NEC® Article 430 and Tables Explanation

Columns 1 & 2

Motor horsepower ratings are listed in Column 1. Full load amps from Tables 430.247 through 430.250 are provided in Column 2.

Column 3

Various fuse types are listed in Column 3. The LPJ_SP is a 600Vac, 0 - 600 amp, time-delay, Class J, "Low-Peak fuse, with a 300,000 amp interrupting rating. The TCF is a 600Vac, 1 - 100 amp dual-element, time-delay, IP-20 finger-safe fuse with Class J performance. The LP-CC is a 600Vac, 0 - 30 amp, time-delay, Class CC, Low-Peak fuse with a 200,000 amp interrupting rating. The LPS-RK_SP and LPN-RK_SP are 600 and 250Vac, 0 - 600 amp, time-delay, Class RK1, Low-Peak fuses with interrupting ratings of 300,000 amps. FRS-R and FRN-R are 600 and 250Vac, 0 - 600 amp, time-delay, Class RK5, Fusetron Dual-Element fuses with interrupting ratings of 200,000 amps. The KRP-C_SP is a 600Vac, 601 - 6000 amp, time-delay, Class L, Low-Peak fuse, with a 300,000 amp AC interrupting rating. The DC listed ratings for these fuses are:

LPJ	1 to 600SP	300Vdc	LPN-RK	0 to 60SP	125Vdc
TCF	1 to 100	300Vdc	LPN-RK	70 to 600SP	250Vdc
LP-CC	½ to 2 ⅘₀	300Vdc	LPS-RK	0 to 600SP	300Vdc
LP-CC	3 to 15	150Vdc	FRN-R	0 to 600	125Vdc
LP-CC	20 to 30	300Vdc	FRS-R	0 to 600	300Vdc

Column 4 - Optimal Branch Circuit Protection

There are two distinct levels of protection philosophy provided in this Column. LPS-RK_SP, LPN-RK_SP, FRS-R and FRN-R fuses are sized for motor running "back-up" protection and provide superb short circuit protection at the same time. LPJ_SP, TCF, and LP-CC fuses are sized a little larger but are even more current limiting, providing an even greater degree of short circuit protection for the motor circuit.

All the fuses selected from this column provide short circuit and ground-fault protection for motor branch circuits (430.52), but typically are not the maximum allowed. Fuses sized in accordance with Column 4 must be used in conjunction with properly sized motor overload protection such as overload relays or solid state motor controllers (430.32). This fuse sizing is normally large enough to allow the overload protective device to operate on overloads without opening the fuse. Yet for many cases, this fuse amp rating selection is smaller than the maximums allowed per Columns 5 or 6 (430.52). In some cases, this smaller amp rating selection may provide the benefits of a smaller size disconnect and better short circuit protection. If a motor has a long starting time, high starting current profile or is cycled frequently, it may be necessary to use Column 5 or 6.

The LPS-RK_SP, LPN-RK_SP, FRS-R and FRN-R fuses sized per this column provide short circuit and ground-fault protection for motor branch circuits (430.52) as discussed in the previous paragraph. In addition, these dual-element fuses exhibit longer time-delay characteristics and can therefore be sized to provide back-up motor overload protection. The fuse sizing in Column 4 for LPS-RK_SP, LPN-RK_SP, FRS-R and FRN-R fuses provides a degree of motor and circuit overload protection to back-up the normal motor overload protective device. Note: This level of protection requires a well-designed, true dual-element fuse. The Fusetron Fuses, FRS-R and FRN-R, and Low-Peak Fuses, LPS-RK_SP and LPN-RK_SP, are the industry leading dual-element fuses with excellent over-load time-delay characteristics and current-limiting short circuit ability. The Low-Peak Dual-Element Fuses have better current-limiting ability than Fusetron Dual-Element Fuses.

The amp ratings in Column 4 are determined by using Column 2 motor ampacity values and the following:

- **LPJ_SP & TCF: 150%** or the next larger Cooper Bussmann amp rating if 150% does not correspond to a Cooper Bussmann fuse amp rating.
- **LP-CC ½ to 15A: 200%** (150% for DC) or the next larger Cooper Bussmann size if 200% (150% for DC) does not correspond to a Cooper Bussmann fuse amp rating.
- **LP-CC 20 to 30A: 300%** (150% for DC) or the next larger Cooper Bussmann size if 300% (150% for DC) does not correspond to a Cooper Bussmann fuse amp rating.
- **LPS-RK_SP and LPN-RK_SP: 130%** or the next larger Cooper Bussmann amp rating if 130% does not correspond to a Cooper Bussmann fuse amp rating.
- **FRS-R and FRN-R: 125%** or the next larger Cooper Bussmann amp rating if 125% does not correspond to a Cooper Bussmann fuse amp rating.

Column 5 - Branch Circuit Protection, Max. General Applications

Fuses selected from this column are intended to provide short circuit and ground-fault protection for motor branch circuits. Fuses sized in accordance with Column 5 must be used in conjunction with properly sized motor overload protection such as overload relays or solid state motor controllers (430.32). Column 5 fuse sizing provides the maximum NEC® Table 430.52 amp ratings for general purpose applications. It takes into account 430.52(C)(1) Exception No. 1, which allows the next standard amp rating fuse (per standard fuse amp ratings in 240.6) to be used if the maximum percentage in Table 430.52 does not correspond to a standard fuse amp rating. If this Column 5 fuse sizing does not allow the motor to start, then Column 6 may provide a larger amp rating.

