Power Switching Devices

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

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

Comparison Guide

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

① Includes heater replacement and lost production.

ASPYRE®

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

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

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

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

Features and Benefits

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

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

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

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

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

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

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

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

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

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

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

ASPYRE

Typical Applications

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

Specifications

Power Bases

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

Load Amp Range

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

SCR and Amperage Rating

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

Line and Load Voltage Range

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

Voltage frequency

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

Controller Operating Supply Voltage

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

Control Modes and Load Types

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

Digital Inputs 1 and 2

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

Output Control Firing Types

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

Electromechanical Relay Output

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

Relay Functions

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

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

- 10VDC @ 10mA max.

ASPYRE

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

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

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

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

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

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

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

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

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

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

Configuration
- PC software tool and RS485, USB port, or on-board keypad and LED display

Integrated Data Logging
- Storage: 16 GB SD memory card
- .CSV file type
- User programmable logging intervals 1 to 255 seconds
- Up to 10 parameters selectable by user: line frequency, output voltage (RMS), output current (RMS), output power (average), status, commands, set point, current limit set point (RMS), load resistance, input voltage (RMS)

Real Time Clock and Battery Back-up
- Typical battery life: 5 years at 77°F (25°C)
- CR2032 field replaceable battery

Cooling mode
- Forced air (fan)
- 24VDC, 120 or 240VAC, 17 watts per fan used

Control Terminals
- Terminals are touch safe, removable, 12 to 22 AWG

Line and Load Terminals
- Compatible with crimp lug terminals or busbar
- Refer to user manual for wire size, compression and torque requirements

ASPYRE

Mounting
- Panel mounting with screws
- Must be mounted with heat sink fins in vertical orientation

Environment
- 0 to 40°C without derating
- 5 to 90% RH (relative humidity), non-condensing
- Up to 2000 meters above sea level max.
- Over 1000 meters of altitude reduce the nominal current by 2% for each 100 meters
- Storage temperature -25 to 70°C max.

Agency Approval and Regulatory
- cULus 508 Listed File E73741
- cUL® Listed to C22.2 No. 14
- CE EMC Directive 2014-30-EU, EN 60947-4-3 Class A Emissions
- CE Safety Directive 2014-35-EU, EN 60947-4-1, -4-3
- IP20 with all covers in place
- RoHS 2011-65-EU
- W.E.E.E 2012-19-EU
- 690VAC units not covered by UL®

Accessories
- Free Watlow ASPYRE configuration software on the Watlow website at http://www.watlow.com/en/resources-and-support/Technical-Library/Software-and-Demos
- 6 ft USB 2.0 to micro USB device cable 0219-0480-0000
- Fuses - see table in next column

Fuses

ASPYRE Model Number	Qty. Used Per Unit	Fuse Part Number		
		Watlow	Cooper Bussmann®	Siba
DT_ _ _ - 035 ...	1 to 3*	17-8050	FWP-50A14Fa	
DT_ _ _ - 040 ...				
DT_ _ _ - 060 ...		0808-0363-0160		20 559 20.160
DT_ _ _ - 090 ...				
DT_ _ _ - 120 ...		0808-0363-0180		20 559 20.180
DT_ _ _ - 150 ...		0808-0363-0200		20 559 20.200
DT_ _ _ - 180 ...		0808-0363-0250		20 559 20.250
DT_ _ _ - 210 ...		0808-0363-0315		20 559 20.315
DT1_ _ - 300 ...	1	0808-0362-0000	350FM	
DT1_ _ - 400 ...	1	0808-0358-0000	550FMM	
DT1_ _ - 500 ...	1	0808-0359-0000	700FMM	
DT1_ _ - 600 ...	4	0808-0363-0250		20 559 20.250
DT1_ _ - 700 ...	4			
DT2_ _ - 300 ...	3	0808-0357-0000	450FMM	
DT2_ _ - 400 ...	3	0808-0358-0000	550FMM	
DT2_ _ - 450 ...	6	0808-0360-0000	315FM	
DT2_ _ - 500 ...	6			
DT2_ _ - 600 ...	4	0808-0357-0000	450FMM	
DT2_ _ - 700 ...	4			
DT3_ _ - 300 ...	3			
DT3_ _ - 350 ...	3	0808-0358-0000	550FMM	
DT3_ _ - 400 ...	3			
DT3_ _ - 450 ...	3	0808-0359-0000	700FMM	
DT3_ _ - 500 ...	3			

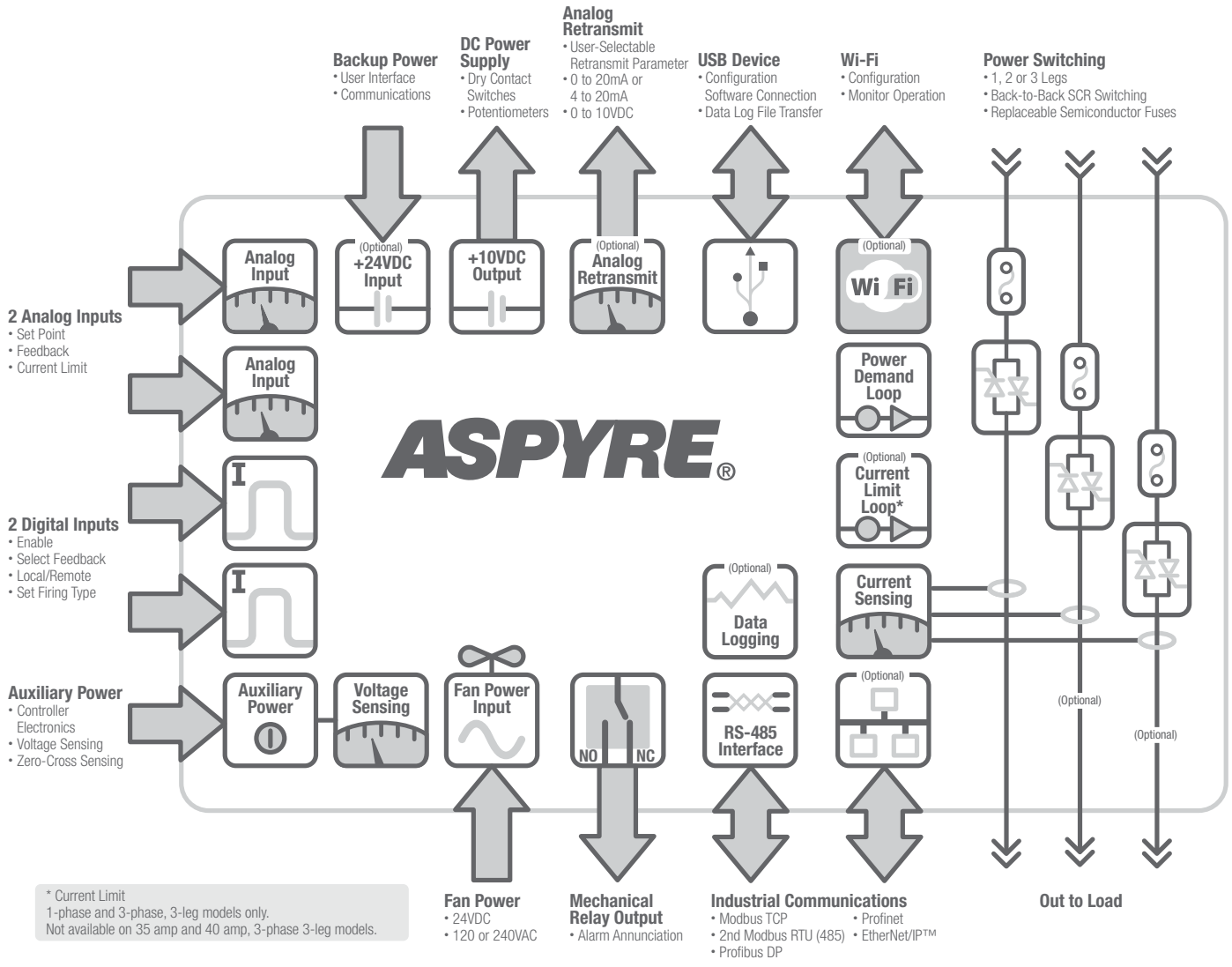
* One fuse per switched leg.

Amperage Rating Chart

Number of Controlled Legs	Current (A)	Repetitive Peak Reverse Voltage (Uimp) (480V)	(600V)	Maximum Peak One Cycle (10msec.) (A)	Fuse I^2T Value Suggested A^2s (at 500V) tp = 10msec
1, 2 or 3	35	1200	1600	540	1260
1, 2 or 3	40	1200	1600	700	1260
1, 2 or 3	60	1200	1600	1900	10780
1, 2 or 3	90	1200	1600	1900	10780
1, 2 or 3	120	1200	1600	1900	14280
1, 2 or 3	150	1200	1600	5000	17500
1, 2 or 3	180	1200	1600	5000	30800
1, 2 or 3	210	1200	1600	5000	53900
1 or 2	300	1200	1600	7800	73500
3	300	1200	1600	5250	73500
3	350	1200	1600	7800	150500
1	400	1200	1600	7800	150500
2	400	1200	1600	7800	149000
3	400	1200	1600	8000	150500
2	450	1200	1600	7800	215600
3	450	1200	1600	17800	294000
1 or 3	500	1200	1600	17800	294000
2	500	1200	1600	8000	215600
1	600	1200	1600	17800	246400
2	600	1200	1600	17800	294000
1	700	1200	1600	17800	246400
2	700	1200	1600	17800	294000

ASPYRE

I/O Functional Block Diagram



ASPYRE

Dimensions and Shipping Weight

Current and Voltages	1-Phase, 1 Controlled Leg	3-Phase, 2 Controlled Legs	3-Phase, 3 Controlled Legs
35 and 40A **480 and 600VAC**	 4.77 in. H x 2.84 in. W x 7.28 in. D - 2.6 lbs	 4.77 in. H x 4.25 in. W x 7.28 in. D - 4 lbs	 4.77 in. H x 5.67 in. W x 7.28 in. D - 5.5 lbs
60, 90, 120, 150, 180 and 210A **480 and 600VAC**	 10.6 in. (60A) or 10.79 in. (90-210A) H x 3.66 in. W x 6.7 in. D - 9 lbs	 10.6 in. (60A) or 10.79 in. (90-210A) H x 7.36 in. W x 6.7 in. D - 18 lbs	 10.6 in. (60A) or 10.79 in. (90-210A) H x 11.1 in. W x 6.7 in. D - 27 lbs
60, 90, 120, 150, 180 and 210A **690VAC**	 17.33 in. H x 5.40 in. W x 10.63 in. D - 23 lbs	 60-90A = 17.33 in. H x 5.40 in. W x 10.63 in. D - 23 lbs 120-210A = 17.33 in H x 10.32 in. W x 10.63 in. D - 40 lbs	
1 and 2 leg: **300, 400, 500, 600 and 700A** **3 leg:** **300, 350, 400, 450 and 500A** **480, 600 and 690VAC**	 20.47 in. H x 5.4 in. W x 10.63 in. D - 33 lbs	 20.47 in. H x 10.32 in. W x 10.63 in. D - 63 lbs	

ASPYRE

Ordering Information

Base model includes: - power control loop for open loop, voltage, current or power control, two analog inputs (0-10VDC, 4-20mA selectable), two digital inputs, semiconductor fusing and current transformers for each leg, mechanical relay heater break alarm, RS-485 Modbus® communications, pixel OLED user interface and keypad, 10VDC auxiliary power supply

Part Number

①② Model	③ Phase	④⑤ Max. Line & Load Voltage		⑥⑦⑧ Amperage	⑨ Nominal Voltage Supplied to SCR	⑩ Additional Options		⑪ Cooling Fan Voltage	⑫ Add'l Wired Comms.	⑬ Wireless Comm. & Data Logging	⑭⑮ Custom Options- Firmware Overlay, Preset Parameters and Locked Code
DT			-				-				

③	Phase
1 =	1-phase, 1 controlled leg
2 =	3-phase, 2 controlled leg
3 =	3-phase, 3 controlled leg

④⑤	Maximum Line and Load Voltage
48=	480VAC
60=	600VAC
69=	690VAC - Only available for 60A and greater models

⑥⑦⑧	Amperage
035 =	35A
040 =	40A
060 =	60A
090 =	90A
120 =	120A
150 =	150A
180 =	180A
210 =	210A
300 =	300A
350 =	350A - Not available for 1-phase, 1 leg or 3-phase, 2 leg models
400 =	400A
450 =	450A - Not available for 1-phase, 1 leg models
500 =	500A
600 =	600A - Not available for 3-phase, 3 controlled leg models
700 =	700A - Not available for 3-phase, 3 controlled leg models

⑨	Nominal	Maximum Operating Range
1 =	100 or 120VAC	90-135V
2 =	200, 208, 220, 230 or 240VAC	180-265V
3 =	277VAC	249-305V
4 =	380, 400, 415, 440 or 480VAC	342-528V
5 =	600VAC	540-660V
6 =	690VAC*	621-759V

*690VAC only available for 60A and greater models.

