# Power Switching Devices

<table>
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<tr>
<th>Product</th>
<th>Maximum Output</th>
<th>Output Firing</th>
<th>Phase Configurations</th>
<th>Agency Approvals</th>
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<tbody>
<tr>
<td>ASPYRE® DT</td>
<td>1100A</td>
<td>Zero Cross, Phase Angle, Half Cycle, Single Cycle, Delayed Triggering</td>
<td>1 or 3</td>
<td>C-UL®, CE, SCCR, RoHS, W.E.E.E.</td>
<td>295</td>
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<tr>
<td>EZ-ZONE® ST</td>
<td>75A</td>
<td>Zero Cross, Phase Angle</td>
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<td>UL®, CSA, CE, SCCR, RoHS</td>
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<tr>
<td>DIN-A-MITE® A</td>
<td>25A</td>
<td>Zero Cross</td>
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<tr>
<td>DIN-A-MITE B</td>
<td>40A</td>
<td>Zero Cross</td>
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<tr>
<td>DIN-A-MITE C</td>
<td>80A</td>
<td>Zero Cross, Phase Angle</td>
<td>1 or 3</td>
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<tr>
<td>DIN-A-MITE D</td>
<td>100A</td>
<td>Zero Cross</td>
<td>1</td>
<td>UL®, C-UL®, CE, SCCR, RoHS</td>
<td>315</td>
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<tr>
<td>POWER SERIES™</td>
<td>250A</td>
<td>Zero Cross, Phase Angle</td>
<td>1 or 3</td>
<td>UL®, C-UL®, CE, SCCR</td>
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<tr>
<td>E-SAFE® II</td>
<td>35A</td>
<td>Zero Cross</td>
<td>1, 2 or 3</td>
<td>UL®, C-UL®, CE, RoHS, W.E.E.E.</td>
<td>323</td>
</tr>
<tr>
<td>SERIES CZR</td>
<td>42A</td>
<td>Zero Cross</td>
<td>1</td>
<td>UL®, CSA, CE, RoHS</td>
<td>326</td>
</tr>
<tr>
<td>Solid State Relays (SSR)</td>
<td>75A</td>
<td>Zero Cross</td>
<td>1</td>
<td>UL®, CSA, RoHS</td>
<td>329</td>
</tr>
</tbody>
</table>

**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.
# Power Switching Devices

## Comparison Guide

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

1 Includes heater replacement and lost production.
Power Switching Devices

ASPYRE® DT

Watlow’s ASPYRE® DT 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 DT models available include sizes from 35 to 2100 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 DT 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)
• Minimizes damage in the event of a short circuit

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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 need to work in a hazardous environment near high voltage when configuring the controller. High voltage to the controller and panel can be turned off while setting controller configuration.
Power Switching Devices

ASPYRE DT

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 2100A @ 40°C ambient
- Amperage derating curve for other ambient temperatures

SCR Ratings
- Latching current 1A min.
- Power dissipation: approximate 1.25 to 1.5 watts per amp per controlled leg
- Leakage current: (35A to 800A models): 15mA
- Leakage current: (1100A to 2100A models): 300mA
- Short Circuit Current Rating (SCCR): 100,000A up to 600VAC

Line and Load Voltage Range
- 24 to 480V ±10% min./max.
- 24 to 600V ±10% min./max.
- 24 to 690V ±10% min./max.
  690VAC only available for 60A and greater models
- Isolation voltage 2500V

Voltage frequency
- 50 to 60Hz

Feedback Types
- Voltage, voltage squared, current, current squared, power, open loop and external
- All feedback types available with any firing type combination

Load Types
- Normal resistive loads: nichrome, infrared lamps (medium and long waveform)
- Others: Moly (Kanthal® Super), transformers, silicon carbide, UV lamps, short wave infrared lamps (such as tungsten)

Current Limiting and Heater Bakeout
- Available on single-phase models and three-phase, three-leg models 60A to 2100A

<table>
<thead>
<tr>
<th>Firing Type Combinations</th>
<th>Single-Phase</th>
<th>3-Phase, 2-Leg</th>
<th>3-Phase, 3-Leg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero Crossing</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Zero Crossing + Start Ramp</td>
<td>X</td>
<td></td>
<td>X*</td>
</tr>
<tr>
<td>Zero Crossing + Start Ramp + Soft Start</td>
<td>X</td>
<td></td>
<td>X*</td>
</tr>
<tr>
<td>Zero Crossing + Soft Start</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Burst Firing</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Burst Firing + Soft Start</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Burst Firing + Start Ramp</td>
<td>X</td>
<td></td>
<td>X*</td>
</tr>
<tr>
<td>Burst Firing + Start Ramp + Soft Start</td>
<td>X</td>
<td>X*</td>
<td></td>
</tr>
<tr>
<td>Burst Firing + Current Limit</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Digital Inputs 1 and 2
- On ≥4VDC, off <1VDC
- 4 to 30VDC @ 5mA max.
- Optically isolated
- Digital input functions: enable, SSR, alarm reset, change to voltage feedback, local/remote set point enable, change firing to phase angle, select analog input 1 or 2 for set point, enable data logging, enable heater bakeout
- A switched DC control output can be connected to the digital input as an open loop control mode command signal

Analog Inputs 1 and 2
- Voltage: 0 to 10VDC, 15KΩ impedance
- Current: 0 to 20mA or 4 to 20mA, 100Ω impedance
- Potentiometer: 10KΩ min.
- Analog Input 1 Function: set point reference
- Analog Input 2 Functions: current limit, feedback or set point reference

*60A to 2100A models
Power Switching Devices

ASPYRE DT

Analog Output
• 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 setpoint

Alarm Outputs
• Form C, electromechanical relay, 30VDC at 1A resistive load or 0.5A at 125VAC, 6000 cycles at 30VDC, 100,000 cycles at 120VAC
• Alarm Relay Functions: alarm output options for heater open/break, SCR short, current limit and/or communication watchdog and SCR over-temperature
• Open Fuse Relay Output: 1100 to 2100A models

DC Power Supply for Digital Inputs and Potentiometer Remote Set Point Input
• 10VDC @ 10mA max.

