MICROFUSION

THREE PHASE SCR POWER CONTROLLERS

FEATURES

Auto-Ranging Input Voltage

UL: 24 - 600 Vac, 45 - 65 Hz,
CE: 24 - 690 Vac, 45 - 65 Hz

AC Output

8, 16, 32, 50, 80, 100, 130, 160, 200, 240, 320, 400 Amps
(@ 50°C 1829m, 122°F 6000 ft.)

Control Features

Microprocessor-based controller, phase lock loop timing
Firing modes: Zero Cross, Phase Angle, and
Zero Cross Transformer (ZCT) Mode
Feedback: voltage, current, true power, external
Adjustable soft start for phase angle control
Output limits: voltage, current, power
Missing cycle detection
Use SYNC-GUARD™ to power level multiple Zero-Cross controllers
Prevent upstream transformer heating with TRANS-GUARD™
Dedicated input bit for Run/Stop
kWh meter
Heater Bakeout
Resistance Measurement

Analog Interface (Up to Two Analog Inputs)

Standard setpoint ranges: 0 - 5 Vdc, 4 - 20 mA
Field scalable 0 - 10 Vdc , 0 - 20 mA , or potentiometer

Available Fieldbus Interfaces

EtherNet/IP	EtherCat
PROFINET	Modbus RTU (RS-485)
PROFIBUS	Modbus TCP (Ethernet)

Easy Setup via Plug-n-Play USB

Load / Save configurations
Diagnostics with chart and log operations

Two Year Warranty

OPTIONS

General Purpose Input

Second Analog Input Channel

Second setpoint, potentiometer input, external feedback, or Pulse Width Modulation (PWM)

Alarm Relay

Form C relay output

2 x 16 Bit Analog Retransmits

Standard setpoint ranges: 0 - 5 Vdc, 4 - 20 mA
Field scalable 0 - 10 Vdc , 0 - 20 mA , or potentiometer

Current Limit, Power Limit, Voltage Limit

Remote Display

2 line, 16 character text display with 5 buttons

High Performance

True RMS power, load voltage feedback, load current feedback, high resolution control loop. Increased accuracy and linearity.

Isolated I/O

500 Vac isolation from 24 Vdc control power to Analog Inputs. General purpose input, Run/Stop, and Retransmits.

External, Touchsafe Class T Fusing

DESCRIPTION

MicroFUSION is an ultra-compact high-performance microprocessor-based power controller, available in single phase, three phase 4 SCR, or three phase 6 SCR models to control AC loads.

Resistive or transformer-connected loads can be controlled in either Phase Angle, Zero Cross, or Zero Cross Transformer (ZCT) Mode. Output is controlled linearly with respect to command signal and can be set to the average or RMS value of the voltage and current, as well as true instantaneous power or external feedback.

MicroFUSION Series power controllers are available in current ratings from 8 - 400 Amps AC. Auto-ranging voltage circuitry enables main supply voltage from 24 - 600 Vac for UL/cUL or 24 - 690 Vac for CE, (45 - 65 Hz) eliminating the need for hardware jumpers or stocking multiple controllers for international voltages. A separate 24 Vdc power source supplies the control electronics and maintains critical communications to your control system when the mains are absent.

DESCRIPTION, CONTINUED

Status LEDs and a LED bar graph make operation and troubleshooting simple. A plug-n-play USB interface and free Control Panel software for your PC further simplifies installing and configuring the controller to your application. For example, controller settings can be duplicated by simply loading a configuration file saved from a previous unit.

Setpoints can be controlled through the standard analog or optional digital fieldbus interface. The factory-configured analog setpoint signal ranges are 0 - 5 Vdc and 4 - 20 mA, both of which are field scalable from 0 - 10 Vdc or 0 - 20 mA.

The fieldbus interface options include EtherNet/IP, EtherCAT, PROFINET, PROFIBUS, Modbus RTU (RS-485), or Modbus TCP. These can be used to communicate with a PLC or factory control system. PROFINET, Modbus TCP, and EtherNet/IP are also available as internal fieldbus options. All interfaces are also available through an external module. A single external Connect Module can also control up to ten zones, reducing system installation costs.

The robust design of MicroFUSION allows for continuous full-frame current operation, without derating, up to 122°C / 6000 ft [50°C / 1829m] altitude. Cooling is accomplished through natural convection, forced air, optional external panel mount, or optional liquid-cooled chill plate.

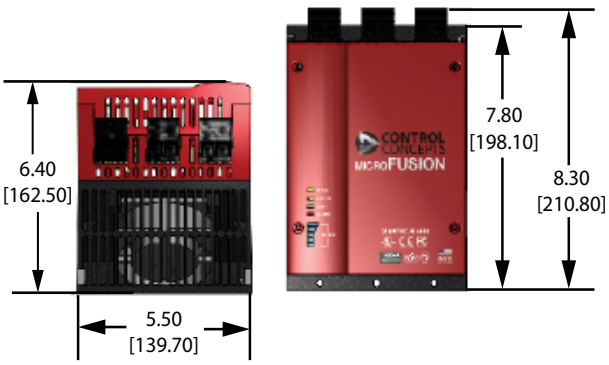
The optional Remote Display provides a clear readout of key parameters and alarm status. Setpoints, limits and alarms are touchpad accessible and easily customized. For additional convenience, a panel mounting kit is available, eliminating the need for external meters, indicators, switches and the associated costs of wiring and labor.