⑩	Current Limit Loop	Analog Retransmit Output 1
A =	Yes	Yes
B =	No	No
C =	Yes	No
D =	No	Yes

Note 1: Current limit loop only available with 1-phase and 3-phase, 3-leg models (DT**1** and DT**3**). Exception: Current limit not available with the 35A and 40A, 3-phase, 3-leg models (DT**3**xx-**035**xx-xxxxx and DT**3**xx-**040**xx-xxxxx).
Note 2: If using both Analog Retransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1-5) an external power supply will be required. Watlow power supply part number: 0847-0299-0000. Descriptions: AC/DC power supply converter for 90-263VAC to 24VDC, 1.30A, 31W.

⑪	Cooling Fan Voltage
0 =	No fan - option only valid for models ≤60A
1 =	120VAC*
2 =	240VAC*
3 =	24VDC*

*Fan voltage required on models ≥90A, not valid option for models ≤60A.

⑫	No Add'l Comms.	Modbus® TCP	2nd Mobus® RTU 485	Profibus DP	Profinet	EtherNet/ IP™
0 =	X					
1 =		X				
2 =			X			
3 =				X		
4 =					X	
5 =						X

Note 1: All additional communication options include auxiliary 24VDC backup power supply for communications.
Note 2: If using both Analog Retransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1-5) an external power supply will be required. Watlow power supply part number: 0847-0299-0000. Descriptions: AC/DC power supply converter for 90-263VAC to 24VDC, 1.30A, 31W.

⑬	Wi-Fi	*Data Logging With Battery Back-Up and Real Time Clock
A =		
B =	X	
C =		X
D =	X	X

*40A and lower models do not include battery back-up or real time clock.

⑭⑮ Custom Options - Firmware Overlay, Preset Parameters and Locked Code	
AA=	Standard with user manual documentation
AB=	Standard without user manual documentation
RC=	Replacement connector hardware only - for configuration entered above
XX=	Contact factory - custom firmware, preset parameters, locked code

EZ-ZONE® ST

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

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

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

Features and Benefits

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

Compact package
- Reduces panel size

Touch-safe package
- Complies with IP2X increasing user safety

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

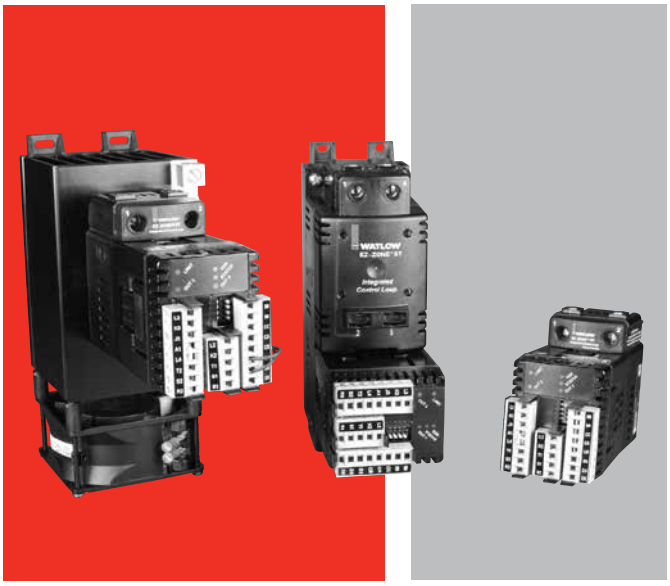
200KA SCCR with proper fusing
- Minimizes damage in the event of a short circuit

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

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

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

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



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

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

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

Optional temperature limit
- Increases safety in over- and under-temperature condition

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

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

DIN-A-MITE® A

The DIN-A-MITE® A power controller provides a low-cost, highly compact and versatile solid state option for controlling electric heat. This controller is designed and manufactured with the quality features expected from Watlow. DIN-rail and panel mounting is standard on every controller. There is no need to worry about mercury, the DIN-A-MITE controller is mercury free.

Features include single-phase zero cross switching up to 25 amperes at 600VAC (see rating curve). A unique integrated design removes the guesswork associated with selecting a proper heat sink and adequate terminations for the application.

Variable time-base, 4-20mA process control and VAC/VDC input contactor versions are available. All options are model number dependent and factory configurable. This power controller also includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.

Features and Benefits

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

DIN-rail and panel mounting
- Provides versatility and quick, low-cost installation

Compact size
- Reduces panel space and cost

Touch-safe terminals
- Increases safety for installer and user

Mercury free
- Assures environmental safety

Faster switching with solid state
- Saves energy and extends heater life

UL® 508 listed, C-UL®, RoHS and CE with filter
- Meets applications requiring agency approval
- Reduces end product documentation cost

Back-to-back SCR design
- Ensures a rugged design

DIN-A-MITE A

Specifications

Operator Interface
- Control input
- Input indication LED

Amperage
- Single-phase, see the output rating curve
- Max. I^2t for fusing: 4000A^2sec
- Latching current: 400mA max.
- Holding current: 200mA max.
- Power dissipation is 1.2 watts per ampere switched
- 200KA SCCR, Type 1 and 2 approved with the recommended fusing; see user manual

Line Voltage
- 24 to 660VAC model number dependent; see ordering information
- Off-state leakage: 1mA at 77°F (25°C) max.
- 50/60Hz independent

Control Mode, Zero Cross
- Control option C: VDC input, contactor output
- Control option K: VAC input, contactor output
- To increase service life on contactor models, the cycle time should be less than three seconds
- Control option F: 4 to 20mA DC input, variable time-base control output (3 cycles on, 3 cycles off at 50% power)

Control Input
- AC contactor: 24VAC ±10%, 120VAC +10/-25%, 240VAC +10/-25% @ 25mA max.
- DC contactor: 4.5 to 32VDC: max. current @ 4.5VDC is 8mA
- Loop powered linear current 4 to 20mA DC: loop-powered, control option F0 only (requires current source with 6.2VDC available, no more than three DIN-A-MITE inputs can be connected in series)

Agency Approvals
- CE with proper filter:
  204/108/EC Electromagnetic Compatibility Directive
  EN 61326-1: Industrial Immunity Class A Emissions
  2006/95/EC Low Voltage Directive
  EN 50178 Safety Requirements
  Installation category III, pollution degree 2
- c UL us LISTED UL® 508 listed and C-UL® File E73741
- 2011/65/EU RoHS 2

Control Input Terminals
- Compression: will accept 24 to 16 AWG (0.2 to 1.5 mm^2) wire

Line and Load Terminals
- Compression: will accept 18 to 8 AWG (0.8 to 8.4 mm^2) wire

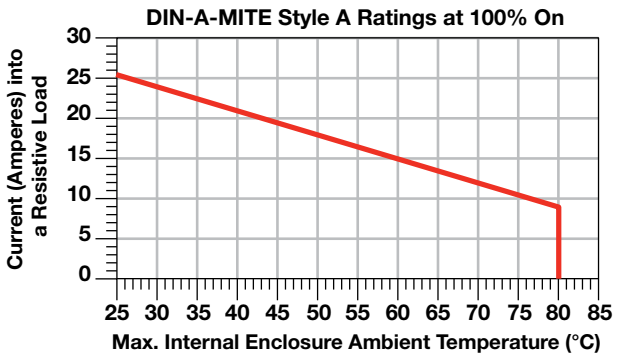
Operating Environment
- -4 to 176°F (-20 to 80°C); see the output rating curve chart for your application
- 0 to 90% RH (relative humidity), non-condensing
- Insulation tested to 3,000 meters
- Units are suitable for “Pollution degree 2”

Mounting
Options include DIN-rail or standard back panel mounting
- DIN EN 50022, 35 mm by 7.5 mm
- Mount cooling fins vertically

Dimensions
- 3.7 in. (94 mm) high x 2.0 in. (50 mm) wide x 3.9 in. (98 mm) deep
- Weight: 0.71 lb (0.32kg)

Specifications are subject to change without notice.

Output Rating Curve



DIN-A-MITE A

Ordering Information

Part Number

①	②	③ Phase	④ Cooling & Current Rating		⑤ ⑥ Line & Load Voltage	⑦ ⑧ Control		⑨	⑩ User Manual	⑪ ⑫ Custom Options
D	A	1	0	-			-	0		

③	Phase
1 =	1-phase, 1 controlled leg

④	Cooling and Current Rating (See rating curve)
0 =	Natural convection current rating 18A @ 50°C

⑤ ⑥	Line and Load Voltage
02 =	24 to 48VAC
24 =	120 to 240VAC
60 =	277 to 600VAC

⑦ ⑧	Control
C0 =	4.5 to 32VDC input, contactor output
F0 =	4 to 20mA DC input, variable time-base output
K1 =	22 to 26VAC input, contactor output
K2 =	100 to 120VAC input, contactor output
K3 =	200 to 240VAC input, contactor output

⑩	User Manual
0 =	English
1 =	German
2 =	Spanish
3 =	French

⑪ ⑫	Custom Options
00 =	Standard part
XX =	Any letter or number, custom options

Recommended Fuses and Fuse Holders

Semiconductor Fuses and Holders

Part Number	Description
17-8025	25A fuse
17-5110	10-25A holder

DFJ Combination Fuses and Holders

Part Number	Description
0808-0325-0020	20A fuse
0808-0325-0030	30A fuse
0808-0326-1530	15-30A holder

DIN-A-MITE B

The DIN-A-MITE B power controller provides a low-cost, highly compact and versatile solid state option for controlling electric heat. This controller is designed and manufactured with the quality features expected from Watlow. DIN-rail and panel mounting are standard on every control. There is no need to worry about mercury, the DIN-A-MITE controller is mercury free.

Features include single-phase and three-phase zero cross switching up to 40 and 22 amperes, respectively, at 600VAC (see rating curve). A unique, integrated design removes the guesswork associated with selecting a proper heat sink and adequate terminations for the application.

Variable time-base, 4-20mA process control and VAC/VDC input contactor versions are available. A shorted output alarm option is also available. All options are model number dependent and factory configurable. This power controller includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.

Features and Benefits

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

DIN-rail and panel mounting
- Provides versatility and quick, low-cost installation

Compact size
- Reduces panel space and cost

Touch-safe terminals
- Increases safety for installer and user

Single- and three-phase power
- Permits use in a variety of applications

Mercury free
- Assures environmental safety

Faster switching with solid state
- Saves energy and extends heater life

UL® 508 listed, C-UL®, RoHS and CE with filter
- Meets applications requiring agency approval
- Reduces end product documentation cost

Back-to-back SCR design
- Ensures a rugged design

Shorted output alarm (optional)
- Simplifies troubleshooting and reduces downtime

DIN-A-MITE B

Specifications

Operator Interface
- Control input and indication light
- Alarm output and indication light

Amperage Rating
- See the output rating curve
- Max. surge current for 16.6ms, 380A peak
- Max. I^2t for fusing is 4,000A^2s
- Latching current: 400mA max.
- Holding current: 200mA max.
- Off-state leakage 1mA at 77°F (25°C) max.
- Power dissipation = 1.2 watts per ampere per leg switched
- 200KA SCCR, Type 1 and 2 approved with the recommended fusing; see user manual

Line Voltage
- 24 to 660VAC model number dependent; see ordering information

Control Mode, Zero Cross
- Control option C: VDC input, contactor output
- Control option K: VAC input, contactor output
- To increase service life on contactor models, the cycle time should be less than three seconds
- Control option F: 4 to 20mA DC input, variable time-base control output

Control Input
- AC contactor: 24VAC ±10%, 120VAC +10/-25%, 240VAC +10/-25% @ 25mA max. per controlled leg
- DC contactor: 4.5 to 32VDC: max. current @ 4.5VDC is 6mA per leg. Add 2mA per LED used to the total current
- Linear current: 4 to 20mA DC: loop-powered, control option F0 only (requires current source with 6.2VDC available, no more than three DIN-A-MITE inputs connected in series)

Alarm

Shorted SCR Alarm Option
- Alarm state when the input command signal off and a 10A or more load current is detected by the current transformer (two turns required for 5A and three turns for 2.5A)

Alarm Output
- Energizes on alarm, non-latching
- Triac 24 to 240VAC, external supply with a current rating of 300mA @ 77°F (25°C), 200mA @ 122°F (50°C), 100mA @ 176°F (80°C) and a holding current of 200 µA with a latching current of 5mA typical

Agency Approvals
- CE with proper filter:
  204/108/EC Electromagnetic Compatibility Directive
  EN 61326-1: Industrial Immunity Class A Emissions
  2006/95/EC Low Voltage Directive
  EN 50178 Safety Requirements
  Installation category III, pollution degree 2
- c UL us LISTED UL® 508 listed and C-UL® File E73741
- 2011/65/EU RoHS 2

Control Input Terminals
- Compression: will accept 24 to 16 AWG (0.2 to 1.5 mm^2) wire

Line and Load Terminals
- Compression: will accept 18 to 8 AWG (0.8 to 8.4 mm^2) wire

Operating Environment
- See the output rating curve
- 0 to 90% RH (relative humidity), non-condensing
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Operating temperature: -4 to 176°F (-20 to 80°C)
- Insulation tested to 3,000 meters

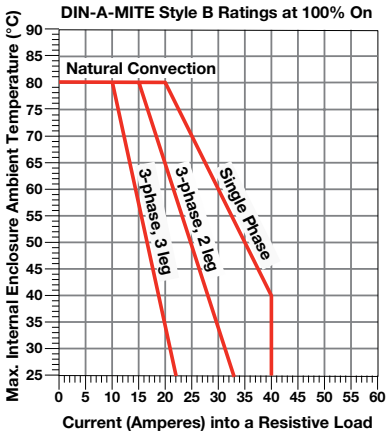
DIN-rail Mount
- DIN EN 50022, 35 mm by 7.5 mm

Back-Panel Mount
- Four mounting holes No. 6 to No. 8 (M3 to M4) fastener

Dimensions
- 3.7 in. (94 mm) high x 3.3 in. (83 mm) wide x 4.9 in. (124 mm) deep
- Weight: 1.5 lb (0.68kg)

Specifications are subject to change without notice.

