



## APPLICATION

# Three-Phase Motors

### Overload Protection of Three-Phase Submersible Motors **Class 10 Protection Required**

The characteristics of submersible motors are different than standard motors and special overload protection is required.

If the motor is locked, the overload protection must trip within 10 seconds to protect the motor windings. Subtrol/SubMonitor, a Franklin-approved adjustable overload relay, or a Franklin-approved fixed heater must be used.

Fixed heater overloads must be the ambient-compensated quick-trip type to maintain protection at high and low air temperatures.

All heaters and amp settings shown are based on total line amps. When determining amperage settings or making heater selections for a six-lead motor with a Wye-Delta starter, divide motor amps by 1.732.

Pages 29, 30 and 31 list the correct selection and settings for some manufacturers. Approval for other manufacturers' types not listed may be requested by calling Franklin's Submersible Service Hotline at 800-348-2420.

Refer to notes on page 30.

**Table 29 - 60 Hz 4" Motors**

HP	KW	VOLTS	NEMA STARTER SIZE	HEATERS FOR OVERLOAD RELAYS		ADJUSTABLE RELAYS (NOTE 3)	
				FURNAS (NOTE 1)	G.E. (NOTE 2)	SET	MAX.
1/2	0.37	200	00	K31	L380A	3.2	3.4
		230	00	K28	L343A	2.7	2.9
		380	00	K22	L211A	1.7	1.8
		460	00	-	L174A	1.4	1.5
		575	00	-	-	1.2	1.3
3/4	0.55	200	00	K34	L510A	4.1	4.4
		230	00	K32	L420A	3.5	3.8
		380	00	K27	L282A	2.3	2.5
		460	00	K23	L211A	1.8	1.9
		575	00	K21	L193A	1.5	1.6
1	0.75	200	00	K37	L618A	5.0	5.4
		230	00	K36	L561A	4.4	4.7
		380	00	K28	L310A	2.6	2.8
		460	00	K26	L282A	2.2	2.4
		575	00	K23	L211A	1.8	1.9
1.5	1.1	200	00	K42	L750A	6.3	6.8
		230	00	K39	L680A	5.5	5.9
		380	00	K32	L420A	3.3	3.6
		460	00	K29	L343A	2.8	3.0
		575	00	K26	L282A	2.2	2.4
2	1.5	200	0	K50	L111B	8.6	9.3
		230	0	K49	L910A	7.5	8.1
		380	0	K36	L561A	4.6	4.9
		460	00	K33	L463A	3.8	4.1
		575	00	K29	L380A	3.0	3.2
3	2.2	200	0	K55	L147B	11.6	12.5
		230	0	K52	L122B	10.1	10.9
		380	0	K41	L750A	6.1	6.6
		460	0	K37	L618A	5.1	5.5
		575	0	K34	L510A	4.1	4.4
5	3.7	200	1	K62	L241B	19.1	20.5
		230	1	K61	L199B	16.6	17.8
		380	0	K52	L122B	10.0	10.8
		460	0	K49	L100B	8.3	8.9
		575	0	K42	L825A	6.6	7.1
7.5	5.5	200	1	K68	L332B	28.4	30.5
		230	1	K67	L293B	24.6	26.4
		380	1	K58	L181B	14.9	16.0
		460	1	K55	L147B	12.3	13.2
		575	1	K52	L122B	9.9	10.6
10	7.5	380	1	K62	L241B	19.5	21.0
		460	1	K60	L199B	16.1	17.3
		575	1	K56	L165B	12.9	13.6



