

## Modular and Scalable Power Controller Family Ideal for a Wide Range of Applications



Watlow's new ASPYRE<sup>®</sup> 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.

### Typical Applications

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

### 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

#### c-UL<sup>®</sup> 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<sup>®</sup> Super), transformers, silicon carbide, UV lamps and tungsten
- Protects and extends the life of connected loads

## Features and Benefits (cont)

### 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™, 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.

## 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

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

\* 60A to 2100A models

### 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

### 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

## Specifications (cont)

### Analog Output Functions\*

- Retransmit: load voltage, current, power or setpoint

### Alarm Outputs

- Form C, electromechanical relay, 30VDC max. 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: 1100A 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

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

### 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 Configurator 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™, PROFIBUS DP or 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 interval 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) (Not required for all models. See ordering information)
- 24VDC, 120 or 240VAC (See ordering information for available options)
- 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°C without derating
- 5 to 90% RH (relative humidity), non-condensing
- Up to 6560 feet (2000 m) 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

### 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 Emissions
- CE Safety Directive 2014-35-EU, EN 60947-4-1, -4-3
- IP20 with all covers in place
- RoHS 2011-65-EU
- W.E.E 2012-19-EU
- 690VAC units not covered by UL®

### Accessories

- Free Watlow ASPYRE configuration software on the Watlow website at <http://www.watlow.com/en/resources-and-support/Technical-Library/Software-and-Demos>
- 6 ft USB 2.0 to micro USB device cable (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 on next page.

\*Note: If using both Analog Retransmit (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 8.

## Specifications (con't)

### Fuses

ASPYRE Model Number	Watlow Fuse Part Number		Qty. Used Per Unit
	480V and 600V	690V	
DT___ - 035 ...	17-8050	N/A	1/leg
DT___ - 040 ...			
DT___ - 060 ...	0808-0363-0160	2048-2760	
DT___ - 090 ...			
DT___ - 120 ...			
DT___ - 150 ...			
DT___ - 180 ...	0808-0363-0250	2048-4418	
DT___ - 210 ...	0808-0363-0315	2048-4426	
DT1__ - 300 ...	0808-0362-0000	N/A	1
DT1__ - 400 ...	0808-0358-0000	0808-0358-0000	1
DT1__ - 500 ...	0808-0359-0000	0808-0359-0000	1
DT1__ - 600 ...	0808-0363-0250	0808-0363-0250	4
DT1__ - 700 ...			
DT2__ - 300 ...	0808-0357-0000	2055-5072	3
DT2__ - 400 ...	0808-0358-0000	0808-0358-0000	3
DT2__ - 450 ...	0808-0360-0000	0808-0360-0000	6
DT2__ - 500 ...			
DT2__ - 600 ...	0808-0357-0000	0808-0357-0000	4
DT2__ - 700 ...			
DT3__ - 300 ...	0808-0357-0000	2055-5072	3
DT3__ - 350 ...	0808-0358-0000	0808-0358-0000	3
DT3__ - 400 ...			
DT3__ - 450 ...	0808-0359-0000	0808-0359-0000	3
DT3__ - 500 ...			
DT___ - 800 ...	0808-0363-0250	0808-0363-0250	4 /leg
DT___ - 1K1 ...	2078-4948	2078-5301	2/leg
DT___ - 1K4 ...	2078-5257	2078-5358	
DT___ - 1K6 ...	2078-5261	2078-5413	
DT___ - 1K8 ...			
DT___ - 2K1 ...			