Output Rating Curve



Current Rating Table

Phase	Cooling	Current at 122°F (50°C)
1	0	35A
2, 8	0	25A
3, 9	0	17A

DIN-A-MITE B

Ordering Information

Part Number

①	②	③	④		⑤ ⑥	⑦ ⑧		⑨	⑩	⑪ ⑫
		Phase	Cooling & Current Rating	-	Line & Load Voltage	Control	-	Alarm	User Manual	Custom Options
D	B			-			-			

③	Phase
1 =	1-phase, 1 controlled leg
2 =	3-phase, 2 controlled legs
3 =	3-phase, 3 controlled legs
8 =	2 independent zones (control options C or K)
9 =	3 independent zones (control options C or K)

④	Cooling and Current Rating (See rating curve)
0 =	Natural convection

⑤ ⑥	Line and Load Voltage
02 =	24 to 48VAC
24 =	120 to 240VAC
60 =	277 to 600VAC

⑦ ⑧	Control
C0 =	4.5 to 32VDC input, contactor output
F0 =	4 to 20mA DC input, variable time-base output
K1 =	22 to 26VAC input, contactor output
K2 =	100 to 120VAC input, contactor output
K3 =	200 to 240VAC input, contactor output

⑨	Alarm
0 =	No alarm
S =	Shorted SCR alarm

⑩	User Manual
0 =	English
1 =	German
2 =	Spanish
3 =	French

⑪ ⑫	Custom Options
00 =	Standard part
XX =	Any letter or number, custom options

Recommended DIN-rail Mount Fuses and Fuse Holders

Semiconductor Fuses and Holders

Part Number	Description
17-8020	20A fuse
17-8025	25A fuse
17-8030	32A fuse
17-8040	40A fuse
17-8050	50A fuse
17-5110	10-25A holder
17-5114	32-50A holder

DFJ Combination Fuses and Holders

Part Number	Description
0808-0325-0020	20A fuse
0808-0325-0030	30A fuse
0808-0325-0040	40A fuse
0808-0325-0050	50A fuse
0808-0326-1530	15-30A holder
0808-0326-3560	35-60A holder

DIN-A-MITE C

The DIN-A-MITE C silicon controlled rectifier (SCR) power controller provides a low cost, compact and versatile solid state option for controlling electric heat. This controller is designed and manufactured with the quality features expected from Watlow. DIN-rail/panel mount and through-wall mount versions are available.

Features include single-phase, three-phase/two leg, and three-phase/three leg, 24-600VAC operation. Current switching capabilities range from 30 to 80A depending on the model ordered.

Variable time-base, linear voltage and current process control or VAC/VDC input contactor versions are available. Single-phase, phase angle firing and current limiting are also available. All options are model number dependent and factory configurable. This power controller includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.

Features and Benefits

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

DIN-rail, panel and thru-wall mounting
- Provides versatility and quick, low-cost installation

Compact size
- Reduces panel space and cost

Touch-safe terminals
- Increases safety for installer and user

One- and three-phase power
- Can be used in a variety of applications

Open heater/shorted output alarm
- Notifies the user in case of an open heater or shorted output

Mercury free
- Assures environmental safety

Faster switching with solid state
- Saves energy and extends heater life

UL® 508 listed, C-UL®, RoHS and CE with filter
- Meets applications requiring agency approval
- Reduces end product documentation cost

System solution component
- Provides single source thermal loop

Back-to-back SCR design
- Ensures a rugged design

DIN-A-MITE C

Specifications

Operator Interface

- Control input and indication light
- Alarm output and indication light
- Current limit indication LED

Amperage Rating

- See output rating curves on the next page
- Max. surge current for 16.6ms, 1,350A peak
- Max. I^2t for fusing is 9100A^2s
- Latching current: 500mA max.
- Holding current: 200mA max.
- Fan current: 0.14A for 24VDC; 0.12A for 120VAC; 0.06A for 240VAC
- Off-state leakage 1mA at 77°F (25°C) max.
- Power dissipation: 1.2 watts per ampere per leg switched
- 200KA SCCR, Type 1 and 2 approved with the recommended fusing; see user manual

Line Voltage

- 24 to 48VAC units: 20.4VAC min. to 53VAC max.
- 100 to 240VAC units: 48VAC min. to 265VAC max.
- 277 to 600VAC units: 85VAC min. to 660VAC max.
- 100 to 120VAC, 200 to 208VAC, 230 to 240VAC, 277VAC, 400VAC, 480VAC, 600VAC, +10/-15%, 50 to 60Hz independent ±5% (control options L, P and S)

Alarms (Zero Cross Models Only)

Shorted SCR Alarm Option

- Alarm state when the input command signal is off and a 10A or more load current is detected by the current transformer (two turns required for 5A and three turns for 2.5A)

Open Heater Alarm Option (Control Option S Only)

- Alarm state when the input command signal is on and the load current detected by the current transformer is 20% less than customer adjusted set point

Alarm Output

- Energizes on alarm, non-latching
- Triac 24 to 240VAC, external supply with a current rating of 300mA @ 77°F (25°C), 200mA @ 122°F (50°C), 100mA @ 176°F (80°C) and a holding current of 200µA with a latching current of 5mA typical

Agency Approvals

- CE with proper filter:
  204/108/EC electromagnetic compatibility directive
  EN 61326-1: industrial immunity Class A emissions not suitable for Class B environments
  Phase angle and phase angle with current limit (control options P and L) are not CE approved for conducted or radiated emissions
  2006/95/EC low voltage directive EN 50178 safety requirements installation category III, pollution degree 2
- UL® 50 Type 4X enclosure, Class 1, Div. 2 per ANSI/ISA 12.12.01. Through-wall heat sink models T4 File 184390
- c UL us LISTED UL® 508 listed and C-UL® File E73741
- Shock and vibration tested to IEC 60068-2-32
- Vibration tested to IEC 60068-2-6
- 2011/65/EU RoHS 2

Control Input Terminals

- Compression: will accept 24 to 16 AWG (0.2 to 1.5 mm^2) wire
- Torque to 4.4 in. lb (0.5 Nm) max. with a 1/8 in. (3.5 mm) blade screwdriver

Line and Load Terminals

- Compression: will accept 14 to 3 AWG (2.5 to 25 mm^2) wire
- Torque to 24 in. lb (2.7 Nm) max. with a 1/4 in. (6.4 mm) blade screwdriver, or a type 1A, #2 Pozi driver

Operating Environment

- See the output rating curve chart on next page
- 0 to 90% RH (relative humidity), non-condensing
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Operating temperature: -29 to 176°F (-34 to 80°C)
- Insulation tested to 3,000 meters

DIN-Rail Mount

- DIN EN 50022, 35 mm by 7.5 mm

Back-Panel Mount

- Four mounting holes No. 6 to No. 8 (M3 to M4) fastener

Through-Wall Mount

- See page 312 for through-wall panel cutout (**Note:** Mount cooling fins vertically.)

Additional Specifications for Contactors and Proportional Controllers

Control Mode, Zero-Cross

- Control option C: VDC input, contactor output
- Control option K: VAC input, contactor output
- To increase service life on contactor models, the cycle time should be less than three seconds
- Control option F: 4 to 20mA DC input, variable time-base control output

DIN-A-MITE C

Specifications *(Continued)*

Control Input

- AC contactor: 24VAC ±10%, 120VAC +10/-25%, 240VAC +10/-25% @ 25mA max. per controlled leg
- DC contactor: 4.5 to 32VDC: max. current @ 4.5VDC is 6mA per leg, add 2mA per LED used to the total current
- Loop-powered linear current 4 to 20mA DC: loop-powered, control option F0 only, no more than three inputs connected in series

Additional Specifications for Phase Angle, Phase Angle Current Limit and Single-Cycle Variable Time-Base

Operation

- With control option S (single-cycle, variable time-base) the output is not on for more than one consecutive AC cycle below 50% power and not off for more than one consecutive AC cycle above 50% power
- Phase angle control, single-phase only

Control Input

- 0 to 20mA, 4 to 20mA, 0 to 5VDC, 1 to 5VDC and 0 to 10VDC
- Input impedance 250Ω for 4mA to 20mA, 5kΩ for linear voltage input

Output Voltage

- 100 to 120VAC, 200 to 208VAC, 230 to 240VAC, 277VAC, 400VAC, 480VAC and 600VAC, ±10%

Linearity (Control Option S)

- ±5% input to output power over 0 to 100% of span between calibration points

Linearity (Control Options P and L)

- ±5% input to output power, as referenced to a sinusoidal power curve, between calibration points

Resolution

- Better than 0.1% of input span with respect to output change

Soft Start (Control Options P and L)

Typically:

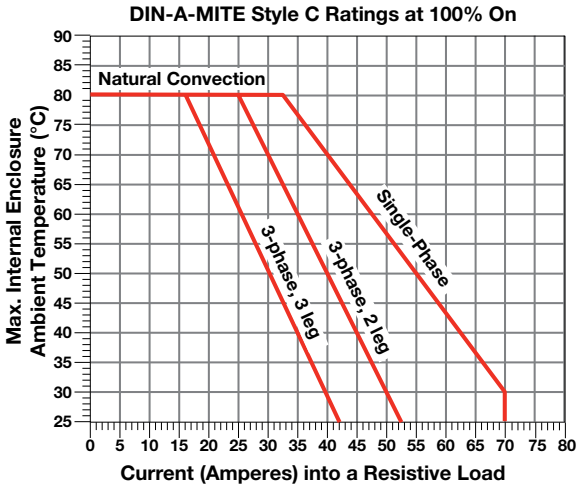
- 5 seconds soft start on power up
- Soft start on thermostat overtemperature
- Soft start on 1/2 cycle drop out detection
- 1 second soft start on set point change

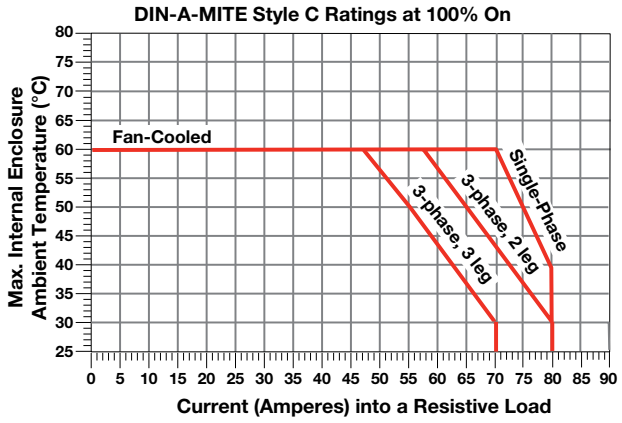
Options

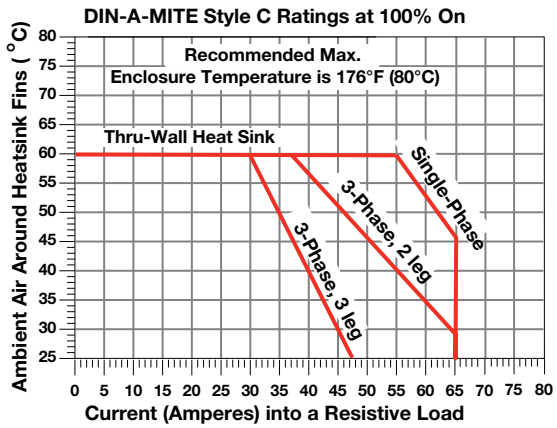
- Manual control kit (1kΩ potentiometer) 08-5362
- Alarm option is not available on control options P or L

Specifications are subject to change without notice.