# APPLICATION

## Three-Phase Motors

**Table 30 - 60 Hz 6" Standard & Hi-Temp Motors**

HP	KW	VOLTS	NEMA STARTER SIZE	HEATERS FOR OVERLOAD RELAYS		ADJUSTABLE RELAYS (NOTE 3)	
				FURNAS (NOTE 1)	G.E. (NOTE 2)	SET	MAX.
5	3.7	200	1	K61	L220B	17.6	19.1
		230	1	K61	L199B	15.4	16.6
		380	0	K52	L122B	9.4	10.1
		460	0	K49	L100B	7.7	8.3
		575	0	K42	L825A	6.1	6.6
7.5	5.5	200	1	K67	L322B	26.3	28.3
		230	1	K64	L293B	22.9	24.6
		380	1	K57	L165B	13.9	14.9
		460	1	K54	L147B	11.4	12.3
		575	1	K52	L111B	9.1	9.8
10	7.5	200	2(1)	K72	L426B	34.4	37.0
		230	2(1)	K70	L390B	29.9	32.2
		380	1	K61	L220B	18.1	19.5
		460	1	K58	L181B	15.0	16.1
		575	1	K55	L147B	12.0	12.9
15	11	200	3(1)	K76	L650B	50.7	54.5
		230	2	K75	L520B	44.1	47.4
		380	2(1)	K68	L322B	26.7	28.7
		460	2(1)	K64	L265B	22.0	23.7
		575	2(1)	K61	L220B	17.7	19.0
20	15	200	3	K78	L787B	64.8	69.7
		230	3(1)	K77	L710B	56.4	60.6
		380	2	K72	L426B	34.1	36.7
		460	2	K69	L352B	28.2	30.3
		575	2	K64	L393B	22.7	24.4
25	18.5	200	3	K86	L107C	80.3	86.3
		230	3	K83	L866B	69.8	75.0
		380	2	K74	L520B	42.2	45.4
		460	2	K72	L426B	34.9	37.5
		575	2	K69	L352B	27.9	30.0
30	22	200	4(1)	K88	L126C	96.7	104.0
		230	3	K87	L107C	84.1	90.4
		380	3(1)	K76	L650B	50.9	54.7
		460	3(1)	K74	L520B	42.0	45.2
		575	3(1)	K72	L390B	33.7	36.2
40	30	380	3	K83	L866B	69.8	75.0
		460	3	K77	L710B	57.7	62.0
		575	3	K74	L593B	46.1	49.6
50	37	380	3	K87	L107C	86.7	93.2
		460	3	K83	L950B	71.6	77.0
		575	3	K77	L710B	57.3	61.6
60	45	380	4(1)	K89	L126C	102.5	110.2
		460	4(1)	K87	L107C	84.6	91.0
		575	4(1)	K78	L866B	67.7	72.8

### Footnotes for Tables 29, 30, and 31

**NOTE 1:** Furnas intermediate sizes between NEMA starter sizes apply where (1) is shown in tables, size 1.75 replacing 2, 2.5 replacing 3, 3.5 replacing 4, and 4.5 replacing 5. Heaters were selected from Catalog 294, table 332 and table 632 (starter size 00, size B). Size 4 starters are heater type 4 (JG). Starters using these heater tables include classes 14, 17 and 18 (inNOVA), classes 36 and 37 (reduced voltage), and classes 87, 88 and 89 (pump and motor control centers). Overload relay adjustments should be set no higher than 100% unless necessary to stop nuisance tripping with measured amps in all lines below nameplate maximum. Heater selections for class 16 starters (Magnetic Definite Purpose) will be furnished upon request.

**NOTE 2:** General Electric heaters are type CR123 usable only on type CR124 overload relays and were selected from Catalog GEP-126OJ, page 184. Adjustment should be set no higher than 100%, unless necessary to stop nuisance tripping with measured amps in all lines below nameplate maximum.

**NOTE 3:** Adjustable overload relay amp settings apply to approved types listed. Relay adjustment should be set at the specified SET amps. Only if tripping occurs with amps in all lines measured to be within nameplate maximum amps should the setting be increased, not to exceed the MAX value shown.

**NOTE 4:** Heaters shown for ratings requiring NEMA size 5 or 6 starters are all used with current transformers per manufacturer standards. Adjustable relays may or may not use current transformers depending on design.



# APPLICATION Three-Phase Motors

**Table 31 - 60 Hz 8" Motors**

MOTOR MODEL PREFIX	HP	KW	VOLTS	NEMA STARTER SIZE	HEATERS FOR OVERLOAD RELAYS		ADJUSTABLE RELAYS (NOTE 3)	
					FURNAS (NOTE 1)	G.E. (NOTE 2)	SET	MAX.
239600	460	3	K77	L710B	56	60		
239610	575	3	K73	L520B	45	48		
239661	50	37	380	3	K86	L107C	81	87
239601			460	3	K78	L866B	68	73
239611			575	3	K77	L710B	56	60
239662	60	45	380	4(1)	K89	L126C	101	108
239602			460	4(1)	K86	L107C	83	89
239612			575	4(1)	K78	L787B	64	69
239663	75	55	380	4	K92	L142C	121	130
239603			460	4(1)	K89	L126C	100	107
239613			575	4(1)	K85	L950C	79	85
239664	100	75	380	5(1)	K28	L100B	168	181
239604			460	4	K92	L155C	134	144
239614			575	4	K90	L142C	108	116
239165	125	93	380	5	K32	L135B	207	223
239105			460	5(1)	K29	L111B	176	189
239115			575	5(1)	K26	L825A	140	150
239166	150	110	380	5	-	L147B	248	267
239106			460	5(1)	K32	L122B	206	221
239116			575	5(1)	K28	L100B	165	177
239167	175	130	380	6	K26	-	270	290
239107			460	5	K33	L147B	233	250
239117			575	5	K31	L111B	186	200
239168	200	150	380	6	K27	-	316	340
239108			460	5	K33	L165B	266	286
239118			575	5	K32	L135B	213	229

