

Wiring Safety Guide

ASPYRE Power Controllers

April, 2019 2055-8256 Rev. A

Safety Information

	CAUTION – Warning or Hazard that needs further explanation than the label on unit can provide. Consult User's Guide for further information.
	Electrical Shock Hazard - Symbol (a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.
	ESD Sensitive product, use proper grounding and handling techniques when installing or servicing product.
	Do not throw in trash, use proper recycling techniques or consult manufacturer for proper disposal.
	Unit is a Listed device per Underwriters Laboratories. It has been investigate to ANSI/UL® 508 standards for Industrial Control Switches and equivalent to CSA C22.2 #14. For more detail search for File E73741 on www.ul.com.
	Unit is compliant with European Union directives. See Declaration of Conformity for further details on Directives and Standards used for Compliance.

Safety Notes

⚠WARNING! To avoid damage to property and equipment, injury and loss of life, adhere to applicable electrical codes and standard wiring practices when installing and operating this product. Failure to do so could result in damage, injury and death.

⚠WARNING! All service including inspection, installation, wiring, maintenance, trouble-shooting, fuse or other user-serviceable component replacement must be performed only by properly qualified personnel. Service personnel must read this manual before proceeding with work. While service is being performed, other, unqualified personnel should not work on the unit or be allowed in the immediate vicinity.

⚠WARNING! When in use, the power controller is connected to dangerous voltages. Do not remove the protective covers without first disconnecting and preventing power from being restored while servicing the unit.

⚠WARNING! Electric Shock Hazard: when the power controller has been energized, after shutting off the power, wait at least one minute for internal capacitors to discharge before commencing work that brings you in to contact with power connections or internal components.

⚠WARNING: The installation must be protected by electromagnetic circuit breakers or by fuses. The semiconductor fuses located inside the power controller are classified for UL® as supplementary protection for semiconductor devices. They are not approved for branch circuit protection.

⚠NOTE! The nominal current is specified for ambient temperatures at or below 40° C. Ensure the application design allows for adequate cooling of each power controller. The power controller must be mounted vertically. The cooling design must prevent air heated by one power controller from causing power controllers mounted above to exceed the ambient operating temperature limit. When power controllers are mounted side by side allow a minimum spacing of 15mm between them.

⚠NOTE! Use only copper cables and wires rated for use at 75°C or greater.

⚠AVERTISSEMENT! Pour éviter d'endommager la propriété et l'équipement, les blessures et la perte de vie, respecter les codes électriques en vigueur et les pratiques de câblage standard au moment de l'installation et de l'utilisation de ce produit. Dans le cas contraire, cela peut entraîner la mort, des blessures graves ou des dommages.

⚠AVERTISSEMENT! Tous les services, y compris l'inspection, l'installation, le câblage, l'entretien, le dépannage, le remplacement de fusibles ou d'autres composants pouvant être réparés par l'utilisateur, doivent être effectués uniquement par un personnel dûment qualifié. Le personnel de service doit lire ce manuel avant d'effectuer tout travail. Pendant que l'entretien est exécuté, tout personnel non qualifié ne doit effectuer de travail sur l'appareil ni se trouver à proximité.

⚠AVERTISSEMENT! Au moment de l'utilisation, le régulateur de puissance est connecté à des tensions dangereuses. Ne retirer aucun couvercle de protection sans d'abord débrancher l'appareil et ainsi empêcher l'alimentation d'être rétablie pendant l'entretien.

⚠AVERTISSEMENT! Risque de décharges électriques : lorsque le régulateur de puissance est mis sous tension, après avoir été éteint, attendre au moins une minute pour que les condensateurs internes se déchargent avant de commencer tout travail incluant le contact avec les connexions électriques ou les composants internes.

⚠AVERTISSEMENT! L'installation doit être protégée par des disjoncteurs électromagnétiques ou des fusibles. Les fusibles pour semi-conducteurs situés à l'intérieur du régulateur de puissance sont classés UL® comme protection supplémentaire pour les dispositifs pour semi-conducteurs. Ils ne sont pas approuvés pour la protection des circuits de dérivation.

⚠REMARQUE : Le courant nominal est précisé pour des températures ambiantes égales ou inférieures à 40°C. S'assurer que la conception de l'application permette le refroidissement adéquat de chaque régulateur de puissance. Le régulateur de puissance doit être monté verticalement. La conception de refroidissement doit empêcher l'air chauffé par le régulateur de puissance de dépasser la limite de température de fonctionnement ambiante de la part des régulateurs de puissance montés au-dessus. Lorsque les régulateurs de puissance sont montés côte à côte, il faut conserver un espacement minimal de 15 mm entre les deux.

