Watlow® has manufactured solid state power controllers for over forty 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

- **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

© 2003, 2009, 2011 Watlow Electric Manufacturing Company. All rights reserved.
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 Output
  Amperage Chart and Rating Curves
- Min. load 1A rms ac
- Max. leakage current 5mA
- 200KA SCR, Type 2 approved with the recommended fusing;
  see user manual

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

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

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

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

Retransmit
- Field selectable and scalable, 0 to 20mA with 8000Ω max.
  load or 0 to 10VDC with 1kΩ min.
- Default: 4 to 20mA

Resolution:
- mA ranges = ±20µA
- 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

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/amperes 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
- ⅝ in. (10 mm) Allen head compression terminals will accept
  6 AWG to 350 MCM wire. Allen wrench adapter (included)
  for ⅝ in. (10 mm) socket, 6 point only
- Torque to 180 in.-lbs (20.3 Nm)
- Wire strip to 1⅞ in. (40 mm)
- Requires 194°F (90°C) wire insulation rating on line and load
  terminals

Controller Terminals
- Touch safe
- ⅝ in. (2.5 mm) blade screwdriver, accepts 12-22 AWG or
  2 No. 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 EN50178, 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 2004/08/EC (EN61326-1), Class A with filter,
  CE 2006/95/EC (EN50178)
**Power Series**

*Solid State Power Control*

**Mounting Flange** (Already Installed)

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

**Front View**

**Top View**

**Bottom View**

**POWER SERIES Features**

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

- **Ground Lug**
  - Built in, designed for easy ground connections.

- **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.

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

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

- **Allen Wrench**
  - Used to torque terminals one to six and ground lug.
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>
<th>⑪</th>
<th>⑫</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>Phase</td>
<td>Heater Diagnostics</td>
<td>Output Amperage Rating</td>
<td>Output Voltage Rating</td>
<td>Comm.</td>
<td>Feedback/Retransmit</td>
<td>Custom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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.

### 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-Phase and 4-Wire Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>Amp</td>
<td>Code</td>
</tr>
<tr>
<td>Non Fan Cooled</td>
<td>Fan Cooled</td>
<td></td>
</tr>
<tr>
<td>N20</td>
<td>100A</td>
<td>N20</td>
</tr>
<tr>
<td>N25</td>
<td>140A</td>
<td>N25</td>
</tr>
<tr>
<td>N30</td>
<td>165A</td>
<td>N30</td>
</tr>
<tr>
<td>F20</td>
<td>125A</td>
<td>F20</td>
</tr>
<tr>
<td>F25</td>
<td>200A</td>
<td>F25</td>
</tr>
<tr>
<td>F30</td>
<td>250A</td>
<td>F30</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>F35</td>
</tr>
</tbody>
</table>

To be automatically connected to the nearest North American Technical Sales Office:

1-800-WATLOW2 • www.watlow.com • inquiry@watlow.com

International Technical Sales Offices: Australia, +61 3 9335 6448 • China, +86 21 3532 8532 • France, +33 1 41 32 79 70 • Germany, +49 (0) 72 53 / 94 00-0 • Italy, +39 024588941 • Japan, +81 3 3518 6630 • Korea, +82 2 2628 5770 • Malaysia, +60 3 8076 8745 • Mexico, +52 442 217 6235 • Singapore, +65 6773 9488 • Spain, +34 91 675 12 92 • Taiwan, +886 7 288 5188 • United Kingdom, +44 (0) 115 964 0777