Output Rating Curves



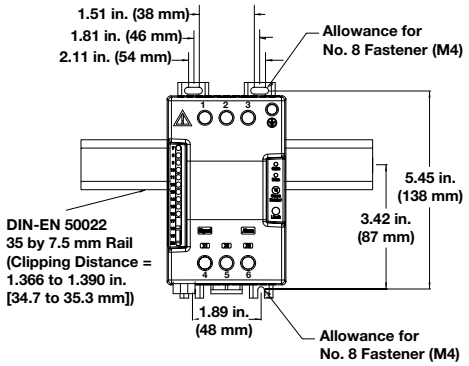




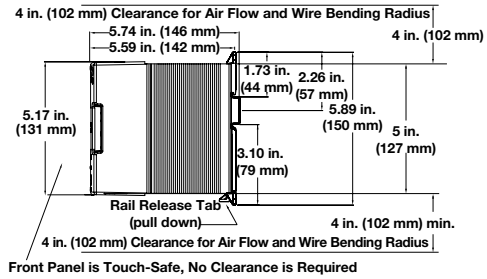
DIN-A-MITE C

Dimensions—Natural Convection, DIN-rail/Panel Mount

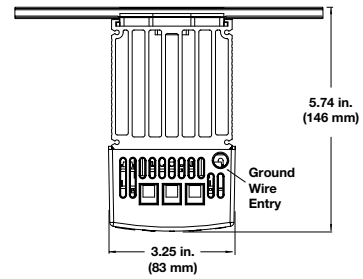
Front



Side

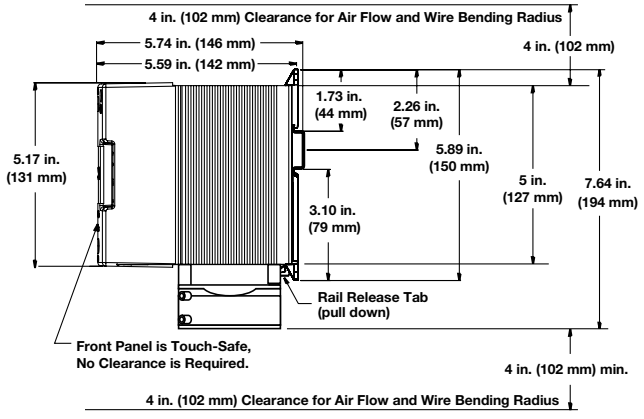


Top



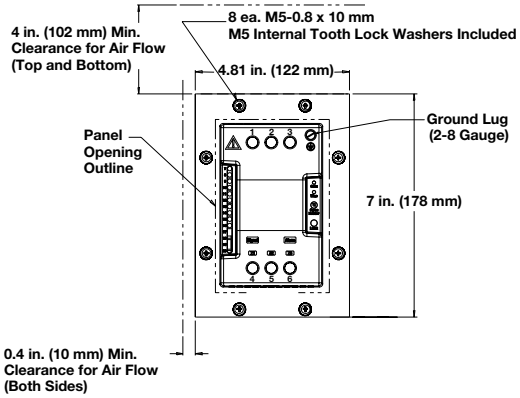
Dimensions—Fan Cooled, DIN-rail/Panel Mount

Side

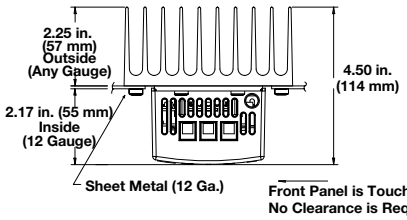


Dimensions—Natural Convection, Through-Wall Mount①

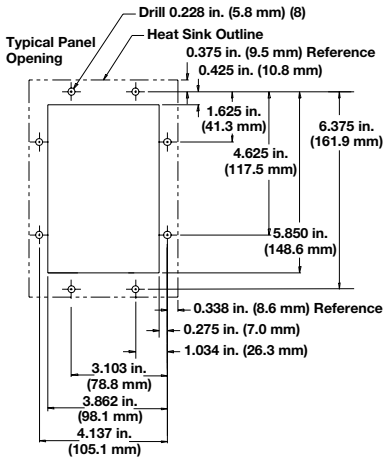
Front



Top



Panel Cutout



① With the potential for high through-wall heat sink temperatures, application may require a touch-safe shield.

DIN-A-MITE C

Extended Heater and Power Controller Life with Variable Time-Base

With variable time-base control, the power controller automatically adjusts the time-base and output power with respect to the command signal. Accelerated life testing shows that variable time-base control significantly reduces expansion and contraction of the heater element. This extends heater and power controller life while improving process temperature control. This saves money on heaters, downtime and maintenance.

Loop-Powered or Transformer Powered

Loop-Powered

By using a temperature controller's 4-20mA process output signal as the power supply for the DIN-A-MITE input, the cost of the power controller can be reduced. With control option F0 the 4-20mA control signal simultaneously powers the DIN-A-MITE's internal electronics and provides the input command signal.

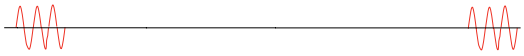
Transformer-Powered

DIN-A-MITE controllers with single-cycle, variable time-base or phase angle outputs (control options L, P and S) detect the power line zero cross with a transformer that also powers their internal electronics. These units can be controlled manually with a potentiometer or automatically with a temperature controller using any of the control options: 4-20mA, linear voltage (0-5,1-5 and 0-10VDC).

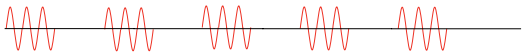
Loop-Powered, Variable Time-Base Output

Models: DC_ _ - _ _F0 - _ _ _ _

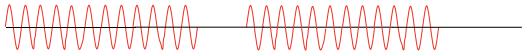
20% Power Output: **3 AC cycles on, 12 cycles off**



50% Power Output: **3 AC cycles on, 3 cycles off**



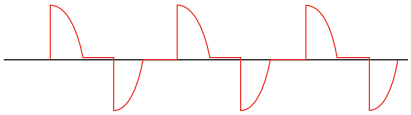
80% Power Output: **12 AC cycles on, 3 cycles off**



With loop-powered, variable time-base control, the minimum on or off time is three cycles.

Phase Angle Output

Models: DC1_ - _ _ [L, P] _ - 0_ _ _

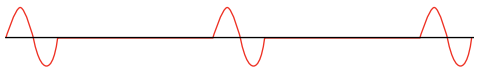


Phase angle control (control options L and P) is infinitely variable over the period of the AC sine wave. It provides a variable voltage and/or current output. The phase angle circuitry is transformer powered and accepts a linear voltage, current or potentionmeter input.

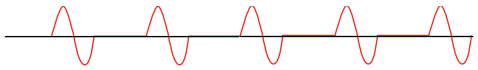
Single-Cycle, Variable Time-Base Output

Models: DC_ _ - _ _S_ - _ _ _ _

25% Power Output: **1 AC cycle on, 3 cycles off**



50% Power Output: **1 AC cycle on, 1 cycle off**



With single-cycle, variable time-base control, at 50 percent power, the output is on for one cycle and off for one cycle. At 25 percent, it is on for one cycle and off for three cycles. Under 50 percent, the output is not on for more than one consecutive cycle; over 50 percent the output is not off for more than one consecutive cycle.

Semiconductor Fuses for Applications through 600VAC

Fuse Part Number		
Fuse Rating	**Watlow**	**Cooper Bussman®**
40A	**17-8040**	FWP-40A14F
50A	**17-8050**	FWP-50A14F
63A	**17-8063**	FWP-63A22F
80A	**17-8080**	FWP-80A22F
100A	**17-8100**	FWP-100A22F

Fuse Holder Part Number		
Fuse Rating	**Watlow**	**Ferraz Shawmut**
40A	**17-5114**	US141I
50A	**17-5114**	US141I
63A	**17-5122**	US221I
80A	**17-5122**	US221I
100A	**17-5122**	US221I

Combined Branch Protection and Semiconductor Fuses for Applications through 480VAC

Fuse Part Number		
Fuse Rating 125% of Load	**Watlow**	**Cooper Bussman®**
20A	**0808-0325-0020**	DFJ-20
30A	**0808-0325-0030**	DFJ-30
40A	**0808-0325-0040**	DFJ-40
50A	**0808-0325-0050**	DFJ-50
63A	**0808-0325-0060**	DFJ-60
80A	**0808-0325-0080**	DFJ-80
100A	**0808-0325-0100**	DFJ-100

Fuse Holder Part Number		
Fuse Rating	**Watlow**	**Cooper Bussman®**
20 and 30A	**0808-0326-1530**	CH30J1i
40 to 63A	**0808-0326-3560**	CH60J1i
80 and 100A	**0808-0326-7010**	J601001CR

DIN-A-MITE C

Ordering Information

Part Number

①	②	③	④	⑤ ⑥	⑦ ⑧		⑨	⑩	⑪ ⑫
		Phase	Cooling & Current Rating/Leg	Line & Load Voltage	Control		Alarm	User Manual	Custom Options
D	C					-			

③	Phase
1 =	1-phase, 1 controlled leg
2 =	3-phase, 2 controlled legs
3 =	3-phase, 3 controlled legs (use with four wire wye)
8 =	2 independent zones (control options C, K)
9 =	3 independent zones (control options C, K)

④	Cooling and Current Rating Per Leg (See chart below)
0 =	Natural convection standard DIN-rail or panel heat sink
1 =	Fan cooled 120VAC standard DIN-rail or panel heat sink
2 =	Fan cooled 240VAC standard DIN-rail or panel heat sink
3 =	Fan cooled 24VDC standard DIN-rail or panel heat sink
T =	Natural convection through-wall or cabinet heat sink (NEMA 4X)

⑤ ⑥	Line and Load Voltage
02 =	24 to 48VAC (control options C, F, K)
12 =	100 to 120VAC (control options L, P, S)
20 =	200 to 208VAC (control options L, P, S)
24 =	100 to 240VAC (control options C, F, K); 230 to 240VAC (control options L, P, S)
27 =	277VAC (control options L, P, S)
40 =	400VAC (control options L, P, S)
48 =	480VAC (control options L, P, S)
60 =	277 to 600VAC (control options C, F, K); 600VAC (control options L, P, S)

⑦ ⑧	Control
C0 =	4.5 to 32VDC input, contactor output
F0 =	4 to 20mA DC input, variable time-base output
K1 =	22 to 26VAC input, contactor output
K2 =	100 to 120VAC input, contactor output
K3 =	200 to 240VAC input, contactor output
L (0 to 5) =	Phase angle output with current limiting* (single-phase only)
P (0 to 5) =	Phase angle output* (single-phase only)
S (0 to 5) =	Single-cycle variable time-base output
	0 = 4 to 20mA input
	1 = 12 to 20mA input (option S only)
	2 = 0 to 20mA input
	3 = 0 to 5VDC input
	4 = 1 to 5VDC input
	5 = 0 to 10VDC input
*Not CE approved for conducted or radiated emissions.	

⑨	Alarm
0 =	No alarm
S =	Shorted SCR alarm (not available with control options L or P)
H =	Open-heater and shorted-SCR alarm (control option S only)

⑩	User Manual
0 =	English
1 =	German
2 =	Spanish
3 =	French

⑪ ⑫	Custom Options
00 =	Standard part
1X =	1-second soft start (control options P, L)
XX =	Any letter or number, custom options, labeling, etc.

DIN-A-MITE C Current Rating Table

Phase	Cooling	Current at 122°F (50°C)
1	0	55A
1	T	60A
1	1, 2, 3	75A
2, 8	0	40A
2, 8	T	46A
2, 8	1, 2, 3	65A
3, 9	0	30A
3, 9	T	35A
3, 9	1, 2, 3	55A

DIN-A-MITE D

The DIN-A-MITE D silicon controlled rectifier (SCR) power controller provides an inexpensive, versatile product for controlling heat in an efficient package. This controller is designed and manufactured with the quality features expected from Watlow. The mounting footprint matches that of the industry standard mercury displacement relay (MDR), but there is no need to worry about mercury, the DIN-A-MITE controller is mercury free.

The DIN-A-MITE Style D is capable of zero cross switching up to 100 amperes single-phase, at 600VAC at 86°F (30°C), depending on the model selected. Combining the input of two or three controllers allows control of three-phase loads. The controller is completely touch-safe and includes on-board, front-accessible, semiconductor fuses. Options include a current transformer for load current monitoring and a shorted output alarm. The controller is UL® 508, C-UL® and CE approved making it ideal for panels and cabinets that require agency approvals.

Variable time-base, 4-20mA process control and VAC/VDC input contactor options are available. All options are model number dependent and factory configurable. This power controller also includes 200KA short circuit current rating (SCCR) tested up to 480VAC to minimize damage in the event of a short circuit when used with required fusing.

