



ASPYRE 690V Intelligent Power Controllers Instruction Manual

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Watlow's new 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.

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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® 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™, 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 $\pm 10\%$ min./max.
- 24 to 600V $\pm 10\%$ min./max.
- 24 to 690V $\pm 10\%$ 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 $\geq 4\text{VDC}$, off $<1\text{VDC}$
- 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, 15K Ω impedance
- Current: 0 to 20mA or 4 to 20mA, 100 Ω impedance
- Potentiometer: 10K Ω 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 500 Ω max. load with 50 μ A nominal resolution
- 0 to 10VDC into a 500 Ω min. load with 50mV nominal resolution.

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

- ASPIRE 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™, PROFIBUS DP or

PROFICIENT

- 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.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 Re transmit (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.

Fuses

ASPYREModel 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 ...	0808-0363-0180		
DT____ – 150 ...	0808-0363-0200	2048-4405	
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

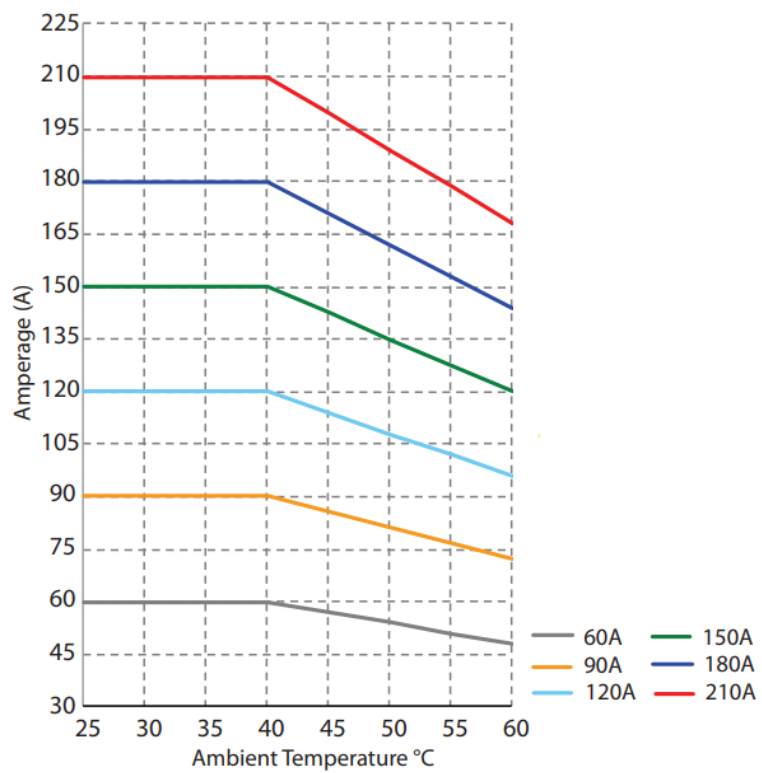
Item	Maximum Voltage	Amperage
2148-0134	480/600VAC	1100A
2148-0169	480/600VAC	1400A
2148-0175	480/600VAC	1600A
2148-0188	480/600VAC	1800A
2148-0214	480/600VAC	2100A
2148-0238	690VAC	1100A
2148-0246	690VAC	1400A
2148-0251	690VAC	1600A
2148-0267	690VAC	1800A
2148-0272	690VAC	2100A

Replacement Connectors

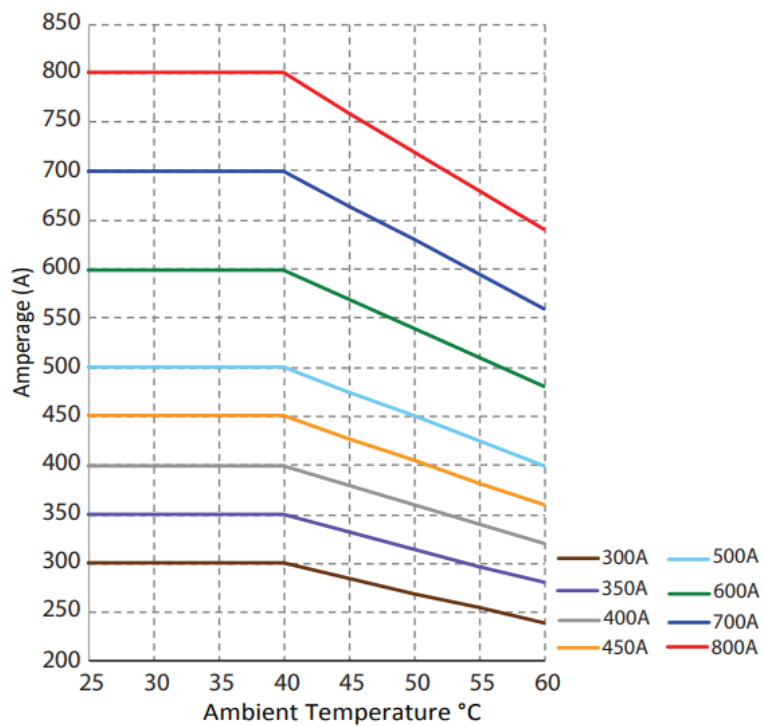
Price	Part Number	Description
\$ 75.00	2306-2721	Single phase, 35 or 40A
75.00	2306-2737	Two-leg, 35 or 40A
75.00	2306-2745	Three-leg, 35 or 40A
85.00	2306-2759	60 to 210A, 480 or 600V
85.00	2306-2768	300 to 800A, 480 or 600V

