

UL[®] and NEC[®] Requirements for Electric Panel Assemblies Marked with Fault Current or SCCR



Effective April 2006 through UL[®] 508A, the National Electric Code[®] (NEC[®]) requires that electrical panel assemblies be marked with the available fault current or Short-Circuit Current Rating (SCCR). See Article 409.110 of the 2008 edition of NEC[®]. The SCCR rating must be marked on all industrial electrical panels and will be rated at the level of the lowest SCCR component.



What Is Short-Circuit Current Rating (SCCR)?

SCCR is a safety consideration that gives a rating ensuring a circuit or piece of equipment will not produce a dangerous arc flash. An arc flash results in an explosion caused by an insulation failure or air ionization from an over-voltage event. An arc flash with 1,000 amperes or more can cause substantial damage, fire or injury. The massive energy released in the fault rapidly vaporizes the metal conductors involved, blasting molten metal and expanding plasma outward with extreme force. The reason behind the code change is to prevent fire, injury or death.

The SCCR rating represents the maximum level of short-circuit current that the component or assembly can withstand and is used for determining compliance with NEC[®] Article 110.10. Although this rating can be marked on individual components or assemblies, the assembly rating takes into account all components contained within the equipment. Do not make the mistake to assume that the interrupting rating of the over current protective device protecting the circuit represents the SCCR for the entire circuit. Interrupting ratings apply solely to the over current protective device and are used for compliance with NEC[®] Article 110.9.

All industrial electrical systems have a known "Fault Current," which is available from the utility that serves the building. If the incoming power and the buss power are rated at 68,000 amps, then any new control panel installed in that area must have a SCCR rating of at least 68,000 amps.

Every component within the power switching circuit must meet or exceed the available fault current where the panel is to be installed. If a device has not been tested for a SCCR, then the generic rating of 5,000 amperes is assigned for a switch (Silicon Controlled Rectifiers are switches). Most installed panel locations will require a higher SCCR rating than 5,000 amperes.



What does this mean to you?

If on-site power supply available fault current is higher than your SCCR panel rating, additional mitigation measures will be required in order to meet the lower SCCR rating of the electrical panel. See document references listed at the end of this white paper. This may mean installing a transformer on location to limit the available fault current. By selecting tested power components such as **Watlow[®] DIN-A-MITE[®]** tested to 200,000 amperes; **ASPYRE[®]** products tested to 100,000 amperes; and **EZ-ZONE[®] RM**, PM and Flex modules tested to 10,000 amperes, the additional mitigation measures may not be required reducing the panel installation cost for you and your customer.

Watlow has tested the following power controllers for short-circuit current rating (SCCR). These devices have a rating of 200,000 amperes when used with the listed fuse in each hot leg. SCCR defaults to 5,000 amperes per UL[®] 508A guidelines and the United States National Electric Code (NEC[®]) with any other untested combination. Semiconductor fuses do not meet branch circuit requirements per NEC[®]. The combination DFJ fuse does provide branch circuit protection and will protect the semiconductor device. Use either the Watlow semiconductor fuse with branch circuit protection or the Bussmann Combination fuse to both prevent arc flash and protect the power controller.

SCCR ratings are not valid at all unit voltages, see tables below for details.