The amp ratings in Column 5 are deter-mined by using Column 2 motor ampacity values and the following:

- **LPJ_SP, TCF, LPS-RK_SP, LPN-RK_SP, FRS-R, FRN-R and KRP-C_SP: 175%** (150% for DC motors) or the next larger **240.6 standard** fuse amp rating if 175% (150% for DC motors) does not correspond to a standard fuse amp rating.
- **LP-CC: 300%** (150% for DC motors) or the next larger **240.6 standard** fuse amp rating if 300% (150% for DC motors) does not correspond to a standard fuse amp rating.

Sizes shown for the LP-CC can also be used for non-time delay fuses such as **JKS, KTN-R, KTS-R, JJN, JJS, and KTK-R**.

Column 6 - Branch Circuit Protection, Max. Heavy Start

When the amp rating shown in Column 5 is not sufficient to start a motor, a larger amp rating is often available by utilizing 430.52(C)(1) Exception No. 2. The amp ratings in Column 6 are the larger of the amp rating allowed by 430.52(C)(1) Exception No. 1, or 430.52(C)(1) Exception No. 2. These amp ratings will often be required when acceleration times are greater than 5 seconds, when plugging or jogging applications exist, or where there are high inrush currents (such as Design E or energy efficient Design B motors). (In a few cases, the amp rating in Column 6 may be smaller than the maximum permitted due to the limitation of the fuse type, such as LP-CC, Class CC fuses that are only available in ratings up to 30 amps. In these cases, if the amp rating shown is not sufficient to start the motor, select a different family of fuses that meet the requirements.) The amp ratings in Column 6 are determined by using Column 2 motor ampacity values and the following:

- **LPJ_SP, TCF, LPS-RK_SP, LPN-RK_SP, FRS-R, and FRN-R: 225%** or the next smaller Cooper Bussmann amp rating if 225% does not correspond to a Cooper Bussmann fuse amp rating.
- **LP-CC: 400%** or the next smaller Cooper Bussmann amp rating if 400% does not correspond to a Cooper Bussmann fuse amp rating.
- **KRP-C_SP: 300%** or the next smaller Cooper Bussmann amp rating, if 300% does not correspond to a Cooper Bussmann amp rating.

Sizes shown for the LP-CC can also be used for non-time delay fuses such as **JKS, KTN-R, KTS-R, JJN, JJS, AND KTK-R**.

Column 7

Horsepower-rated switch sizes given in Column 7 are based on 115% (430.110) of Column 2. Switch sizes need to be increased when, because of starting requirements, the fuses are sized above the rating of the switch shown in this column.

Column 8

Sizes listed are for general-purpose magnetic controllers (single speed, full-volt-age for limited plugging and jogging-duty) as shown in NEMA Standards Publication ICS-2-2000.

NEC® Article 430 and Tables Explanation

Column 9

Copper wire sizes are based upon 125% (430.22) of values shown in Column 2 and ampacities listed in Table 310.16 for 75°C terminals. Although the NEC® allows 60°C terminations for equipment rated 100 amp or less, most equipment terminations have been rated for 75°C conductors. If equipment terminations are rated for 60°C conductors only, the 60°C ampacities must be utilized and therefore larger conductor sizes may be required than those shown in this column. See 110.14(C) (1)(a)(4).

Column 10

These rigid metallic conduit sizes are based upon copper conductors with THWN or THHN insulation, Table C8 of Annex C, and 75°C equipment terminals.

Conduit sizes are for three conductors per circuit for three phase motors and two conductors per circuit for single phase and DC motors. Conduit sizes may need to be increased if equipment grounding conductors or neutrals are also installed in the conduit.

If equipment terminations are rated for 60°C conductors only, the 60°C ampacities must be utilized and therefore larger conductor sizes and conduit sizes may be required.

Conductors operated in a high ambient temperature may need to be derated. (See correction factor table at the bottom of Table 310.16.)

200Vac Three-Phase Motors & Circuits

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Fuse Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
½	2.5	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J J[f] CC RK1 RK5	4 6 5 3 ½ 3 ⅘	6 6 10 6 6	6 6 10 6 6	30	00	14	½
¾	3.7	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J J[f] CC RK1 RK5	5 ⅘ 6 7 ½ 5 5	10 10 15 10 10	10 10 15 10 10	30	00	14	½
1	4.8	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J J[f] CC RK1 RK5	8 10 10 6 ¼ 6	10 10 15 10 10	10 10 15 10 10	30	00	14	½
1 ½	6.9	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J J[f] CC RK1 RK5	12 15 15 9 9	15 15 25 15 15	15 15 25 15 15	30	00	14	½
2	7.8	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J J[f] CC RK1 RK5	12 15 25 12 10	15 15 25 15 15	17 ½ 17 ½ 30 17 ½ 17 ½	30	0	14	½
3	11	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J J[f] CC RK1 RK5	17 ½ 17 ½ 25 15 15	20 20 – 20 20	20 20 – 20 20	30	0	14	½
5	17.5	LPJ_SP TCF LPN-RK_SP FRN-R	J J[f] RK1 RK5	30 30 25 25	35 35 35 35	35 35 35 35	30*	1	12	½
7 ½	25.3	LPJ_SP TCF LPN-RK_SP FRN-R	J J[f] RK1 RK5	40 40 35 35	45 45 45 45	50 50 50 50	60	1	10**	½**
10	32.2	LPJ_SP TCF LPN-RK_SP FRN-R	J J[f] RK1 RK5	50 50 45 45	60 60 60 60	70 – 70 70	60*	2	8**	½**
15	48.3	LPJ_SP TCF LPN-RK_SP FRN-R	J J[f] RK1 RK5	80 80 70 70	90 90 90 90	100 100 100 100	100	3	6**	¾**
20	62.1	LPJ_SP TCF LPN-RK_SP FRN-R	J J[f] RK1 RK5	100 100 90 80	110 – 110 110	125 – 125 125	100*	3	4**	1

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

f Class J performance, special finger-safe dimensions.