DIMENSIONS

Dimensions in Inches [mm]. MicroFUSION can be DIN rail mounted (up to 80 A) or panel mounted.

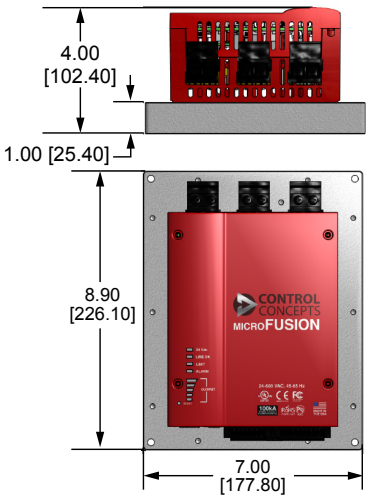
8 - 80 A

DIN Rail / Panel Mount



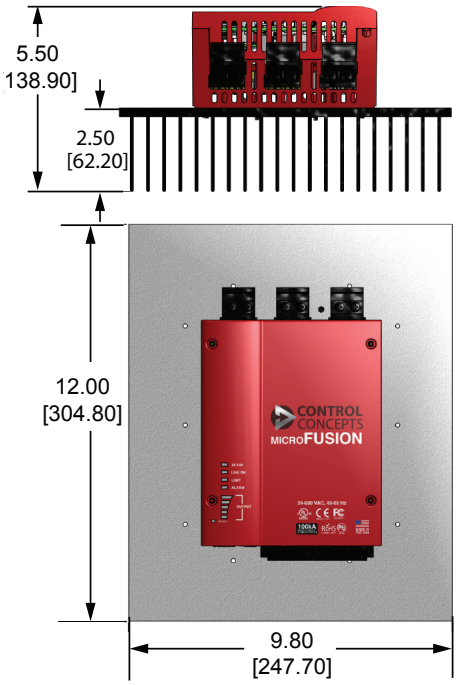
Weight: 6.40 lb [2.91 kg]

Liquid - Cooled



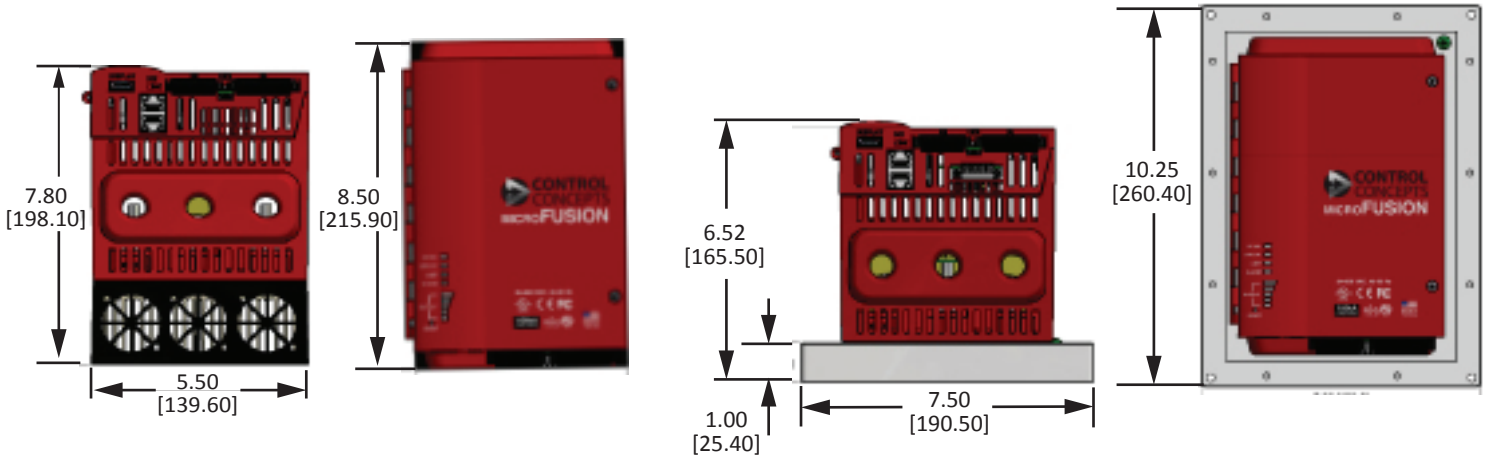
Weight: 7.80 lb [3.54 kg]