Ambient Temperature Derating

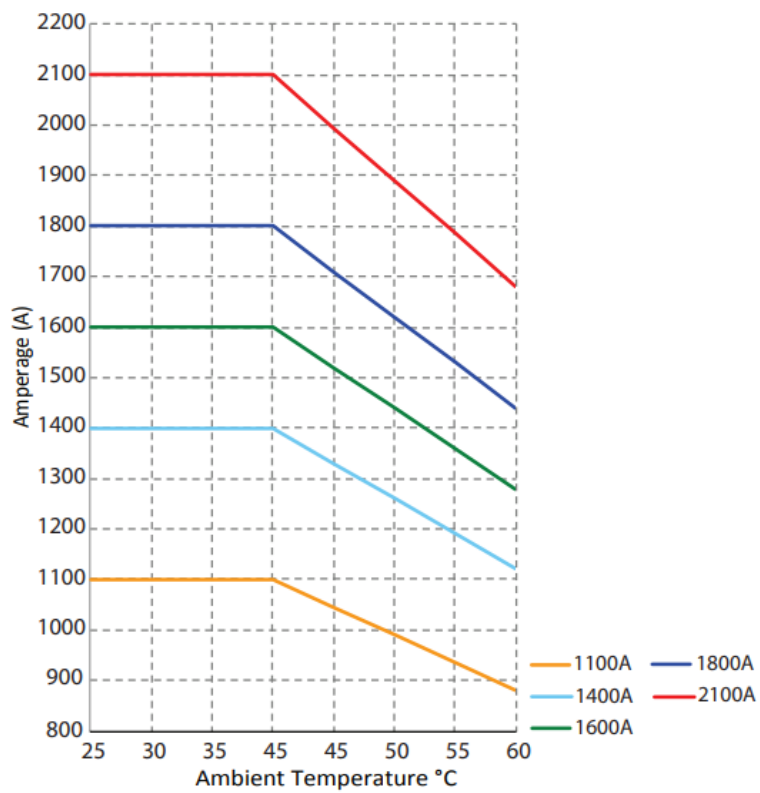
60A to 210A Models



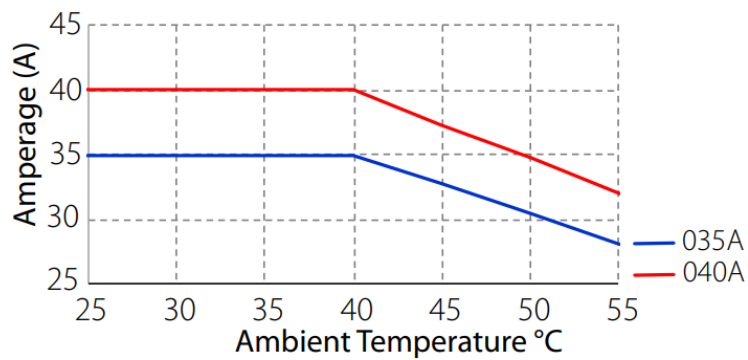
300A to 800A Models



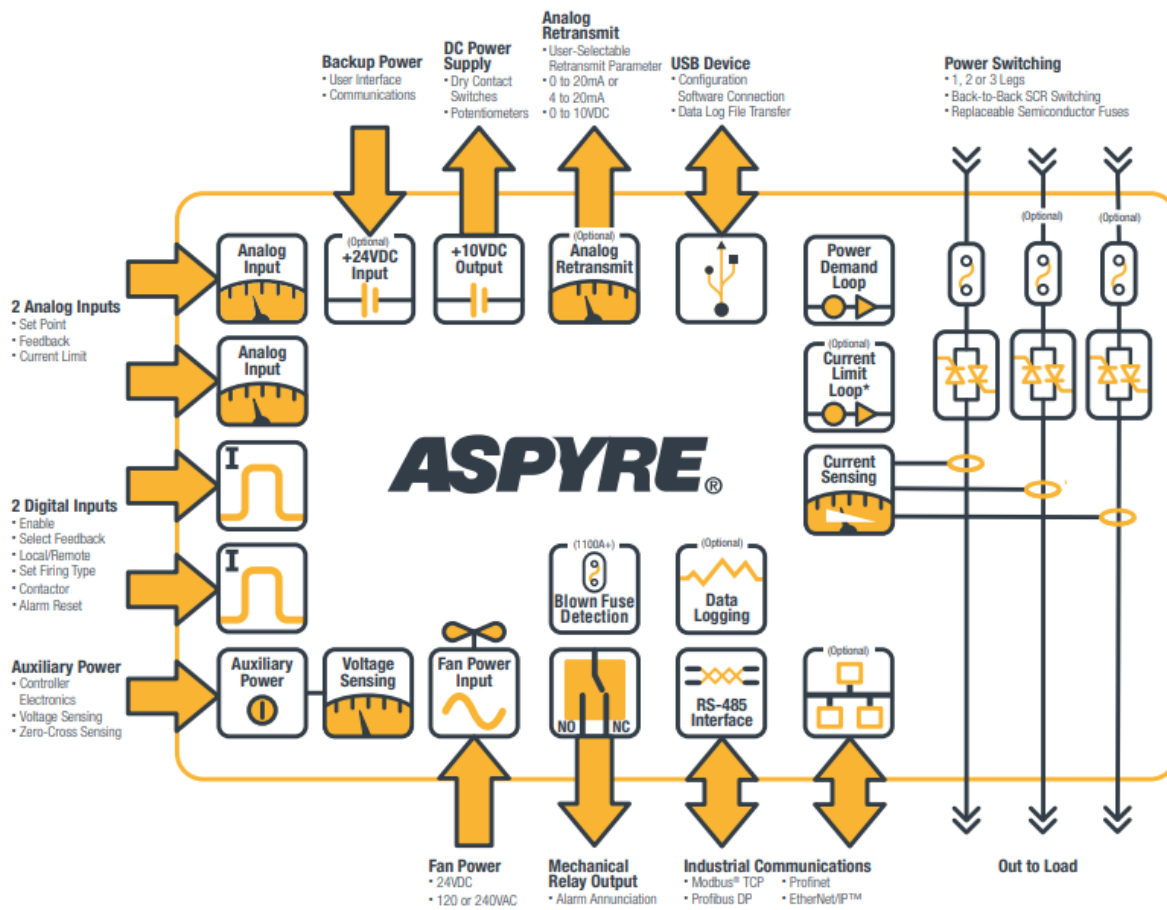
1100A to 2100A Models






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
35 and 40A480 and 600VAC	4.77 in. H x 2.84 in. W x 7.28 in. D – 2.6 lbs	4.77 in. H x 4.25 in. W x 7.28 in. D – 4 lbs	4.77 in. H x 5.67 in. W x 7.28 in. D – 5.5 lbs
			

60, 90, 120, 150, 180 and
210A 480 and 600VAC

10.6 in. (60A) or 10.79 in.
(90-210A) H x 3.66 in. W
x 6.7 in. D – 9 lbs



10.6 in. (60A) or 10.79 i
n. (90-210A) H x 7.36 in.
W x 6.7 in. D – 18 lbs



10.6 in. (60A) or 10.79 in. (
90-210A) H x 11.1 in. W x 6.
7 in. D – 27 lbs



60, 90, 120, 150, 180 and
210A 690VAC

17.33 in. H x 5.40 in. W x
10.63 in. D – 23 lbs



60-90A = 17.33 in. H x 5.40 in. W x 10.63 in. D – 23 lb
s120-210A = 17.33 in H x 10.32 in. W x 10.63 in. D – 4
0 lbs



<p>1 and 2 leg:300, 400, 500, 600 and 700A3 leg:300, 350, 400, 450 and 500A4 80, 600 and 690VAC</p>	<p>20.47 in. H x 5.4 in. W x10.63 in. D – 33 lbs</p> 	<p>20.47 in. H x 10.32 in. W x 10.63 in. D – 63 lbs</p> 
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<p>Current and Voltages</p>	<p>1-Phase,1 Controlled Leg</p>	<p>3-Phase,2 Controlled Legs</p>	<p>3-Phase,3 Controlled Legs</p>
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<p>800A480, 600, 690VAC</p>	<p>22.1 in. H x 5.4 in. W x10.7 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 x10. 7 in. D – 69.5 lbs</p> 