200Vac Three-Phase Motors & Circuits continued

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Class	Optimal Branch Ckt Protection AMPS [1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS [1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS [1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	125	150	175				
25	78.2	LPN-RK_SP	RK1	110	150	175	100*	3	3**	1**
		FRN-R	RK5	100	150	175				
		LPJ_SP	J	150	175	200				
30	92	LPN-RK_SP	RK1	125	175	200	200	4	2**	1**
		FRN-R	RK5	125	175	200				
		LPJ_SP	J	200	225	250				
40	120	LPN-RK_SP	RK1	175	225	250	200*	4	1/0	1 ¼
		FRN-R	RK5	150	225	250				
		LPJ_SP	J	225	300	300				
50	150	LPN-RK_SP	RK1	200	300	300	200*	5	3/0	1 ½
		FRN-R	RK5	200	300	300				
		LPJ_SP	J	300	350	350				
60	177	LPN-RK_SP	RK1	250	350	350	400	5	4/0	2
		FRN-R	RK5	225	350	350				
		LPJ_SP	J	350	400	450				
75	221	LPN-RK_SP	RK1	300	400	450	400*	5	300	2
		FRN-R	RK5	300	400	450				
		KRP-C_SP	L	–	–	650				
		LPJ_SP	J	450	500	600				
100	285	LPN-RK_SP	RK1	400	500	600	400*	6	500	3
		FRN-R	RK5	400	500	600				
		KRP-C_SP	L	–	–	800				
		LPJ_SP	J	600	–	–				
125	359	LPN-RK_SP	RK1	500	–	–	600*	6	4/0 2/PHASE	(2)2
		FRN-R	RK5	450	–	–				
		KRP-C_SP	L	–	700	1000				
		LPN-RK_SP	RK1	600	–	–				
150	414	FRN-R	RK5	600	–	–	600*	6	300 2/PHASE	(2)2
		KRP-C_SP	L	–	800	1200				
200	552	KRP-C_SP	L	–	1000	1600	1200	72	500 2/PHASE	(2)3

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

208Vac Three-Phase Motors & Circuits

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size2	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	4	6	6				
		TCF	Jf	6	6	6				
½	2.4	LP-CC	CC	5	10	10	30	00	14	½
		LPN-RK_SP	RK1	3 ½	6	6				
		FRN-R	RK5	3	6	6				
		LPJ_SP	J	5 ⁹⁄₁₀	10	10				
		TCF	Jf	6	10	10				
¾	3.5	LP-CC	CC	7	15	15	30	00	14	½
		LPN-RK_SP	RK1	5	10	10				
		FRN-R	RK5	4 ½	10	10				
		LPJ_SP	J	7	10	10				
		TCF	Jf	10	10	10				
1	4.6	LP-CC	CC	10	15	15	30	00	14	½
		LPN-RK_SP	RK1	6	10	10				
		FRN-R	RK5	6	10	10				
		LPJ_SP	J	10	15	15				
		TCF	Jf	10	15	15				
1 ½	6.6	LP-CC	CC	15	20	25	30	00	14	½
		LPN-RK_SP	RK1	9	15	15				
		FRN-R	RK5	9	15	15				

*Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

**If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

f Class J performance, special finger-safe dimensions.

208Vac Three-Phase Motors & Circuits continued

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Fuse Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	12	15	15				
		TCF	J[f]	15	15	15				
2	7.5	LP-CC	CC	15	25	30	30	0	14	½
		LPN-RK_SP	RK1	10	15	15				
		FRN-R	RK5	10	15	15				
		LPJ_SP	J	17 ½	20	20				
3	10.6	TCF	J[f]	17 ½	20	20	30	0	14	½
		LPN-RK_SP	RK1	15	20	20				
		FRN-R	RK5	15	20	20				
		LPJ_SP	J	30	30	35				
5	16.7	TCF	J[f]	30	30	35	30*	1	12	½
		LPN-RK_SP	RK1	25	30	35				
		FRN-R	RK5	25	30	35				
		LPJ_SP	J	40	45	50				
7 ½	24.2	TCF	J[f]	40	45	50	60	1	10**	½
		LPN-RK_SP	RK1	35	45	50				
		FRN-R	RK5	35	45	50				
		LPJ_SP	J	50	60	60				
10	30.8	TCF	J[f]	50	60	60	60	2	8	½**
		LPN-RK_SP	RK1	45	60	60				
		FRN-R	RK5	40	60	60				
		LPJ_SP	J	70	90	100				
15	46.2	TCF	J[f]	70	90	100	60*	3	6**	¾**
		LPN-RK_SP	RK1	70	90	100				
		FRN-R	RK5	60	90	100				
		LPJ_SP	J	90	110	125				
20	59.4	TCF	J[f]	90	–	–	100*	3	4**	1
		LPN-RK_SP	RK1	80	110	125				
		FRN-R	RK5	80	110	125				
		LPJ_SP	J	125	150	150				
25	74.8	LPN-RK_SP	RK1	100	150	150	100*	3	3**	1**
		FRN-R	RK5	100	150	150				
		LPJ_SP	J	150	175	175				
30	88	LPN-RK_SP	RK1	125	175	175	200	4	2**	1**
		FRN-R	RK5	110	175	175				
		LPJ_SP	J	175	200	250				
40	114	LPN-RK_SP	RK1	150	200	250	200*	4	1/0	1 ¼
		FRN-R	RK5	150	200	250				
		LPJ_SP	J	225	300	300				
50	143	LPN-RK_SP	RK1	200	300	300	200*	5	3/0	1 ½
		FRN-R	RK5	200	300	300				
		LPJ_SP	J	300	300	350				
60	169	LPN-RK_SP	RK1	225	300	350	400	5	4/0	2
		FRN-R	RK5	225	300	350				
		LPJ_SP	J	350	400	450				
75	211	LPN-RK_SP	RK1	300	400	450	400*	5	300	2
		FRN-R	RK5	300	400	450				
		KRP-C_SP	L	–	–	601				
		LPJ_SP	J	450	500	600				
100	273	LPN-RK_SP	RK1	400	500	600	400*	6	500	3
		FRN-R	RK5	350	500	600				
		KRP-C_SP	L	–	–	800				
		LPJ_SP	J	600	–	–				
125	343	LPN-RK_SP	RK1	450	–	–	600*	6	4/0 2/PHASE	(2)2
		FRN-R	RK5	450	–	–				
		KRP-C_SP	L	–	601	1000				
		LPJ_SP	J	600	–	–				
150	396	LPN-RK_SP	RK1	600	–	–	600*	6	250 2/PHASE	(2)2
		FRN-R	RK5	500	–	–				
		KRP-C_SP	L	–	700	1100				
200	528	KRP-C_SP	L	–	1000	1500	1200*	7	400 2/PHASE	(2)2-2 ½

*Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

**If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

f Class J performance, special finger-safe dimensions.

COOPER Bussmann

230Vac Three-Phase Motors & Circuits (220-240Vac Systems)

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Fuse Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
½	2.2	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J Jf CC RK1 RK5	3 ½ 6 4 ½ 3 2 8/10	6 6 10 6 6	6 6 10 6 6	30	00	14	½
¾	3.2	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J Jf CC RK1 RK5	5 6 7 4 ½ 4	6 6 10 6 6	7 6 12 7 7	30	00	14	½
1	4.2	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J Jf CC RK1 RK5	7 10 9 5 ⅘ 5 ⅘	10 10 15 10 10	10 10 15 10 10	30	00	14	½
1 ½	6	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J Jf CC RK1 RK5	9 10 12 8 7 ½	15 15 20 15 15	15 15 20 15 15	30	00	14	½
2	6.8	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J Jf CC RK1 RK5	12 15 15 9 9	15 15 25 15 15	15 15 25 15 15	30	0	14	½
3	9.6	LPJ_SP TCF LP-CC LPN-RK_SP FRN-R	J Jf CC RK1 RK5	15 15 30 15 12	20 20 30 20 20	20 20 30 20 20	30	0	14	½
5	15.2	LPJ_SP TCF LPN-RK_SP FRN-R	J Jf RK1 RK5	25 25 20 20	30 30 30 30	30 30 30 30	30	1	14	½
7 ½	22	LPJ_SP TCF LPN-RK_SP FRN-R	J Jf RK1 RK5	35 34 30 30	40 40 40 40	45 45 45 45	30*	1	10	½
10	28	LPJ_SP TCF LPN-RK_SP FRN-R	J Jf RK1 RK5	45 45 40 35	50 50 50 50	60 60 60 60	60	2	10**	½
15	42	LPJ_SP TCF LPN-RK_SP FRN-R	J Jf RK1 RK5	70 70 60 60	80 80 80 80	90 90 90 90	60*	2	6	¾
20	54	LPJ_SP TCF LPN-RK_SP FRN-R	J Jf RK1 RK5	90 90 80 70	100 100 100 100	110 – 110 110	100*	3	4	1
25	68	LPJ_SP LPN-RK_SP FRN-R	J RK1 RK5	110 90 90	125 125 125	150 150 150	100*	3	4**	1
30	80	LPJ_SP LPN-RK_SP FRN-R	J RK1 RK5	125 110 100	150 150 150	175 175 175	100*	3	3**	1**
40	104	LPJ_SP LPN-RK_SP FRN-R	J RK1 RK5	175 150 150	200 200 200	225 225 225	200*	4	1**	1 ¼**
50	130	LPJ_SP LPN-RK_SP FRN-R	J RK1 RK5	200 175 175	250 250 250	250 250 250	200*	4	2/0	1 ½
60	154	LPJ_SP LPN-RK_SP FRN-R	J RK1 RK5	250 225 200	300 300 300	300 300 300	200*	5	3/0	1 ½

*Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

**If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

f Class J performance, special finger-safe dimensions.

4 Limited by 600 amp being the largest amp rating for FRN-R and LPN-RK_SP.

230Vac Three-Phase Motors & Circuits (220-240Vac Systems) continued

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Fuse Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	300	350	400				
75	192	LPN-RK_SP	RK1	250	350	400	400	5	250	2
		FRN-R	RK5	250	350	400				
		LPJ_SP	J	400	450	500				
100	248	LPN-RK_SP	RK1	350	450	500	400*	5	350	2 ½
		FRN-R	RK5	350	450	500				
		KRP-C_SP	L	–	–	700				
		LPJ_SP	J	500	600	–				
125	312	LPN-RK_SP	RK1	450	600	–	400*	6	3/0 2/PHASE	(2) 1 ½
		FRN-R	RK5	400	600	–				
		KRP-C_SP	L	–	—	900				
		LPJ_SP	J	600	–	–				
150	360	LPN-RK_SP	RK1	500	6004	–	600*	6	4/0 2/PHASE	(2) 2
		FRN-R	RK5	450	6004	–				
		KRP-C_SP	L	–	700	1000				
200	480	FRN-R	RK5	600	–	–	600*	6	350 2/PHASE	(2) 2-2 ½
		KRP-C_SP	L	–	1000	1400				

*Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

**If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

4 Limited by 600 amp being the largest amp rating for FRN-R and LPN-RK_SP.

460Vac Three-Phase Motors & Circuits (440-480Vac Systems)