External Mount



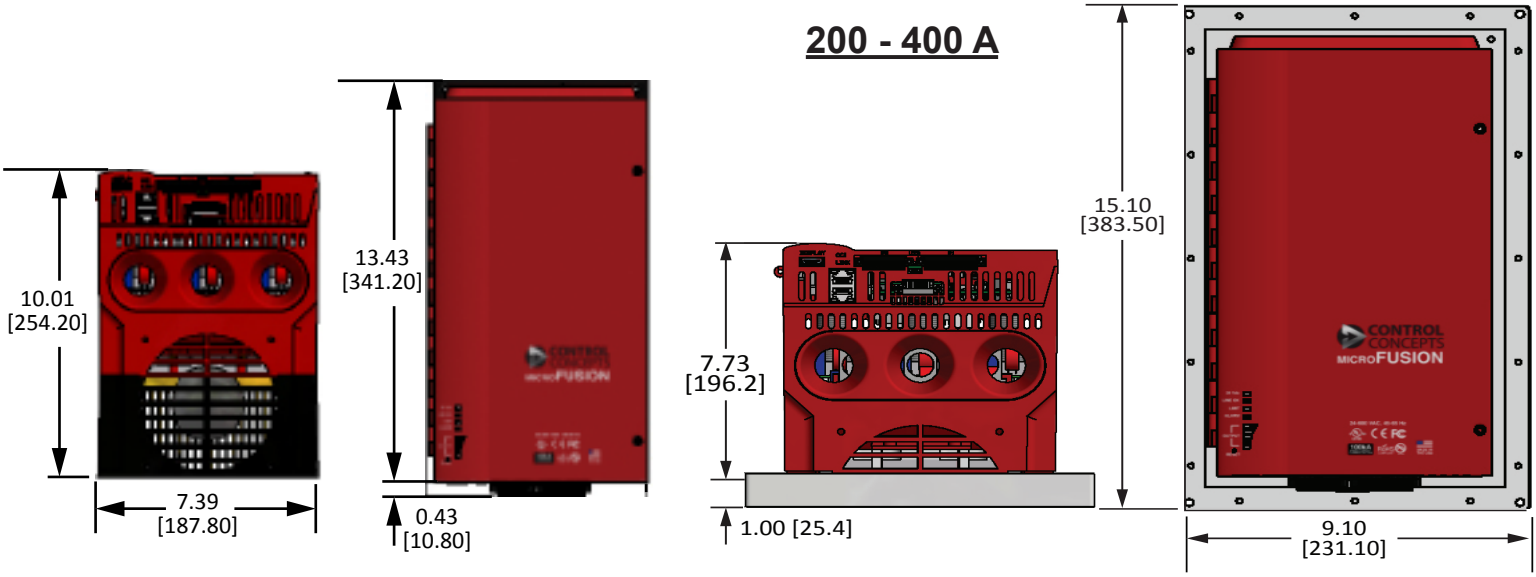
Weight: 9.20 lb [4.17 kg]

100 - 160 A



Weight: Fan Cooled 11.6 lb [5.26 kg] , Liquid Cooled 14.8 lb [6.71 kg]

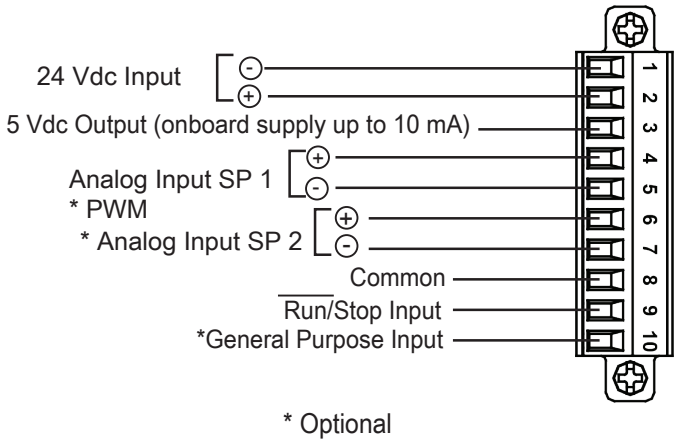
200 - 400 A



200 - 240A Weight: Fan Cooled 18.00 lb [8.16 kg], Liquid Cooled: 23.50 lb [10.66 kg]
320 - 400A Weight: Fan Cooled: 19.40 lb [8.80 kg], Liquid Cooled: 25 lb [11.34 kg]

