

MODELS: FR-E800 Series

TITLE: Branch Circuit Protection for FR-E800 drives

Acceptable fuses and circuit breakers for FR-E800 drives

Purpose

This document outlines alternative fuses and circuit breakers that can be used for branch circuit protection on FR-E800 drives.

Fuse Information

FR-E800 drives are suitable for use on a circuit capable of delivering not more than 100 kA symmetrical amperes (RMS) at 120, 240, 480 and 600 V maximum with semiconductor fuses.

FR-E800 drives are suitable for use on a circuit capable of delivering not more than 31 kA or 5kA symmetrical amperes (RMS) at 120, 240, 480 and 600 V maximum with Listed Class J fuses, Class T and Class CC when protected by appropriate fuses.

The drives are tested in accordance with standard UL 61800-5-1 on a circuit having available system fault current of 100 kA maximum with semiconductor fuses and 31 kA or 5kA maximum with Listed Class fuses.

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				

The testing allows other Listed fuses, which have let-through characteristics equal to or above these thresholds, to be used. Therefore, Listed Class J, T, Class CC and semiconductor fuses can also be used, since they provide equal or better protection.

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In addition to the above guidelines, the following rules must be followed:

1. Fuses are required as part of the installation. Fuses are not included in the drives and must be provided by others.
2. The UL listed fuses in the hardware manual tables, or the tables in this document are the required branch circuit protection per NEC.
3. Drives that have a Minimum Enclosure Volume listed must be mounted in an enclosure when the UL class fuses are used with the drive. Minimum Enclosure Volume specified in the tables below.
4. Listed Class J, T, Class CC and semiconductor fuses can also be used, since they provide equal or better protection.
5. When installing a drive, always follow installation instructions and NEC requirements.
6. Semiconductor fuses listed in the tables below and throughout the document are base part numbers only. Semiconductor fuses with optional indicators can be used and have no impact on the drive UL listing, performance, or rating of the fuse.
7. The current rating of UL class fuses shall be four times or less the maximum full-load motor output current rating

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FR-E820 3 ϕ 200V-240V SCCR with Fuse

FR-E820-[]	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 (in ³)
0.1K(0008)	1.9	1.3	10	700	170M1408 170M1308 170M1358	3	600	3051
0.2K(0015)	3.0	2.0	10	700	170M1408 170M1308 170M1358	6	600	3051
0.4K(0030)	5.1	3.5	16	700	170M1409 170M1309 170M1359	10	600	3051
0.75K(0050)	8.2	6.0	25	700	170M1411 170M1311 170M1361	15	600	3051
1.5K(0080)	12.5	9.6	40	700	170M1413 170M1313 170M1363	20	600	3051
2.2K(0110)	16.1	12.0	50	700	170M1414 170M1314 170M1364	25	600	3051
3.7K(0175)	25.5	19.6	80	700	170M1416 170M1316 170M1366	40	600	3051
5.5K(0240)	37.1	30.0	125	700	170M1418 170M1318 170M1368	60	600	3051
7.5K(0330)	48.6	40.0	160	700	170M1419 170M1319 170M1369	70	600	3051
11K(0470)	74.3	56.0	200	700	170M1420 170M1320 170M1370	110	600	3051
15K(0600)	90.5	69.0	250	700	170M1421 170M1321 170M1471	150	600	3051
18.5K(0760)	112.9	88.0	315	700	170M1422 170M1322 170M1472	175	600	3051
22K(0900)	139.5	115.0	315	700	170M1422 170M1322 170M1472	200	600	3051

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FR-E840-0.4K to 7.5K 3 ϕ 380V-480V SCCR with Fuse

FR-E840-[]	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 (in ³)
0.4K(0016)	3.3	2.1	10	700	170M1408 170M1308 170M1358	6	600	3051
0.75K(0026)	6.0	3.5	20	700	170M1410 170M1310 170M1360	10	600	3051
1.5K(0040)	8.9	5.5	25	700	170M1411 170M1311 170M1361	15	600	3051
2.2K(0060)	10.7	6.9	32	700	170M1412 170M1312 170M1362	15	600	3051
3.7K(0095)	16.2	11.1	50	700	170M1414 170M1314 170M1364	25	600	3051
5.5K(0120)	24.9	17.5	80	700	170M1416 170M1316 170M1366	35	600	3051
7.5K(0170)	32.4	23.0	80	700	170M1416 170M1316 170M1366	45	600	3051

FR-E840-11K to 22K 3 ϕ 380V-500V SCCR with Fuse

FR-E840-[]	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 (in ³)
11K(0230)	46.7	35.0	160	700	170M1419 170M1319 170M1469	70	600	3051
15K(0300)	54.2	41.0	160	700	170M1419 170M1319 170M1469	80	600	3051
18.5K(0380)	59.1	45.0	200	700	170M1420 170M1320 170M1370	90	600	3051
22K(0440)	75.6	60.0	250	700	170M1421 170M1321 170M1471	110	600	3051

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FR-E860 3 ϕ 575V SCCR with Fuse

FR-E860-[]	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 (in ³)
0.75K(0017)	4.3	2.5	16	700	170M1409 170M1309 170M1359	10	600	3051
1.5K(0027)	5.9	3.6	20	700	170M1410 170M1310 170M1360	10	600	3051
2.2K(0040)	8.9	5.6	32	700	170M1412 170M1312 170M1362	20	600	3051
3.7K(0061)	12.4	8.2	40	700	170M1413 170M1313 170M1363	25	600	3051
5.5K(0090)	15.9	11.0	50	700	170M1414 170M1314 170M1364	30	600	3051
7.5K(0120)	22.4	16.0	63	700	170M1415 170M1315 170M1365	35	600	3051

