

General

All tables are based on the operation of the motor and controller in the same ambient temperature, 40°C (104°F) or less. Always be certain the correct thermal units are installed in the starter before operating the motor. Each thermal unit shall be installed such that its catalog number is visible. On melting alloy thermal units the ratchet wheel must engage the pawl assembly.

Selection Procedure

1. Determine motor data:
 - a. Full load current rating
 - b. Service factor

NOTE: If motor full load current is not known, a tentative thermal unit selection could be made, based on horsepower and voltage. Refer to Page 22.

2. Motor and controller in *same ambient temperature*:
 - a. All starter classes, except Class 8198:
 1. For 1.15 to 1.25 service factor motors use 100% of motor full load current for thermal unit selection.
 2. For 1.0 service factor motors use 90% of motor full load current for thermal unit selection.
 - b. Class 8198 only:
 1. For 1.0 service factor motors use 100% of motor full load current for thermal unit selection.
 2. For 1.15 to 1.25 service factor motors use 110% of motor full load current for thermal unit selection.
3. Motor and controller in *different ambient temperatures*:
 - a. Multiply motor full load current by the multiplier in Table A. Use the resultant full load current for thermal unit selection.

4. Locate proper selection table from index, Pages 19 and 20.
 - a. The proper thermal unit number will be found adjacent, to the right of the range of full load currents in which the motor full load current or resultant full load current falls.

5. See Page 21 for calculation of trip current rating.

Slow Trip Thermal Unit Selection

To select Type SB slow trip thermal units, the selection table for a standard Type B thermal unit may be used with the following modifications: For continuous rated motors having service factors of 1.15 to 1.25, select thermal units from the

standard Type B table using 93% (102% for Class 8198) of the full load current shown on the motor nameplate and then substitute an SB for the B in the thermal unit type number.

Example: A motor with a full load current of 14 amps controlled by an 8536 SCG3 would require B22 thermal units for standard trip applications and SB19.5 thermal units for slow trip applications. The SB is selected by multiplying 14 amps times 93% for 13.02 amps and using this value to select B19.5s. Then add the S prefix to arrive at SB19.5s.

For continuous rated motors having a service factor of 1.0, select thermal units in the same manner using 84% (93% for Class 8198) of full load current shown on the motor nameplate.

NOTE: SB thermal units are used on Size 0, 1, 2 and only some Size 3 applications. Check thermal unit tables for current ranges.

Table A: Selection of Thermal Units for Special Applications

Class of Controller	Continuous Duty Motor Service Factor	Melting Alloy and Non-Compensated Bimetallic Relays			Ambient Temp.- Comp. Relays
		Ambient Temperature of Motor			
		Same as Controller Ambient	Constant 10° C (18° F) Higher Than Controller Ambient	Constant 10° C (18° F) Lower Than Controller Ambient	Constant 40° C (104° F) or Less, for Any Controller Ambient
		Full Load Current Multiplier			
All Classes, Except 8198	1.15 to 1.25	1.0	0.9	1.05	1.0
	1.0	0.9	0.8	.95	0.9
Class 8198	1.15 to 1.25	1.1	1.0	1.15	1.1
	1.0	1.0	0.9	1.05	1.0

Thermal Units

Melting Alloy		Bimetallic	
Type of Trip	Thermal Unit Type	Type of Trip	Thermal Unit Type
Standard	A	Standard	AR
	B		AF
	C		AU
	CC		E
	DD		
Quick	FB		
Slow	SB		