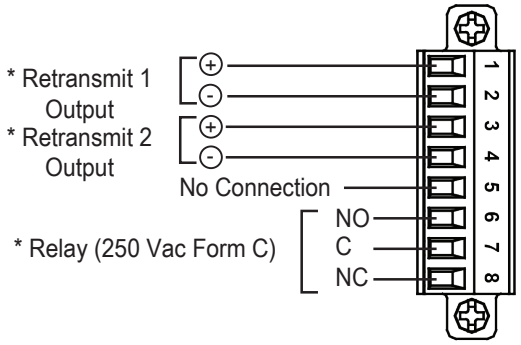
P1/P2 CONNECTOR

P1 Connector



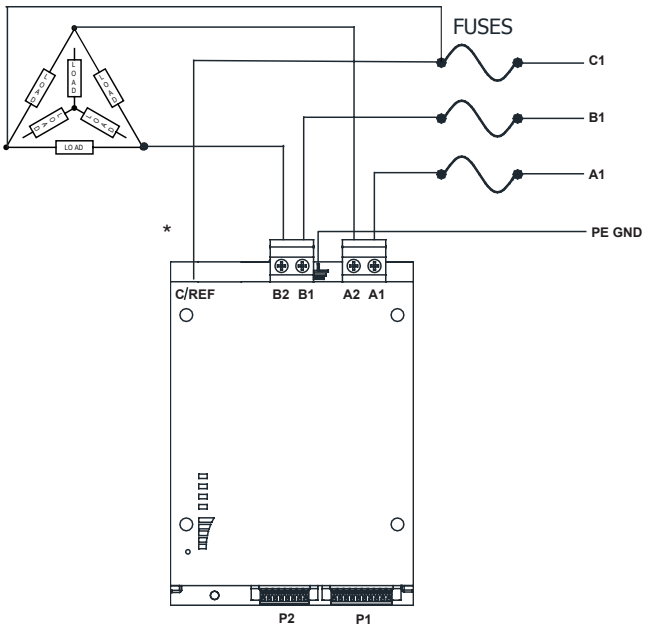
* Optional

P2 Connector



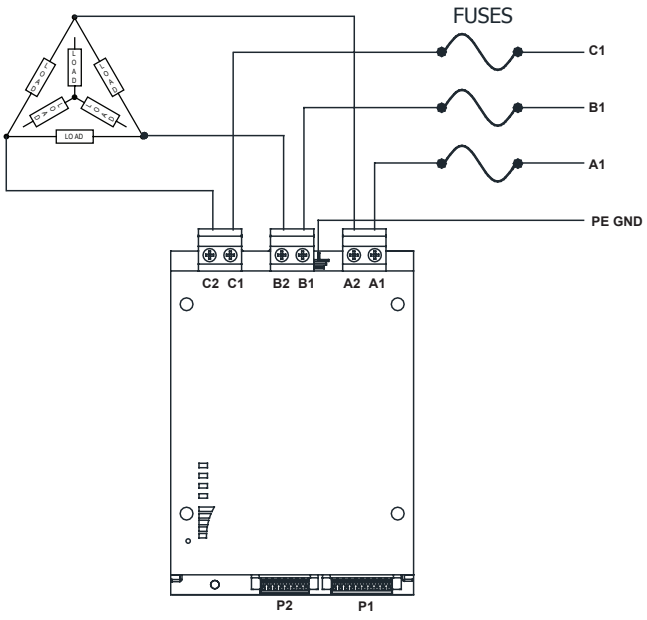
THREE PHASE LINE/LOAD CONNECTIONS

Three Phase, 2 Leg, 8 - 80 A

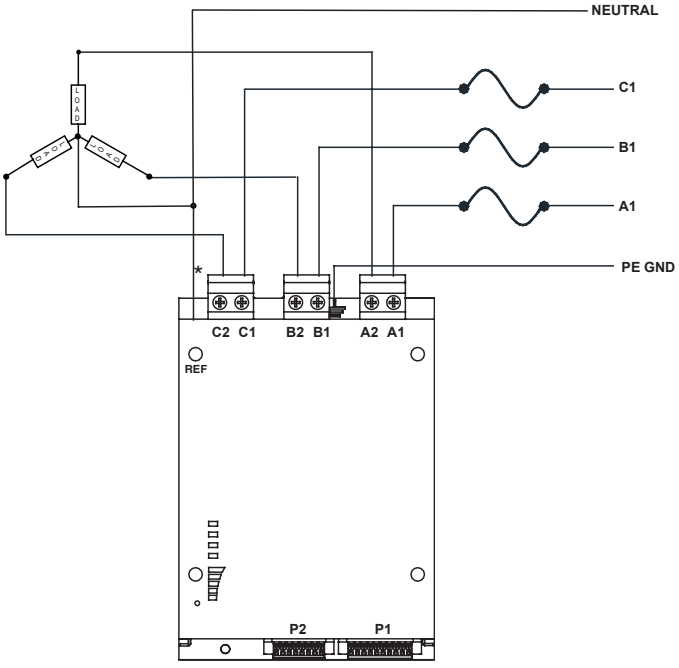


* Note: 0.60 mA maximum through C Ref connection at 600 Vac.

Three Phase, Delta or Wye, 8 - 80 A

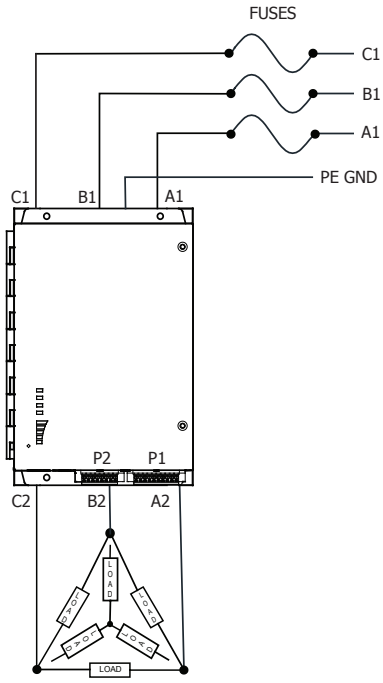


Three Phase, Four Wire Wye, 8-80



* Note: 0.60 mA maximum through Ref connection at 600 Vac.