Auxiliary Power Input
• 35A to 800A: 8VA max.
• 1100A to 2100A: 14VA max.
• For 35A to 800A must be same as nominal switched line voltage

<table>
<thead>
<tr>
<th>Auxiliary Power Option</th>
<th>Max. Operating Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>100/120VAC</td>
<td>90 to 135VAC</td>
</tr>
<tr>
<td>200/208/220/230/240VAC</td>
<td>180 to 265VAC</td>
</tr>
<tr>
<td>277VAC</td>
<td>249 to 305VAC</td>
</tr>
<tr>
<td>380/400/415/440/480VAC</td>
<td>342 to 528VAC</td>
</tr>
<tr>
<td>600VAC</td>
<td>540 to 660VAC</td>
</tr>
<tr>
<td>690VAC</td>
<td>621 to 759VAC</td>
</tr>
</tbody>
</table>

Fusing
• Integrated semiconductor fuse

Diagnostics Messages
• Heater break (open), SCR short circuit (closed), current limit, thermal switch, SD card error, communication watchdog error, bakeout in process, auxiliary voltage too low or high, voltage line loss
• Additional messages for 1100A to 2100A models: blown fuse, fan failure

Configuration
• ASPYRE Configuration PC software via EIA-485 or USB, and on-board operator interface

Operator Interface
• 0.96 in. white OLED display with 128 x 64 pixel resolution
• Four buttons: local/remote (L/R), function (F) up arrow and down arrow
• Four indicators: local/remote mode, enable, communication and alarm

Connectivity*
• Port 1: Modbus® RTU
• Port 2: Modbus® TCP, EtherNet/IP™, PROFINET
• USB 2.0 device

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

Integrated Data Logging
• Storage: 16 GB SD memory card
• File type: comma separated value (*.csv)
• 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)

Cooling mode
• Forced air (fan)
• 24VDC, 120 or 240VAC
• 60A to 210A Models: one 17 W fan per switched leg
• 300A to 700A Models: 34 W (single-phase models), 68 W (two-leg and three-leg models)
• 800A Models: two 17 W fans per switched leg
• 1100A to 2100A Models: two 75 W fans per switched leg

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

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

Environment
• 0 to 40° without derating
• 5 to 90% RH (relative humidity), non-condensing
• Up to 6560 feet (2000m) above sea level maximum
• Over 1000 meters of altitude reduce the nominal current by 2% for each 100 meters
• Storage temperature -25 to 70°C max.
• Pollution degree: Installation Category III, Pollution degree 2
• Install away from direct sun light, conductive dust, corrosive gas, vibration, water and corrosive salts

**Note:** If using both Analog Restransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1, 3, 4 or 5) an external power supply is required. See power supply accessory on page ??
Power Switching Devices

ASPYRE DT

Agency Approval and Regulatory
- 35A to 700A models: cULus 508 Listed File E73741
- 35A to 700A models: cUL® Listed to C22.2 No. 14
- 800A to 2100A models: UL® 508 Listed File E73741
- CE EMC Directive 2014-30-EU, EN 60947-4-3 Class A
- CE Safety Directive 2014-35-EU, EN 60947-4-1, 4-3
- RoHS 2011-65-EU
- W.E.E.E. 2012-19-EU
- 690VAC units not covered by UL®

Accessories
- 6 ft USB 2.0 to micro USB device cable (p/n 0219-0480-0000)
- External power supply UL® Class 2, 90-263VAC input, 24VDC output, 1.30A, 31W (p/n 0847-0299-0000)
- Fuses - see table in next column

Fuses

<table>
<thead>
<tr>
<th>ASPYRE Model Number</th>
<th>Qty. Used Per Unit</th>
<th>480V and 600V</th>
<th>690V</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/leg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DT_ _ _ - 035 ...</td>
<td>1</td>
<td>17-8050</td>
<td>N/A</td>
</tr>
<tr>
<td>DT_ _ _ - 040 ...</td>
<td></td>
<td>0808-0363-0160</td>
<td>2048-2760</td>
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<td>DT_ _ _ - 060 ...</td>
<td></td>
<td>0808-0363-0180</td>
<td>2048-4405</td>
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<td>DT_ _ _ - 090 ...</td>
<td></td>
<td>0808-0363-0200</td>
<td>2048-4418</td>
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<tr>
<td>DT_ _ _ - 120 ...</td>
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<td>0808-0363-0250</td>
<td>2048-4426</td>
</tr>
<tr>
<td>DT_ _ _ - 150 ...</td>
<td></td>
<td>0808-0363-0315</td>
<td>2048-4426</td>
</tr>
<tr>
<td>DT_ _ _ - 180 ...</td>
<td></td>
<td>0808-0362-0000</td>
<td>N/A</td>
</tr>
<tr>
<td>DT_ _ _ - 210 ...</td>
<td></td>
<td>0808-0358-0000</td>
<td>0808-0359-0000</td>
</tr>
<tr>
<td>DT1_ _ _ - 300 ...</td>
<td>1</td>
<td>0808-0358-0000</td>
<td>0808-0359-0000</td>
</tr>
<tr>
<td>DT1_ _ _ - 400 ...</td>
<td>1</td>
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<td>0808-0359-0000</td>
</tr>
<tr>
<td>DT1_ _ _ - 500 ...</td>
<td>1</td>
<td>0808-0359-0000</td>
<td>0808-0359-0000</td>
</tr>
<tr>
<td>DT1_ _ _ - 600 ...</td>
<td>4</td>
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<td>0808-0363-0250</td>
</tr>
<tr>
<td>DT1_ _ _ - 700 ...</td>
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<td>0808-0363-0250</td>
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<tr>
<td>DT2_ _ _ - 300 ...</td>
<td>3</td>
<td>0808-0357-0000</td>
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<tr>
<td>DT2_ _ _ - 400 ...</td>
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<td>2055-5072</td>
</tr>
<tr>
<td>DT2_ _ _ - 450 ...</td>
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<td>0808-0359-0000</td>
</tr>
<tr>
<td>DT2_ _ _ - 500 ...</td>
<td>6</td>
<td>0808-0360-0000</td>
<td>0808-0360-0000</td>
</tr>
<tr>
<td>DT3_ _ _ - 300 ...</td>
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<td>2055-5072</td>
</tr>
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<td>DT3_ _ _ - 350 ...</td>
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<td>2055-5072</td>
</tr>
<tr>
<td>DT3_ _ _ - 400 ...</td>
<td>3</td>
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<td>DT3_ _ _ - 450 ...</td>
<td>3</td>
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<td>0808-0359-0000</td>
</tr>
<tr>
<td>DT3_ _ _ - 500 ...</td>
<td>3</td>
<td>0808-0359-0000</td>
<td>0808-0359-0000</td>
</tr>
<tr>
<td>DT_ _ _ - 800 ...</td>
<td>4/leg</td>
<td>0808-0363-0250</td>
<td>0808-0363-0250</td>
</tr>
<tr>
<td>DT_ _ _ - 1K1 ...</td>
<td>2/leg</td>
<td>2078-4948</td>
<td>2078-5301</td>
</tr>
<tr>
<td>DT_ _ _ - 1K4 ...</td>
<td></td>
<td>2078-5257</td>
<td>2078-5358</td>
</tr>
<tr>
<td>DT_ _ _ - 1K6 ...</td>
<td></td>
<td>2078-5257</td>
<td>2078-5358</td>
</tr>
<tr>
<td>DT_ _ _ - 1K8 ...</td>
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<td>2078-5261</td>
<td>2078-5413</td>
</tr>
<tr>
<td>DT_ _ _ - 2K1 ...</td>
<td></td>
<td>2078-5261</td>
<td>2078-5413</td>
</tr>
</tbody>
</table>

