

Useful Tables

General Information

Table 430-91: Motor Controller Enclosure Section Table

provides a degree of protection against the following environmental conditions	For Outdoor Use						
	Enclosure Type Number ¹⁾						
	3	3R	3S	4	4X	6	6P
Incidental contact with the enclosed equipment	x	x	x	x	x	x	x
Rain, snow and sleet	x	x	x	x	x	x	x
Sleet *	-	-	x	-	-	-	-
Windblown dust	x	-	x	x	x	x	x
Hosedown	-	-	-	x	x	x	x
Corrosive agents	-	-	-	-	x	-	x
Occasional temporary submersion	-	-	-	-	-	x	x
Occasional prolonged submersion	-	-	-	-	-	-	x

* mechanism shall be operable when ice covered

provides a degree of protection against the following environmental conditions	For Indoor Use									
	Enclosure Type Number ¹⁾									
	1	2	4	4X	5	6	6P	12	12K	13
Incidental contact with the enclosed equipment	x	x	x	x	x	x	x	x	x	x
Falling dirt	x	x	x	x	x	x	x	x	x	x
Falling liquids and light splashing	x	x	x	x	x	x	x	x	x	x
Circulating dust, lint, fibers and flyings	-	-	x	x	-	x	x	x	x	x
Settling airborne dust, lint, fibers and flyings	-	-	x	x	x	x	x	x	x	x
Hosedown and splashing water	-	-	x	x	-	x	x	-	-	-
Oil and coolant seepage	-	-	-	-	-	-	-	x	x	x
Oil or coolant spraying and splashing	-	-	-	-	-	-	-	-	-	x
Corrosive agents	-	-	-	x	-	-	x	-	-	-
Occasional temporary submersion	-	-	-	-	-	x	x	-	-	-
Occasional prolonged submersion	-	-	-	-	-	-	x	-	-	-

¹⁾ Enclosure type number shall be marked on the motor controller enclosure

Table 430-10(b): Minimum Wire Bending Space at the Terminals of Enclosed Motor Controllers (in inches)

Size of Wire AWG or kcmil	Wires per terminal *	
	1	2
14 - 10	not specified	-
8 - 6	1 ½	-
4 - 3	2	-
2	2 ½	-
1	3	-
1/0	5	5
2/0	6	6
3/0 - 4/0	7	7
250	8	8
300	10	10
350 - 500	12	12
600 - 700	14	16
750 - 900	18	19

* where provision for 3 or more wires exists, the minimum wire bending space shall be in accordance with the requirements of Article 373

**Table 310-16: Allowable Ampacities of Insulated Conductors Rated 0 through 2000 Volts, 60° to 90°C (140° to 194°F).
Not more than Three Current-carrying Conductors in Raceway or Cable or Earth (directly buried), based on Ambient Temperature of 30°C (86°F)**

Size	Temperature Rating of Conductor, see Table 310-13						Size
	60°C 140°F	75°C 167°F	90°C 194°F	60°C 140°F	75°C 167°F	90°C 194°F	
AWG kcmil	Types TW ¹⁾ UF ¹⁾	Types FEPW ¹⁾ RH ¹⁾ RHW ¹⁾ THHW ¹⁾ THW ¹⁾ THWN ¹⁾ XHHW ¹⁾ USE ¹⁾ ZW ¹⁾	Types TBS SA SIS FEP ¹⁾ FEPB ¹⁾ MI RHH ¹⁾ RHW-2 THHN ¹⁾ THHW ¹⁾ THW-2 ¹⁾ USE-2 XHH XHHW ¹⁾ XHHW-2 ¹⁾ ZW-2	Types TW ¹⁾ UF ¹⁾	Types FEPW ¹⁾ RH ¹⁾ RHW ¹⁾ THHW ¹⁾ THW ¹⁾ THWN ¹⁾ XHHW ¹⁾ USE ¹⁾ ZW ¹⁾	Types TBS SA SIS FEP ¹⁾ FEPB ¹⁾ MI RHH ¹⁾ RHW-2 THHN ¹⁾ THHW ¹⁾ THW-2 ¹⁾ USE-2 XHH XHHW ¹⁾ XHHW-2 ¹⁾ ZW-2	AWG kcmil
	Copper			Aluminum or Copper-clad Aluminum			
18	...	...	14	...	...	...	...
16	...	...	18	...	...	...	...
14	20 ¹⁾	20 ¹⁾	25 ¹⁾
12	25 ¹⁾	25 ¹⁾	30 ¹⁾	20 ¹⁾	20 ¹⁾	25 ¹⁾	12
10	30	35 ¹⁾	40 ¹⁾	25	30 ¹⁾	35 ¹⁾	10
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	70	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000