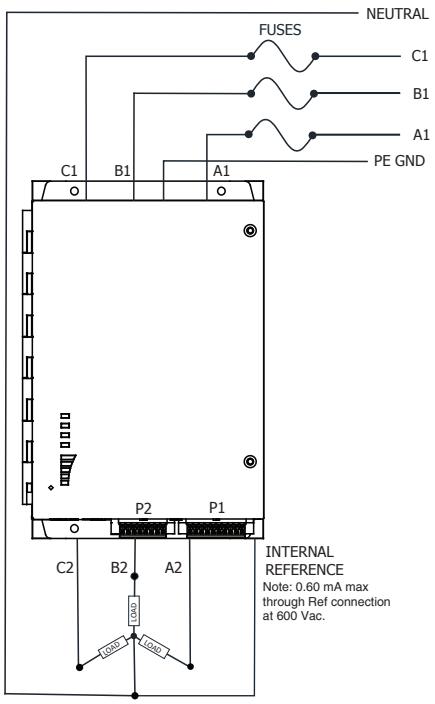
Three Phase, Delta or Wye, 100 - 160 A



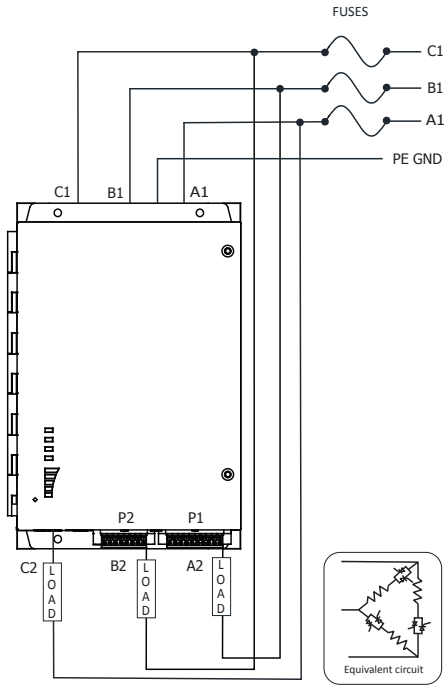
See manual for recommended wire sizes.

THREE PHASE LINE/LOAD CONNECTIONS

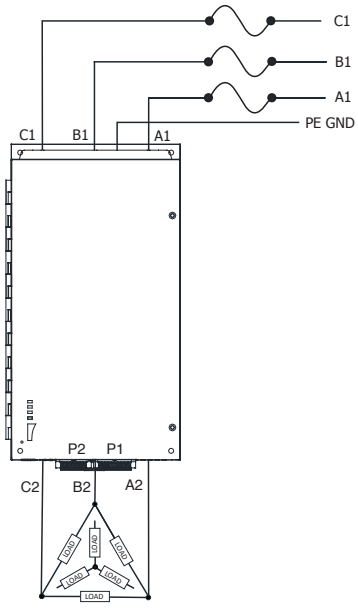
Three Phase, Four Wire Wye,100 - 160 A



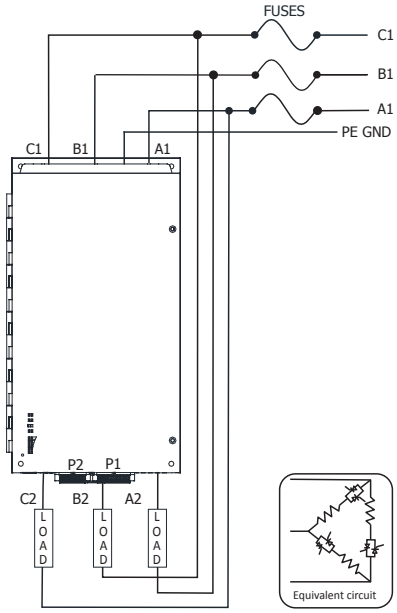
Three Phase, Inside Delta, 100 - 160 A



Three Phase, Delta Wye, 200 - 400 A



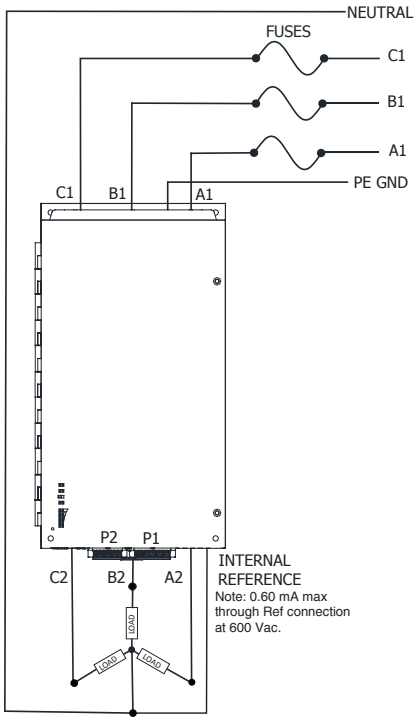
Three Phase, Inside Delta, 200 - 400 A



See manual for recommended wire sizes.

THREE PHASE LINE/LOAD CONNECTIONS, CONTINUED

Three Phase, 4 Wire Wye, 200 - 400 A



See manual for recommended wire sizes.

FEATURE COMPARISON

MicroFUSION is available with one of four performance options: SX-S (Standard board), SX-L (Standard board with Current features), HX-L (High Performance board with Current and Voltage features) and HX-P (Fully populated High Performance board)

● = Included
☐ = Option Available at Manufacturing Time
O = Field Upgradable Option
- = Not available