N/A - Not available
**ASPYRE DT**

I/O Functional Block Diagram

- **Backup Power**
  - User Interface
  - Communications

- **DC Power Supply**
  - Dry Contact Switches
  - Potentiometers

- **Analog Input**
  - User-Selectable Retransmit Parameter
  - 0 to 20mA or 4 to 20mA
  - 0 to 10VDC

- **USB Device**
  - Configuration
  - Software Connection
  - Data Log File Transfer

- **Analog Retransmit**
  - +10VDC Output
  - +24VDC Input

- **Power Supply**
  - +10VDC Output

- **Power Switching**
  - 1, 2 or 3 Legs
  - Back-to-Back SCR Switching
  - Replaceable Semiconductor Fuses

- **Fan Power**
  - 24VDC
  - 120 or 240VAC

- **Blown Fuse Detection**
  - Optional

- **Current Sensing**
  - Optional

- **Data Logging**
  - Optional

- **Mechanical Relay Output**
  - Alarm Annunciator

- **Industrial Communications**
  - Modbus® TCP
  - Profibus® DP
  - EtherCAT®

- **Auxiliary Power**
  - Controller Electronics
  - Voltage Sensing
  - Zero-Cross Sensing

- **DC Power Supply**
  - Dry Contact Switches
  - Potentiometers

- **Fan Power Input**
  - NO NC

- **RS-485 Interface**
  - Optional

- **Out to Load**

- **Power Switching Devices**
  - 1, 2 or 3 Legs
  - Back-to-Back SCR Switching
  - Replaceable Semiconductor Fuses

- **Power Switching Devices**
  - 120 or 240VAC

* Current Limit

1-phase and 3-phase, 3-leg models only.
Not available on 35 amp and 40 amp, 3-phase 3-leg models.
## ASYPRE DT

### Dimensions and Shipping Weight

<table>
<thead>
<tr>
<th>Current and Voltages</th>
<th>1-Phase, 1 Controlled Leg</th>
<th>3-Phase, 2 Controlled Legs</th>
<th>3-Phase, 3 Controlled Legs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1-Phase</strong></td>
<td><img src="image1.png" alt="Image 1" /> 4.77 in. H x 2.84 in. W x 7.28 in. D - 2.6 lbs</td>
<td><img src="image2.png" alt="Image 2" /> 4.77 in. H x 4.25 in. W x 7.28 in. D - 4 lbs</td>
<td><img src="image3.png" alt="Image 3" /> 4.77 in. H x 5.67 in. W x 7.28 in. D - 5.5 lbs</td>
</tr>
<tr>
<td><strong>3-Phase</strong></td>
<td><img src="image4.png" alt="Image 4" /> 10.6 in. (60A) or 10.79 in. (90-210A) H x 3.66 in. W x 6.7 in. D - 9 lbs</td>
<td><img src="image5.png" alt="Image 5" /> 10.6 in. (60A) or 10.79 in. (90-210A) H x 7.36 in. W x 6.7 in. D - 18 lbs</td>
<td><img src="image6.png" alt="Image 6" /> 10.6 in. (60A) or 10.79 in. (90-210A) H x 11.1 in. W x 6.7 in. D - 27 lbs</td>
</tr>
<tr>
<td><strong>60, 90, 120, 150, 180, and 210A</strong></td>
<td><img src="image7.png" alt="Image 7" /> 17.33 in. H x 5.40 in. W x 10.63 in. D - 23 lbs</td>
<td>60-90A = <img src="image8.png" alt="Image 8" /> 17.33 in. H x 5.40 in. W x 10.63 in. D - 23 lbs</td>
<td>120-210A = <img src="image9.png" alt="Image 9" /> 17.33 in. H x 10.32 in. W x 10.63 in. D - 40 lbs</td>
</tr>
<tr>
<td><strong>60, 90, 120, 150, 180 and 210A</strong></td>
<td><img src="image10.png" alt="Image 10" /> 20.47 in. H x 5.4 in. W x 10.63 in. D - 33 lbs</td>
<td><img src="image11.png" alt="Image 11" /> 20.47 in. H x 10.32 in. W x 10.63 in. D - 63 lbs</td>
<td></td>
</tr>
</tbody>
</table>
**ASPYRE DT**