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Fuse Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	1 $^{8}/_{10}$	3	3				
		TCF	J/	3	3	3				
½	1.1	LP-CC	CC	2 ¼	6	6	30	00	14	½
		LPS-RK_SP	RK1	1 1½	3	3				
		FRS-R	RK5	1 $^{8}/_{10}$	3	3				
		LPJ_SP	J	2 ½	3	3 ½				
		TCF	J/	3	3	3				
¾	1.6	LP-CC	CC	3 $^{3}/_{10}$	6	6 ¼	30	00	14	½
		LPS-RK_SP	RK1	2 ¼	3	3 ½				
		FRS-R	RK5	2	3	3 ½				
		LPJ_SP	J	3 $^{3}/_{10}$	6	6				
		TCF	J/	6	6	6				
1	2.1	LP-CC	CC	4 ½	10	10	30	00	14	½
		LPS-RK_SP	RK1	2 $^{8}/_{10}$	6	6				
		FRS-R	RK5	2 $^{8}/_{10}$	6	6				
		LPJ_SP	J	4 ½	6	6				
		TCF	J/	6	6	6				
1 ½	3	LP-CC	CC	6	10	12	30	00	14	½
		LPS-RK_SP	RK1	4	6	6 ¼				
		FRS-R	RK5	4	6	6 ¼				
		LPJ_SP	J	5 $^{6}/_{10}$	6	7				
		TCF	J/	6	6	6				
2	3.4	LP-CC	CC	7 1	5	15	30	00	14	½
		LPS-RK_SP	RK1	4 ½	6	7				
		FRS-R	RK5	4 ½	6	7 ½				
		LPJ_SP	J	8	10	10				
		TCF	J/	10	10	10				
3	4.8	LP-CC	CC	10	15	15	30	0	14	½
		LPS-RK_SP	RK1	6 ¼	10	10				
		FRS-R	RK5	6	10	10				
		LPJ_SP	J	12	15	15				
		TCF	J/	15	15	15				
5	7.6	LP-CC	CC	25	25	30	30	0	14	½
		LPS-RK_SP	RK1	10	15	15				
		FRS-R	RK5	10	15	15				

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

/ Class J performance, special finger-safe dimensions.

460Vac Three-Phase Motors & Circuits (440-480Vac Systems) continued

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	17 ½	20	20				
7 ½	11	TCF	Jf	17 ½	20	20	30	1	14	½
		LPS-RK_SP	RK1	15	20	20				
		FRS-R	RK5	15	20	20				
		LPJ_SP	J	25	25	30				
10	14	TCF	Jf	25	25	30	30	1	14	½
		LPS-RK_SP	RK1	20	25	30				
		FRS-R	RK5	17 ½	25	30				
		LPJ_SP	J	35	40	45				
15	21	TCF	Jf	35	40	45	30*	2	10	½
		LPS-RK_SP	RK1	30	40	45				
		FRS-R	RK5	30	40	45				
		LPJ_SP	J	45	50	60				
20	27	TCF	Jf	45	50	60	60	2	10**	½
		LPS-RK_SP	RK1	40	50	60				
		FRS-R	RK5	35	50	60				
		LPJ_SP	J	60	60	70				
25	34	TCF	Jf	60	60	70	60*	2	8**	½**
		LPS-RK_SP	RK1	45	60	70				
		FRS-R	RK5	45	60	70				
		LPJ_SP	J	60	70	90				
30	40	TCF	Jf	60	70	90	60*	3	8**	½**
		LPS-RK_SP	RK1	60	70	90				
		FRS-R	RK5	50	70	90				
		LPJ_SP	J	80	100	110				
40	52	TCF	Jf	80	100	–	100*	3	6**	¾**
		LPS-RK_SP	RK1	70	100	110				
		FRS-R	RK5	70	100	110				
		LPJ_SP	J	100	125	125				
50	65	TCF	Jf	100	–	–	100*	3	4**	1
		LPS-RK_SP	RK1	90	125	125				
		FRS-R	RK5	90	125	125				
		LPJ_SP	J	125	150	150				
60	77	LPS-RK_SP	RK1	110	150	150	100*	4	3**	1**
		FRS-R	RK5	100	150	150				
		LPJ_SP	J	150	175	200				
75	96	LPS-RK_SP	RK1	125	175	200	200	4	1**	1 ¼**
		FRS-R	RK5	125	175	200				
		LPJ_SP	J	200	225	250				
100	124	LPS-RK_SP	RK1	175	225	250	200*	4	2/0	1 ½
		FRS-R	RK5	175	225	250				
		LPJ_SP	J	250	300	350				
125	156	LPS-RK_SP	RK1	225	300	350	200*	5	3/0	1 ½
		FRS-R	RK5	200	300	350				
		LPJ_SP	J	300	350	400				
150	180	LPS-RK_SP	RK1	250	350	400	400	5	4/0	2
		FRS-R	RK5	225	350	400				
		LPJ_SP	J	400	450	500				
200	240	LPS-RK_SP	RK1	350	450	500	400*	5	350	2 ½
		FRS-R	RK5	300	450	500				
		KRP-C_SP	L	–	–	700				
		LPJ_SP	J	500	600	–				
250	302	LPS-RK_SP	RK1	400	600	–	400*	6	3/0 2/PHASE	(2) 1 ½
		FRS-R	RK5	400	600	–				
		KRP-C_SP	L	–	–	900				
		LPJ_SP	J	600	–	–				
300	361	LPS-RK_SP	RK1	500	6004	–	600*	6	4/0 2/PHASE	(2) 2
		FRS-R	RK5	500	6004	–				
		KRP-C_SP	L	–	700	1000				
		LPS-RK_SP	RK1	600	–	–				
350	414	FRS-R	RK5	600	–	–	600*	6	300 2/PHASE	(2) 2
		KRP-C_SP	L	–	800	1200				
400	477	KRP-C_SP	L	–	1000	1400	600*	6	350 2/PHASE	(2)2 ½
		FRS-R	RK5	600	–	–				
450	515	KRP-C_SP	L	–	1000	1500	1200*	7	400 2/PHASE	(2) 2 ½
500	590	KRP-C_SP	L	–	1200	1600	1200*	7	500 2/PHASE	(2) 3

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

4 Limited by 600 amp being the largest amp rating for FRS-R and LPS-RK_SP.

f Class J performance, special finger-safe dimensions.