FEATURE LIST	SX-S	SX-L	HX-L	HX-P
Auto-Ranging Input: 24 - 600 Vac for UL/cUL, 690 Vac for CE	●	●	●	●
Phase Angle[1] and Zero Cross Firing Modes	●	●	●	●
Adjustable Phase Angle Soft-Start[1]	●	●	●	●
Heater Bake Out	●	●	●	●
Touchsafe Design	●	●	●	●
UL Listed, CE, 100kA SCCR, and RoHS certifications	●	●	●	●
Micro USB Connection (USB Plug-N-Play)	●	●	●	●
Free Control Panel Software	●	●	●	●
DIN Rail Mountable (Up to 80A)	●	●	●	●
Panel Mount	●	●	●	●
Run/Stop	●	●	●	●
Overcurrent Trip	●	●	●	●
Analog Input (0 - 10 Vdc, 0/4 - 20 mA or potentiometer)	●	●	●	●
CCI Link™ Connectivity	●	●	●	●
TRANS-GUARD™ - Prevent upstream transformer heating	●	●	●	●
LED Bar Graph	●	●	●	●
Fixed Current Limit - 105% of Frame	●	-	-	-
Adjustable Current Limit	O	●	●	●
Alarm Relay	O	O	●	●
Current Control	O	●	●	●
Load Voltage Control	-	-	●	●
Voltage Limit	-	-	●	●
Monitor Load Current - Provides load current data via software, display, or fieldbus	O	●	●	●
Isolated I/O	☐	☐	☐	☐
2 Analog Input Channel (0 - 10 Vdc, 0/4 - 20 mA or potentiometer)	O	O	O	O
General Purpose Input	O	O	O	O
Pulse Width Modulation Input (PWM)	O	O	O	O
Accessory Option: Remote Display	O	O	O	O
SYNC-GUARD™ Connectivity - Power level multiple Zero-Cross controllers	O	O	O	O
External Fieldbus Options: Modbus TCP, Modubs RTU, EtherNet/IP, PROFINET, PROFIBUS, EtherCat	O	O	O	O
Internal Fieldbus Options: PROFINET, Modbus TCP, and EtherNet/IP	☐	☐	☐	☐
External Panel Mount Heatsink (Up to 50 A)	☐	☐	☐	☐

[1] Except for 4DY models

FEATURE COMPARISON LIST, continues on next page

FEATURE COMPARISON, CONTINUED

FEATURE LIST, CONTINUED	SX-S	SX-L	HX-L	HX-P
Water Cooled Heatsink	□	□	□	□
Zero Cross Transformer Firing Mode	-	-	O	O
Retransmit (RTX): 2x High Resolution Analog Outputs 0 -10 Vdc or 0/4-20 mA	-	-	O	O
Power Limit	-	-	O	●
True Power Control	-	-	O	●
Monitor True RMS Power - Provides true power data via software, display, or fieldbus	-	-	O	●
High Resolution Control Loop	-	-	O	●
Kwh Meter	-	-	O	●
HiPer Mode - High performance low conduction angle firing mode	-	-	O	●
Resistance Measurement	-	-	O	●

SPECIFICATIONS

POWER	
Line Voltage (Auto Ranging)	UL/cUL: 24 - 600 Vac (Nominal) +10% / -15% (Contact CCI for other options) CE: 24 - 690 Vac (Nominal) +10% / -15% (Contact CCI for other options)
Line Frequency (Auto Ranging)	45 - 65 Hz
Frame Current Ratings (Amps)	Continuous RMS (AC) 8 | 16 | 32 | 50 | 80 |100 | 130 | 160 |200 | 240 | 320 | 400
Current Rating - Peak Surge	20X frame rating for 10 ms
Minimum Hold/Latch Current	500 mA up to 160 A 1 A at 200 - 400 A
Max Leakage Current	10.6 mA @ 600 VAC 50/60 Hz
SCR Rating (PIV)	1600 V peak forward & reverse
Fusing	Optional external Class T, branch-rated, touch-safe fusing
Thermal	Integrated heat sink thermal sensor
Current Limit	105% (SX-S), 20 - 105% (SX-L, HX) of continuous rating of Frame Amp Rating
Current Trip	50 - 450% of continuous rating
Power Dissipation	1.3 Watt per A of load current per phase
Control Power / Operates Internal Control Electronics	24 Vdc +10 / -15% (See Page 8 for DC power consumption)
Utilization Categories	See manual for ratings

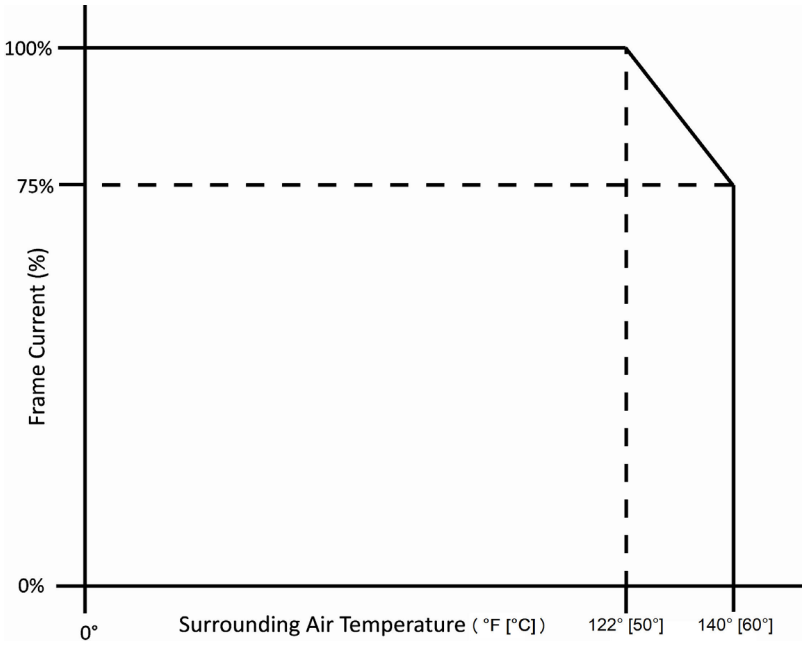
ENVIRONMENTAL	
Surrounding Air Operating Temp	32°F to 122°F [0°C to 50°C] with derating for 140°F [60°C]
Humidity	20 to 90% RH Non-Condensing
Rated Operating Altitude	Up to 6000 ft [1829 m] at full rated current
Contaminates	RoHS Compliant, CE Pollution Degree 2
Storage Temperature	- 4°F to 176°F [-20°C to 80°C]

NOTE: Refer to the Operators Manual for EMC and other pertinent information.