DIN-A-MITE Semiconductor and Combination Fuses

Model	Fuse Rating 125% of load	Watlow Semiconductor Fuse Part No.	Watlow Semiconductor Fuse Holder Part No.	*Bussmann Semiconductor Fuse Part No.	Bussmann/ *Watlow Combination Fuse Part No.	Bussmann/ *Watlow Fuse Holder for Combination Fuse	SCCR in Amperes	SCCR Max Voltage
DIN-A-MITE A, B, C	20A	17-8020 or 1107-8964	17-5110 or 1728-3946	FWC-20A10F	DFJ-20 0808-0325-0020 or 1280-8223	CH30J1i 0808-0326- 1530 or 1621-9995	200,000	480 VAC~
DIN-A-MITE A, B, C	25A	17-8025 or 1891-6036		FWC-25A10F	DFJ-25 No Watlow P/N			
DIN-A-MITE A ¹ , B, C	30A	17-8030 or 1829-7197	FWP-30A14F	DFJ-30 0808-0325-0030 or 1726-1403				
DIN-A-MITE A ¹ , B, C	40A	17-8040 or 1314-4396	17-5114 or 1197-5116	FWP-40A14F	DFJ-40 0808-0325-0040 or 1003-6251	CH60J1i 0808-0326- 3560 or 1626-1208		
DIN-A-MITE B ¹ , C	50A	17-8050 or 1070-9985		FWP-50A14F	DFJ-50 0808-0325-0050 or 1893-2479			
DIN-A-MITE B ¹ , C	63A	17-8063 or 1094-4923	17-5122 or 1133-1542	FWP-63A22F	DFJ-60 0808-0325-0060 or 1466-6868	JM601001CR 0808-0326- 7010 or 1115-7468		
DIN-A-MITE C	80A	17-8080 or 1132-4242		FWP-80A22F	DFJ-80 0808-0325-0080 or 1749-6622			
DIN-A-MITE C	100A	17-8100 or 1836-8349		FWP-100A22F	DFJ-100 0808-0325-0100 or 1125-6340			
DIN-A-MITE D ²	65A x 2	0808-0096- 0000 or 1808-8019	Not Applicable	170N3437	Not Applicable	Not Applicable		

¹ FPW series can be used up to this rating to protect the SCR. DFJ series cannot as it must follow the branch circuit 125% rating rule.

² **DIN-A-MITE** D uses two semiconductor 65A fuses in parallel.

DIN-A-MITE Branch Circuit Fuses

Model	Branch Class Fuse Rating	Watlow Fuse Holder Part No.	Fuse Mfg. Part No.	SCCR in Amperes	SCCR Max Voltage
DIN-A-MITE B	60A - Type 1 protection only	0808-0326-3560	Eaton Bussmann Class J, CF, T 60A	200,000 A	480 VAC~
DIN-A-MITE C	100A - Type 1 protection only	0808-0326-7010	Eaton Bussmann Class J, CF, T 100A	200,000 A	480 VAC~

*Per UL 508A Table SB4.2 let through ratings, where the specified branch circuit protection related to the high fault short circuit current rating is a Class CC, G, J, L, RK1, RK5, or T fuse, a fuse of a different class is able to be used at the same high fault rating where the peak let-through current and I²t of the new fuse is not greater than that of the specified fuse.

Definitions from EN 60947-4-3

Type 1 Protection - Coordination requires that, under short-circuit conditions, the device shall cause no danger to persons or to the installation and may not be suitable for further service without repair and replacement of parts.

Type 2 Protection - Coordination requires that, under short-circuit conditions, the device shall cause no danger to persons or to the installation and shall be suitable for further use.

For Type 2 protection you must use the tested semiconductor or combination fuses listed in this document. For Type 1 protection any manufacturer's umbrella branch-rated fuse of the appropriate amperage or less can be substituted.

EZ-ZONE ST Semiconductor and Combined Fuses

Model	Fuse Rating 125% of Load	Watlow Semiconductor Fuse Part No.	Watlow Semiconductor Fuse Holder Part No.	*Bussmann Semiconductor Fuse Part No.	Bussmann/ *Watlow Combination Fuse Part No.	Bussmann/ *Watlow Fuse Holder for Combination Fuse	SCCR in Amperes	SCCR Max Voltage
EZ-ZONE ST ≤ 25A	30A	17-8030 or 1829-7197	17-5114 or 1197-5116	FWP-30A14F	DFJ-30 0808-0325-0030 or 1726-1403	CH30J1i 0808-0326-1530 or 1621-9995	200,000	480VAC~
EZ-ZONE ST ≤ 25A	40A ¹	17-8040 or 1314-4396		FWP-40A14F	DFJ-30 is max size 125% rating			480VAC~
EZ-ZONE ST ≤ 50A	50A	17-8050 or 1070-9985	17-5122 or 1133-1542	FWP-50A22F	DFJ-50 0808-0325-0050 or 1893-2479	CH60J1i 0808-0326-3560 or 1626-1208		480VAC~
EZ-ZONE ST ≤ 50A	63A ¹	17-8063 or 1094-4923		FWP-63A22F	DFJ-50 is max size for I2T at 480V			480VAC~
EZ-ZONE ST ≤ 50A					DFJ-60 0808-0325-0060 or 1466-6868	CH60J1i 0808-0326-3560 or 1626-1208		DFJ fuse 240VAC~ FWP fuse 480VAC~
EZ-ZONE ST ≤ 75A	80A	17-8080 or 1132-4242		FWP-80A22F	DFJ-80 0808-0325-0080 or 1749-6622	JM60100-1CR 0808-0326-7010 or 1115-7468		480VAC~
EZ-ZONE ST ≤ 75A	90A	Not available	Not available	DFJ-90 No Watlow P/N	480VAC~			
EZ-ZONE ST ≤ 75A	100A	17-8100 or 1836-8349	17-5122 or 1133-1542	FWP-100A22F	DFJ-100 0808-0325-0100 or 1125-6340			DFJ fuse 240VAC~ FWP fuse 480VAC~