COOPER Bussmann

575Vac Three-Phase Motors & Circuits (550-600Vac Systems)

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	 Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	1 7/10	3	3				
		TCF	Jf	3	3	3				
½	0.9	LP-CC	CC	1 8/10	3	3 ½	30	0	14	½
		LPS-RK_SP	RK1	1 ¼	3	3				
		FRS-R	RK5	1 ⅛	3	3				
		LPJ_SP	J	2	3	3				
		TCF	Jf	3	3	3				
¾	1.3	LP-CC	CC	2 8/10	6	6	30	0	14	½
		LPS-RK_SP	RK1	1 8/10	3	3				
		FRS-R	RK5	1 8/10	3	3				
		LPJ_SP	J	2 8/10	3	3 ½				
		TCF	Jf	3	3	3				
1	1.7	LP-CC	CC	3 ½	6	6 ¼	30	0	14	½
		LPS-RK_SP	RK1	2 ¼	3	3 ½				
		FRS-R	RK5	2 ¼	3	3 ½				
		LPJ_SP	J	4	6	6				
		TCF	Jf	6	6	6				
1 ½	2.4	LP-CC	CC	5	10	10	30	0	14	½
		LPS-RK_SP	RK1	3 3/10	6	6				
		FRS-R	RK5	3	6	6				
		LPJ_SP	J	4 ½	6	6				
		TCF	Jf	6	6	6				
2	2.7	LP-CC	CC	5 8/10	10	10	30	0	14	½
		LPS-RK_SP	RK1	4	6	6				
		FRS-R	RK5	3 ½	6	6				
		LPJ_SP	J	6	10	10				
		TCF	Jf	6	10	10				
3	3.9	LP-CC	CC	5	15	15	30	0	14	½
		LPS-RK_SP	RK1	5 8/10	10	10				
		FRS-R	RK5	5	10	10				
		LPJ_SP	J	10	15	15				
		TCF	Jf	10	15	15				
5	6.1	LP-CC	CC	15	20	20	30	0	14	½
		LPS-RK_SP	RK1	8	15	15				
		FRS-R	RK5	8	15	15				
		LPJ_SP	J	15	20	20				
		TCF	Jf	15	20	20				
7 ½	9	LP-CC	CC	30	30	30	30	1	14	½
		LPS-RK_SP	RK1	12	20	20				
		FRS-R	RK5	12	20	20				
		LPJ_SP	J	17 ½	20	20				
10	11	TCF	Jf	17 ½	20	20	30	1	14	½
		LPS-RK_SP	RK1	15	20	20				
		FRS-R	RK5	15	20	20				
		LPJ_SP	J	30	30	35				
15	17	TCF	Jf	30	30	35	30*	2	12	½
		LPS-RK_SP	RK1	25	30	35				
		FRS-R	RK5	25	30	35				
		LPJ_SP	J	35	40	45				
20	22	TCF	Jf	35	40	45	30*	2	10	½
		LPS-RK_SP	RK1	30	40	45				
		FRS-R	RK5	30	40	45				
		LPJ_SP	J	45	50	60				
25	27	TCF	Jf	45	50	60	60	2	10**	½**
		LPS-RK_SP	RK1	40	50	60				
		FRS-R	RK5	35	50	60				
		LPJ_SP	J	50	60	70				
30	32	TCF	Jf	50	60	70	60*	3	8	½
		LPS-RK_SP	RK1	45	60	70				
		FRS-R	RK5	40	60	70				
		LPJ_SP	J	70	80	90				
40	41	TCF	Jf	70	80	90	60*	3	6	¾
		LPS-RK_SP	RK1	60	80	90				
		FRS-R	RK5	60	80	90				
		LPJ_SP	J	80	100	110				
50	52	TCF	Jf	80	100	–	100*	3	6**	¾**
		LPS-RK_SP	RK1	70	100	110				
		FRS-R	RK5	70	100	110				

*Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

**If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

f Class J performance, special finger-safe dimensions.