SPECIFICATIONS, CONTINUED

RELIABILITY	
Mean Time Between Failure (MTBF)	100,000 Hours at 25°C

TEMPERTURE DERATING
Surrounding Air Temperature effect on the Controller



PERFORMANCE		
	Standard	**High Performance Option**
Setpoint Resolution	10k	10k or 64k
Internal Control Loop Resolution	16k	64k
Output Resolution	12k @ 50Hz, 10k @ 60Hz	50k @ 50Hz, 42k @ 60Hz
Response Time	Adjustable from 50 msec to 2 sec	Adjustable from 50 msec to 2 sec
Accuracy (Full Conduction)		
Voltage	3% of frame rating	0.5% of frame rating
Current	3% of frame rating	0.5% of frame rating
Power	6% of frame rating	1% of frame rating
Output Linearity	4% from 5 to 100% output range	1% from 5 to 100% output range
Accuracy	+10% to -15% line voltage change will result in a max output change of 0.5% from 5 to 100% output range	+10% to -15% line voltage change will result in a max output change of 0.05% from 5 to 100% output range
Temperature Drift	Output shall not change greater than 0.5% per degree C max over the operating temperature range from 5 to 100% output range	Output shall not change greater than 0.2% per degree C max over the operating temperature range from 5 to 100% output range

SPECIFICATIONS, CONTINUED

COOLING

Din Rail/Panel Mount	Forced Air / Natural Convection
External Panel Mount	Natural Convection
Liquid Cooled	Flow rate: 1 GPM [3.79 LPM] minimum Maximum inlet temperature: 122° F [50° C] Maximum pressure: 60 PSI [4.137 Bar] Up to 50% glycol water solution Pressure Drop: 2.60 PSI at 1 GPM Particulate filtered water containing less than:

Mineral	Recommended Limit
Calcium	< 50 PPM
Magnesium	< 50 PPM
Total Hardness	< 100 PPM (5 Grains)
Chloride	< 25 PPM
Sulfate	< 25 PPM

A corrosive inhibitor must be used for deionized or demineralized water
PH must be between 4 and 9.

DC POWER CONSUMPTION

8 - 160 Amp Three Phase	24 Watts
200 - 400 Amp Three Phase	33 Watts
Onboard Fieldbus Module	Add 0.7 Watts
CCI Connect Module	Add 6 Watts for each Connect Module in the system, not per controller

ENCLOSURE PROTECTIVE RATING

International	IP 20
Remote Display	IP 65, UL Type 1 & 12
External Panel Mount	IP 65, UL Type 4
Liquid Cooled	IP 65, UL Type 4

I^2t DATA (8.3 - 10 msec)

Frame Size	Conditions	I^2t Data
0 - 80	Junction Temp 125°C	16200 A^2s
100 - 160	Junction Temp 125°C	80000 A^2s
200 - 240	Junction Temp 125°C	125000 A^2s
320 - 400	Junction Temp 125°C	320000 A^2s

ISOLATION

Signal to Line/Load	4000 Vac minimum
Line/Load to Ground	2500 Vac minimum
Signal to Ground	2000 Vac minimum
Line to Load	1400 Vac minimum
Network	1500 Vac minimum
USB	2500 Vac minimum
Signal to Processor	1500 Vac minimum
Remote Display	2500 Vac minimum

SCCR - TYPE 1 COORDINATION

Frame 1Ø / 3Ø	Required Fusing *	SCCR Rating
8 Amp	10A Fast Acting J or T	100 kA
16 Amp	20A Fast Acting J or T	100 kA
32 Amp	40A Fast Acting J or T	100 kA
50 Amp	60A Fast Acting J or T	100 kA
80 Amp	100A Fast Acting J or T	100 kA
100 Amp	125A Fast Acting J or T	100 kA
130 Amp	175A Fast Acting J or T	100 kA
160 Amp	200A Fast Acting J or T	100 kA
200 Amp	250A Fast Acting J or T	100 kA
240 Amp	300A Fast Acting J or T	100 kA
320 Amp	400A Fast Acting J or T	100 kA
400 Amp	500A Fast Acting J or T	100 kA

* Maximum fuse Ampere shown above, fuses with lower Ampere rating can also be used.

ANALOG SETPOINT INPUTS

Voltage	0 - 10 Vdc 0 to 65535	Update period: 6 ms
Voltage Impedance	200 kOhm	
Max Voltage	+/- 15 Vdc	
Current Mode	0 - 20 mA 0 to 32767	
Current Impedance	249 Ohm	
Max Current	+/- 31 mA or +/- 7.8 Vdc	
Pulse Width-Modulation	0 - 100% Frequency range: 20 Hz to 2 kHz max	

ACCESSORIES

CCI LINK ™

MicroFUSION features CCI Link™, a proprietary deterministic digital bus that enables multiple CONTROL CONCEPTS devices to communicate with each other. CCI Link™ is currently used to enable SYNC-GUARD™ over a digital bus.