¹ FPW series can be used up to this rating to protect the SCR. DFJ series cannot as it must follow the branch circuit 125% rating rule.

EZ-ZONE RM Fuses for 10A SSR

Model	Fuse Rating 125% of Load	Watlow Semiconductor Fuse Part No.	Watlow Semiconductor Fuse Holder Part No.	*Bussmann Semiconductor Fuse Part No.	*Bussmann Branch Fuse Part No.	Watlow Branch Fuse Holder Part No.	SCCR in Amperes	SCCR Max Voltage
EZ-ZONE RM Dual 10A SSR RMEEx-KAKA-xxxx FMHA-KAAA-xxxx	12.5A	17-8012 or 1801-2596	17-5110 or 1728-3946	FWC12A10F	⁵ Any Class CC fuse LP-CC, KTK-R, FNQ-R to 125% of rated current or 20A	0808-0235-0000 or 1263-5521	10,000	240VAC~

When the semiconductor fuse is used, complies with Type 2 protection. When the branch circuit fuse is used units comply with Type 1 protection.

EZ-ZONE RM and PM Branch Fuses

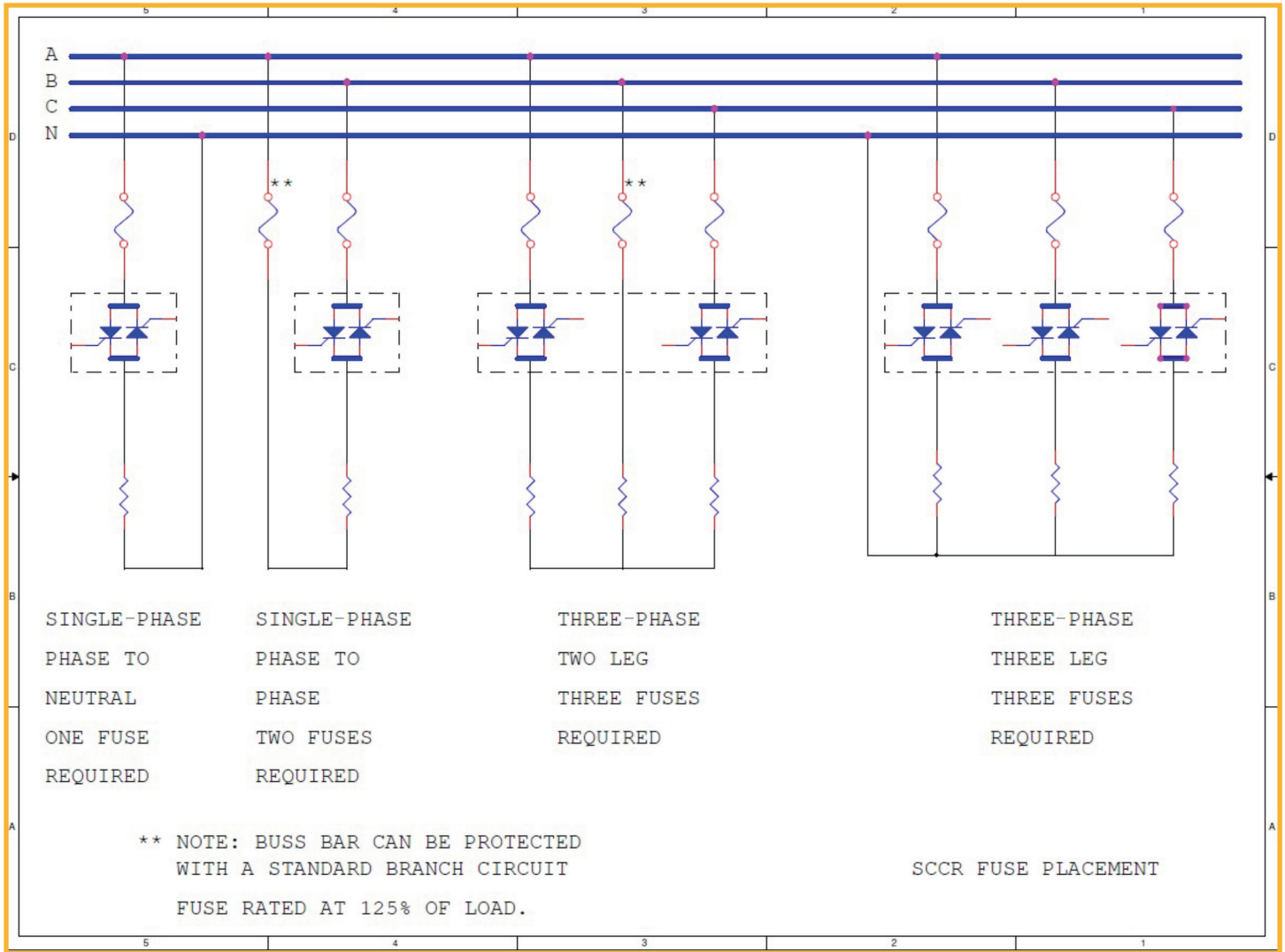