<p>1100A480, 600, 690VAC</p>	<p>21.7 in. H x 13 in. W x13.7 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 x13. 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 x13. 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 x13. 7 in. D – 216.1 lbs</p> 

Accessories

- ASPYRE Configurator software on the Watlow website at <https://www.watlow.com/Products/Controllers/Software/aspire-configurator>
- External power supply UL® Class 2, 90-263VAC input, 24VDC output, 1.30A, 31W (p/n 0847-0299-0000)
- Fuses – see table on page 4

USB Cables

Earlier models use USB micro B, Later models use USB C.

- 6 ft USB 2.0 to micro USB device cable (p/n 0219-0480-0000)
- 6 ft USB type C to USB type C data and charging (p/n 2316- 7309)
- 6 ft USB type A to USB type C data and charging (p/n 2317- 0654)

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

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


1-800-WATLOW2

www.watlow.com

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Documents / Resources

	<p>ASPYPE 690V Intelligent Power Controllers [pdf] Instruction Manual 690V Intelligent Power Controllers, 690V, Intelligent Power Controllers, Power Controllers, Controllers</p>
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References

- [Watlow](#) Global Supplier of Industrial Electric Thermal Solutions | Watlow
- [Software](#) | Watlow
- [ASPYPE® DT Configurator](#) | Watlow
- [User Manual](#)