0.5 ft [0.15m] cable	0058003-0050-005
1 ft [0.3 m] cable	0058003-0050-01
3 ft [0.9m] cable	0058003-0050-03
5 ft [1.5m] cable:	0058003-0050-05
15 ft [4.6m] cable:	0058003-0050-15
25 ft [7.6m] cable:	00580003-0050-25

FIELDBUS INTERFACE

Modbus RTU (RS-485), Modbus TCP (Ethernet), EtherNet/IP, EtherCAT, PROFINET, or PROFIBUS.
Simplify your cabling, eliminate A/D conversion error, and gain access to monitor information.
Internal interface option: Modbus TCP, EtherNet/IP, or PROFINET.
External interface option: All fieldbus interfaces are available. Controls up to ten zones.

REMOTE HAND TERMINAL

This handheld display can be plugged into any MicroFUSION or FUSION device to view and change parameters on the display list. Part Number: SMADISPLAY-RTK.

Cables may be purchased to connect the MicroFUSION and FUSION devices.

	MicroFUSION	**FUSION**
5 ft [1.5m] cable:	0058007-0050-05	0058003-0050-05
15 ft [4.6m] cable:	0058007-0050-15	0058003-0050-15
25 ft [7.6m] cable:	0058007-0050-25	0058003-0050-25

REMOTE DISPLAY

When the Remote Display is panel mounted it's easy to view and customize limits, setpoints, and alarm conditions via the 2-Line, 16-character text display. UL-type 1 & 12 ratings, IP65

5 ft [1.5m] cable:	SMAUFUSION-RDK5
15 ft [4.6m] cable:	SMAUFUSION-RDK15
25 ft [7.6m] cable:	SMAUFUSION-RDK25

ACCESSORIES, CONTINUED

DIN RAIL POWER SUPPLIES

24 Watt – 0091011-0024-1
60 Watt – 0091011-0060-1
96 Watt – 0091011-0096-1
120 Watt – 0091011-0120-1

USB CABLE

15 FT [4.92 m], Micro USB cable: 0058006-0000-15

OTHER ACCESSORIES

Please contact us for fuse sizing and other accessory needs and we will accommodate you.

MODEL NUMBERS

uF3 □□□□ - □ - □□□□□ - □

Board Type
SX = Standard
HX = High performance

Load Config
4DY = 3 phase, 2 leg
6DY = 3 phase, Delta / Wye
64Y = 3 phase, 4 Wire Wye
6ID = 3 phase, Inside Delta

Frame Style
A = 16 - 32 A (Panel Mount / DIN Rail)
B = 50 - 80 A (Panel Mount / DIN Rail)
C = 16 - 32 A (External Mount)
D = 50 A (External Mount)
E = 16 - 32 A (Liquid Cooled)
F = 50 - 80 A (Liquid Cooled)
G = 8 A (Panel Mount / DIN Rail)
H = 8 A (External Mount)
I = 8A (Liquid Cooled)
J = 100 - 160 A (Panel Mount)
K = 200 - 240 A (Panel Mount)
L = 320 - 400 A (Panel Mount)
M = 100 - 160 A (Liquid Cooled)
N = 200 - 240 A (Liquid Cooled)
O = 320 - 400 A (Liquid Cooled)

Option Board
Ø = None
I = EtherNet/IP
E = Modbus TCP
N = PROFINET

Amp Size
8 = 8 Amps[2]
16 = 16 Amps
32 = 32 Amps
50 = 50 Amps
80 = 80 Amps
100 = 100 Amps
130 = 130 Amps
160 = 160 Amps
200 = 200 Amps
240 = 240 Amps
320 = 320 Amps
400 = 400 Amps

Performance
Available with SX:
S = Standard
L = Adjustable Current Limit and Current Feedback
Available with HX:
L = Adjustable Current Limit, Current Feedback, Load Voltage Feedback, & Voltage Limit
P = High Performance (Includes Load Voltage Feedback, True RMS Power Control, Current Limit, Power Limit, and High Resolution Control Loop)

I/O
Ø = None [3]
1 = Alarm Relay (1x Form C) [3]
2 = General Purpose Input, Analog Input Channel 2, Pulse Width Modulation Input [3]
3 = Alarm Relay and General Purpose Input, Analog Input Channel 2, Pulse Width Modulation
4 = Isolated I/O [3]
5 = Isolated I/O with Alarm Relay
6 = Isolated I/O with Gen. Purpose Input, Analog Input Channel 2, Pulse Width Modulation [3]
7 = Isolated I/O with Alarm Relay and Gen. Purpose Input, Analog Input Channel 2 / Pulse Width Modulation

Retransmits
Ø = None
R = Retransmits[2] (Two 16-bit analog retransmits for voltage, load resistance, current, power)

Sync
Ø = None
S = Digital SYNC-GUARD™

Zero Cross Transformer Mode (ZCT)
Ø = None
Z = Zero Cross Transformer Mode [2]

Branch Rated Class T Fuse Options

Blank = None	F030 = 30 A	F060 = 60 A	F110 = 110 A	F250 = 250 A
F010 = 10 A	F035 = 35 A	F070 = 70 A	F125 = 125 A	F300 = 300 A
F015 = 15 A	F040 = 40 A	F080 = 80 A	F150 = 150 A	F350 = 350A
F020 = 20 A	F045 = 45 A	F090 = 90 A	F175 = 175 A	F400 = 400A
F025 = 25 A	F050 = 50 A	F100 =100A	F200 = 200 A	F450 = 450A
			F225 = 225 A	F500 = 500A

See “Fusing Options,” page 8, for more information.

[1] Contact factory for availability
[2] Only available with HX type board
[3] Only applicable for SX; Alarm relay is standard for HX

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