Model	Fuse Rating 125% of max Load	Semiconductor Fuse	*Bussmann Branch Fuse Part No.	Watlow Branch Fuse Holder Part No.	SCCR in Amperes	SCCR Max Voltage
EZ-ZONE RM, PM No-arc 15A relay RMC outputs D,J or Y RMC-X_X_X_X-XXXX PMXXXXH-XXXHXXX FMMA-XXHX-XXXX	20A	Not tested with this output	⁵ Class CC fuse LP-CC, KTK-R, FNQ-R to 125% of rated current or 20A	0808-0235- 0000 or 1263-5521	10,000	240VAC
EZ-ZONE RM, PM 5A Mechanical Relay PMXXEJ-XXEJXXX RMC outputs B,F,G,H,J,K,L,M, or R RMC-X_X_X_X-XXXX RMEX-JJJX-XXXX RMHX-XXJJ-XXXX RMSX-XXJ(J,B)-XXXX RMLX-XXJ(J,B)-XXXX FM(M,L)A-XEJX-XXXX FMHA-JAAA-XXXX	7A	Not tested with this output				
EZ-ZONE RM Quad 2A SSR output RMEX-LLLL-XXXX RMHX-XXLL-XXXX FMHA-LAAA-XXXX	2.5A	Not tested with this output				

⁵ NOTE: Watlow tested worst case 20A umbrella fuse based on wire size typically used in panels. While this fuse will provide the stated Type 1 protection, it is suggested to use a fuse based on the NEC 125% rating of the load.