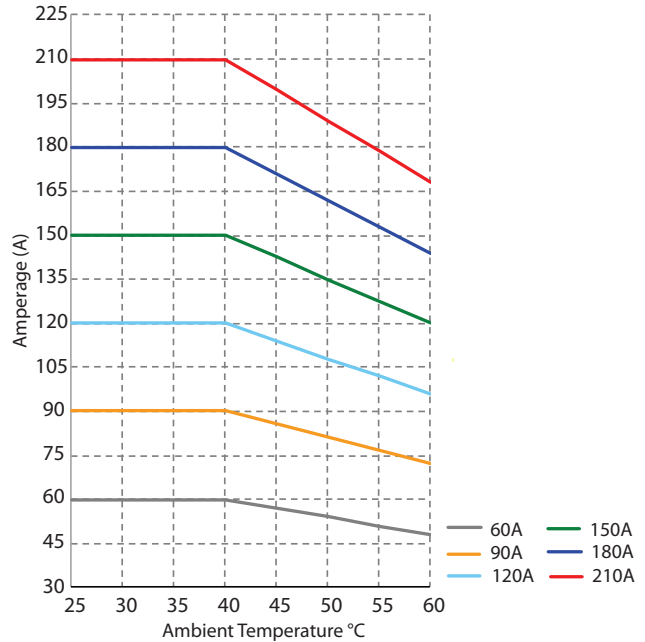
N/A - Not available

### Replacement Power Modules

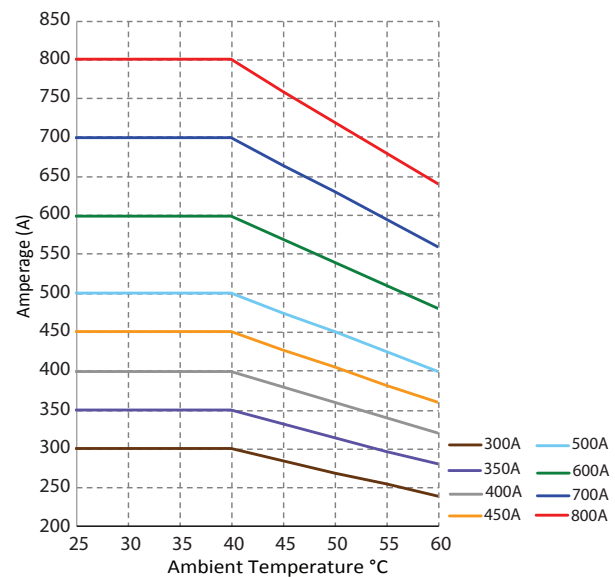
Item	Maximum Voltage	Amperage
2148-0134	480/600VAC	1100A
2148-0169	480/600VAC	1400A
2148-0175	480/600VAC	1600A
2148-0188	480/600VAC	1800A
2148-0214	480/600VAC	2100A
2148-0238	690VAC	1100A
2148-0246	690VAC	1400A
2148-0251	690VAC	1600A
2148-0267	690VAC	1800A
2148-0272	690VAC	2100A