Features and Benefits

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

Standard panel mount
- Provides same mount as industry standard 100A MDR

Compact size
- Reduces panel space and cost

Touch-safe terminals
- Increases safety for installer and user

Mercury free
- Assures environmental safety

Faster switching with solid state
- Saves energy and extends heater life

UL® 508 listed, C-UL®, RoHS and CE with filter
- Meets applications requiring agency approval
- Reduces end product documentation

Back-to-back SCR design
- Ensures a rugged design

On-board semiconductor fusing
- Provides quick access with no extra mounting necessary

DIN-A-MITE D

Specifications

Amperage
- See the Output Rating Curve below
- Max. surge current for 16.6ms, 1,800A peak
- Latching current: 500mA min.
- Holding current: 200mA min.
- Power dissipation is 1.4 watts per ampere switched including on-board fusing
- 200KA SCCR, Type 1 and 2 approved with the recommended fusing; see user manual

Line Voltage
- 24 to 48VAC units: 20VAC min. to 53VAC max.
- 100 to 240VAC units: 48VAC min. to 265VAC max.
- 277 to 480VAC units: 85VAC min. to 528VAC max.
- 277 to 600VAC units: 85VAC min. to 660VAC max.
- 50/60Hz independent ±5%

Control Mode, Zero Cross
- Control option C: VDC input, contactor output
- Control option K: VAC input, contactor output
- To increase service life, the cycle time should be less than three seconds
- Control option F: 4 to 20mA DC input, variable time-base control output

Control Input
- AC contactor: 24VAC ±10%, 120VAC +10/-25%, 240VAC +10/-25% @ 25 mA max. per controlled leg
- DC Contactor: 4.5 to 32VDC: max. current @ 4.5VDC is 8mA per leg
- Linear current: 4 to 20mA DC, loop powered, input Type F0 option only, no more than three DIN-A-MITE inputs connected in series

Shorted SCR Alarm Option
- Alarm state when the input command signal off and a 15A or more load current is detected by the current transformer

Alarm Output
- Energizes on alarm, non-latching
- Triac 24 to 240VAC external supply with a current rating of 300mA @ 77°F (25°C)

Current Sensing
- On-board current transformer (CT), typically 0.2VAC output signal per ampere sensed into 1,000Ω load

Agency Approvals
- CE with proper filter:
  204/108/EC Electromagnetic Compatibility Directive
  EN 61326-1: Industrial Immunity Class A Emissions
  Not suitable for Class B emissions environment
  2006/95/EC Low Voltage Directive
  EN 50178 Safety Requirements
- c UL us LISTED UL® 508-listed and C-UL® File E73741

Control Input Terminals
- Compression: will accept 26 to 12 AWG (0.13 to 3.3 mm^2) wire

Line and Load Terminals
- Compression: will accept 6 to 2 AWG (13.3 to 33.6 mm^2) wire

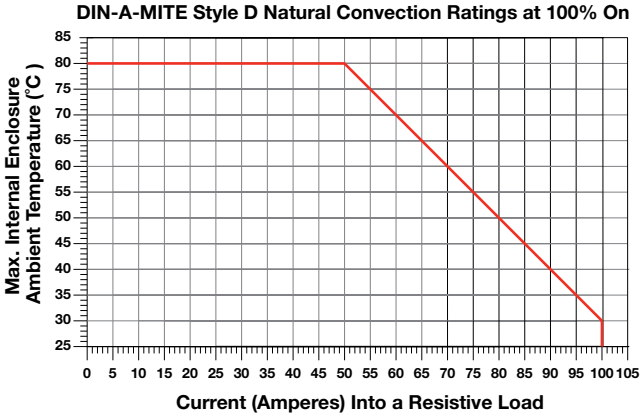
Operating Environment
- Operating temperature range: -4 to 176°F (-20 to 80°C)
- 0 to 90% RH (relative humidity), non-condensing
- Vibration: 2 g, 10Hz to 150Hz, applied in any one of three axes
- Storage temperature: -40 to 185°F (-40 to 85°C)
- Insulation tested to 3,000 meters
- Installation Category III, pollution degree 2

Mounting
- Back-panel mounting; fits the same mounting pattern as a 100A, single-phase mercury displacement relay
- On-board semiconductor fusing

Dimensions
- 7.3 in. (185 mm) high x 2.6 in. (66 mm) wide x 9.4 in. (239 mm) deep
- Weight: 6.5 lb (2.95kg)

Specifications are subject to change without notice.

Output Rating Curve



DIN-A-MITE D

Ordering Information

Part Number

①	②	③	④	⑤ ⑥	⑦ ⑧	⑨	⑩	⑪ ⑫
		Phase	Cooling & Current Rating	Line & Load Voltage	Control	Current Sensing or Alarm	User Manual	Custom Options
D	D	1	0	-		-		

③	Phase
1 =	1-phase, 1 controlled leg

④	Cooling and Current Rating (See rating curve)
0 =	Natural convection

⑤ ⑥	Line and Load Voltage
02=	24 to 48VAC
24 =	120 to 240VAC
48 =	277 to 480VAC
60 =	277 to 600VAC

⑦ ⑧	Control
C0 =	4.5 to 32VDC input, contactor output
F0 =	4 to 20mA DC input, variable time-base output
K1 =	22 to 26VAC input, contactor output
K2 =	100 to 120VAC input, contactor output
K3 =	200 to 240VAC input, contactor output

⑨	Current Sensing or Alarm
0 =	No alarm
1 =	Load current transformer
S =	Shorted SCR alarm

⑩	User Manual
0 =	English
1 =	German
2 =	Spanish
3 =	French

⑪ ⑫	Custom Options
00 =	Standard part

Replacement Semiconductor Fuse

Watlow Part Number	Cooper Bussmann® Part Number
0808-0096-0000	170N3437

POWER SERIES™

Watlow has manufactured solid state power controllers for over fifty years. Watlow's POWER SERIES™ is a microprocessor-based product that features application flexibility unmatched by any other silicon controlled rectifier (SCR) power controller on the market today. Watlow's POWER SERIES controllers include single and three-phase models from 65 to 250 amperes. Field configurable phase-angle or zero-cross firing improves application flexibility on site where needed.

50/60Hz independent operation allows utilization almost everywhere in the world without special calibration considerations. Serial communication via Modbus® RTU allows setup and monitoring of load status from a computer station or control room.

On-board semiconductor fusing improves reliability by protecting the SCRs from heater short circuits. Plus, on-board heater bakeout and control diagnostics can help eliminate initial start up problems. All these benefits are in a touch-safe package that can be quickly and easily mounted in a control cabinet.

Watlow's POWER SERIES controllers are UL® and C-UL® listed, ensuring that they meet world safety and operational standards.

Features and Benefits

200KA short circuit current rating (SCCR)
- Minimizes damage in the event of a short circuit

Microprocessor-based technology
- Extremely versatile and field configurable

Snap-fit on a pre-mounted plate
- Simplifies installation

Models 65 through 250 amperes rating
- Handles a wide range of loads

UL® 508 listed, C-UL® and CE with filter
- Meets applications requiring agency approval

Adjustable soft start
- Provides application flexibility

Heater and control diagnostics capability
- Monitors actual heater and controller performance

Electrically touch-safe package
- Enhances safety for installer and users

Serial communications with Modbus® RTU protocol
- Provides computer control and/or monitoring

Multizone capability
- Increases application flexibility and reduces panel space

POWER SERIES

Specifications

Power Bases

- Single-phase, (2 SCRs)
- 3-phase, 2-leg control, (4 SCRs)
  Resistive load only, zero-cross firing only
- 3-phase, 3-leg control, (6 SCRs)
- 3-phase, 3-leg control, (6 SCRs) for 4-wire wye loads
- Multizone, two and three single-phase zones

Output Control Options

- Zero-cross control, fixed time base
  - Time base one or four seconds with digital programmer
- Zero-cross control, variable time base
- Phase-angle control and phase-angle control with current limit (not for 3-phase, 2-leg models)
  - Soft start factory default four seconds upon power-up, and adjustable from 0.0 to 120 seconds
  - Soft start upon input signal change, output rate of change adjustable to limit max. rate of change from 0.1 to 100% per 0.1 second. Factory default 10%
- Current transformer included when required
- Line voltage compensated (variable time base and phase angle controllers only)
- Standby or non-operational mode

Output Voltage and Current Rating

- 24 to 120VAC (+10%, -15%)
- 200 to 480VAC (+10%, -15%)
- 200 to 600VAC (+10%, -15%)
- 65 through 250A per pole, model dependent; see amperage chart on the POWER SERIES spec sheet on the Watlow web site
- Min. load 1A rms ac
- Max. leakage current 5mA
- 200KA SCCR, Type 2 approved with the recommended fusing; see user manual

Alarms

- Single alarm relay
- Latching or non-latching
- Separate high and low values
- Alarm silencing (inhibit) on power up for alarm
- Alarm indication LEDs, shorted SCR, open heater, fuse
- Electromechanical relay, Form C contact, software configurable
  - Min. load current 10mA @ 5VDC
  - Rated resistive loads: 3A @ 250VAC or 30VDC max., inductive load rating 1.5A with a power factor ≥ 0.4 without contact suppression

Heater Bakeout

- For single-phase (phase to neutral) and 3-phase 6 SCR models only (not for 3-phase, 2-leg models)
- Soft start with over current trip, runs until programmed bakeout time expires, then goes burst or phase-angle firing. Factory default of 24 hours
- Adjustable 0 - 9999 minutes with over-current trip
- Internal current transformer included

Command Signal Input

Analog

- Input signal: field selectable and scalable, 0 to 20mA or 0 to 10VDC
- Default input signal: 4 to 20mA
- Manual control input via digital programmer/display
- Voltage input impedance 11kΩ nominal
- Current input impedance 100Ω nominal

Digital

- On-board digital programmer/display and optional serial communications

Retransmit

- Field selectable and scalable, 0 to 20mA with 800Ω max. load or 0 to10VDC with 1KΩ min. load
- Default: 4 to 20mA
- Resolution:
  mA ranges = ±5µA
  VDC ranges = 2.5mV nominal
- Calibration accuracy:
  mA ranges = ±20µA
  VDC ranges = 10mV nominal
- Temperature stability: 100ppm/°C

Digital Programmer/Display and Communications Capabilities

- Programming functions
  - Adjust input and output control type, alarms and soft start, heater bakeout and current limit prompts
- Monitoring functions
  - Display input and output values along with actual output current
- Data retention of digital programmer/display upon power failure via nonvolatile memory

Serial Communications

- RS-232 for single drop control
- EIA-485 for single or multidrop control
  - 32 units maximum can be connected. With additional 485 repeater hardware, up to 247 units may be connected
- Isolated
- Modbus® RTU protocol
- 1200, 2400, 4800, 9600, 19200 baud rates

Controller Power Supply

- Universal line voltage input range 100 to 240VAC (+10%, -15%) at 55VA max.
- 50/60Hz ± 5% line frequency independent
- Controller line voltage for electronic power supply can be run on separate line voltage

POWER SERIES

Specifications *(Continued)*

Natural Convection and Fan Cooled Models

- Cabinet venting may be required
- See Amperage Chart with Ordering Information for available configurations

Power Dissipation (Watts)

- Approximately 1.25 watts/ampere per controlled leg

Isolation

- Command signal to load and line/load to ground 2200VAC min.
- On-board semiconductor fuses provide SCR protection

Mounting

- Output Amperage Rating F35: back panel
- Other Output Amperage Ratings: removable mounting plate

High Current Terminals

- Touch safe
- 3/8 in. (10 mm) Allen head compression terminals will accept 6 AWG to 350 MCM wire. Allen wrench adapter (included) for 3/8 in. (10 mm) socket, 6 point only
- Torque to 180 in.-lbs (20.3 Nm)
- Wire strip to 1 1/8 in. (30 mm)
- Requires 194°F (90°C) wire insulation rating on line and load terminals

Controller Terminals

- Touch safe
- 1/8 in. (2.5 mm) blade screwdriver, accepts 12-22 AWG or 2 ea. 22-18 AWG wires
- Torque to 8 in.-lbs (0.9 Nm)
- Wire strip to 0.24 in. (6 mm)

Operating Environment

- 122°F (50°C) base rating
  - 32 to 140°F (0 to 60°C) fan cooled
  - 32 to 149°F (0 to 65°C) natural convection cooled
- 0 to 90% RH, non-condensing
- Meets EN 50178, Pollution degree three

Storage Temperature

- -40 to 185°F (-40 to 85°C)

Shipping Weight

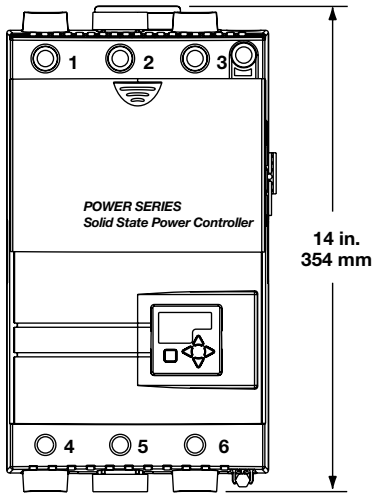
- Output Amperage Rating F35: 38 lbs (17.2 kg)
- Other Output Amperage Ratings: 23 lbs (10.3 kg)

