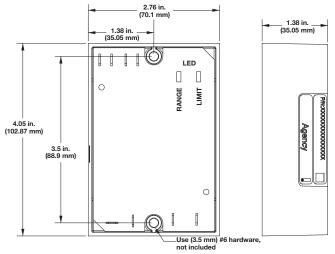- RoHS directive (2011-65-EU)

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

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

Dimensional Drawing

Ordering Information

Part Number

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

③	Set Point
F =	Fixed set point

④	Package
4 =	Potted case, spade terminals

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

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

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

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

⑭ ⑮	Custom Options
AA =	Standard

TLM SERIES

The Watlow TLM series is a compact, cost-effective solution for multi-channel, redundant temperature monitoring. Each TLM has eight channels to continuously monitor thermocouples, RTDs, or thermal switches, making it ideal for multi-zone applications. Choose an individual temperature limit for each channel from the standard list or consult the factory for other limits.

The TLM is equipped with flexible interlocks, which are designed to interface with redundant controls. The alarms latch and require operator intervention to clear for process and equipment protection. Semiconductor capital equipment OEMs will find these features ideal for meeting SEMI S2 safety guidelines.

The TLM is compact and easy to install on a panel or a DIN-rail. No cutout is required, reducing installation and fabrication costs. Troubleshooting is simplified through a self-test diagnostics input, which simulates the alarm state. The TLM-8 is FM approved as a temperature limit switch, bears the CE mark (LVD and EMC Directives) and is UL® and C-UL® listed.

Features and Benefits

Multi-channel monitoring
- Eight channels in one package make the TLM ideal for multi-zone applications

Multiple sensor types
- TLM accepts six thermocouple types, RTDs and thermal switches (one sensor type per TLM unit)

Selectable alarm limits
- TLM-8 can be ordered with a different temperature limit on each channel

Compact, easy-to-install, sub-panel mounting
- Reduces installation time

Flexible interlocks
- Interfaces with redundant controls; ideal for SEMI S2 applications

Self-test diagnostics
- Simplifies troubleshooting

Latching alarms
- Protects process and equipment

CE, UL®, C-UL® and Factory Mutual (FM) Approvals
- Global acceptance for safety and EMC compliance

Typical Applications

- Any process requiring multi-channel redundant temperature monitoring
- Semiconductor capital equipment requiring SEMI S2
- Electronics packaging equipment
- Plastic injection molding and extrusion equipment

TLM SERIES

Specifications

Analog Inputs
- Number of sensor inputs: 8

Sensor Inputs (Trip Point Ranges)
- RTD 100Ω, platinum, 2-wire (DIN Curve: -100 to 850°C)
- Thermal switch
- Type E T/C (100 to 801°C)
- Type J T/C (100 to 754°C)
- Type K T/C (100 to 1205°C)
- Type R T/C (500 to 1720°C)
- Type S T/C (500 to 1711°C)
- Type T T/C (100 to 384°C)

Accuracy
- Part numbers starting with "TLME": ±5 percent of trip point
- Part numbers starting with "TLMC": see table below

TLMC Accuracy Specification

Sensor(s)	Trip Point Accuracy Ambient: 15 to 35°C	Trip Point Accuracy Ambient: 0 to 60°C
J, K, E, T, RTD	±0.5% of trip point ±2°C	±0.5% of trip point ±4°C
S, R	±0.5% of trip point ±3°C	±0.5% of trip point ±5°C

Repeatability
- Better than 5°C or accuracy for trip point, whichever is less

Digital Inputs
- Alarm acknowledge digital input: 5-30VDC, optically isolated
- Alarm simulation digital input: 5-30VDC, optically isolated

Electromechanical Alarm Relays
- Contact arrangement: open in power off condition
- Contact action: latch open in alarm condition
- Maximum contact rating: 1A @ 30VDC

Indicator Lights
- 8 individual red alarm status indicator lights
- 1 green supply power indicator light

Dimensions
- 9.30 in. (236 mm) x 3.61 in. (92 mm) x 1.87 in. (48 mm) depth; add 0.75 in. (20 mm) to depth for DIN-rail mount

Power Requirements
- 12-24VDC, 3.2 watts, class 2 power supply

Environmental
- Temperature: 0 to 60°C (operating); -20 to 100°C (storage)
- Relative humidity: 0-95 percent, non-condensing

Agency Approvals/Compliance
- UL®, C-UL® listed (File No. E185611)
  Process Control Equipment UL® 61010
  Process Control Equipment C22.2 #61010-1
- FM
  Temperature Limit Switches-Non Indicating Class 3545
  Temperature Supervisory Switch Class 3545
- CE
  Low Voltage Directive (LVD) 2006-95-EC
  Electromagnetic Compatibility Directive (EMC) 2004/108/EC