Thermal Unit Selection

Controller					Thermal Unit Selection Table Number				
					Hand Reset Melting Alloy			Bimetallic	
Starter Type	Class	Type	*Series	Size	Standard Trip (20)	Quick Trip (10)	Slow Trip (30)	Non-Compensated	Compensated
Manual Starters FHP	2510 2512 8908	F	A	FHP	43★	....	....	....	....
Manual Starters (Small Enclosure)	2510	M, T	A	M-0 M-1 M-1P	1 1 1	72 72 72	X X X	.... .... ....	.... .... ....
Manual Starters (Large Enclosure)	2510 2511 2512 8925	M, T	A	M-0 M-1 M-1P	2 2 2	73 73 73	X X X	.... .... ....	.... .... ....
Manual Starter w/LVP (Small Enclosure)	2510	M, T	A	M-0 M-1 M-1P	3 3 3	.... .... ....	X X X	.... .... ....	.... .... ....
Manual Starter w/LVP (Large Enclosure)	2510 2511 2512 8908	M, T	A	M-0 M-1 M-1P	4 4 4	.... .... ....	X X X	.... .... ....	.... .... ....
Manual Loom Sw.	2510	MBL, TBL	A	M-0	7	....	X	....	....
DC Magnetic Starters	7135	C, D	....	1,2	65	....	X	....	....
	7136	E	....	3	9	....	....	....	....
	7735	F	....	4	10	....	....	....	....
	7736	G	....	5	12	....	....	....	....
	7736	G	....	5	12	....	....	....	....
AC Magnetic Starters (Small Enclosure)	8536 8904♦ (Starter In Own Enclosure)	A (8536 only)	B, C	00	17★	....	....	....	....
		SA	A, B	00	13	....	X	....	....
		SB	A	0	13	74	X	8	33
		SC	A	1	13	74	X	8	33
		SC	A	1P	41	....	X	....	....
	8933	SD	A	2	56	75	X	62	70
		SE	A	3	18	76◊	134◊X	63	37‡
		SE	B	3	....	....	....	142	....
		SF	A	4	54	77◊	....	11	29‡
		SF	B	4	....	....	....	144	....
		SG	A	5	49■	....	....	38	46
		SH	A	6	21	....	....	39	47
		SC	A	1 Fusible 1 Circuit Breaker	66 15	74 74	.... ....	64	33
		SD	A	2 Fusible 2 Circuit Breaker	67 58†	75 75	.... ....	57	70
		SE	A	3 Small Enclosure 3 Large Enclosure	16 68†	76◊ 76◊	134◊X 133◊X	51	37‡
		SE	B	3	....	....	....	141	....
		SF	A	4	61	77◊	....	35	29†
		SF	B	4	....	....	....	143	....
		SG	A	5	24	....	....	52	46
		SH	A	6	20	....	....	48	47
	8998 8999 (Model 3 Control Center) I-LINE® and QMB Motor Starter Centers	SC	A	1 Fusible 1 Circuit Breaker	109 115	.... ....	.... ....	.... ....	97 103
		SD	A	2 Fusible 2 Circuit Breaker	110 116	.... ....	.... ....	.... ....	98 104
		SE	A	3 Fusible 3 Circuit Breaker	111 117	.... ....	.... ....	.... ....	99 105
		SF	A	4 Fusible 4 Circuit Breaker	112 118	.... ....	.... ....	.... ....	100 106
		SG	A	5 Fusible 5 Circuit Breaker	113 119	.... ....	.... ....	.... ....	101 107
		SH	A	6 Fusible 6 Circuit Breaker	114 120	.... ....	.... ....	.... ....	102 108
		SC#	A	1 Fusible 1 Circuit Breaker	109 115	.... ....	.... ....	.... ....	97 103
		SD#	A	2 Fusible 2 Circuit Breaker	110 116	.... ....	.... ....	.... ....	98 104
		SE#	A	3 Fusible 3 Circuit Breaker	111 117	.... ....	.... ....	.... ....	99 105
		SF#	A	4 Fusible 4 Circuit Breaker	112 118	.... ....	.... ....	.... ....	100 106
		SG#	A	5 Fusible 5 Circuit Breaker	113 119	.... ....	.... ....	.... ....	101 107
		SH#	A	6 Fusible 6 Circuit Breaker	114 120	.... ....	.... ....	.... ....	102 108
	8911	DPSG	A	20-30A	135	....	....	....	....
		DPSG	A	40A	145	....	....	....	....
		DPSG	A	50A	146	....	....	....	....

Table continued on the next page; see Page 20 For Footnotes.

NOTE: For thermal unit selection tables for other devices including obsolete devices, consult local Square D field office.