⚠REMARQUE : N'utiliser que des câbles et des fils en cuivre pour l'utilisation à 75°C ou plus.

Identifying the Product

The product identification label includes not only the part number but also the voltage and current ratings and auxiliary and fan voltage requirements.

Max. Load Current: 120A	Use Wire rated 75°C, Max Ambient 40°C	
Max. Load Voltage: 600Vac ~ 50/60Hz	Max Ambient 40°C	
Auxiliary Voltage : 540-660Vac ~ 50/60Hz 6VA	For use in Pollution	
Fan Voltage : 120 VAC	Degree 2 Environment	
Second Port : Modbus TCP	User Manual:	
1 Phase 1 Leg Control	1917-1409	IND. CONT. EQ. E73741 2R05

Specifications

Environment

- Ambient operating temperature: 0 to 40°C
- Mount power controllers vertically
- 5 to 95% 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.

SCCR Rating

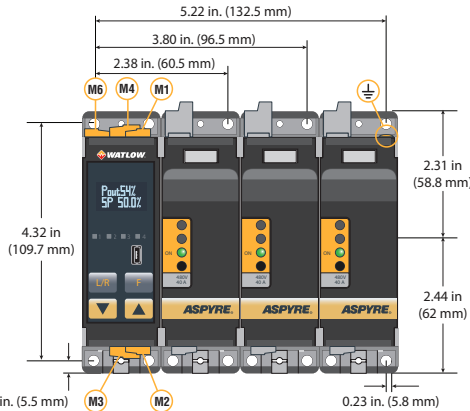
- SCCR rating 100,000A up to 600VAC

Terminal Identification and Mounting Holes

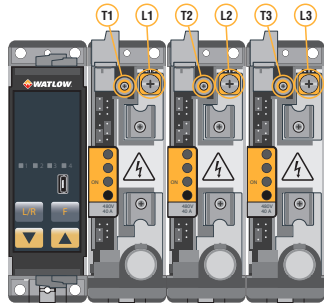
The following illustrations show the locations for line power, load, earth ground and signal connections. Line connections are: L1, L2, L3. Load connections are: T1, T2 and T3.

Connection Locations 35A to 40A Models

Covers Closed



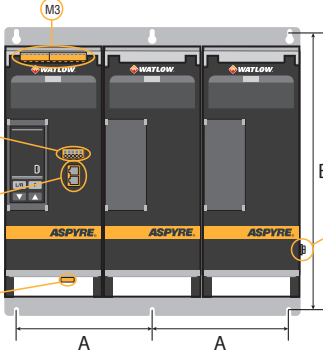
Covers Tipped Forward



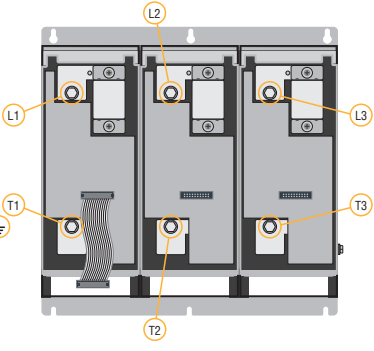
⚠NOTE! Three-phase, three-leg model is shown. Single-phase and three-phase, two-leg models have fewer power and load connections.

Connection Locations 60A to 210A, 400V & 600V Models

Covers Closed



Covers Tipped Forward

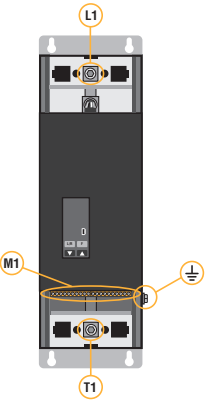


Mounting Slots for 60A to 210A, 400V & 600V Models

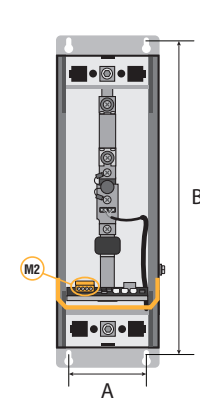
Model	A	B (no fans)	B (with fans)	Slot Width	Hole Size
DT1...	2.80 in. (71 mm)	10.06 in. 256 mm	10.24 in. 260 mm	0.2 in. 5 mm	0.35 in. 9 mm
DT2...	6.50 in. (165 mm)				
DT3...	5.10 in. (129.5 mm) 2 pl.				