Correction Factor

Ambient Temp °C	For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below						Ambient Temp °F
21-25	1.08	1.05	1.04	1.08	1.05	1.04	70-77
26-30	1.00	1.00	1.00	1.00	1.00	1.00	78-86
31-35	.91	.94	.96	.91	.94	.96	87-95
36-40	.82	.88	.91	.82	.88	.91	96-104
41-45	.71	.82	.87	.71	.82	.87	105-113
46-50	.58	.75	.82	.58	.75	.82	114-122
51-55	.41	.67	.76	.41	.67	.76	123-131
56-60	...	.58	.71	...	.58	.71	132-140
61-70	...	.33	.58	...	.33	.58	141-158
71-80	...	...	.41	...	...	.41	159-176

¹⁾ Unless otherwise specifically permitted elsewhere in this code, the overcurrent protection for conductor types marked with ¹⁾ shall not exceed 15 amperes for No. 14, 20 amperes for No. 12 and 30 amperes for No. 10 copper, or 15 amperes for No. 12 and 25 amperes for No. 10 aluminum and copper-clad aluminum after any correction factors for ambient temperature and number of conductors have been applied.

Conversion Tables

Table A : Millimeters to Inches

mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
1	0.0393	26	1.0236	51	2.0078	76	2.9921	105	4.1338	260	10.2362
2	0.0787	27	1.0629	52	2.0472	77	3.0315	110	4.3307	270	10.6299
3	0.1181	28	1.1023	53	2.0866	78	3.0708	115	4.5275	280	11.0236
4	0.1574	29	1.1417	54	2.1259	79	3.1102	120	4.7244	290	11.4173
5	0.1968	30	1.1811	55	2.1653	80	3.1496	125	4.9212	300	11.8110
6	0.2362	31	1.2204	56	2.2047	81	3.1889	130	5.1181	325	12.7952
7	0.2755	32	1.2598	57	2.2440	82	3.2283	135	5.3149	350	13.7795
8	0.3149	33	1.2992	58	2.2834	83	3.2677	140	5.5118	375	14.7637
9	0.3543	34	1.3385	59	2.3228	84	3.3070	145	5.7086	400	15.7480
10	0.3937	35	1.3779	60	2.3622	85	3.3464	150	5.9055	425	16.7322
11	0.4330	36	1.4173	61	2.4015	86	3.3858	155	6.1023	450	17.7165
12	0.4724	37	1.4566	62	2.4409	87	3.4252	160	6.2992	475	18.7007
13	0.5118	38	1.4960	63	2.4803	88	3.4645	165	6.4960	500	19.6850
14	0.5511	39	1.5354	64	2.5196	89	3.5039	170	6.6929	525	20.6692
15	0.5905	40	1.5748	65	2.5590	90	3.5433	175	6.8897	550	21.6535
16	0.6299	41	1.6141	66	2.5984	91	3.5826	180	7.0866	575	22.6377
17	0.6692	42	1.6535	67	2.6378	92	3.6220	185	7.2834	600	23.6220
18	0.7086	43	1.6929	68	2.6771	93	3.6614	190	7.4803	650	25.5905
19	0.7480	44	1.7322	69	2.7165	94	3.7007	195	7.6771	700	27.5590
20	0.7874	45	1.7716	70	2.7559	95	3.7401	200	7.8740	750	29.5275
21	0.8267	46	1.8110	71	2.7952	96	3.7795	210	8.2677	800	31.4960
22	0.8661	47	1.8503	72	2.8346	97	3.8189	220	8.6614	850	33.4645
23	0.9055	48	1.8897	73	2.8740	98	3.8582	230	9.0551	900	35.4330
24	0.9448	49	1.9291	74	2.9133	99	3.8976	240	9.4488	950	37.4015
25	0.9842	50	1.9685	75	2.9527	100	3.9370	250	9.8425	1000	39.3700