575Vac Three-Phase Motors & Circuits (550-600Vac Systems) continued

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.250 HP	Motor FLA Table 430.250 AMPS	Fuse Type	Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	100	110	125				
60	62	LPS-RK_SP	RK1	90	110	125	100*	4	4**	1
		FRS-R	RK5	80	110	125				
		LPJ_SP	J	125	150	150				
75	77	LPS-RK_SP	RK1	110	150	150	100*	4	3**	1**
		FRS-R	RK5	100	150	150				
		LPJ_SP	J	150	175	200				
100	99	LPS-RK_SP	RK1	150	175	200	200	4	1**	1 ¼**
		FRS-R	RK5	125	175	200				
		LPJ_SP	J	200	225	250				
125	125	LPS-RK_SP	RK1	175	225	250	200*	5	2/0	1 ½
		FRS-R	RK5	175	225	250				
		LPJ_SP	J	225	300	300				
150	144	LPS-RK_SP	RK1	200	300	300	200*	5	3/0	1 ½
		FRS-R	RK5	200	300	300				
		LPJ_SP	J	300	350	400				
200	192	LPS-RK_SP	RK1	250	350	400	400	5	250	2
		FRS-R	RK5	250	350	400				
		LPJ_SP	J	400	450	500				
250	242	LPS-RK_SP	RK1	350	450	500	400*	6	350	2 ½
		FRS-R	RK5	350	450	500				
		KRP-C_SP	L	–	–	700				
		LPJ_SP	J	450	600	600				
300	289	LPS-RK_SP	RK1	400	600	600	400*	6	500	3
		FRS-R	RK5	400	600	600				
		KRP-C_SP	L	–	–	800				
		LPJ_SP	J	600	600	–				
350	336	LPS-RK_SP	RK1	450	600	–	600*	6	4/0 2/PHASE	(2) 2
		FRS-R	RK5	450	600	–				
		KRP-C_SP	L	–	601	1000				
		LPJ_SP	J	600	–	–				
400	382	LPS-RK_SP	RK1	500	–	–	600*	6	250 2/PHASE	(2) 2
		FRS-R	RK5	500	–	–				
		KRP-C_SP	L	–	700	1100				
		LPS-RK_SP	RK1	600	–	–				
450	412	FRS-R	RK5	600	–	–	600*	7	300 2/PHASE	(2) 2
		KRP-C_SP	L	–	800	1200				
500	472	FRS-R	RK5	600	–	–	600*	7	350 2/PHASE	(2) 2 ½
		KRP-C_SP	L	–	1000	1400				

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

115Vac Single-Phase Motors & Circuits (110-120Vac Systems)

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.248 HP	Motor FLA Table 430.248 AMPS	Fuse Type	Fuse Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	8	10	10				
		TCF	J*f*	10	10	10				
⅛	4.4	LP-CC	CC	9	15	15	30	00	14	½
		LPN-RK_SP	RK1	6	10	10				
		FRN-R	RK5	5 6/10	10	10				
		LPJ_SP	J	9	15	15				
		TCF	J*f*	10	15	15				
¼	5.8	LP-CC	CC	12	20	20	30	00	14	½
		LPN-RK_SP	RK1	8	15	15				
		FRN-R	RK5	7 ½	15	15				
		LPJ_SP	J	12	15	15				
		TCF	J*f*	15	15	15				
⅓	7.2	LP-CC	CC	15	25	25	30	00	14	½
		LPN-RK_SP	RK1	10	15	15				
		FRN-R	RK5	9	15	15				
		LPJ_SP	J	15	20	20				
		TCF	J*f*	15	20	20				
½	9.8	LP-CC	CC	30	30	30	30	0	14	½
		LPN-RK_SP	RK1	15	20	20				
		FRN-R	RK5	15	20	20				
		LPJ_SP	J	25	25	30				
¾	13.8	TCF	J*f*	25	25	30	30	0	14	½
		LPN-RK_SP	RK1	20	25	30				
		FRN-R	RK5	17 ½	25	30				
		LPJ_SP	J	25	30	35				
1	16	TCF	J*f*	25	30	35	30*	0	14	½
		LPN-RK_SP	RK1	25	30	35				
		FRN-R	RK5	20	30	35				
		LPJ_SP	J	30	35	45				
1 ½	20	TCF	J*f*	30	35	45	30*	1	12	½
		LPN-RK_SP	RK1	30	35	45				
		FRN-R	RK5	25	35	45				
		LPJ_SP	J	40	45	50				
2	24	TCF	J*f*	40	45	50	30*	1	10	½
		LPN-RK_SP	RK1	35	45	50				
		FRN-R	RK5	30	45	50				
		LPJ_SP	J	60	60	70				
3	34	TCF	J*f*	60	60	70	60*	2	8**	½**
		LPN-RK_SP	RK1	45	60	70				
		FRN-R	RK5	45	60	70				
		LPJ_SP	J	90	100	125				
5	56	TCF	J*f*	90	100	–	100*	3	4	¾**
		LPN-RK_SP	RK1	80	100	125				
		FRN-R	RK5	70	100	125				
		LPJ_SP	J	125	150	175				
7 ½	80	LPN-RK_SP	RK1	110	150	175	100*	3	3**	1**
		FRN-R	RK5	100	150	175				
		LPJ_SP	J	150	175	225				
10	100	LPN-RK_SP	RK1	150	175	225	200*	42	1	1 ¼
		FRN-R	RK5	125	175	225				

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

f Class J performance, special finger-safe dimensions.

230Vac Single-Phase Motors & Circuits (220-240Vac Systems)