Agency Approvals

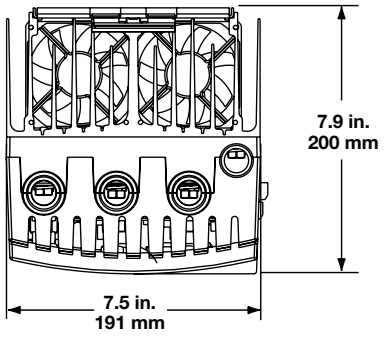
- UL® 508 listed, File #E73741, Vol. 3, Sec. 2
- C-UL® listed to C22.2 NO. 14
- CE 2014/30/EC (EN 61326-1), Class A with filter
  CE 2014/35/EC (EN 50178:1997)

Dimensions (Output Amperage Ratings: N20, N25, N30, F20, F25 or F30)

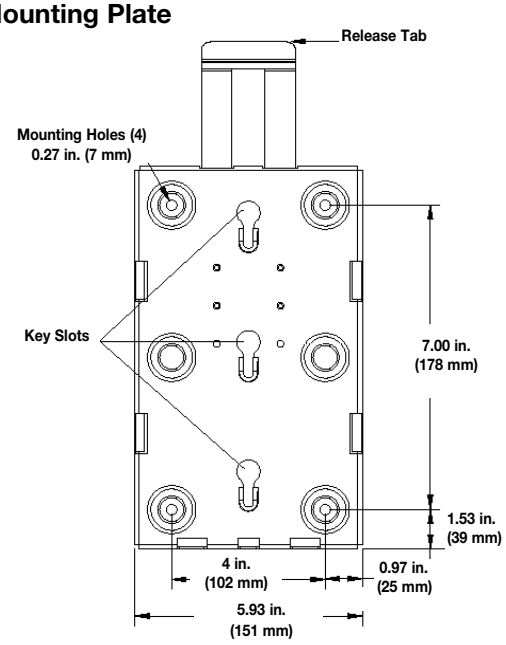
Front View



Top View

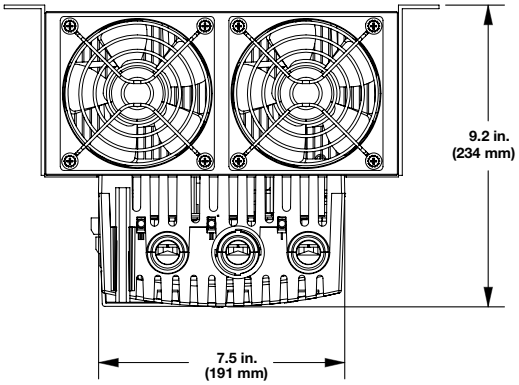


Mounting Plate

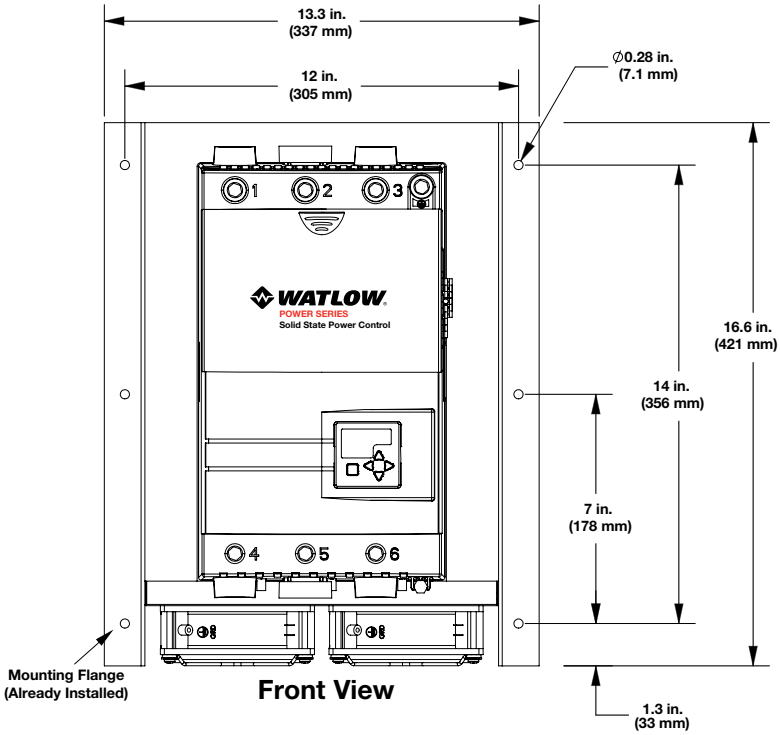


POWER SERIES

Dimensions (Output Amperage Rating: F35)



Bottom View



Front View

Single-Phase Configuration

This configuration can be purchased with any or all the features available on the POWER SERIES, based on customer preference. It is intended for resistive heaters, but can also be used on transformer connected loads in the phase angle firing mode.

Three-Phase, Two Leg Configuration

This configuration is intended for zero cross firing only into a stable resistive heater. Typically, a three-phase delta or ungrounded wye connected heater is used and only two of the three VAC line phases are switched. The third phase is a direct connection through a bussbar on board the POWER SERIES. Heater current monitoring and kVA options are available via the heater diagnostics option.

Three-Phase, Three-Leg Configuration

All POWER SERIES options are available with this configuration. It works well with phase angle firing into a three-phase, three-wire wye or delta connected heater. In this configuration, the more common applications are transformer connected loads with heaters requiring a soft start and/or current limiting.

The three-phase, four-wire configuration is intended for zero cross firing into a three-phase grounded wye/star heater. (This is a separate hardware option, model number dependent.)

Single-Phase, Multizone Configuration

This configuration is available in two and three single-phase zones and all the features of a single-phase unit are available. (Note that there is only one alarm relay and all zones in the controller must use the same control method.)

Heater Diagnostics

Heater diagnostics may include some or all of the features that require heater current monitoring, depending on the model selected. Heater current monitoring is only available with heater diagnostics installed on the controller. The features dependent on heater current monitoring are heater bakeout, current limiting, heater kVA monitoring, retransmit and heater monitoring alarms such as open heater, heater out of tolerance, load balance and shorted SCR detection/error. Heater diagnostics must also be installed if you need phase angle control with current limit.

POWER SERIES

Ordering Information

Part Number

①	② Package Style	③ Phase	④ Heater Diagnostics		⑤⑥⑦ Output Amperage Rating	⑧ Output Voltage Rating		⑨ Comm.	⑩ Feedback/ Retransmit	⑪⑫ Custom
P	C			-			-			

②	Package Style
C =	65 to 250A

③	Phase
1 =	1-phase
2 =	3-phase/2-leg control, (4 SCRs)
3 =	3-phase/3-leg control, (6 SCRs)
4 =	3-phase/4-wire, wye connected load
8 =	2 single-phase zones (specify 01 or 03 for custom)
9 =	3 single-phase zones (specify 01 or 03 for custom)

④	Heater Diagnostics
0 =	None
1 =	Heater diagnostics (Current limiting and heater bakeout are only available on single-phase and 3-phase, 3-leg controllers)

⑤⑥⑦	Output Amperage Rating
See amperage chart below	

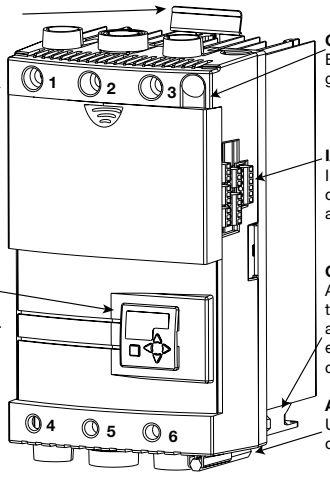
⑧	Output Voltage Rating
A =	24 to 120V
B =	200 to 480V
C =	200 to 600V

⑨	Communications
0 =	None
1 =	EIA/TIA-232/485 communications, opto-isolated, (field selectable)

⑩	Feedback/Retransmit
0 =	None
1 =	Load current feedback (0-10V or 0-20mA scalable retransmit output) (Must have heater diagnostics selected)

⑪⑫	Custom
00 =	None
AA =	No Watlow logo with agency approval marks
AB-ZZ =	Custom, contact your Watlow representative for options
01 =	Select for PC8 or PC9 using single-phase power supply, Watlow logo
03 =	Select for PC8 or PC9 using multi-phase power supply, Watlow logo

POWER SERIES Features



Removable Mounting Plate
Power Series snaps on a pre-mounted, removable subplate.

Terminal Cover
Electrically touch-safe package.

Fuse Cover
Slides up and down for fuse maintenance and covers the high voltage components.

Digital Programmer/Display
For controller configuration, setup and monitoring features.

Ground Lug
Built in, designed for easy ground connections.

I/O Port
Input, retransmit output, communications and alarms.

On-Board Fan
A fan is integrated into the package on forced air cooled models to eliminate separate power connection for fan.

Allen Wrench
Used to torque terminals one to six and ground lug.

Amperage Chart—122˚F (50˚C)

	Single-Phase		3-Phase, 2-Leg and 2 Single-Phase Zones		3-Phase, 3-Leg, 3 Single-Phase Zones and 4-Wire Model	
	Code	Amp	Code	Amp	Code	Amp
Non Fan Cooled	N20	100A	N20	80A	N20	65A
	N25	140A	N25	105A	N25	85A
	N30	165A	N30	120A	N30	105A
Fan Cooled	F20	125A	F20	120A	F20	90A
	F25	200A	F25	160A	F25	140A
	F30	250A	F30	185A	F30	155A
	N/A	N/A	F35	250A	F35	225A

Note: For current ratings at other temperatures see the rating curves in the POWER SERIES User's Manual available at www.watlow.com.

Replacement Fuses for Power Series

Watlow Part Number	Description	Bussmann Part Number
0808-0102-0100	100 amp @ 600VAC	170M1317
0808-0102-0125	125 amp @ 600VAC	170M1318
0808-0102-0160	160 amp @ 600VAC	170M1319
0808-0102-0200	200 amp @ 600VAC	170M1320
0808-0102-0250	250 amp @ 600VAC	170M1321
0808-0102-0315	315 amp @ 600VAC	170M1322

E-SAFE® II

The E-SAFE® II hybrid power switch provides reliable and accurate power switching up to 35 amperes at 158°F (70°C). This mercury-free product is specifically designed to operate in the higher ambient temperatures of foodservice equipment applications.

Utilization of mercury relays is being eliminated due to many regulations affecting its use in the United States and around the world. The E-SAFE II is the best performing product at the most economical price. Because of the product's unique design, there is no need to purchase costly heat sinks used with traditional solid state relays (SSRs). In addition, since this is a three-phase device, there is no need to wire multiple command signals. With a switching life of millions of cycles and an ambient rating of 158°F (70°C), with no heat sink required, this product is superior to typical SSRs.

The E-SAFE II hybrid power switch provides foodservice operators with longer contact life and higher performance than typical mechanical contactors used in equipment. By using Watlow's patent NO-ARC technology, the E-SAFE II can switch millions of cycles to increase the life of the product with reduced noise and increased temperature accuracy. E-SAFE II's inherent ability to operate at fast cycle times makes it an ideal complementary product for a time, proportional, integral derivative (PID) controller.

E-SAFE II is mercury free, RoHS compliant by design, CE approved and C-UL®/UL® recognized. The reliability of the product is protected by a two-year warranty.