**Dimensions and Shipping Weight (con’t)**

<table>
<thead>
<tr>
<th>Current and Voltages</th>
<th>1-Phase, 1 Controlled Leg</th>
<th>3-Phase, 2 Controlled Legs</th>
<th>3-Phase, 3 Controlled Legs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>800A</strong>&lt;br&gt;480, 600, 690VAC</td>
<td><img src="image1.png" alt="Image" /> 22.1 in. H x 5.4 in. W x 10.7 in. D - 23.2 lbs</td>
<td><img src="image2.png" alt="Image" /> 22.1 in. H x 10.9 in. W x 10.7 in. D - 46.3 lbs</td>
<td><img src="image3.png" alt="Image" /> 22.1 in. H x 16.2 in. W x 10.7 in. D - 69.5 lbs</td>
</tr>
<tr>
<td><strong>1100A</strong>&lt;br&gt;480, 600, 690VAC</td>
<td><img src="image4.png" alt="Image" /> 21.7 in. H x 13 in. W x 13.7 in. D - 59.5 lbs</td>
<td><img src="image5.png" alt="Image" /> 21.7 in. H x 20.6 in. W x 13.7 in. D - 108 lbs</td>
<td><img src="image6.png" alt="Image" /> 21.7 in. H x 28.3 in. W x 13.7 in. D - 158.7 lbs</td>
</tr>
<tr>
<td><strong>1400, 1600, 1800, 2100A</strong>&lt;br&gt;480, 600, 690VAC</td>
<td><img src="image7.png" alt="Image" /> 28.8 in. H x 13 in. W x 13.7 in. D - 74.9 lbs</td>
<td><img src="image8.png" alt="Image" /> 28.8 in. H x 20.6 in. W x 13.7 in. D - 143.3 lbs</td>
<td><img src="image9.png" alt="Image" /> 28.8 in. H x 28.3 in. W x 13.7 in. D - 216.1 lbs</td>
</tr>
</tbody>
</table>
## Power Switching Devices

### ASPYRE DT

#### 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

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Phase

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

#### Maximum Line and Load Voltage

48= 480VAC
60= 600VAC
69= 690VAC - Only available for 60A and greater models

#### 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
800 = 800A
1K1 = 1100A
1K4 = 1400A
1K6 = 1600A
1K8 = 1800A
2K1 = 2100A

#### Auxiliary Power

<table>
<thead>
<tr>
<th></th>
<th>35 to 40A</th>
<th>60 to 800A</th>
<th>1100 to 2100A</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>2</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>3</td>
<td>OK</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>4</td>
<td>OK</td>
<td>OK</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>OK</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
<td>OK</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Note:** For 35A to 800A models you must choose the nominal, switched line voltage. For 1100A to 2100A models the auxiliary power is independent of the switched voltage.

#### Additional Options

- **Current Limit Loop**
- **Analog Retransmit Output 1**
  - A = X
  - B = X
  - C = X
  - D = X

**Note 1:** Current limit loop only available with 1-phase and 3-phase, 3-leg models (DT1 and DT3). Exception: Current limit not available with the 35A and 40A, 3-phase, 3-leg models (DT3x-035xx-xxxxx and DT3x-040xx-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 is required. See Accessories.

#### Cooling Fan Voltage

<table>
<thead>
<tr>
<th></th>
<th>35A to 40A</th>
<th>60A to 690V</th>
<th>60A to 690V</th>
<th>90A to 800A</th>
<th>1100A to 2100A</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No fan</td>
<td>OK</td>
<td>OK</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>120VAC</td>
<td>N/A</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>2</td>
<td>240VAC</td>
<td>N/A</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
</tr>
<tr>
<td>3</td>
<td>24VDC</td>
<td>N/A</td>
<td>OK</td>
<td>N/A</td>
<td>N/A</td>
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</table>

**Note:** Available for these models. N/A = Not available for these models.

#### Additional Wired Communication (Modbus® RTU-485 Comes Standard in all Models)

<table>
<thead>
<tr>
<th></th>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>No additional communications option</td>
<td>Modbus® TCP</td>
<td>Profibus DP</td>
<td>Profinet</td>
<td>EtherNet/IP™</td>
<td></td>
</tr>
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</table>

**Note 1:** If using both Analog Retransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1-5) an external power supply is required. See Accessories.

#### Data Logging

<table>
<thead>
<tr>
<th></th>
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<th>C</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>No data logging</td>
<td>Data logging with battery backup and real time clock</td>
</tr>
</tbody>
</table>

**Note:** 35A and 40A models do not include battery backup or real time clock.

#### Custom Options - Firmware Overlay, Preset Parameters and Locked Code

<table>
<thead>
<tr>
<th></th>
<th>AA</th>
<th>AB</th>
<th>RC</th>
<th>XX</th>
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</thead>
<tbody>
<tr>
<td>AA</td>
<td>Standard with user manual documentation</td>
<td>Standard without user manual documentation</td>
<td>Replacement connector hardware only - for configuration entered above</td>
<td>Contact factory - custom firmware, preset parameters, locked code</td>
</tr>
</tbody>
</table>
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.
Power Switching Devices

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
Power Switching Devices

**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\(^2\)sec
- 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
- 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 Style A Ratings at 100% On](image)
DIN-A-MITE A

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>A</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>00</td>
<td>XX</td>
</tr>
</tbody>
</table>