## Ambient Temperature Derating

### 60A to 210A Models

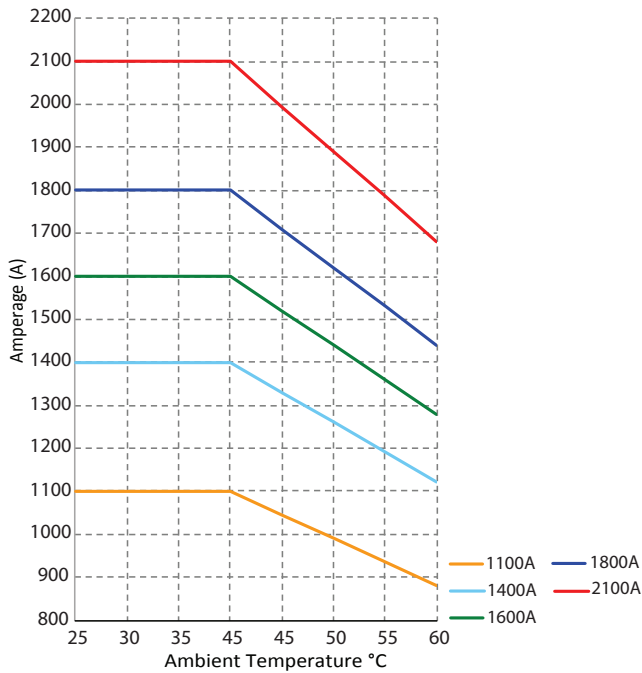


### 300A to 800A Models

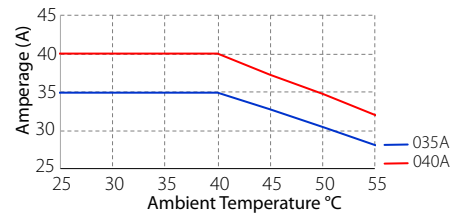


## Ambient Temperature Derating (cont.)

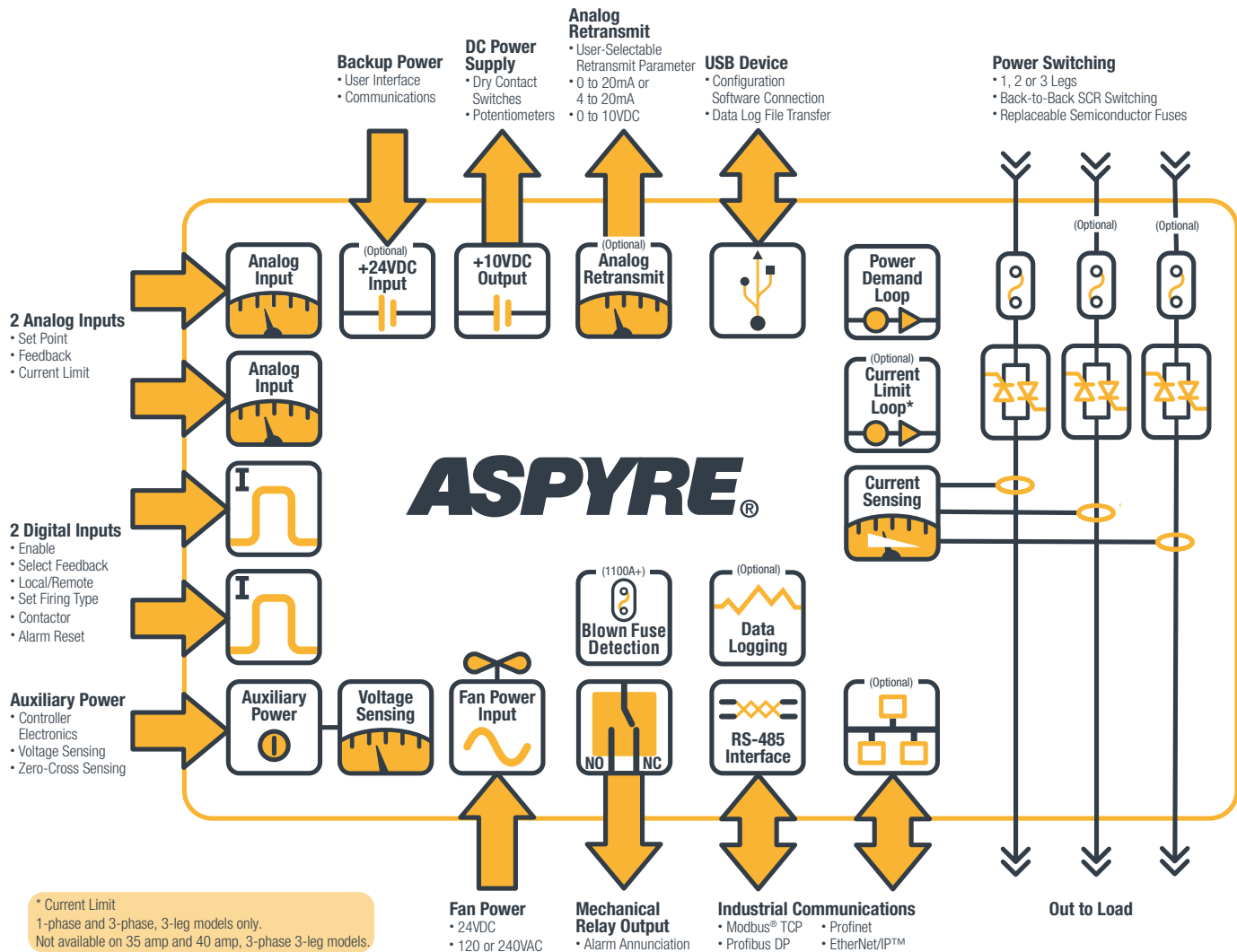
### 1100A to 2100A Models



### 35A to 40A Models











## I/O Functional Block Diagram



## Dimensions and Shipping Weight

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

## Dimensions and Shipping Weight (cont)

Current and Voltages	1-Phase, 1 Controlled Leg	3-Phase, 2 Controlled Legs	3-Phase, 3 Controlled Legs
<p>800A 480, 600, 690VAC</p>	 <p>22.1 in. H x 5.4 in. W x 10.7 in. D - 23.2 lbs</p>	 <p>22.1 in. H x 10.9 in. W x 10.7 in. D - 46.3 lbs</p>	 <p>22.1 in. H x 16.2 in. W x 10.7 in. D - 69.5 lbs</p>
<p>1100A 480, 600, 690VAC</p>	 <p>21.7 in. H x 13 in. W x 13.7 in. D - 59.5 lbs</p>	 <p>21.7 in. H x 20.6 in. W x 13.7 in. D - 108 lbs</p>	 <p>21.7 in. H x 28.3 in. W x 13.7 in. D - 158.7 lbs</p>
<p>1400, 1600, 1800, 2100A 480, 600, 690VAC</p>	 <p>28.8 in. H x 13 in. W x 13.7 in. D - 74.9 lbs</p>	 <p>28.8 in. H x 20.6 in. W x 13.7 in. D - 143.3 lbs</p>	 <p>28.8 in. H x 28.3 in. W x 13.7 in. D - 216.1 lbs</p>

## 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

① ② Model	③ Phase	④ ⑤ Max. Line & Load Voltage	⑥ ⑦ ⑧ Amperage	⑨ Auxiliary Power	⑩ Current Limit Loop/ Analog Retransmit Output	⑪ Cooling Fan Voltage	⑫ Add'l Wired Comms.	⑬ Data Logging	⑭ ⑮ Custom Options - Firmware Overlay, Preset Parameters and Locked Code
<b>DT</b>									

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

④ ⑤ Maximum Line and Load Voltage	
48 =	480VAC
60 =	600VAC
69 =	690VAC - Only available for 60A and greater models

⑥ ⑦ ⑧ Amperage	
035 =	35A
040 =	40A
060 =	60A
090 =	90A
120 =	120A
150 =	150A
180 =	180A
210 =	210A