Typical Applications

- Griddles
- Convection ovens
- Steamers
- Toaster ovens
- Fryers
- Conveyor ovens
- Holding cabinets
- Dishwashers/warewashers

Features and Benefits

Mercury free
- Improves safety by eliminating risk of toxic metals in proximity to food
- Adheres to federal and state regulations to phase out and ban mercury

High ambient temperature rating of 158°F (70°C)
- Specifically designed to operate in the higher ambient temperatures of foodservice applications

NO-ARC hybrid power switch technology
- Combines the current carrying capacity of mechanical contacts with the longevity of solid state technology
- Allows faster cycling times than mechanical contactors
- Delivers more precise temperature control, saves energy, extends heater life and decreases total cost of ownership

Compact and touch-safe package
- Fits in shallow foodservice cabinets
- Allows for horizontal or vertical mounting installations
- Increases safety for installer/operator
- Uses Ultem® enclosure material with a horizontal burn rating (HB) rating of 338°F (170°C) and a UL® flame retardant rating of 94 5VA

RoHS compliant by design
- Specifically designed to meet Asian and European requirements

LED indicator light
- Indicates command signal presence from controller
- Assists in troubleshooting

Agency approvals
- UL® recognition, C-UL® and CE
- W.E.E.E. compliant

E-SAFE II

Specifications

Output voltage
- 200/240VAC +10/-15%, 50/60Hz, 100/120VAC +10/-15%, 50/60Hz

Output amperage
- Up to 35A single, dual and three-phase

Operating environment
- 32 to 158°F (0 to 70°C) operating temperature
- 0 to 90% RH (relative humidity), non-condensing
- Operational life: four million switching cycles
- Installation category III, pollution degree 2

Control mode
- NO-ARC hybrid contactor

Input command signal
- 3 to 32VDC, 24VAC +20/-20%, off state ≤2.7VDC
- 100 to 240VAC +10/-15%, (85 to 264VAC)
  Note: On the 100 to 240VAC input models, do not use a RC snubber on the E-SAFE II relay input or the temperature control command signal output

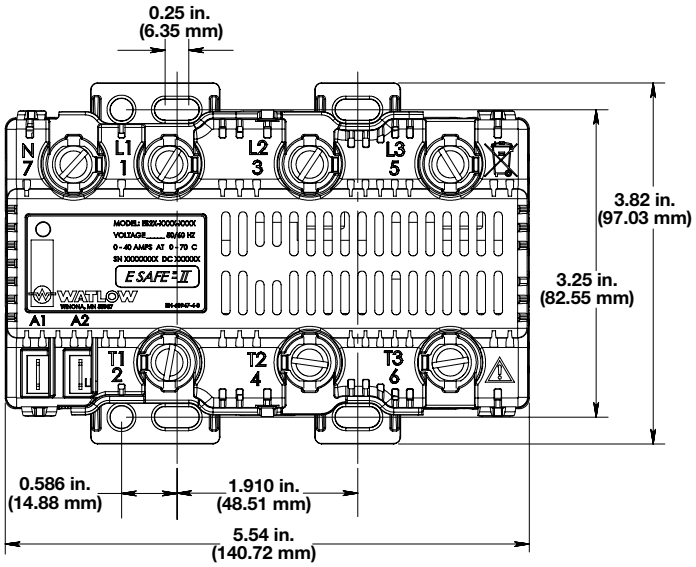
LED indicator light
- Built in LED assists in troubleshooting; LED “off” indicates relay(s) are open, LED “on” indicates relay(s) are closed.

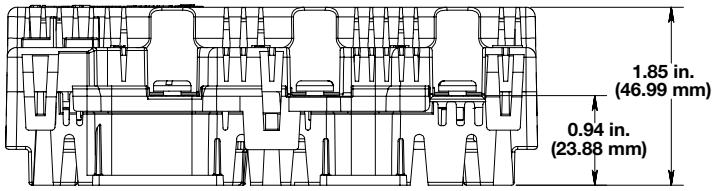
Input command signal terminals
- 1/4 in. fast on appliance

Line and load terminals
- No. 10 screw will accept ring or spade, 1/4 in. (6.35 mm) x 10-32

Mounting
- Back panel mount, horizontal or vertical mounting options

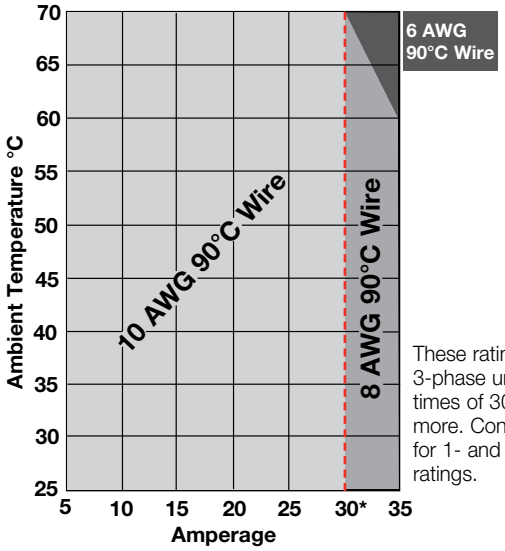
Dimensional Drawings





E-SAFE II

Product Rating Curve



These ratings apply to 3-phase units with cycle times of 30 seconds or more. Consult the factory for 1- and 2-phase unit ratings.

UL® Conditions of Acceptability
Applications must be tested as described below for specific wire insulation or specific wire gauge sizes. Tests shall be performed in the end application under worst case operating conditions.

Test Procedure

A. Monitor temperatures of terminals, using thermocouples between the ring terminal and connectors L1, L2 or L3. The temperature must not exceed 203°F (95°C).
B. Monitor temperatures of wire insulation, using a thermocouple located three inches from the connector. The temperature must not exceed the insulation rating of the wire.

*30A is maximum rating when operating above 240VAC.
Warning: Thermocouples attached to terminals will be at load voltage potential, measurements need to be taken with isolated equipment or isolate the sensor from terminal with suitable insulation.

Ordering Information

Part Number

①②③	④ Number of Poles	⑤ Load Voltage		⑥⑦ Command Signal Voltage	⑧ Future Option		⑨ Future Option	⑩⑪⑫ Custom Options
ES2		-			0	-	0	

④	Number of Poles
1 =	1 pole
2 =	2 poles controlled
3 =	3 poles controlled

⑤	Load Voltage
1 =	100 to 120VAC
2 =	200 to 240VAC
3 =	230/277VAC (400/480VAC with wye/star, neutral connected to center required)

⑥⑦	Command Signal Voltage
LV =	Low voltage 3 to 24VDC or 24VAC
HV =	High voltage 100 to 240VAC +10/-15% (85 to 264VAC)

⑩⑪⑫	Custom Options
000 =	Standard product
Any three letters or numbers = cosmetic options	

SERIES CZR

The SERIES CZR solid state relay provides a low-cost, highly-compact and versatile solid state option for controlling electric heat. With DIN-rail and back panel mounting standard on every controller, the CZR allows for simple and quick installation.

The extensive capabilities of the SERIES CZR include single-phase, 18 to 42 ampere zero-cross switching up to 600VAC (see output rating curve). Its unique integrated design removes the guesswork associated with selecting a proper heat sink and precise terminations for the application.

This controller holds many agency certifications and is ideal for applications that require UL®, CSA and CE approvals. The SERIES CZR is available in VAC/VDC input contactor versions and all configurations are model number dependent and factory selectable.

The SERIES CZR is protected by a two-year warranty.

Features and Benefits

DIN-rail or standard panel mount
- Versatile, quick and low-cost installation

Compact size
- Reduces panel space and cost

Touch-safe terminals
- Increases installer and operator safety

Mercury free
- Environmentally safe

Faster switching with solid state
- Saves energy and extends heater life

UL® 508 recognized, CSA LR700195 certified, CE 60950 and RoHS
- Applications requiring agency approval

Back-to-back SCR design
- Offers rugged design for different application environments

SERIES CZR

Specifications

Control Mode
- Zero-cross fired contactor output

Operator Interface
- Command signal input
- Input signal indication LED

Input Command Signal
- Input Type DC1
  - Turn on voltage 4VDC max., turn off voltage 1VDC min.
  - Input current: dc typically 10mA @ 4VDC,13mA @ 32VDC
- Input Type AC1
  - 90 to 140Vrms, must turn on at 90VAC, must turn off at 10VAC
  - Input current: 15mA typical @ 120VAC

Output Voltage
- 24V; 24VAC min. to 280VAC max.
- 48V; 48VAC min. to 530VAC max.
- Off state leakage: 10mA at 77°F (25°C) max. for 24 through 480VAC models
- Holding current: 250mA max.

Output Amperage
- See output rating curve. Ratings are into a resistive heater load.

Output Amperage Rating

Model	18	24	34	42
Max. Surge Current 16.6 mSec	625	250	625	1000
Max. I^2t Fusing	1620	260	1620	4150

Agency Approvals
- Class II construction
- UL® 508 recognition, File #E73741 and CSA File LR 700195
- CE per 2006/95/EC Low Voltage Directive
- 2011/65/EU RoHS

Output Terminals
- Compression type
- For 18A models:
  - Max. wire size 3.0 mm (10 AWG), torque to 0.6Nm (5.3 in. lbs)
- For 24 to 42A models:
  - Max. wire size 16.0 mm (6 AWG stranded) torque to 1.5-1.7Nm (13-15 in. lbs)

Operating Environment
- Up to 176°F (80°C). See output rating curves for applications
- 0 to 90% RH (relative humidity), non-condensing
- Insulation tested to 3,000 meters
- Units are suitable for “pollution degree 2”
- Cycle time should be less than 3 seconds

Mounting
Options include DIN-rail or standard back panel mounting.
- The DIN-rail specification: DIN EN 50022, 1.38 in. x 0.30 in. (35 mm x 7.5 mm)
- Min. clipping distance: 1.37 in. (34.8 mm)
- Max. clipping distance: 1.39 in. (35.3 mm)
- Mount cooling fins vertical

Weight/Dimensions
- 9.2 oz (260g)
- 24 to 42A models: 3.95 in. (100 mm) high x 1.75 in. (45 mm) wide x 4.3 in. (109 mm) deep
- 18A models: 3.95 in. (100 mm) high x 0.89 in. (22.6 mm) wide x 3.9 in. (99 mm) deep

SERIES CZR

Ordering Information

Part Number

①	②	③④	⑤	⑥⑦	⑧	⑨⑩⑪	⑫
	Control Mode	Output Amperage		Output Voltage		Input Type (Contactor)	
C	Z		- A		V	-	0

②	Control Mode
Z =	Zero cross

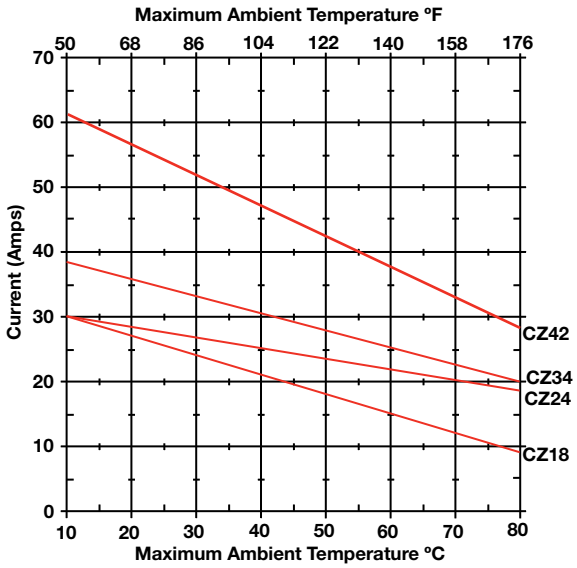
③④	Output Amperage
18 =	18A
24 =	24A
34 =	34A
42 =	42A

⑥⑦	Output Voltage
24 =	24 to 280VAC
48 =	48 to 530VAC

⑨⑩⑪	Input Type (Contactor)
DC1=	4 to 32VDC
AC1=	90 to 140VAC

Note: Do not use the AC1 input type with temperature controller outputs that include an AC snubber filter. This could cause the SERIES CZR to stay full on.

Output Rating Curve



Solid State Relays (SSR)

Watlow solid state relays (SSR) offer many of the advantages of solid state power controllers, yet at a lower cost. Watlow's extensive knowledge in power controller design has led to the development of a special fast cycle input card that enables a SSR to operate from a standard 4-20mA instrumentation command signal. Test results have shown that a zero cross SSR in combination with the fast cycle card promotes better temperature control and longer heater life than slow cycle relays. Through a time proportional cycle rate of one tenth of a second heater life will be extended.

Both low and high voltage models are available from 24 up to 530VAC. All ac output models include back-to-back Silicon Controlled Rectifiers (SCRs) for a more rugged design than the traditional triac based SSR. The internal design allows it to handle high currents and the harsh electrical environments of heavy industry. Watlow also offers a switched VDC model for dc heating applications.

Watlow can provide all the components necessary for trouble-free operation. This includes two standard convenience items: a thermal foil to ensure proper thermal transfer from the relay to the heat sink and belville washers that ensure the relay is mounted with sufficient pressure for good heat transfer. Matched semiconductor fuses and heat sinks are available to complete the power switching package.