Connection Locations Single-Phase, 60A to 210A, 690V Models

Top & Bottom Covers Off

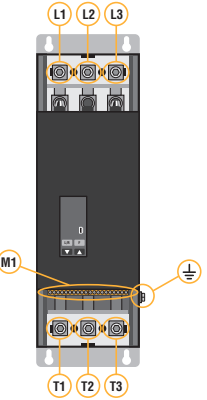


Center Cover Tipped Forward

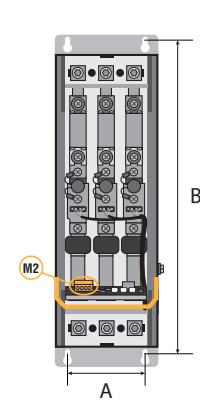


Connection Locations Three-Phase, 60A & 90A, 690V Models

Top & Bottom Covers Off

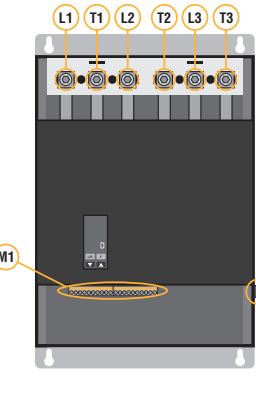


Center Cover Tipped Forward

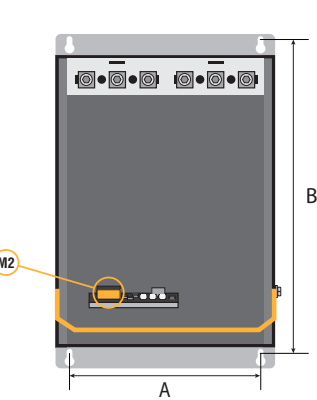


Connection Locations Three-Phase, 120A to 210A, 690V Models

Top & Bottom Covers Off

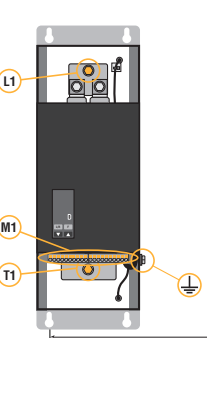


Top & Bottom Covers Off

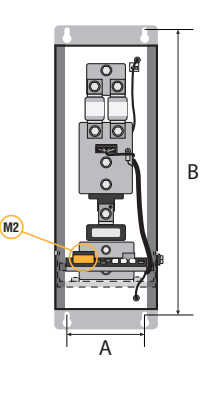


Connection Locations Single-Phase, 300A to 700A Models

Top & Bottom Covers Off

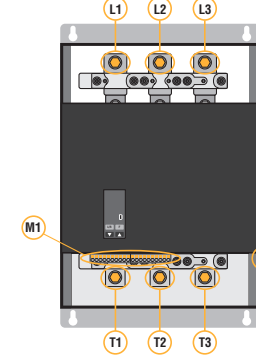


Center Cover Tipped Forward

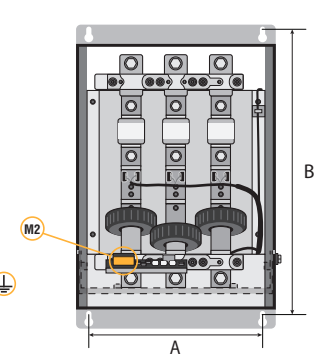


Connection Locations Three-Phase, 300A to 500A Models

Top & Bottom Covers Off



Center Cover Tipped Forward



⚠NOTE! Three-leg, 400A model shown. The width of the bus bar, number of bolts, number of fuses and their placement vary by model. In all cases the M2 connector is as indicated.

Mounting Slots for 60A to 210A, 690V & 300A to 700A Models

Model	Current (A)	A	B	Slot Width	Hole Size
DT_...	60 to 90	3.82 in. (97 mm)	16.14 in. (410 mm)	0.28 in. 7 mm	0.47 in. 12 mm
DT1...	120 to 210				
DT2...	120 to 210				
DT3...	120 to 210	8.74 in. (222 mm)	19.29 in. (490 mm)		
DT1...	300 to 700	3.82 in. (97 mm)			
DT2...	300 to 700	8.74 in. (222 mm)			
DT3...	300 to 500				

Wiring Instructions

Select cables or bus bar for line power, load connections and earth grounds per National Electric Code or local applicable electric code.