Thermal Unit Selection

Controller					Thermal Unit Selection Table Number				
Starter Type	Class	Type	*Series	Size	Hand Reset Melting Alloy			Bimetallic	
					Standard Trip	Quick Trip (10)	Slow Trip (30)	Non-Compensated	Compensated
AC Magnetic Starters (Large Enclosure)	8198	G, S	....	....	5	....	X	....	6
	8536 (Starter Used in Multi-Motor Panel)	A (8536 only)	B, C	00	14★	....	....	....	....
	8538 8904■	SA	A, B	00	53	....	X	55	25
	8539 8906	SB	A	0	15	78	X	64	33
	8606 8907	SC	A	1	15	78	X	64	33
	8630● 8920	SD	A	2	58	79	X	57	70
	8640▲ 8922	SE	A	3	16	80◇	133◇X	51	37‡
	9089 8924		B	3	....	....	....	141	....
	8647 8925	SF	A	4	61	81◇	....	35	29‡
	8650 8930		B	4	....	....	....	143	....
	8736 8941	SG	A	5	24■	....	....	52	46
	8738	SH	A	6	20	....	X	48	47
	8810 8811 8812	CB, DB, SB, UB	A	0	15	78	X	64	33
		CC, DC, SC, UC	A	1	15	78	X	64	33
		CD, DD, SD, UD	A	2	58	79	X	57	70
		CE, DE, SE, UE	A	3	16	80◇	133◇X	51	37‡
		CF, DF, SF, UF	A	4	61	81◇	....	35	29‡
		SE	B	3	....	....	....	141	....
		SF	B	4	....	....	....	143	....
		CG, DG, SG, UG	A	5	24■	....	....	52	46
	8940 WELL-GUARD® Control	CH, DH, SH, UH	A	6	20	....	X	48	47
		WC, XC	A	1	....	78	....	....	33
		WD, XD, MD, RD, VD	A	2	....	79	....	....	70
		WE, XE, ME, RE, VE	A	3	....	80◇	....	....	37‡
		PF, WF, XF, MF, RF, VF	A	4	....	81◇	....	....	29‡
		XSG, NSG, MG, RG, VG★	A	5	....	....	....	....	46
	8911	XSH, VH	A	6	....	....	....	....	47
		DPSO	A	20-30A	136	....	....	....	....
				40A	147	....	....	....	....
AC Magnetic Part-Winding	8998 8999 (Model 5 MCC)	SC#	A	1 Fusible	127	....	....	....	121
				1 Circuit Breaker	130	....	....	....	124
		SD#	A	2 Fusible	128	....	....	....	122
				2 Circuit Breaker	131	....	....	....	125
		SE#	A	3 Fusible	129	....	....	....	123
				3 Circuit Breaker	132	....	....	....	126
Separately Mounted Overload Relays	9065	AF	B	4(133A)	....	....	....	30	....
		AG	A	5(266A)	....	....	....	36	....
		AR	A	1(25A)	....	....	....	32	....
		AT	A	2(45A)	....	....	....	60	....
		AU	....	3(86A)	....	....	....	50	....
		DA	A	1(25A)	....	....	....	140‡	....
		GA	A	2(60A)	....	....	....	139‡	....
		HA	A	3(100A)	....	....	....	138‡	....
		JA	A	4(180A)	....	....	....	137‡	....
		C	A	1(25A)	44	82	X	....	....
		F	B	4(133A)	19	85◇	....	....	....
		G	A	5(266A)	22	....	....	....	....
		MEO	A	(32A)	86	....	....	....	....
				1(26A)	59	83	X	23	42
		S	A	2(45A)	69	84	X	27	71
				3(86A)	34	....	....	....	....
				4(133A)	28	....	....	....	....
		T	A	2(45A)	31	....	X	....	....
		U	....	3(86A)	40	....	....	....	....

★ Series letters listed refer to the marking on the nameplate of the basic open type starter. When the starter is supplied in a controller containing other devices, the controller may have a different series letter marked on the enclosure nameplate.

◆ Small enclosure tables apply for **Class 8904** non-combination and non-reversing starters. For combination and reversing **Class 8904** starters refer to the large enclosure selections, index above.