Features and Benefits

Fast cycle card
- Increases heater life
- Optimizes temperature control
- Allows for higher watt density heaters

Zero cross firing
- Results in minimal electrical noise

Back-to-back SCR design
- Withstands harsh or hostile industrial environments

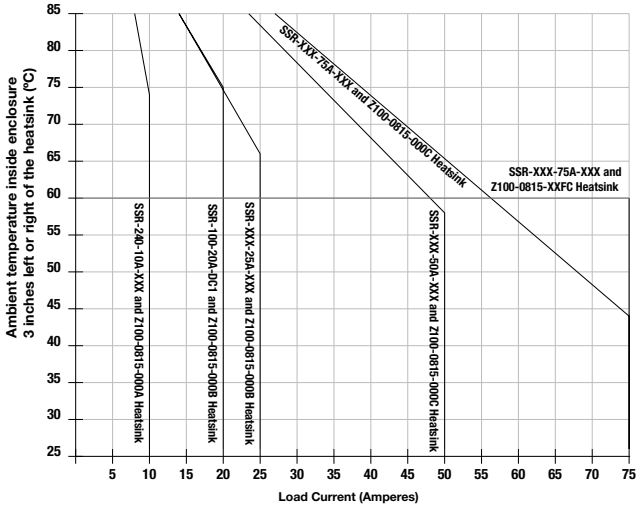
UL® recognized File #E151484 and #E73741
CSA certified up to 600VAC, File #LR700195
VDE 60950 License #40021401, File #1995500
up to 480VAC, CE - EN 60950 and RoHS
- Meets applications requiring agency approval

Solid State Relays

Specifications

Specifications Standard To All SSRs:	
Dielectric Strength (Volts)	4000 RMS
Input, DC Control	
Voltage range	3-32VDC
Typical input current	3.4 to 20mA
Turn on voltage (max.)	3VDC
Turn off voltage (min.)	1VDC
Input, AC Control	
Voltage range	90-280VAC
Typical input current	2mA (typical) @ 120VAC 4mA (typical) @ 240VAC
Turn on voltage (max.)	90VAC
Turn off voltage (min.)	10VAC
AC Output (Max.)	
Forward voltage drop	1.5VAC and 2.1VDC
Min. holding current (mA)	50mA
Turn on-off time (ms)	up to 10ms (max.)
Frequency range	47 to 63Hz

Ambient Temperature Operating Curve



120/240VAC						
Model Number	**SSR-240-10A-DC1**	**SSR-240-25A-DC1**	**SSR-240-50A-DC1**	**SSR-240-10A-AC1**	**SSR-240-25A-AC1**	**SSR-240-50A-AC1**
Current output	10A	25A	50A	10A	25A	50A
Nominal voltage	120/240VAC	120/240VAC	120/240VAC	120/240VAC	120/240VAC	120/240VAC
One cycle surge current	120A	250A	625A	120A	250A	625A
Max. I^2t for fusing	$60A^2$ seconds	$260A^2$ seconds	$1,620A^2$ seconds	$60A^2$ seconds	$260A^2$ seconds	$1,620A^2$ seconds
Thermal resistance	1.48° C/W	1.05° C/W	0.63° C/W	1.48° C/W	1.05° C/W	0.31° C/W
Ambient operating temperature	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)
Output (Max.)						
Voltage range	48-280VAC	48-280VAC	48-280VAC	48-280VAC	48-280VAC	48-280VAC
Over voltage rating	600V (peak)	600V (peak)	600V (peak)	600V (peak)	600V (peak)	600V (peak)
Off state leakage	10mA	10mA	10mA	10mA	10mA	10mA

120/240VAC			Random Fired Models			100VDC
Model Number	**SSR-240-75A-DC1**	**SSR-240-75A-AC1**	**SSR-480-50A-RND**	**SSR-480-75A-RND**	**SSR-240-10A-RND**	**SSR-100-20A-DC1**
Current output	75A	75A	50A	75A	10A	20A
Nominal voltage	120/240VAC	120/240VAC	480VAC	480VAC	120/240VAC	100VDC
One cycle surge current	1000A	1000A	625A	1000A	120A	42A (10ms)
Max. I^2t for fusing	$6000A^2$ seconds	$6000A^2$ seconds	$1,620A^2$ seconds	$6000A^2$ seconds	$60A^2$ seconds	N/A
Thermal resistance	0.31° C/W	0.31° C/W	0.63° C/W	0.31° C/W	1.48° C/W	1.06° C/W
Ambient operating temperature	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-4 to 176°F (-20 to 80°C)
Output (Max.)						
Voltage range	48-280VAC	48-280VAC	80-530VAC	80-530VAC	48-280VAC	0-100VDC
Over voltage rating	600V (peak)	600V (peak)	1200V (peak)	1200V (peak)	600V (peak)	N/A
Off state leakage	10mA	10mA	10mA	10mA	10mA	0.3mA VDC

480 VAC						
Model Number	**SSR-480-25A-DC1**	**SSR-480-50A-DC1**	**SSR-480-75A-DC1**	**SSR-480-25A-AC1**	**SSR-480-50A-AC1**	**SSR-480-75A-AC1**
Current output	25A	50A	75A	25A	50A	75A
Nominal voltage	480VAC	480VAC	480VAC	480VAC	480VAC	480VAC
One cycle surge current	250A	625A	1000A	250A	625A	1000A
Max. I^2t for fusing	$260A^2$ seconds	$1,620A^2$ seconds	$6,000A^2$ seconds	$260A^2$ seconds	$1,620A^2$ seconds	$6,000A^2$ seconds
Thermal resistance	1.02° C/W	0.63° C/W	0.31° C/W	1.02° C/W	0.63° C/W	0.31° C/W
Ambient operating temperature	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)	-40 to 176°F (-40 to 80°C)
Output (Max.)						
Voltage range	48-530VAC	48-530VAC	48-530VAC	48-530VAC	48-530VAC	48-530VAC
Over voltage rating	1200V (peak)	1200V (peak)	1200V (peak)	1200V (peak)	1200V (peak)	1200V (peak)
Off state leakage	10mA	10mA	10mA	10mA	10mA	10mA

Solid State Relays

Heater Life

Watlow has extensively tested electric heating elements with a variety of power switching devices. Results prove that the life of an electric element dramatically increases when the on-off cycle time that is used to time-proportion the heater is kept at less than one second. This reduces the thermal expansion and contraction of the element and improves heater life as much as 20 times. This very fast cycle time controls temperature much more accurately and allows the use of higher watt density heating elements.

Fast Cycle Card

In order to obtain the very rapid cycling time required for longer heater life, accurate temperature control and higher watt densities, Watlow has developed a loop-powered firing card for SSRs. This card operates from a standard instrumentation signal of 4 to 20mA and controls solid state relays with a time proportional cycle rate of less than one second (4VAC cycles on and 4VAC cycles off at 50 percent power).

Thermal Transfer

A thermal foil is provided with each solid state relay for mounting on the base of the relay to improve heat transfer. In addition, two belville washers are supplied to provide the proper pressure for this transfer of heat. Use two #8-32 screws 0.625 in. (16 mm) long to secure the relay to the heat sink.

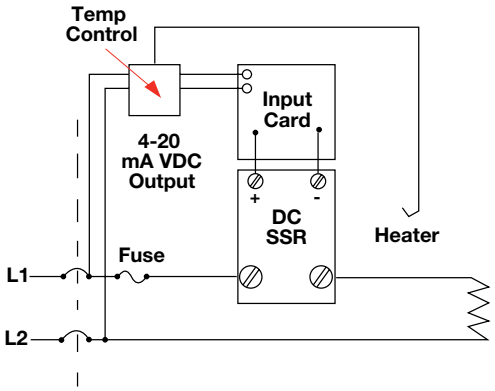
Replacing Contactors or Mercury Displacement Relays (MDRs)

Improvements in heater life and control accuracy can be achieved with SSRs operated with rapid cycle times as compared to slower operating electromechanical relays or even MDRs. When replacing these types of relays with the SSR, it is important to consider two aspects:

1. **Heat**
   Solid state devices require a small voltage to turn on, which is consumed as heat (approx. 1.5 volts x amps = watts). This heat must be removed from the device and is usually accomplished by mounting the relay on a heat sink.
2. **Failure Mode**
   Solid state devices should last for many years when properly protected with voltage snubbers, mounted on appropriate heat sinks and when fused with semiconductor fuses against the high currents caused by electrical shorts. Watlow's SSRs include an internal voltage snubber. However, if the unit fails, the most probable condition will be a short. Mechanical relays also have a good probability of failing short. In all cases where uncontrolled full power can cause damage, it is recommended that a high limit temperature controller and contactor be used for protection.

Wiring Diagrams

Single-Phase Fast Cycle Input Card



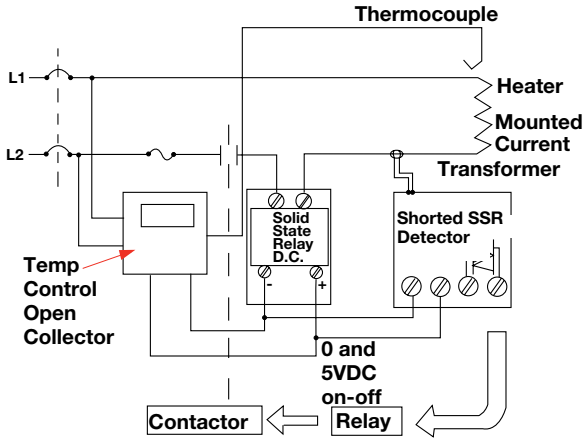
Shorted SSR Alarm

The most prevalent concern when using solid state relays is the possibility of a relay failing in a shorted condition. With this in mind, Watlow has designed a cost effective "Shorted SSR Alarm."

The device monitors the output (current through the heater) and activates a triac (alarm) if there is no command signal from the temperature controller. The triac can be wired to a bell, or to a normally closed latching relay to remove power to the heater.

The shorted SSR alarm is not a substitute for an agency-approved high-temperature limit device.

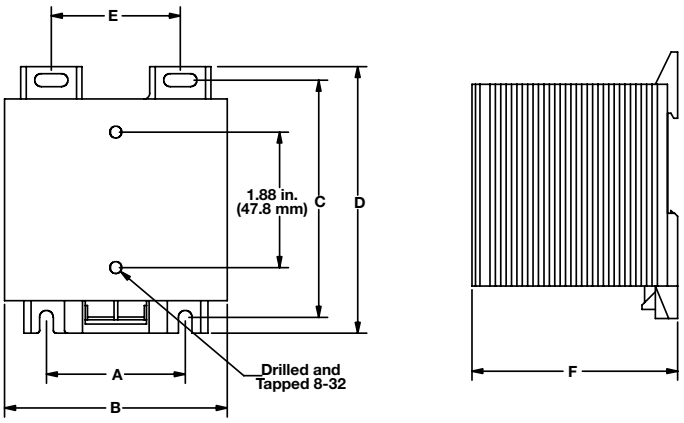
Single-Phase Shorted SSR Detector



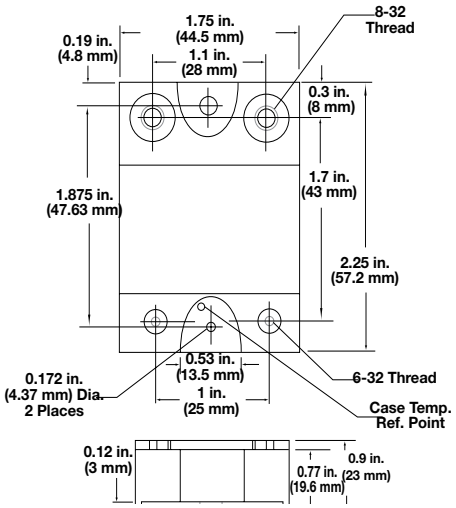
Note: Semiconductor power switching devices are not legal for over temperature limit or safety devices. For limit and safety devices you must have a positive mechanical break of all electrically hot legs simultaneously.

Solid State Relays

Dimensions - Heat Sink



Dimensions - Solid State Relay



Heat Sink Dimensions by Part Number

Part Number	Descriptor	Dimensions											
		A		B		C		D		E		F	
		in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
Z100-0815-000A	18A	N/A		1.8	(46)	3.25	(82.6)	3.7	(94)	N/A		1.9	(48)
Z100-0815-000B	35A	1.91	(48.5)	3.2	(81)	3.25	(82.6)	3.7	(94)	1.81	(46)	2.9	(74)
Z100-0815-000C	55A	1.89	(48)	3.2	(81)	5.45	(138.4)	5.89	(149.6)	1.81	(46)	3.6	(91)
Z100-0815-XXFC*	75A	1.89	(48)	3.2	(81)	5.45	(138.4)	7.16	(181.9)	1.81	(46)	3.6	(91)

*Fan cooled

Ordering Information

Part Number

①②③		④⑤⑥		⑦⑧		⑨		⑩⑪⑫
		Voltage		Current				Control Voltage
SSR	-		-			A	-	

④⑤⑥	Voltage
100 =	0 to 100VDC (20A model only)
240 =	24 to 240VAC
480 =	24 to 530VAC

⑦⑧	Current
10 =	10A
20 =	20A (100VDC model only)
25 =	25A
40 =	40A
50 =	50A
75 =	75A

⑩⑪⑫	Control Voltage
DC1 =	3 to 32VDC (see specifications)
AC1 =	90 to 280VAC
RND =	3 to 32VDC (10, 50 and 75A models only)
Note: Relay will also include thermal foil, two belville washers and #8-32 screws for mounting to a heat sink.	

Heat Sinks (sold separately)	
Z100-0815-000A =	18A or 2.2°C/watt
Z100-0815-000B =	35A or 1.1°C/watt
Z100-0815-000C =	55A or 0.6°C/watt
Z100-0815-12FC =	75A or 0.16°C/watt (120VAC fan)
Z100-0815-24FC =	75A or 0.16°C/watt (240VAC fan)

Fast Cycle Input Card and Shorted SSR Alarm Card	
For direct mounting on zero cross dc input solid state relay.	
RPC-5399-42-000 =	Fast cycle input card, 4 to 20mA input
RPC-5386-0000 =	Shorted SSR alarm card

Sub Cycle Fuses - I^2T (sold separately)
Recommended and available with holders.