**Phase**
1 = 1-phase, 1 controlled leg

**Cooling and Current Rating**
0 = Natural convection current rating 18A @ 50°C

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

**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

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

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

Recommended Fuses and Fuse Holders

### Semiconductor Fuses and Holders

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-8025</td>
<td>25A fuse</td>
</tr>
<tr>
<td>17-5110</td>
<td>10-25A holder</td>
</tr>
</tbody>
</table>

### DFJ Combination Fuses and Holders

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0808-0325-0020</td>
<td>20A fuse</td>
</tr>
<tr>
<td>0808-0325-0030</td>
<td>30A fuse</td>
</tr>
<tr>
<td>0808-0326-1530</td>
<td>15-30A holder</td>
</tr>
</tbody>
</table>
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
Power Switching Devices

**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. I²t for fusing is 4,000A²s
- 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
  - 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 mm²) wire

**Line and Load Terminals**
- Compression: will accept 18 to 8 AWG (0.8 to 8.4 mm²) 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**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Cooling</th>
<th>Current at 122°F (50°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>25A</td>
</tr>
<tr>
<td>2, 8</td>
<td>0</td>
<td>25A</td>
</tr>
<tr>
<td>3, 9</td>
<td>0</td>
<td>17A</td>
</tr>
</tbody>
</table>
# Power Switching Devices

## DIN-A-MITE B

### Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th></th>
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<tr>
<td>D</td>
<td>B</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 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)

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

#### Line and Load Voltage
- 02 = 24 to 48VAC
- 24 = 120 to 240VAC
- 60 = 277 to 600VAC

#### 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

# Recommended DIN-rail Mount Fuses and Fuse Holders

### Semiconductor Fuses and Holders

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-8020</td>
<td>20A fuse</td>
</tr>
<tr>
<td>17-8025</td>
<td>25A fuse</td>
</tr>
<tr>
<td>17-8030</td>
<td>32A fuse</td>
</tr>
<tr>
<td>17-8040</td>
<td>40A fuse</td>
</tr>
<tr>
<td>17-8050</td>
<td>50A fuse</td>
</tr>
<tr>
<td>17-5110</td>
<td>10-25A holder</td>
</tr>
<tr>
<td>17-5114</td>
<td>32-50A holder</td>
</tr>
</tbody>
</table>

### DFJ Combination Fuses and Holders

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0808-0325-0020</td>
<td>20A fuse</td>
</tr>
<tr>
<td>0808-0325-0030</td>
<td>30A fuse</td>
</tr>
<tr>
<td>0808-0325-0040</td>
<td>40A fuse</td>
</tr>
<tr>
<td>0808-0325-0050</td>
<td>50A fuse</td>
</tr>
<tr>
<td>0808-0326-1530</td>
<td>15-30A holder</td>
</tr>
<tr>
<td>0808-0326-3560</td>
<td>35-60A holder</td>
</tr>
</tbody>
</table>
Power Switching Devices

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
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 9100A²s
- 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
- 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 mm²) 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 mm²) 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 Pozidriver

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
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.
**DIN-A-MITE C**

### Dimensions—Natural Convection, DIN-rail/Panel Mount

#### Front

- Allowance for No. 8 Fastener (M4)
- 1.51 in. (38 mm)
- 1.81 in. (46 mm)
- 2.11 in. (54 mm)
- 1.89 in. (48 mm) Allowance for No. 8 Fastener (M4)
- 5.45 in. (138 mm)
- 3.42 in. (87 mm)

#### Side

- 4 in. (102 mm) Min. Clearance for Air Flow and Wire Bending Radius
- 5.74 in. (146 mm)
- 5.59 in. (142 mm)
- 5.17 in. (131 mm)
- Rail Release Tab (pull down)
- 4 in. (102 mm) min.

#### Top

- 5.74 in. (146 mm)
- 3.25 in. (83 mm)
- 3.275 in. (83 mm) Min. Clearance for Air Flow (Both Sides)

### Dimensions—Fan Cooled, DIN-rail/Panel Mount

#### Side

- 4 in. (102 mm) Clearance for Air Flow and Wire Bending Radius
- 5.74 in. (146 mm)
- 5.59 in. (142 mm)
- 5.17 in. (131 mm)
- Rail Release Tab (pull down)
- 4 in. (102 mm) min.

Front Panel is Touch-Safe, No Clearance is Required.

### Dimensions—Natural Convection, Through-Wall Mount

#### Front

- 4 in. (102 mm) Min. Clearance for Air Flow (Top and Bottom)
- 2.25 in. (57 mm) Min. Clearance for Air Flow (Any Gauge)
- 2.17 in. (55 mm) Min. Clearance for Air Flow (12 Gauge)

#### Panel Opening

- 4.625 in. (117.5 mm)
- 5.85 in. (148.6 mm)
- 6.375 in. (161.9 mm)
- 0.375 in. (9.4 mm) Reference
- 0.275 in. (7.0 mm)
- 0.25 in. (6.3 mm)

#### Sheet Metal (12 Ga.)

- Front Panel is Touch-Safe, No Clearance is Required

#### Heat Sink Outline

- 0.275 in. (7.0 mm)
- 0.25 in. (6.3 mm)
- 0.225 in. (5.8 mm)
- 0.228 in. (5.8 mm) Reference

#### Typical Panel

- Drilling 0.228 in. (5.8 mm) (8)
- 0.375 in. (9.5 mm) Reference
- 0.425 in. (10.8 mm)

#### Panel Cutout

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

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__ - _FO - ______

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: DC__ - _ [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 potentiometer 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

<table>
<thead>
<tr>
<th>Fuse Part Number</th>
<th>Fuse Rating</th>
<th>Cooper Bussman®</th>
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</thead>
<tbody>
<tr>
<td>17-8040</td>
<td>40A</td>
<td>FWP-40A14F</td>
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<tr>
<td>17-8050</td>
<td>50A</td>
<td>FWP-50A14F</td>
</tr>
<tr>
<td>17-8063</td>
<td>63A</td>
<td>FWP-63A22F</td>
</tr>
<tr>
<td>17-8080</td>
<td>80A</td>
<td>FWP-80A22F</td>
</tr>
<tr>
<td>17-8100</td>
<td>100A</td>
<td>FWP-100A22F</td>
</tr>
</tbody>
</table>

| Fuse Holder Part Number | | |
|-------------------------| | |
| US141I                  | | |
| US221I                  | | |