● For **Class 8630** starters divide the delta connected motor full load current by 1.73, and use this quotient to select thermal units.

▲ For **Class 8640** starters use the full load current of each motor winding as a basis for thermal unit selection - normally one-half total motor current.

■ Large enclosure tables apply for **Class 8904** combination and reversing starters. For non-combination and non-reversing **Class 8904** starters refer to small enclosure selections.

† Use for Autotransformer Starters (Fusible and Circuit Breaker).

‡ Order Type E thermal units by number from Square D Company.

★ Type A thermal units for full load currents lower than those listed in this table are available. For complete information, consult local Square D field office.

◇ Form Y81 must be specified to use quick trip (Class 10) or slow trip (Class 30) thermal units on Size 3 starters and quick trip (Class 10) thermal units on Size 4 starters.

X This device will accept Type SB slow trip (Class 30) thermal units. For selection, see Page 18.

Refers to type number of starter in MCC, not actual type number of MCC.

■ For Y500 Device select Table 151, which uses "B" Thermal Units.



Thermal Unit Selection Tables 72 thru 77

Table 72

Motor Full-Load Current (Amp)		Thermal Unit Number
1 T. U.	3 T. U.	
2.38-2.62	2.38-2.62	FB 3.33
2.63-2.94	2.63-2.94	FB 3.71
2.95-3.31	2.95-3.31	FB 4.1
3.32-3.43	3.32-3.43	FB 4.5
3.44-3.81	3.44-3.81	FB 4.75
3.82-4.32	3.82-4.32	FB 5.3
4.33-4.75	4.33-4.75	FB 6.1
4.76-5.38	4.76-5.38	FB 6.75
5.39-5.75	5.39-5.75	FB 7.45
5.76-5.97	5.76-5.97	FB 7.8
5.98-6.30	5.98-6.30	FB 8.21
6.31-6.55	6.31-6.55	FB 8.6
6.56-6.89	6.56-6.89	FB 9.0
6.90-7.14	6.90-7.14	FB 9.5
7.15-7.36	7.15-7.36	FB 10
7.37-8.30	7.37-8.30	FB 10.6
8.31-8.59	8.31-8.59	FB 11.2
8.60-9.01	8.60-9.01	FB 12.1
9.02-9.68	9.02-9.68	FB 13.1
9.69-9.99	9.69-9.99	FB 13.9
10.0-10.9	10.0-10.9	FB 14.8
11.0-11.3	11.0-11.3	FB 15.6
11.4-12.4	11.4-12.0	FB 16.4
12.5-12.9	....	FB 17.6
13.0-14.0	....	FB 18.4
14.1-14.5	....	FB 19.4
14.6-15.7	....	FB 21.1
15.8-16.6	....	FB 22.6
16.7-18.0	....	FB 23.6
Following Selections for Size M-1 & M-1P Only.		
....	11.4-12.4	FB 16.4
....	12.5-12.9	FB 17.6
....	13.0-14.0	FB 18.4
....	14.1-14.5	FB 19.4
....	14.6-15.7	FB 21.1
....	15.8-16.6	FB 22.6
16.7-17.6	16.7-17.6	FB 23.6
17.7-18.3	17.7-18.3	FB 24.8
18.4-19.4	18.4-19.4	FB 26.7
19.5-20.5	19.5-20.5	FB 28.3
20.6-21.7	20.6-21.7	FB 29.6
21.8-22.8	21.8-22.8	FB 30.5
22.9-24.3	22.9-24.3	FB 32.5
24.4-24.7	24.4-24.7	FB 34.1
24.8-25.4	24.8-25.4	FB 35
25.5-26.0	25.5-26.0	FB 36.6
Following Selections for Size M-1P Only.		
26.1-27.7	....	FB 38.3
27.8-28.9	....	FB 40.2
29.0-30.6	....	FB 42
30.7-32.5	....	FB 44
32.6-36.0	....	FB 46