Load wiring for 35A and 40A models requires 90°C rated wire otherwise use 75°C wire.

Connect RS-485 communication common to any analog common terminal.

If using the 10VDC power supply to power dry contact switches connected to digital inputs, connect the digital input common to the analog common.

For models that require auxiliary power to be supplied, the auxiliary power must be synchronized with the phase connected to the L1 line power input. The auxiliary voltage is indicated on the product identification label and encoded in the part number as the nominal voltage (character 9).

Line Power, Load and Earth Ground Torque

Current	Voltage	Line Power & Load Torque	Earth Ground
35A to 40A	400V or 600V	26.6 in.-lb. (3.0 Nm)	31 in.-lb. (3.5 Nm)
60A to 120A	400V or 600V	70.8 in.-lb. (8.0 Nm)	70.8 in.-lb. (8.0 Nm)
150A to 210A	400V or 600V	141.6 in.-lb. (16.0 Nm)	
60A to 210A	690V	177 in.-lb. (20.0 Nm)	
300A to 700A	400V or 600V	505 in.-lb. (57 Nm)	221 in.-lb. (25.0 Nm)

Control Signal and Ground Torque

4 in.-lb. (0.11 Nm)

Control Signal Terminals 35A to 40A Models

M1 Terminal Connections

M1	Function	Description
10	Analog common 10V & 24V	For analog inputs, retransmit output and RS-485
11	Factory connection	
12	Factory connection	
13	Factory connection	
14		C (common)
15	Alarm output	NO (normally open contact)
16		NC (normally closed contact)

M2 Terminal Connections

M2	Function	Description
1	Analog common 10V & 24V	For analog inputs, retransmit output and RS-485
2	Digital input common	Reference to analog common, if necessary
3	Digital input 2	
4	Digital input 1	
5	Analog input 1+	Set point signal input
6	Analog common 10V & 24V	For analog inputs, retransmit output and RS-485
7	+10VDC power supply	For digital inputs and potentiometer
8	Not used	
9	Not used	

M3 Terminal Connections

M3	Function	Description
A+	Port 1 Modbus® RTU RS-	Connect to B+ on USB-to-485 adapter
B-	485	Connect to A- on USB-to-485 adapter

M4 Terminal Connections

M4	Function	Description
L1	Auxiliary power input	Line 1
-	Not used	
L2/N	Auxiliary power input	Line 2 or neutral (DT1 models)

M5 Terminal Connections*

M5	Function	Description
A+	Port 2 Modbus® RTU	Connect to B+ on USB-to-485 adapter
B-	RS-485	Connect to A- on USB-to-485 adapter

*Connect 485 signal here only on units with the second Modbus® RTU 485 communications port option. Connecting signal here on units with other wired communications options will interfere with the operation of that option.

M6 Terminal Connections

M6	Function	Description
17	24VDC power input	Supplemental power for applications that use both analog retransmit and the second communication port (other than Modbus® RTU.)
18	Analog common 10V & 24V	For analog inputs, retransmit output and RS-485
19	Analog input 2+	Alternate set point, external feedback or current limit (DT1)
20	Retransmit output+	

Control Signal Terminals 60A to 210A, 400V and 600V Models

M1 Terminal Connections (90A to 210A only)

M1	Function	Description
F1	Power input for fan	+ For DC fans, line or neutral for AC fans
F2		- For DC fans, line or neutral for AC fans

M2 Terminal Connections (DT1 and DT2 only)

M2	Function	Description
L1	Auxiliary power input	Line 1
-	Not used	
L2/N	Auxiliary power input	Line 2 or neutral on single-phase units

M3 Terminal Connections

M3	Function	Description
1	Analog common 10V & 24V	For digital inputs and potentiometer
2	Digital input common	Reference to analog common, if necessary
3	Digital input 2	See “Configurable Digital Inputs (Digital Input 1 and Digital Input 1)” on page 26
4	Digital input 1	Set point signal input
5	Analog input 1+	Set point signal input
6	Analog common 10V & 24V	For analog inputs, retransmit output and RS-485
7	+10VDC power supply	For dry contact digital inputs or potentiometers for analog inputs
8	Analog input 2+	Alternate set point, external feedback or current limit (DT1 and DT3)
9	Not used	
10	Retransmit output+	
11	Port 1 Modbus® RTU	Connect to B+ on USB-to-485 adapter
12	RS-485	Connect to A- on USB-to-485 adapter
13	Analog common 10V & 24V	For analog inputs, retransmit output and RS-485
14		C (common)
15	Alarm output	NC (normally closed contact)
16		NO (normally open contact)