Combined Branch Protection and Semiconductor Fuses for Applications through 480VAC

| Fuse Part Number | | |
|------------------| | |
| 0808-0326-0020   | DFJ-20 |
| 0808-0326-0030   | DFJ-30 |
| 0808-0326-0040   | DFJ-40 |
| 0808-0326-0050   | DFJ-50 |
| 0808-0326-0060   | DFJ-60 |
| 0808-0326-0080   | DFJ-80 |
| 0808-0326-0100   | DFJ-100|

| Fuse Holder Part Number | | |
|-------------------------| | |
| CH30J1i                 | | |
| CH60J1i                 | | |
| J601001CR               | | |
### DIN-A-MITE C

**Ordering Information**

<table>
<thead>
<tr>
<th>Part Number</th>
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<th>3</th>
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<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D</td>
<td>C</td>
<td>Phase</td>
<td>Cooling &amp; Current Rating/Leg</td>
<td>Line &amp; Load Voltage</td>
<td>Control</td>
<td>Alarm</td>
<td>User Manual</td>
<td>Custom Options</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 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)

#### 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)

#### 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)

#### Control

<table>
<thead>
<tr>
<th>0</th>
<th>4.5 to 32VDC input, contactor output</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td>4 to 20mA DC input, variable time-base output</td>
</tr>
<tr>
<td>K1</td>
<td>22 to 26VAC input, contactor output</td>
</tr>
<tr>
<td>K2</td>
<td>100 to 120VAC input, contactor output</td>
</tr>
<tr>
<td>K3</td>
<td>200 to 240VAC input, contactor output</td>
</tr>
<tr>
<td>L (0 to 5)</td>
<td>Phase angle output with current limiting* (single-phase only)</td>
</tr>
<tr>
<td>P (0 to 5)</td>
<td>Phase angle output* (single-phase only)</td>
</tr>
<tr>
<td>S (0 to 5)</td>
<td>Single-cycle variable time-base output</td>
</tr>
</tbody>
</table>

* Not CE approved for conducted or radiated emissions.

#### Alarm

<table>
<thead>
<tr>
<th>0</th>
<th>No alarm</th>
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</thead>
<tbody>
<tr>
<td>S</td>
<td>Shorted SCR alarm (not available with control options L or P)</td>
</tr>
<tr>
<td>H</td>
<td>Open-heater and shorted-SCR alarm (control option S only)</td>
</tr>
</tbody>
</table>

#### User Manual

<table>
<thead>
<tr>
<th>0</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>2</td>
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#### Custom Options

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1X</td>
<td>1-second soft start (control options P, L)</td>
</tr>
<tr>
<td>XX</td>
<td>Any letter or number, custom options, labeling, etc.</td>
</tr>
</tbody>
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---

### DIN-A-MITE C Current Rating Table

<table>
<thead>
<tr>
<th>Phase</th>
<th>Cooling</th>
<th>Current at 122°F (50°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>55A</td>
</tr>
<tr>
<td>1</td>
<td>T</td>
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<td>35A</td>
</tr>
<tr>
<td>3, 9</td>
<td>1, 2, 3</td>
<td>55A</td>
</tr>
</tbody>
</table>
Power Switching Devices

**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
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
- UL® 508-listed and C-UL® File E73741

Control Input Terminals
- Compression: will accept 26 to 12 AWG (0.13 to 3.3 mm²) wire

Line and Load Terminals
- Compression: will accept 6 to 2 AWG (13.3 to 33.6 mm²) 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
Power Switching Devices

DIN-A-MITE D

Ordering Information

Part Number

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>1</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

1 = 1-phase, 1 controlled leg

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

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

6 = 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 = Custom Options
00 = Standard part

Replacement Semiconductor Fuse

<table>
<thead>
<tr>
<th>Watlow Part Number</th>
<th>Cooper Bussmann® Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0808-0096-0000</td>
<td>170N3437</td>
</tr>
</tbody>
</table>
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

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 to 10VDC 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
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 Switching Devices

POWER SERIES

Ordering Information

Part Number

<table>
<thead>
<tr>
<th></th>
<th>Package Style</th>
<th>Phase</th>
<th>Heater Diagnostics</th>
<th>Output Amperage Rating</th>
<th>Output Voltage Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C = 65 to 250A

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)

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

0 = 24 to 120V
1 = 200 to 480V
2 = 200 to 600V

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.

Amperage Chart—122°F (50°C)

<table>
<thead>
<tr>
<th>Single-Phase</th>
<th>3-Phase, 2-Leg and 2 Single-Phase Zones</th>
<th>3-Phase, 3-Leg, 3 Single-Phase Zones and 4-Wire Model</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
<td>Amp</td>
<td>Code</td>
</tr>
<tr>
<td>N20</td>
<td>10A</td>
<td>N20</td>
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<tr>
<td>N25</td>
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<td>250A</td>
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<td>N/A</td>
<td>N/A</td>
<td>F35</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Watlow Part Number</th>
<th>Description</th>
<th>Bussmann Part Number</th>
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<tbody>
<tr>
<td>0808-0102-0100</td>
<td>100 amp @ 600VAC</td>
<td>170M1317</td>
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<tr>
<td>0808-0102-0125</td>
<td>125 amp @ 600VAC</td>
<td>170M1318</td>
</tr>
<tr>
<td>0808-0102-0160</td>
<td>160 amp @ 600VAC</td>
<td>170M1319</td>
</tr>
<tr>
<td>0808-0102-0200</td>
<td>200 amp @ 600VAC</td>
<td>170M1320</td>
</tr>
<tr>
<td>0808-0102-0250</td>
<td>250 amp @ 600VAC</td>
<td>170M1321</td>
</tr>
<tr>
<td>0808-0102-0315</td>
<td>315 amp @ 600VAC</td>
<td>170M1322</td>
</tr>
</tbody>
</table>
Power Switching Devices