Table B : Decimal to Fraction

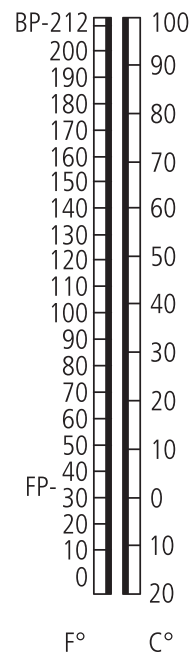
decimal	fraction equivalent	decimal	fraction equivalent
0.0156	1/64	0.5156	33/64
0.0312	1/32	0.5312	17/32
0.0469	3/64	0.5469	35/64
0.0625	1/16	0.5625	9/16
0.0781	5/64	0.5781	37/64
0.0937	3/32	0.5937	19/32
0.1094	7/64	0.6094	39/64
0.125	1/8	0.625	5/8
0.1406	9/64	0.6406	41/64
0.1562	5/32	0.6562	21/32
0.1719	11/64	0.6719	43/64
0.1875	3/16	0.6875	11/16
0.2031	13/64	0.7031	45/64
0.2187	7/32	0.7187	23/32
0.2344	15/64	0.7344	47/64
0.25	1/4	0.74	3/4
0.2656	17/64	0.7656	49/64
0.2812	9/32	0.7812	25/32
0.2969	19/64	0.7969	51/64
0.3125	5/16	0.8125	13/16
0.3281	21/64	0.8281	53/64
0.3437	11/32	0.8437	27/32
0.3594	23/64	0.8594	55/64
0.375	3/8	0.875	7/8
0.3906	25/64	0.8906	57/64
0.4062	13/32	0.9062	29/32
0.4219	27/64	0.9219	59/64
0.4375	7/16	0.9375	15/16
0.4531	29/64	0.9531	61/64
0.4687	15/32	0.9687	31/32
0.4844	31/64	0.9844	63/64
0.5	1/2	1.0	1

How to use conversion table A and B

To convert millimeters to inches:

- a) 27mm - from table A, 27mm = 1.0629"
+ from table B, 0.0629 = 1/16" → 27mm = 1-1/16"
- b) 295mm - from table A, 290mm = 11.4173"
+ 5mm = 0.1968"
+ from table B, 0.6141 = 39/64" → 295mm = 11-39/64"

To convert	to	multiply by
Atmospheres	pounds per square inch	14.7
Cubic centimeters	cubic inches	0.06102
Cubic inches	cubic centimeters	16.39
Feet	meters	0.3048
Gallons (Br. imp.)	liters	4.546
Gallons (U.S.)	liters	3.785
Grams	ounces (avoirdupois)	0.0353
HP	kilowatts	0.7457
Kilograms	pounds	2.205
Kilograms	tons (2,000 lb.)	0.001102
Kilograms	tons (2,240 lb.)	0.0009842
Kilometers	miles	0.6214
Kilowatts	HP	1.341
Joules	calories	0.239
Liters	gallons (Br. imp.)	0.220
Liters	gallons (U.S.)	0.2642
Meters	feet	3.281
Meters	yards	1.094
Miles	kilometers	1.609
Millimeters	inches	0.03937
Newton (force)	pounds	0.2248
Newton-meter	foot-pounds	0.737
Ounces (avoirdupois)	grams	28.349
Pounds	kilograms	0.4536
Tons (2,000 lb.)	kilograms	907.18
Tons (2,240 lb.)	kilograms	1016.0
Yards	meters	0.9144