M4 Terminal Connections for Modbus® RTU Secondary Communication Option

M4	Function	Description
1	+24VDC input	Supplemental power for applications that use both analog retransmit and the second communication port (other than Modbus® RTU.)
2	Analog common 10V & 24V	For 24VDC input and RS-485 common
3	Not used	
4	Port 2 Modbus® RTU	Connect to A- on USB-to-485 adapter
5	RS-485*	Connect to B+ on USB-to-485 adapter

*Connect 485 signal here only on units with the second Modbus® RTU 485 communications port option. Connecting signal here on units with other wired communications options will interfere with the operation of that option.

Control Signal Terminals 60A to 210A, 690V & 300A to 700A Models

M1 Terminal Connections

M1	Function	Description
1		NO (normally open contact)
2	Alarm output	C (common)
3		NC (normally closed contact)
4	Analog input 2+	Alternate set point, external feedback or current limit (DT1 and DT3)
5	Digital input 2	See “Configurable Digital Inputs (Digital Input 1 and Digital Input 2)” on page 26
6	Digital input 1	
7	Port 1 Modbus® RTU	Connect to B+ on USB-to-485 adapter
8	RS-485*	Connect to A- on USB-to-485 adapter
9	+10VDC power supply	For dry contact or potentiometer inputs
10	Analog common 10V & 24V	
11	Analog common 10V & 24V	For analog inputs, retransmit and RS-485 common
12	Analog input 1+	Set point signal input
13	Digital input common	Reference to analog common, if necessary
14	Not Used	
15	Power input for fan	+ For DC fans, line or neutral for AC fans
16		- For DC fans, line or neutral for AC fans
17	Not used	
18	Auxiliary power input	Line 1
19	Not used	
20	Auxiliary power input	Line 2 or neutral on single phase units

M2 Terminal Connections

M2	Function
1	+24VDC supplemental power for applications that use both analog retransmit and the second communication port (other than Modbus® RTU)
2	Unused
3	Retransmit output+
4	Analog common 10V & 24V for 24VDC input, retransmit output and RS-485

Secondary Modbus® RTU Terminal Connections*

	Function	Description
A+	Port 2 Modbus®	Connect to B+ on USB-to-485 adapter
B-	RTU RS-485	Connect to A- on USB-to-485 adapter

*Connect 485 signal here only on units with the second Modbus® RTU 485 communications port option. Connecting signal here on units with other wired communications options will interfere with the operation of that option.

Communication Port Options

All models include at least one RS-485 communication port. Some models include a second communication port.

Communication Options 35A to 40A Models

Model	Communication Option	Connector Type	Connector Location
DT__-_-_-_-_-_0__	No additional port	N/A	N/A
DT__-_-_-_-_-_1__	Modbus® TCP (Ethernet)	RJ-45	Top, next to M1
DT__-_-_-_-_-_2__	Modbus® RTU (2 nd RS485 port)	Removable screw terminal	Bottom, M5
DT__-_-_-_-_-_3__	Profibus DP	DB9	Top, next to M1
DT__-_-_-_-_-_4__	Profinet	RJ-45	
DT__-_-_-_-_-_5__	EtherNet/IP™	RJ-45	

Communication Options 60A to 210A, 480V and 600V Models

Model	Communication Option	Connector Type
DT__-_-_-_-_-_0__	No additional port	N/A
DT__-_-_-_-_-_1__	Modbus® TCP (Ethernet)	RJ-45
DT__-_-_-_-_-_2__	Modbus® RTU (2 nd RS485 port)*	Removable Screw Terminal (M4)
DT__-_-_-_-_-_3__	Profibus DP	DB9
DT__-_-_-_-_-_4__	Profinet	RJ-45
DT__-_-_-_-_-_5__	EtherNet/IP™	RJ-45

Communication Options 60A to 210A, 690V and all 300A to 700A Models

Model	Communication Option	Connector Location on Daughter Card
DT__-_-_-_-_-_0__	No additional port	N/A
DT__-_-_-_-_-_1__	Modbus® TCP (Ethernet)	RJ-45 on right side
DT__-_-_-_-_-_2__	Modbus® RTU (2 nd RS485 port)	2-pin connector on left side*
DT__-_-_-_-_-_3__	Profibus DP	DB9 connector on right side
DT__-_-_-_-_-_4__	Profinet	RJ-45 on right side
DT__-_-_-_-_-_5__	EtherNet/IP™	RJ-45

