

MODELS: FR-D800 Series

**TITLE: Branch Circuit Protection Devices to Comply with the UL61800-5-1 Standard
for the FR-D800 Series Inverters**

1. Purpose

This document provides information on branch circuit protection devices used with the FR-D800 Series general-purpose inverter to comply with the UL 61800-5-1 standard.

2. Fuse Information

The fuse selection tests have been conducted in accordance with the UL 61800-5-1 standard.

- The tests with semiconductor fuses have been conducted in circuits where a maximum short circuit current of 100kA occur.
- The tests with UL class fuses have been conducted in circuits where a maximum short circuit current of 31kA or 5kA occur.

Please refer to section 3 below for the fuses to be used for each inverter model and capacity.

Rating (A)	Between Threshold & 50 kA		100 kA		200 kA		300 kA (if marked)	
	$I_p \times 10^3$ (A)	$I^2t \times 10^3$	$I_p \times 10^3$ (A)	$I^2t \times 10^3$	$I_p \times 10^3$ (A)	$I^2t \times 10^3$	$I_p \times 10^3$ (A)	$I^2t \times 10^3$
1	6	7	1.0	0.8	12	7	18.5	8.4
3			1.5	1.2				
6			2.3	2.0				
10			3.3	3.0				
15			4.0	4.0				
20			5.0	5.0				
25			6.0	5.5				
30			7.5	7.0				
35	8	30	7.5	12	16	30	24.367	36
40			8.0	17				
45			8.5	18				
50			9.0	22				
60			10.0	30				
70	12	60	11.5	50	20	80	28.367	96
80			12.5	60				
90			13.5	75				
100			14.0	80				

In addition to the above information, the rules that must be followed to comply with the standard are:

1. Semiconductor fuses are not included with the inverter and must be procured separately.
2. The semiconductor fuses listed in this document's tables are necessary branch circuit protection devices to comply with the NEC (National Electrical Code).
3. The inverters listed with explicit minimum enclosure volume in section 3 below must be mounted in the enclosure when using with the UL class fuses. Minimum Enclosure Volume is specified in each table.
4. Listed Class J, T, CC fuses, and semiconductor fuses may be used.
5. When installing the inverter, follow the inverter installation procedures and the requirements of the NEC (National Electrical Code).
6. The semiconductor fuses listed in the subsequent tables indicate only the basic part numbers. Fuses with indicators may also be used without affecting the inverter's UL certification, performance, or the ratings of the semiconductor fuses.
7. The current rating of UL class fuses must be four times or less the maximum full-load output current rating of the motor driven by the inverter.

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3. Fuse selection

(1) FR-D820 3 ϕ 200V-240V SCCR with Fuse

FR-D820-[]	Input Current (A)	Output Current (A)	SCCR 100kA			SCCR 31kA		
			Semiconductor Fuses			UL Class fuse		
			Current (A)	Voltage (V)	Bussmann	Current (A)	Voltage (V)	Minimum Enclosure Volume (in3)
0.1K-008	1.8	1.4	10	700	170M1408 170M1308 170M1358	3	300 or 600	3051
0.2K-014	3.4	2.5	10	700	170M1408 170M1308 170M1358	6	300 or 600	3051
0.4K-025	5.6	4.2	16	700	170M1409 170M1309 170M1359	10	300 or 600	3051
0.75K-042	8.0	6.0	25	700	170M1411 170M1311 170M1361	15	300 or 600	3051
1.5K-070	13.7	10.0	40	700	170M1413 170M1313 170M1363	20	300 or 600	3051
2.2K-100	20.6	16.5	50	700	170M1414 170M1314 170M1364	30	300 or 600	3051
3.7K-165	31.2	23.8	80	700	170M1416 170M1316 170M1366	50	300 or 600	3051
5.5K-238	40.5	31.8	100	700	170M1417 170M1317 170M1367	60	300 or 600	3051
7.5K-318	57.5	45.0	160	700	170M1419 170M1319 170M1369	90	300 or 600	3051
11K-450	74.4	58.0	200	700	170M1420 170M1320 170M1370	110	300 or 600	3051
15K-580	89.8	72.0	250	700	170M1421 170M1321 170M1371	150	300 or 600	3051

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(2) FR-D840 3 ϕ 380V- 480V SCCR with Fuse

FR-D840-[]	Input Current (A)	Output Current (A)	SCCR 100kA			SCCR 31kA		
			Semiconductor Fuses			UL Class fuse		
			Current (A)	Voltage (V)	Bussmann	Current (A)	Voltage (V)	Minimum Enclosure Volume (in3)
0.4K-012	3.1	2.2	10	700	170M1408 170M1308 170M1358	6	600	3051
0.75K-022	6.0	3.7	16	700	170M1409 170M1309 170M1359	10	600	3051
1.5K-037	7.8	5.0	20	700	170M1410 170M1310 170M1360	15	600	3051
2.2K-050	11.9	8.1	32	700	170M1412 170M1312 170M1362	17.5	600	3051
3.7K-081	16.1	12.0	40	700	170M1413 170M1313 170M1363	25	600	3051
5.5K-120	21.3	16.3	50	700	170M1414 170M1314 170M1364	35	600	3051
7.5K-163	29.1	23.0	80	700	170M1416 170M1316 170M1366	45	600	3051
11K-230	37.9	29.5	100	700	170M1417 170M1317 170M1367	60	600	3051
15K-295	45.5	38.0	125	700	170M1418 170M1318 170M1368	70	600	3051

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(3) FR-D820S 1 ϕ 200V-240V SCCR with Fuse