Useful Tables

Table 430-150: Full-Load Current Three-Phase Alternating-Current Motors

The following values of full-load currents are typical for motors running at speeds usual for belted motors and motors with normal torques characteristics. Motors built for low speeds (1200 RPM or less) or high torques may require more running current, and multispeed motors will have full-load current varying with speed. In these cases, the nameplate current ratings shall be used. The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 110 to 120, 220, 440 to 480, and 550 to 600 volts.

HP	Induction Type Squirrel-cage and Wound-rotor							Synchronous Type Unity Power Factor* Amperes			
	115V	200V	208V	230V	460V	575V	2300V	230V	460V	575V	2300V
1/2	4.4	2.5	2.4	2.2	1.1	0.9	-	-	-	-	-
3/4	6.4	3.7	3.5	3.2	1.6	1.3	-	-	-	-	-
1	8.4	4.8	4.6	4.2	2.1	1.7	-	-	-	-	-
1 1/2	12.0	6.9	6.6	6.06	3.0	2.4	-	-	-	-	-
2	13.6	7.8	7.5	6.8	3.4	2.7	-	-	-	-	-
3	-	11.0	10.6	9.6	4.8	3.9	-	-	-	-	-
5	-	17.5	16.7	15.2	7.6	6.1	-	-	-	-	-
7 1/2	-	25.3	24.2	22	11	9	-	-	-	-	-
10	-	32.2	30.8	28	14	11	-	-	-	-	-
15	-	48.3	46.2	42	21	17	-	-	-	-	-
20	-	62.1	59.4	54	27	22	-	-	-	-	-
25	-	78.2	74.8	68	34	27	-	53	26	21	-
30	-	92	88	80	40	32	-	63	32	26	-
40	-	120	114	104	52	41	-	83	41	33	-
50	-	150	143	130	65	52	-	104	52	42	-
60	-	177	169	154	77	62	16	123	61	49	12
75	-	221	211	192	96	77	20	155	78	62	15
100	-	285	273	248	124	99	26	202	101	81	20
125	-	359	343	312	156	125	31	253	126	101	25
150	-	414	396	360	180	144	37	302	151	121	30
200	-	552	528	480	240	192	49	400	201	161	40
250	-	-	-	-	302	242	60	-	-	-	-
300	-	-	-	-	361	289	72	-	-	-	-
350	-	-	-	-	414	336	83	-	-	-	-
400	-	-	-	-	477	382	95	-	-	-	-
450	-	-	-	-	515	412	103	-	-	-	-
500	-	-	-	-	590	472	118	-	-	-	-

* For 90 and 80 percent factor, the above figures shall be multiplied by 1.1 and 1.25 respectively.

Table 430-148: Full-Load Currents in Amperes Single-Phase Alternating-Current Motors

The following values of full-load currents are for motors running at usual speeds and motors with normal torque characteristics. Motors built for especially low speeds or high torques may have higher full-load currents, and multispeed motors will have full-load current varying with speed, in which case the nameplate current ratings shall be used.

The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 110 to 120 and 220 to 240 volts.

HP	115 Volts	200 Volts	208 Volts	230 Volts
1/6	4.4	2.5	2.4	2.2
1/4	5.8	3.3	3.2	2.9
1/3	7.2	4.1	4.0	3.6
1/2	9.8	5.6	5.4	4.9
3/4	13.8	7.9	7.6	6.9
1	16	9.2	8.8	8
1 - 1/2	20	11.5	11	10
2	24	13.8	13.2	12
3	34	19.6	18.7	17
5	56	32.2	30.8	28
7 - 1/2	80	46	44	40
10	100	57.5	55	50