Table 73

Motor Full-Load Current (Amp)		Thermal Unit Number
1 T. U.	3 T. U.	
2.42-2.67	2.42-2.67	FB 3.33
2.68-3.00	2.68-3.00	FB 3.71
3.01-3.36	3.01-3.36	FB 4.1
3.37-3.53	3.37-3.53	FB 4.5
3.54-3.91	3.54-3.91	FB 4.75
3.92-4.41	3.92-4.41	FB 5.3
4.42-4.83	4.42-4.83	FB 6.1
4.84-5.45	4.84-5.45	FB 6.75
5.46-5.89	5.46-5.89	FB 7.45
5.90-6.04	5.90-6.04	FB 7.8
6.05-6.55	6.05-6.55	FB 8.21
6.56-6.72	6.56-6.72	FB 8.6
6.73-7.00	6.73-7.00	FB 9.0
7.01-7.39	7.01-7.39	FB 9.5
7.40-7.54	7.40-7.54	FB 10
7.55-8.41	7.55-8.41	FB 10.6
8.42-8.91	8.42-8.91	FB 11.2
8.92-9.16	8.92-9.16	FB 12.1
9.17-10.0	9.17-10.0	FB 13.1
10.1-10.3	10.1-10.3	FB 13.9
10.4-11.4	10.4-11.4	FB 14.8
11.5-11.8	11.5-11.8	FB 15.6
11.9-12.9	11.9-12.9	FB 16.4
13.0-13.4	....	FB 17.6
13.5-14.2	....	FB 18.4
14.3-15.1	....	FB 19.4
15.2-18.0	....	FB 21.1
Following Selections for Size M-1 & M-1P Only.		
....	11.5-11.8	FB 15.6
....	11.9-12.9	FB 16.4
....	13.0-13.4	FB 17.6
....	13.5-14.2	FB 18.4
....	14.3-15.1	FB 19.4
15.2-17.1	15.2-17.1	FB 21.1
17.2-18.0	17.2-18.0	FB 22.6
18.1-18.9	18.1-18.9	FB 23.6
19.0-19.7	19.0-19.7	FB 24.8
19.8-20.9	19.8-20.9	FB 26.7
21.0-21.9	21.0-21.9	FB 28.3
22.0-23.1	22.0-23.1	FB 29.6
23.2-24.3	23.2-24.3	FB 30.5
24.4-25.5	24.4-25.5	FB 32.6
25.6-26.0	25.6-26.0	FB 34.1
Following Selections for Size M-1P Only.		
26.1-26.8	....	FB 35
26.9-27.3	....	FB 36.6
27.4-28.7	....	FB 38.3
28.8-30.2	....	FB 40.2
30.3-31.9	....	FB 42
32.0-36.0	....	FB 44

Table 74

Motor Full-Load Current (Amp)		Thermal Unit Number
1 T. U.	3 T. U.	
2.23-2.47	2.23-2.47	FB 3.33
2.48-2.76	2.48-2.76	FB 3.71
2.77-3.04	2.77-3.04	FB 4.1
3.05-3.24	3.05-3.24	FB 4.5
3.25-3.61	3.25-3.61	FB 4.75
3.62-4.19	3.62-4.19	FB 5.3
4.20-4.62	4.20-4.62	FB 6.1
4.63-5.14	4.63-5.14	FB 6.75
5.15-5.39	5.15-5.39	FB 7.45
5.40-5.69	5.40-5.69	FB 7.8
5.70-5.99	5.70-5.99	FB 8.21
6.00-6.29	6.00-6.29	FB 8.6
6.30-6.64	6.30-6.64	FB 9.0
6.65-6.99	6.65-6.99	FB 9.5
7.00-7.39	7.00-7.39	FB 10
7.40-7.79	7.40-7.79	FB 10.6
7.80-7.94	7.80-7.94	FB 11.2
7.95-8.49	7.95-8.49	FB 12.1
8.50-8.99	8.50-8.99	FB 13.1
9.00-9.59	9.00-9.59	FB 13.9
9.60-10.1	9.60-10.1	FB 14.8
10.2-10.6	10.2-10.6	FB 15.6
10.7-11.3	10.7-11.3	FB 16.4
11.4-12.0	11.4-12.0	FB 17.6
12.0-12.6	....	FB 18.4
12.7-13.8	....	FB 19.4
13.9-14.7	....	FB 21.1
14.8-15.2	....	FB 22.6
15.3-16.2	....	FB 23.6
16.3-18.0	....	FB 24.8
Following Selections for Size 1 Only.		
....	12.0-12.6	FB 18.4
....	12.7-13.8	FB 19.4
13.9-14.7	13.9-14.7	FB 21.1
14.8-15.2	14.8-15.2	FB 22.6
15.3-16.2	15.3-16.2	FB 23.6
16.3-17.4	16.3-17.4	FB 24.8
17.5-18.5	17.5-18.5	FB 26.7
18.6-19.6	18.6-19.6	FB 28.3
19.7-20.2	19.7-20.2	FB 29.6
20.3-21.5	20.3-21.5	FB 30.5
21.6-22.4	21.6-22.4	FB 32.6
22.5-23.2	22.5-23.2	FB 34.1
23.3-24.3	23.3-24.3	FB 35
24.4-25.4	24.4-25.4	FB 36.6
25.5-26.0	25.5-26.0	FB 38.3