Agency Approval and Regulatory

- cULus 508 Listed File E73741
- cUL® Listed to C22.2 No. 14
- IP 20 with all covers in place
- Utilization Category: AC-51, AC-55b, AC-56a
- Operation at ambient operating temperatures above 40°C not covered by UL®
- 690 VAC units not covered by UL®
- SCCR rating 100,000A up to 600VAC

Declaration of Conformity

Meets the essential requirements of these European Standards:
2014/35/EU Low-Voltage Directive via
EN 60947-1: 2007: A1 2011, A2 2014
EN 60947-4-3: 2014
2014/30/EU Electromagnetic Compatibility Directive via
EN 60947-4-3: 2014 Group 1 Class A Emissions*
EN 60947-4-3: 2014 Industrial Immunity
EN 60947-1 2007:A1 2011, A2 2014

2011/65/EU RoHS Directive
2012/19/EU W.E.E.E Directive
*Not for use in Class B commercial or residential applications without additional filtering for emissions.

Replacement Fuses

Fuses for 35A to 40A Models

ASPYRE Model	Qty.	Fuse Part Numbers	
		Watlow	Cooper Bussman®
DT__-_-_-035...	1 to 3*	17-8050	FWP-50A14Fa
DT__-_-_-040...			

*One fuse per switched leg.

Fuses for 60A to 210A Models

ASPYRE Model	Qty.	480V and 600V		690V	
		Watlow	Siba	Watlow	Siba
DT__-_-_-060...	1 to 3*	0808-0363-0160	20 559 20.160	2048-2760	20 282 20.160
DT__-_-_-090...					
DT__-_-_-120...		0808-0363-0180	20 559 20.180		
DT__-_-_-150...		0808-0363-0200	20 559 20.200	2048-4405	20 282 20.200
DT__-_-_-180...		0808-0363-0250	20 559 20.250	2048-4418	20 282 20.250
DT__-_-_-210...		0808-0363-0315	20 559 20.315	2048-4426	20 282 20.315

*One fuse per switched leg.

Fuses for300A to 700A Models

Model	Qty.	Fuse Part Numbers			
		Watlow	Cooper Bussman®	Siba	
DT1__-_-300...	1	0808-0362-0000	350FM		
DT1__-_-400...	1	0808-0358-0000	550FMM		
DT1__-_-500...	1	0808-0359-0000	700FMM		
DT1__-_-600...	4	0808-0363-0250		20 559 20.250	
DT1__-_-700...	4				
DT248-300...	3	0808-0357-0000	450FMM		
DT260-300...	3				
DT269-300...	3	2055-5072	400FMM		
DT2__-_-400...	3	0808-0358-0000	550FMM		
DT2__-_-450...	6	0808-0360-0000	315FM		
DT2__-_-500...	6				
DT2__-_-600...	4	0808-0357-0000	450FMM		
DT2__-_-700...	4				
DT348-300...	3				
DT360-300...	3				
DT369-300...	3	2055-5072	400FMM		
DT3__-_-350...	3	0808-0358-0000	550FMM		
DT3__-_-400...	3				
DT3__-_-450...	3	0808-0359-0000	700FMM		
DT3__-_-500...	3				

Torque for Replacement Fuses

	480V and 600V	690V
60A to 120A	26.6 in.-lb. (3 Nm)	44.3 in.-lb. (5 Nm)
150A to 210A	44.3 in.-lb. (5 Nm)	
300A to 700A	221.3 in.-lb. (25 Nm)	

User Manuals

Complete user manuals are available at www.watlow.com/aspyre.

Technical Assistance

If you encounter a problem with your Watlow controller, review your configuration information to verify that your selections are consistent with your application: inputs, outputs, alarms, limits, etc. If the problem persists, you can get technical assistance from your local Watlow representative (see back cover), by e-mailing your questions to wintechsupport@watlow.com or by dialing +1 (507) 494-5656 between 7 a.m. and 5 p.m. Central Time USA & Canada. Ask for for an Applications Engineer. Please have the complete model number available when calling.

How to Reach Us

Watlow Electric Manufacturing Company
12001 Lackland Road
St. Louis, MO 63146
Sales: 1-800-WATLOW2
Manufacturing Support: 1-800-4WATLOW
Email: info@watlow.com
Website: www.watlow.com
From outside the USA and Canada:
Tel: +1 (314) 878-4600
Fax: +1 (314) 878-6814