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**
Power Switching Devices

E-SAFE II

Product Rating Curve

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

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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<tbody>
<tr>
<td>ES2</td>
<td>-</td>
<td>-</td>
<td>Number of Poles</td>
<td>Load Voltage</td>
<td>Command Signal Voltage</td>
<td>Future Option</td>
<td>Future Option</td>
<td>Custom Options</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

6-7. Command Signal Voltage
LV = Low voltage 3 to 24VDC or 24VAC
HV = High voltage 100 to 240VAC +10/-15% (85 to 264VAC)

8. Future Option
0 = Standard product
Any three letters or numbers = cosmetic options
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

<table>
<thead>
<tr>
<th>Model</th>
<th>18</th>
<th>24</th>
<th>34</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Surge Current 16.6 mSec</td>
<td>625</td>
<td>250</td>
<td>625</td>
<td>1000</td>
</tr>
<tr>
<td>Max. Pt Fusing</td>
<td>1620</td>
<td>260</td>
<td>1620</td>
<td>4150</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Control Mode</th>
<th>Output Amperage</th>
<th>Output Voltage</th>
<th>Input Type (Contactor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Z</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Control Mode**
  - Z = Zero cross

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

- **Output Voltage**
  - 24 = 24 to 280VAC
  - 48 = 48 to 530VAC

- **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

![Output Rating Curve Graph]

<table>
<thead>
<tr>
<th>Maximum Ambient Temperature °F</th>
<th>Current (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>68</td>
<td>60</td>
</tr>
<tr>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>104</td>
<td>80</td>
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<tr>
<td>122</td>
<td>90</td>
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<td>140</td>
<td>100</td>
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<tr>
<td>158</td>
<td>110</td>
</tr>
<tr>
<td>176</td>
<td>120</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Ambient Temperature °C</th>
<th>Current (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
</tr>
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<td>40</td>
<td>30</td>
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<tr>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>80</td>
<td>70</td>
</tr>
</tbody>
</table>

CZ42  
CZ34  
CZ24  
CZ18
Power Switching Devices

**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
## Power Switching Devices

### Solid State Relays

#### Specifications

<table>
<thead>
<tr>
<th>Specifications Standard To All SSRs:</th>
<th>4000 RMS</th>
</tr>
</thead>
</table>

#### Input, DC Control

<table>
<thead>
<tr>
<th>Voltage range</th>
<th>3-32VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical input current</td>
<td>3.4 to 20mA</td>
</tr>
<tr>
<td>Turn on voltage (max.)</td>
<td>3VDC</td>
</tr>
<tr>
<td>Turn off voltage (min.)</td>
<td>1VDC</td>
</tr>
</tbody>
</table>

#### Input, AC Control

<table>
<thead>
<tr>
<th>Voltage range</th>
<th>90-280VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical input current</td>
<td>2mA (typical) @ 120VAC 4mA (typical) @ 240VAC</td>
</tr>
<tr>
<td>Turn on voltage (max.)</td>
<td>90VAC</td>
</tr>
<tr>
<td>Turn off voltage (min.)</td>
<td>10VAC</td>
</tr>
</tbody>
</table>

#### AC Output (Max.)

<table>
<thead>
<tr>
<th>Forward voltage drop</th>
<th>1.5VAC and 2.1VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. holding current (mA)</td>
<td>50mA</td>
</tr>
<tr>
<td>Turn on-off time (ms)</td>
<td>up to 10ms (max.)</td>
</tr>
<tr>
<td>Frequency range</td>
<td>47 to 63Hz</td>
</tr>
</tbody>
</table>

### 120/240VAC

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current output</td>
<td>10A</td>
<td>25A</td>
<td>50A</td>
<td>10A</td>
<td>25A</td>
<td>50A</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>120/240VAC</td>
<td>120/240VAC</td>
<td>120/240VAC</td>
<td>120/240VAC</td>
<td>120/240VAC</td>
<td>120/240VAC</td>
</tr>
<tr>
<td>One cycle surge current</td>
<td>120A</td>
<td>250A</td>
<td>625A</td>
<td>120A</td>
<td>250A</td>
<td>625A</td>
</tr>
<tr>
<td>Max. I²t for fusing</td>
<td>60A² seconds</td>
<td>260A² seconds</td>
<td>1,620A² seconds</td>
<td>60A² seconds</td>
<td>260A² seconds</td>
<td>1,620A² seconds</td>
</tr>
<tr>
<td>Thermal resistance</td>
<td>1.48° C/W</td>
<td>1.06° C/W</td>
<td>0.63° C/W</td>
<td>1.48° C/W</td>
<td>1.06° C/W</td>
<td>0.63° C/W</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
</tr>
</tbody>
</table>

#### Output (Max.)

<table>
<thead>
<tr>
<th>Voltage range</th>
<th>48-280VAC</th>
<th>48-280VAC</th>
<th>48-280VAC</th>
<th>48-280VAC</th>
<th>48-280VAC</th>
<th>48-280VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over voltage rating</td>
<td>600V (peak)</td>
<td>600V (peak)</td>
<td>600V (peak)</td>
<td>600V (peak)</td>
<td>600V (peak)</td>
<td>600V (peak)</td>
</tr>
<tr>
<td>Off state leakage</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
</tr>
</tbody>
</table>