300 =	300A - Not available for 1-phase, 690VAC models
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

⑨ Auxiliary Power			
	35 to 40A	60 to 800A	1100 to 2100A
1 =	100 or 120VAC	OK	OK
2 =	200, 208, 220, 230 or 240VAC	OK	OK
3 =	277VAC	OK	N/A
4 =	380, 400, 415, 440 or 480VAC	OK	N/A
5 =	600VAC	OK	N/A
6 =	690VAC	N/A	N/A

**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.

⑩ Current Limit Loop/Analog Retransmit Output							
		35A to 40A			60A to 2100A		
		DT1	DT2	DT3	DT1	DT2	DT3
A =	Both	OK	N/A	N/A	OK	N/A	OK
B =	Neither	OK	OK	OK	OK	OK	OK
C =	Current limit	OK	N/A	N/A	OK	N/A	OK
D =	Retransmit	OK	OK	OK	OK	OK	OK

**Note:** If using both Analog Retransmit (digit 10, options A or D) and Additional Wired Communication (digit 12, options 1-5) an external power supply is required. See Accessories.  
OK = Available for these models.  
N/A = Not available for these models.

⑪ Cooling Fan Voltage						
		35A to 40A	60A 480/600V	60A 690V	90A to 800A	1100A to 2100A
0 =	No fan	OK	OK	N/A	N/A	N/A
1 =	120VAC	N/A	N/A	OK	OK	OK
2 =	240VAC	N/A	N/A	OK	OK	OK
3 =	24VDC	N/A	N/A	OK	OK	N/A

OK = Available for these models.  
N/A = Not available for these models.

⑫ Additional Wired Communication (Modbus® RTU-485 Comes Standard in all Models)	
0 =	No additional communications option
1 =	Modbus® TCP
3 =	Profibus DP
4 =	Profinet
5 =	EtherNet/IP™

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

⑬ Data Logging	
A =	No data logging
C =	Data logging with battery backup and real time clock

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

⑭ ⑮ Custom Options - Firmware Overlay, Preset Parameters and Locked Code	
AA =	Standard
NC =	No IP20 covers on 1100A and greater models
XX =	Contact factory - custom firmware, preset parameters, locked code

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