Table 76

Motor Full-Load Current (Amp)	Thermal Unit Number
19.9-20.8	FB 26.7
20.9-22.2	FB 28.3
22.3-23.8	FB 29.6
23.9-25.4	FB 30.5
25.5-27.2	FB 32.6
27.3-29.2	FB 34.1
29.3-31.9	FB 38.3
32.0-33.8	FB 40.2
33.9-36.1	FB 42
36.2-38.5	FB 44
38.6-41.4	FB 46
41.5-43.6	FB 48
43.7-45.9	FB 50.5
46.0-48.2	FB 52.5
48.3-50.7	FB 55.5
50.8-53.9	FB 58
54.0-56.7	FB 60
56.8-60.8	FB 63.5
60.9-67.6	FB 69
67.6-73.6	FB 77
73.7-82.9	FB 84
83.0-86.0	FB 92

Table 75

Motor Full-Load Current (Amp)	Thermal Unit Number
3.22-3.57	FB 4.75
3.58-4.14	FB 5.3
4.15-4.56	FB 6.1
4.57-5.10	FB 6.75
5.11-5.39	FB 7.45
5.40-5.64	FB 7.8
5.65-5.96	FB 8.21
5.97-6.25	FB 8.6
6.26-6.58	FB 9.0
6.59-6.91	FB 9.5
6.92-7.41	FB 10
7.42-7.82	FB 10.6
7.83-8.32	FB 11.2
8.33-8.89	FB 12.1
8.90-9.47	FB 13.1
9.48-10.0	FB 13.9
10.1-10.5	FB 14.8
10.6-11.1	FB 15.6
11.2-12.0	FB 16.4
12.1-12.7	FB 17.6
12.8-13.5	FB 18.4
13.6-14.6	FB 19.4
14.7-15.7	FB 21.1
15.8-16.5	FB 22.6
16.6-17.4	FB 23.6
17.5-18.8	FB 24.8
18.9-20.1	FB 26.7
20.2-21.0	FB 28.3
21.1-21.6	FB 29.6
21.7-23.3	FB 30.5
23.4-24.3	FB 32.6
24.4-25.0	FB 34.1
25.1-26.3	FB 35
26.4-27.6	FB 36.6
27.7-29.1	FB 38.3
29.2-30.4	FB 40.2
30.5-32.0	FB 42
32.1-33.3	FB 44
33.4-35.2	FB 46
35.3-37.0	FB 48
37.1-38.5	FB 50.5
38.6-40.7	FB 52.5
40.8-45.0	FB 55.5

Table 77

Motor Full-Load Current (Amp)	Thermal Unit Number
48.0-50.9	FB 50.5
51.0-53.7	FB 52.5
53.8-57.0	FB 55.5
57.1-60.4	FB 58
60.5-64.0	FB 60
64.1-71.9	FB 63.5
72.0-83.9	FB 69
84.0-93.1	FB 77
93.2-104	FB 84
105-109	FB 92
110-123	FB 105
124-133	FB 115