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FR-E820S 1 ϕ 200V-240V SCCR with Fuse

FR-E820S -[]	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 (in ³)
0.1K(0008)	2.3	0.8	10	700V	170M1408 170M1308 170M1358	3	600V	3051
0.2K(0015)	4.1	1.5	16	700V	170M1409 170M1309 170M1359	6	600V	3051
0.4K(0030)	7.9	3.0	25	700V	170M1411 170M1311 170M1361	10	600V	3051
0.75K(0050)	11.2	5.0	40	700V	170M1413 170M1313 170M1363	20	600V	3051
1.5K(0080)	17.9	8.0	63	700V	170M1415 170M1315 170M1365	30	600V	3051
2.2K(0110)	25.0	11.0	100	700V	170M1417 170M1317 170M1367	35	600V	3051

FR-E810W 1 ϕ 100V-120V SCCR with fuse

FR-E810W-[]	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 (in ³)
0.1K(0008)	3.7	0.8	16	700V	170M1409 170M1309 170M1359	N/A		
0.2K(0015)	6.8	1.5	20	700V	170M1410 170M1310 170M1360	N/A		
0.4K(0030)	12.4	3.0	40	700V	170M1413 170M1313 170M1363	N/A		
0.75K(0050)	19.6	5	63	700V	170M1415 170M1315 170M1365	N/A		

UL class fuse is not applicable for FR-E810W-0.1, 0.2, 0.4, 0.75K.

Four times the maximum full-load motor output current < Input current rating

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Circuit Breaker Information

FR-E800 drives are suitable for use on a circuit capable of delivering not more than 10 kA symmetrical amperes (RMS) at 600V maximum, when protected by appropriate circuit breakers in the tables below.

Drives that have a Minimum Enclosure Volume listed must be mounted in an enclosure.

Minimum Enclosure Volume specified in the tables below.

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

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FR-E820 3 ϕ 200V-240V SCCR with Circuit Breaker

FR-E820-[]	Input Current (A)	Output Current (A)	SCCR 10kA	
			MCCB	
			Current (A)	Minimum Enclosure Volume (in ³)
0.1K(0008)	1.9	1.3	15	3051
0.2K(0015)	3.0	2.0	15	3051
0.4K(0030)	5.1	3.5	15	3051
0.75K(0050)	8.2	6.0	15	3051
1.5K(0080)	12.5	9.6	30	3051
2.2K(0110)	16.1	12.0	40	3051
3.7K(0175)	25.5	19.6	60	3051
5.5K(0240)	37.1	30.0	60	3051
7.5K(0330)	48.6	40.0	80	3051
11K(0470)	74.3	56.0	125	3051
15K(0600)	90.5	69.0	150	3051
18.5K(0760)	112.9	88.0	175	3051
22K(0900)	139.5	115.0	225	3051

FR-E840 3 ϕ 380V-500V SCCR with Circuit Breaker

FR-E840-[]	Input Current (A)	Output Current (A)	SCCR 10kA	
			MCCB	
			Current (A)	Minimum Enclosure Volume (in ³)
0.4K(0016)	3.3	2.1	15	3051
0.75K(0026)	6.0	3.5	15	3051
1.5K(0040)	8.9	5.5	15	3051
2.2K(0060)	10.7	6.9	20	3051
3.7K(0095)	16.2	11.1	30	3051
5.5K(0120)	24.9	17.5	40	3051
7.5K(0170)	32.4	23.0	50	3051
11K(0230)	46.7	35.0	75	3051
15K(0300)	54.2	41.0	100	3051
18.5K(0380)	59.1	45.0	100	3051
22K(0440)	75.6	60.0	125	3051

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FR-E860 3 ϕ 575V SCCR with Circuit Breaker

FR-E860-[]	Input Current (A)	Output Current (A)	SCCR 10kA	
			MCCB	
			Current (A)	Minimum Enclosure Volume (in ³)
0.75K(0017)	4.3	2.5	15	3051
1.5K(0027)	5.9	3.6	15	3051
2.2K(0040)	8.9	5.6	15	3051
3.7K(0061)	12.4	8.2	20	3051
5.5K(0090)	15.9	11.0	30	3051
7.5K(0120)	22.4	16.0	40	3051

FR-E820S 1 ϕ 200V-240V Circuit Breaker

FR-E820S-[]	Input Current (A)	Output Current (A)	SCCR 10kA	
			MCCB	
			Current (A)	Minimum Enclosure Volume (in ³)
0.1K(0008)	2.3	0.8	15	3051
0.2K(0015)	4.1	1.5	15	3051
0.4K(0030)	7.9	3.0	15	3051
0.75K(0050)	11.2	5.0	15	3051
1.5K(0080)	17.9	8.0	20	3051
2.2K(0110)	25.0	11.0	40	3051

FR-E810W 1 ϕ 100V-120V Circuit Breaker

FR-E810W-[]	Input Current (A)	Output Current (A)	SCCR 10kA	
			MCCB	
			Current (A)	Minimum Enclosure Volume (in ³)
0.1K(0008)	3.7	0.8	15	3051
0.2K(0015)	6.8	1.5	15	3051
0.4K(0030)	12.4	3.0	15	3051
0.75K(0050)	19.6	5	20	3051