FR-D820S-[]	Input Current (A)	Output Current (A)	SCCR 100kA			SCCR 31kA		
			Semiconductor Fuses			UL Class fuse		
			Current (A)	Voltage (V)	Bussmann	Current (A)	Voltage (V)	Minimum Enclosure Volume (in3)
0.1K-008	2.3	0.8	10	700V	170M1408 170M1308 170M1358	10	300 or 600	3051
0.2K-014	3.9	1.4	10	700V	170M1408 170M1308 170M1358	15	300 or 600	3051
0.4K-025	6.6	2.5	16	700V	170M1409 170M1309 170M1359	17.5	300 or 600	3051
0.75K-042	10.9	4.2	32	700V	170M1412 170M1312 170M1362	17.5	300 or 600	3051
1.5K-070	17.4	7.0	50	700V	170M1414 170M1314 170M1364	30	300 or 600	3051
2.2K-100	24.2	10.0	63	700V	170M1415 170M1315 170M1365	40	300 or 600	3051

(4) FR-D810W 1 ϕ 100V-120V SCCR with fuse

FR-D810W-[]	Input Current (A)	Output Current (A)	SCCR 100kA			SCCR 31kA		
			Semiconductor Fuses			UL Class fuse		
			Current (A)	Voltage (V)	Bussmann	Current (A)	Voltage (V)	Minimum Enclosure Volume (in3)
0.1K-008	3.8	0.8	10	700V	170M1408 170M1308 170M1358	N/A		
0.2K-014	6.2	1.4	16	700V	170M1409 170M1309 170M1359	N/A		
0.4K-025	10.5	2.5	25	700V	170M1411 170M1311 170M1361	N/A		
0.75K-042	18.8	4.2	50	700V	170M1414 170M1314 170M1364	N/A		

UL class fuse is not applicable for FR-D810W-0.1K-008, 0.2K-014, 0.4K-0.25 and 0.75K-042.

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4. Circuit Breaker Information

FR-D800 inverters are suitable for use in circuits capable of delivering less than 10 kilo rms symmetrical amperes, 600 V maximum, provided they are protected by the circuit breakers listed in section 5 below.

The inverters listed with explicit minimum enclosure volume in section 5 must be mounted in the enclosure. Minimum Enclosure Volume is specified in each table.

UL 489 Molded Case Circuit Breaker (MCCB) must be provided.

5. Circuit breaker selection

(1) FR-D820 3 ϕ 200V-240V SCCR with Circuit Breaker

FR-D820-[]	Input Current (A)	Output Current (A)	SCCR 10kA		
			MCCB		
			Current (A)	Voltage (V)	Minimum Enclosure Volume (in3)
0.1K-008	1.8	1.4	15	*1	3051
0.2K-014	3.4	2.5	15	*1	3051
0.4K-025	5.6	4.2	15	*1	3051
0.75K-042	8.0	6.0	15	*1	3051
1.5K-070	13.7	10.0	30	*1	3051
2.2K-100	20.6	16.5	40	*1	3051
3.7K-165	31.2	23.8	60	*1	3051
5.5K-238	40.5	31.8	60	*1	3051
7.5K-318	57.5	45.0	80	*1	3051
11K-450	74.4	58.0	125	*1	3051
15K-580	89.8	72.0	150	*1	3051

*1 Rated either of 240, 277, 347, 480Y/277, 480, 600Y/347, 600, 650, 690, and 700 to 1000 Vac

(2) FR-D840 3 ϕ 380V- 480V SCCR with Circuit Breaker

FR-D840-[]	Input Current (A)	Output Current (A)	SCCR 10kA		
			MCCB		
			Current (A)	Voltage (V)	Minimum Enclosure Volume (in3)
0.4K-012	3.1	2.2	15	*2	3051
0.75K-022	6.0	3.7	15	*2	3051
1.5K-037	7.8	5.0	15	*2	3051
2.2K-050	11.9	8.1	20	*2	3051
3.7K-081	16.1	12.0	30	*2	3051
5.5K-120	21.3	16.3	40	*2	3051
7.5K-163	29.1	23.0	50	*2	3051
11K-230	37.9	29.5	75	*2	3051
15K-295	45.5	38.0	100	*2	3051

*2 Rated either of 480Y/277, 480, 600Y/347, 600, 650, 690, and 700 to 1000 Vac

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(3) FR-D820S 1 ϕ 200V-240V SCCR with Circuit Breaker

FR-D820S-[]	Input Current (A)	Output Current (A)	SCCR 10kA		
			MCCB		
			Current (A)	Voltage (V)	Minimum Enclosure Volume (in3)
0.1K-008	2.3	0.8	15	*3	3051
0.2K-014	3.9	1.4	15	*3	3051
0.4K-025	6.6	2.5	15	*3	3051
0.75K-042	10.9	4.2	15	*3	3051
1.5K-070	17.4	7.0	20	*3	3051
2.2K-100	24.2	10.0	40	*3	3051

*3 Rated either of 240, 277, 347, 480Y/277, 480, 600Y/347, 600, 650, 690, and 700 to 1000 Vac

(4) FR-D810W 1 ϕ 100V-120V SCCR with Circuit Breaker

FR-D810W-[]	Input Current (A)	Output Current (A)	SCCR 10kA		
			MCCB		
			Current (A)	Voltage (V)	Minimum Enclosure Volume (in3)
0.1K-008	3.8	0.8	15	*4	3051
0.2K-014	6.2	1.4	15	*4	3051
0.4K-025	10.5	2.5	15	*4	3051
0.75K-042	18.8	4.2	20	*4	3051

*4 Rated either of 120, 127, 120/240, 208, 208Y/120, 240, 277, 347, 480Y/277, 480, 600Y/347, 600, 650, 690, and 700 to 1000 Vac