ASPYRE DT and ASPYRE AT Fuses

Model ASPYRE	Semiconductor Fuse Rating	Watlow Semiconductor Fuse Part No.	Semiconductor Fuse Mfg and Part No.	SCCR in Amperes	SCCR Max Voltage
DTxxx-(035 or 040)xx-xxxxx	50A	17-8050 or 1070-9985	Eaton Bussmann FWP-50A14F	100,000A	600VAC~
DTxxx-(060 or 090)xx-xxxxx	160A	0808-0363-0160 or 1726-6257	Siba 20 559 20.160		
DTxxx-120xx-xxxxx	180A	0808-0363-0180 or 1018-7683	Siba 20 559 20.180		
DTxxx-150xx-xxxxx	200A	0808-0363-0200 or 1244-1039	Siba 20 559 20.200		
DTxxx-180xx-xxxxx	250A	0808-0363-0250 or 1719-6994	Siba 20 559 20.250		
DTxxx-210xx-xxxxx	315A	0808-0363-0315 or 1035-7646	Siba 20 559 20.315		
DT1xx-300xx-xxxxx	350A	0808-0362-0000 or 1696-7825	Eaton Bussmann 350FM		
DT(2 or 3)xx-300xx-xxxxx	450A	0808-0357-0000 or 1682-4243	Eaton Bussmann 450FMM		
DT3xx-350xx-xxxxx or DTxxx-400xx-xxxxx	550A	0808-0358-0000 or 1076-7589	Eaton Bussmann 550FMM		
DT2xx-(450 or 500)xx-xxxxx	315 A (2 per leg)	0808-0360-0000 or 1119-0623	Eaton Bussmann 315FM		
DT3xx-450xx-xxxxx or DT(1 or 3)xx-500xx-xxxxx	700A	0808-0359-0000 or 1278-9993	Eaton Bussmann 700FMM		
DT1xx-(600 or 700)xx-xxxxx, DTxxx-800xx-xxxxx	250A (4 per leg)	0808-0363-0250 or 1719-6994	Siba 20 559 20.250		
DTxxx-(600 or 700)xx-xxxxx	450A (2 per leg)	0808-0357-0000 or 1682-4243	Eaton Bussmann 450FMM		
DTxxx-1k1xx-xxxxx	800A (2 per leg)	2078-4948	Siba 20 681 32 800 or Eaton Bussmann 170M6462		
DTxxx-1k4xx-xxxxx	1250A (2 per leg)	2078-5257	Siba 20 681 32 1250 or Eaton Bussmann 170M6466		
DTxxx-(1k6, 1k8, or 2k1)xx-xxxxx	1400A (2 per leg)	2078-5261	Siba 20 681 32 1400 or Eaton Bussmann 170M6467		
DTxxx-2k1xx-xxxxx	1600A (2 per leg)	2078-5400	Eaton Bussmann 170M6469		
ASPYRE AT 12A	15 amps - Type 1 protection only	N/A	Eaton FAZ-D15X-NA Circuit Breaker	10,000 A	240VAC~
ASPYRE AT 24A	30 amps - Type 1 protection only	N/A	Eaton FAZ-D30X-NA Circuit Breaker	10,000 A	240VAC~
ASPYRE AT 12A	15A	N/A	Eaton Bussmann DFJ15 or Class J/CC/CF/T 15 Amp	100,000 A	480VAC~
ASPYRE AT 24A	30A	0808-0325-0030	Eaton Bussmann DFJ30 or Class J/CC/CF/T 30 Amp	100,000 A	480VAC~
ASPYRE AT 48A	60A	0808-0325-0060	Eaton Bussmann DFJ60 or FWP 60	100,000 A	480VAC~
ASPYRE AT 48A	60A - Type 1 protection only	N/A	Eaton Bussmann Class J, CF, T 60A	100,000 A	480VAC~

Fusing for Various Phase Configurations



Notes Regarding All Products:

- Tests performed with worst case fuse rating of product and smallest SCR module size.
- Fuses designated as Semiconductor only do not have Branch Circuit Ratings and a Separate Branch Circuit Fuse is required in the system.
- The Series DFJ fuse is rated as both a Semiconductor Fuse and Branch Circuit Fuse. UL File E4273 JDDZ, CSA File 53787 Class 1422-02.
- Tests performed with Semiconductor FWP series fuses representative of FWC series fuses.
- Fuses of similar family style (FWP, FWC, FWH, 170M, DFJ) as those tested but of smaller amperage rating are considered compliant.

Document References

NEC® 2008
 NFPA 70™ : National Electrical Code®
 International Electrical Code® Series
<http://www.nfpa.org>

UL® 508 - Industrial Control Equipment
 UL® 508A - Industrial Control Panels
 UL®/EN 60947-4-3 Low-voltage switchGear and controlGear - Part 4-3: Contactors and motor-starters - AC semiconductor controllers and contactors for non-motor loads
 Underwriters Laboratories Inc. (UL®)
 333 Pfingsten Road
 Northbrook, IL 60062-2096

Further information is available at: www.watlow.com