**Table 31A - 60 Hz 8" Hi-Temp 75°C Motors**

MOTOR MODEL PREFIX	HP	KW	VOLTS	NEMA STARTER SIZE	HEATERS FOR OVERLOAD RELAYS		ADJUSTABLE RELAYS (NOTE 3)	
					FURNAS (NOTE 1)	G.E. (NOTE 2)	SET	MAX.
279100	460	3	K77	L710B	60	65		
279110	575	3	K74	L593B	48	52		
279161	50	37	380	3	K87	L107C	89	95
279101			460	3	K83	L866B	73	79
279111			575	3	K77	L710B	59	63
279162	60	45	380	4(1)	K89	L126C	104	112
279102			460	4(1)	K87	L107C	86	92
279112			575	4(1)	K78	L866B	69	74
279163	75	56	380	4	K92	L155C	131	141
279103			460	4(1)	K89	L126C	106	114
279113			575	4(1)	K87	L950C	86	92
279164	100	75	380	5(1)	K28	L100B	168	181
279104			460	5(1)	K26	L825A	139	149
279114			575	4	K90	L142C	111	119
279165	125	93	380	5	K32	L135B	207	223
279105			460	5(1)	K29	L111B	171	184
279115			575	5(1)	K26	L825A	138	148
279166	150	110	380	5	-	L147B	250	269
279106			460	5(1)	K32	L122B	206	222
279116			575	5(1)	K28	L100B	166	178

**Note:** Other relay types from these and other manufacturers may or may not provide acceptable protection, and they should not be used without approval of Franklin Electric.

Some approved types may only be available for part of the listed motor ratings. When relays are used with current transformers, relay setting is the specified amps divided by the transformer ratio.

## Recommended Adjustable Overload Relays

**Advance Controls:** MDR3 Overload

**AEG Series:** B17S, B27S, B27-2

**ABB Type:** RVH 40, RVH65, RVP160, T25DU, T25CT, TA25DU

**AGUT:** MT03, R1K1, R1L0, R1L3, TE set Class 5

**Allen Bradley:** Bulletin 193, SMP-Class 10 only

**Automatic Switch Types:** DQ, LR1-D, LR1-F, LR2 Class 10

**Benshaw:** RSD6 (Class 10) Soft Start

**Bharita C-H:** MC 305 ANA 3

**Clipsal:** 6CTR, 6MTR

**Cutler-Hammer:** C316F, C316P, C316S, C310-set at 6 sec max, Advantage Class10

**Fanal Types:** K7 or K7D through K400

**Franklin Electric:** Subtrol-Plus, SubMonitor

**Fuji Types:** TR-OQ, TR-OQH, TR-2NQ, TR-3NQ, TR-4NQ, TR-6NQ, RCa 3737-ICQ & ICQH

**Furnas Types:** US15 48AG & 48BG, 958L, ESP100-Class 10 only, 3RB10-Class 10

**General Electric:** CR4G, CR7G, RT\*1, RT\*2, RTF3, RT\*4, CR324X-Class 10 only

**Kasuga:** RU Set Operating Time Code = 10 & time setting 6 sec max

**Klockner-Moeller Types:** ZOO, Z1, Z4, PKZM1, PKZM3 & PKZ2

**Lovato:** RC9, RC22, RC80, RF9, RF25 & RF95

**Matsushita:** FKT-15N, 15GN, 15E, 15GE, FT-15N, FHT-15N

**Mitsubishi:** ET, TH-K12ABKP, TH-K20KF, TH-K20KP, TH-K20TAKF, TH-K60KF, TH-K60TAKF

**Omron:** K2CM Set Operating Timing Code = 10 & time setting 6 sec max, SE-KP24E time setting 6 sec max

**Riken:** PM1, PM3

**Samwha:** EOCSR Set for Class 5, EOCSR-ST, EOCSR-SE, EOCSR-AT time setting 6 sec max

**Siemens Types:** 3UA50, -52, -54, -55, -58, -59, -60, -61, -62, -66, -68, -70, 3VUI3, 3VE, 3UB (Class 5)

**Sprecher and Schuh Types:** CT, CT1, CTA 1, CT3K, CT3-12 thru CT3-42, KTA3, CEF1 & CET3 set at 6 sec max, CEP 7 Class 10, CT4, 6, & 7, CT3, KT7

**Square D/Telemecanique:** Class 9065 Types: TD, TE, TF, TG, TJ, TK, TR, TJE & TJF (Class 10), LR1-D, LR1-F, LR2 Class 10, Types 18A, 32A, SS-Class 10, SR-Class 10 and 63-A-LB Series. Integral 18,32,63, GV2-L, GV2-M, GV2-P, GV3-M (1.6-10 amp only) LR9D, SF Class 10, ST Class 10, LT6 (Class 5 or 10), LRD (Class 10), Motor Logic (Class10)

**Toshiba Type:** 2E RC820, set at 8 sec max.

**WEG:** RW2

**Westinghouse Types:** FT13, FT23, FT33, FT43, K7D, K27D, K67D, Advantage (Class 10), MOR, IQ500 (Class 5)

**Westmaster:** OLWROO and OLWTOO suffix D thru P