Ordering Information

Part Number

①②③④	⑤ Sensor Type	⑥ Alarm Relays	⑦ Mounting	⑧ Channel 1	⑨ Channel 2	⑩ Channel 3	⑪ Channel 4	⑫ Channel 5	⑬ Channel 6	⑭ Channel 7	⑮ Channel 8
TLME											

⑤	Sensor Type
0 =	RTD or thermostatic switch
1 =	Type E T/C
2 =	Type J T/C
3 =	Type K T/C
4 =	Type R T/C
5 =	Type S T/C
6 =	Type T T/C

⑥	Alarm Relays
0 =	Global relays only
1 =	Global alarm relays and 8 channel alarm relays

⑦	Mounting
0 =	Panel
1 =	DIN-rail

⑧⑨⑩⑪⑫⑬⑭⑮	Trip Points
	Based on your sensor choice, use the Trip Point Chart on the next page and choose the desired alarm temperature for each channel.

Limits and Scanners

TLM SERIES

Trip Point Chart

Temperature		Trip Point
RTD		
Unused Input		A
103℃	(217℉)	B
121℃	(250℉)	C
151℃	(304℉)	D
215℃	(419℉)	E
324℃	(615℉)	F
404℃	(759℉)	G
478℃	(892℉)	H
584℃	(1083℉)	I
708℃	(1306℉)	J
824℃	(1515℉)	K
Thermostatic switch		K
Type E T/C		
Unused Input		A
101℃	(214℉)	B
202℃	(396℉)	C
302℃	(576℉)	D
403℃	(756℉)	E
502℃	(936℉)	F
600℃	(1112℉)	G
702℃	(1296℉)	H
801℃	(1474℉)	I
Type J T/C		
Unused Input		A
100℃	(212℉)	B
152℃	(307℉)	C
202℃	(396℉)	D
251℃	(484℉)	E
302℃	(576℉)	F
350℃	(662℉)	G
402℃	(756℉)	H
450℃	(842℉)	I
502℃	(936℉)	J
554℃	(1027℉)	K
600℃	(1112℉)	L
653℃	(1207℉)	M
704℃	(1299℉)	N
754℃	(1389℉)	O

Temperature		Trip Point
Type K T/C		
Unused Input		A
100℃	(212℉)	B
150℃	(302℉)	C
200℃	(392℉)	D
252℃	(486℉)	E
303℃	(577℉)	F
353℃	(667℉)	G
401℃	(754℉)	H
455℃	(851℉)	I
504℃	(939℉)	J
556℃	(1033℉)	K
603℃	(1117℉)	L
651℃	(1204℉)	M
701℃	(1294℉)	N
753℃	(1387℉)	O
807℃	(1485℉)	P
851℃	(1564℉)	Q
907℃	(1665℉)	R
952℃	(1746℉	S
998℃	(1828℉)	T
1057℃	(1935℉)	U
1101℃	(2014℉)	V
1157℃	(2115℉)	W
1205℃	(2201℉)	X
Type R T/C		
Unused Input		A
501℃	(934℉)	B
602℃	(1116℉)	C
708℃	(1306℉)	D
800℃	(1472℉)	E
903℃	(1657℉)	F
999℃	(1830℉)	G
1100℃	(2012℉)	H
1206℃	(2203℉)	I
1306℃	(2383℉)	J
1410℃	(2570℉)	K
1497℃	(2727℉)	L
1593℃	(2899℉)	M
1720℃	(3128℉)	N

Temperature		Trip Point
Type S T/C		
Unused Input		A
506℃	(943℉)	B
601℃	(1114℉)	C
700℃	(1292℉)	D
810℃	(1490℉)	E
902℃	(1656℉)	F
1005℃	(1841℉)	G
1110℃	(2030℉)	H
1210℃	(2210℉)	I
1313℃	(2395℉)	J
1404℃	(2559℉)	K
1500℃	(2732℉)	L
1600℃	(2912℉)	M
1711℃	(3112℉)	N
Type T T/C		
Unused Input		A
100℃	(212℉)	B
202℃	(396℉)	C
291℃	(556℉)	D
384℃	(723℉)	E

Please Note: Trip point values and specifications have changed from earlier TLM-8 versions. Please contact the factory if ordering replacement units for models not beginning with TLME.

Note: For other trip points and higher trip point accuracy, consult your supplier regarding the TLMC.

WATLOW