### 120/240VAC

<table>
<thead>
<tr>
<th>Model Number</th>
<th>SSR-240-75A-DC1</th>
<th>SSR-240-75A-AC1</th>
<th>SSR-480-50A-RND</th>
<th>SSR-480-75A-RND</th>
<th>SSR-240-10A-RND</th>
<th>SSR-100-20A-DC1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current output</td>
<td>75A</td>
<td>75A</td>
<td>50A</td>
<td>75A</td>
<td>10A</td>
<td>20A</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>120/240VAC</td>
<td>120/240VAC</td>
<td>480VAC</td>
<td>480VAC</td>
<td>120/240VAC</td>
<td>100VDC</td>
</tr>
<tr>
<td>One cycle surge current</td>
<td>1000A</td>
<td>1000A</td>
<td>625A</td>
<td>1000A</td>
<td>120A</td>
<td>42A (10ms)</td>
</tr>
<tr>
<td>Max. I²t for fusing</td>
<td>6000A² seconds</td>
<td>6000A² seconds</td>
<td>1,620A² seconds</td>
<td>6000A² seconds</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Thermal resistance</td>
<td>0.31° C/W</td>
<td>0.31° C/W</td>
<td>0.63° C/W</td>
<td>0.31° C/W</td>
<td>1.48° C/W</td>
<td>1.06° C/W</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-4 to 176°F (-20 to 80°C)</td>
<td>-4 to 176°F (-40 to 80°C)</td>
</tr>
</tbody>
</table>

#### Output (Max.)

<table>
<thead>
<tr>
<th>Voltage range</th>
<th>48-280VAC</th>
<th>48-280VAC</th>
<th>80-530VAC</th>
<th>80-530VAC</th>
<th>48-280VAC</th>
<th>0-100VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over voltage rating</td>
<td>600V (peak)</td>
<td>600V (peak)</td>
<td>1200V (peak)</td>
<td>1200V (peak)</td>
<td>600V (peak)</td>
<td>N/A</td>
</tr>
<tr>
<td>Off state leakage</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>0.3mA VDC</td>
</tr>
</tbody>
</table>

### 480 VAC

<table>
<thead>
<tr>
<th>Model Number</th>
<th>SSR-480-25A-DC1</th>
<th>SSR-480-50A-DC1</th>
<th>SSR-480-75A-DC1</th>
<th>SSR-480-25A-AC1</th>
<th>SSR-480-50A-AC1</th>
<th>SSR-480-75A-AC1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current output</td>
<td>25A</td>
<td>50A</td>
<td>75A</td>
<td>25A</td>
<td>50A</td>
<td>75A</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>480VAC</td>
<td>480VAC</td>
<td>480VAC</td>
<td>480VAC</td>
<td>480VAC</td>
<td>480VAC</td>
</tr>
<tr>
<td>One cycle surge current</td>
<td>250A</td>
<td>625A</td>
<td>1000A</td>
<td>250A</td>
<td>625A</td>
<td>1000A</td>
</tr>
<tr>
<td>Max. I²t for fusing</td>
<td>2600A² seconds</td>
<td>1,620A² seconds</td>
<td>6,000A² seconds</td>
<td>2600A² seconds</td>
<td>1,620A² seconds</td>
<td>6,000A² seconds</td>
</tr>
<tr>
<td>Thermal resistance</td>
<td>1.02° C/W</td>
<td>0.63° C/W</td>
<td>0.31° C/W</td>
<td>1.02° C/W</td>
<td>0.63° C/W</td>
<td>0.31° C/W</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
<td>-40 to 176°F (-40 to 80°C)</td>
</tr>
</tbody>
</table>

#### Output (Max.)

<table>
<thead>
<tr>
<th>Voltage range</th>
<th>48-530VAC</th>
<th>48-530VAC</th>
<th>48-530VAC</th>
<th>48-530VAC</th>
<th>48-530VAC</th>
<th>48-530VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over voltage rating</td>
<td>1200V (peak)</td>
<td>1200V (peak)</td>
<td>1200V (peak)</td>
<td>1200V (peak)</td>
<td>1200V (peak)</td>
<td>1200V (peak)</td>
</tr>
<tr>
<td>Off state leakage</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
<td>10mA</td>
</tr>
</tbody>
</table>

---

**Ambient Temperature Operating Curve**

![Ambient Temperature Operating Curve](image-url)
Power Switching Devices

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.
Power Switching Devices

Solid State Relays

Dimensions - Heat Sink

Heat Sink Dimensions by Part Number

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Descriptor</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z100-0815-000A</td>
<td>18A</td>
<td>A: 1.8 (46)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: 3.25 (82.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D: 3.7 (94)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E: N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F: 1.9 (48)</td>
</tr>
<tr>
<td>Z100-0815-000B</td>
<td>35A</td>
<td>A: 3.2 (81)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: 3.25 (82.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: 3.7 (94)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D: 1.81 (46)</td>
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<tr>
<td></td>
<td></td>
<td>E: 2.9 (74)</td>
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<tr>
<td>Z100-0815-000C</td>
<td>55A</td>
<td>A: 5.45 (138.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: 5.89 (149.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: 1.81 (46)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D: 3.6 (91)</td>
</tr>
<tr>
<td>Z100-0815-XXFC*</td>
<td>75A</td>
<td>A: 5.45 (138.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: 5.89 (149.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: 1.81 (46)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D: 3.6 (91)</td>
</tr>
</tbody>
</table>

*Fan cooled

Ordering Information

Part Number

1 2 3 4 5 6 7 8 9 10 11 12

SSR  Voltage  Current  Control Voltage

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
<th>Control Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>10A</td>
<td>DC1 = 3 to 32VDC (see specifications)</td>
</tr>
<tr>
<td>240</td>
<td>20A</td>
<td>AC1 = 90 to 280VAC</td>
</tr>
<tr>
<td>480</td>
<td>20A</td>
<td>RND = 3 to 32VDC (10, 50 and 75A models only)</td>
</tr>
<tr>
<td>75A</td>
<td></td>
<td>Note: Relay will also include thermal foil, two belville washers and #6-32 screws for mounting to a heat sink.</td>
</tr>
</tbody>
</table>

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.