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.248 HP	Motor FLA Table 430.248 AMPS	Fuse		Optimal Branch Ckt Protection	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2	Minimum Switch Size 430.110	Minimum NEMA Starter NEMA ICS 2-2000	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16	Minimum Rigid Metallic Conduit Annex C Table C8
		Type	Class	AMPS[1]	AMPS[1]	AMPS[1]	AMPS	Size[2]	Size	Inches
		LPJ_SP	J	3 ½	6	6				
		TCF	Jf	6	6	6				
⅛	2.2	LP-CC	CC	4 ½	10	10	30	00	14	½
		LPN-RK_SP	RK1	3	6	6				
		FRN-R	RK5	2 ⁹⁄₁₀	6	6				
		LPJ_SP	J	4 ½	6	6				
		TCF	Jf	6	6	6				
¼	2.9	LP-CC	CC	6	10	10	30	00	14	½
		LPN-RK_SP	RK1	4	6	6 ¼				
		FRN-R	RK5	4	6	6 ¼				
		LPJ_SP	J	5 ⁹⁄₁₀	10	10				
		TCF	Jf	6	10	10				
⅓	3.6	LP-CC	CC	7	15	15	30	00	14	½
		LPN-RK_SP	RK1	5	10	10				
		FRN-R	RK5	4 ½	10	10				
		LPJ_SP	J	8	10	10				
		TCF	Jf	10	10	10				
½	4.9	LP-CC	CC	10	15	15	30	00	14	½
		LPN-RK_SP	RK1	8	10	10				
		FRN-R	RK5	6 ¼	10	10				
		LPJ_SP	J	12	15	15				
		TCF	Jf	15	15	15				
¾	6.9	LP-CC	CC	15	25	25	30	00	14	½
		LPN-RK_SP	RK1	9	15	15				
		FRN-R	RK5	9	15	15				
		LPJ_SP	J	12	15	17 ½				
		TCF	Jf	15	15	17 ½				
1	8	LP-CC	CC	25	25	30	30	00	14	½
		LPN-RK_SP	RK1	12	15	17 ½				
		FRN-R	RK5	10	15	17 ½				
		LPJ_SP	J	15	20	20				
		TCF	Jf	15	20	20				
1 ½	10	LP-CC	CC	30	30	30	30	0	14	½
		LPN-RK_SP	RK1	15	20	20				
		FRN-R	RK5	15	20	20				
		LPJ_SP	J	20	25	25				
		TCF	Jf	20	25	25				
2	12	LP-CC	CC	25	–	–	30	0	14	½
		LPN-RK_SP	RK1	17 ½	25	25				
		FRN-R	RK5	15	25	25				
		LPJ_SP	J	30	30	35				
3	17	TCF	Jf	30	30	35	30*	1	12	½
		LPN-RK_SP	RK1	25	30	35				
		FRN-R	RK5	25	30	35				
		LPJ_SP	J	45	50	60				
5	28	TCF	Jf	45	50	60	60	2	10**	½
		LPN-RK_SP	RK1	40	50	60				
		FRN-R	RK5	35	50	60				
		LPJ_SP	J	60	70	90				
7 ½	40	TCF	Jf	60	70	90	60*	2	8**	½**
		LPN-RK_SP	RK1	60	70	90				
		FRN-R	RK5	50	70	90				
		LPJ_SP	J	80	90	110				
10	50	TCF	Jf	80	90	–	100*	3	6**	½**
		LPN-RK_SP	RK1	70	90	110				
		FRN-R	RK5	70	90	110				

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

f Class J performance, special finger-safe dimensions.

90Vdc[3] Motors & Circuits

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.257 HP	Motor FLA Table 430.257 AMPS	Fuse Type	Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
		LPJ_SP	J	6	6	6				
		TCF	Jf	6	6	6				
¼	4.0	LPC_CC	CC	6	6	15	30	1	14	½
		LPN-RK_SP	RK1	6	6	9				
		FRN-R	RK5	5	6	9				
		LPJ_SP	J	8	10	10				
		TCF	Jf	10	10	10				
⅓	5.2	LP-CC	CC	10	10	20	30	1	14	½
		LPN-RK_SP	RK1	8	10	10				
		FRN-R	RK5	7	10	10				
		LPJ_SP	J	12	15	15				
		TCF	Jf	15	15	15				
½	6.8	LP-CC	CC	15	15	25	30	1	14	½
		LPN-RK_SP	RK1	9	15	15				
		FRN-R	RK5	9	15	15				
		LPJ_SP	J	15	15	20				
		TCF	Jf	15	15	20				
¾	9.6	LP-CC	CC	15	15	30	30	1	14	½
		LPN-RK_SP	RK1	15	15	20				
		FRN-R	RK5	12	15	20				

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

3 All equipment manufacturers should be consulted about DC voltage ratings of their equipment.

f Class J performance, special finger-safe dimensions.

120Vdc[3] Motors & Circuits

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.257 HP	Motor FLA Table 430.257 AMPS	Fuse		Optimal Branch Ckt Protection	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2	Minimum Switch Size 430.110	Minimum NEMA Starter NEMA ICS 2-2000	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16	Minimum Rigid Metallic Conduit Annex C Table C8
		Type	Class	AMPS[1]	AMPS[1]	AMPS[1]	AMPS	Size[2]	Size	Inches
		LPJ_SP	J	5	6	6				
		TCF	J[f]	6	6	6				
¼	3.1	LP-CC	CC	6	6	12	30	1	14	½
		LPN-RK_SP	RK1	4 ½	6	6 ¼				
		FRN-R	RK5	4	6	6 ¼				
		LPJ_SP	J	7	10	10				
		TCF	J[f]	10	10	10				
⅓	4.1	LP-CC	CC	9	10	15	30	1	14	½
		LPN-RK_SP	RK1	5 ⁹⁄₁₀	10	10				
		FRN-R	RK5	5 ⁹⁄₁₀	10	10				
		LPJ_SP	J	9	10	12				
		TCF	J[f]	10	10	10				
½	5.4	LP-CC	CC	10	10	20	30	1	14	½
		LPN-RK_SP	RK1	7 ½	10	12				
		FRN-R	RK5	7	10	12				
		LPJ_SP	J	12	15	15				
		TCF	J[f]	15	15	15				
¾	7.6	LP-CC	CC	15	15	30	30	1	14	½
		LPN-RK_SP	RK1	10	15	15				
		FRN-R	RK5	10	15	15				
		LPJ_SP	J	15	15	20				
		TCF	J[f]	15	15	20				
1	9.5	LP-CC	CC	15	15	30[5]	30	1	14	½
		LPN-RK_SP	RK1	15	15	20				
		FRN-R	RK5	12	15	20				
		LPJ_SP	J	20	20	25				
		TCF	J[f]	20	20	25				
1 ½	13.2	LP-CC	CC	20	20	30[5]	30	1	14	½
		LPN-RK_SP	RK1	17 ½	20	25				
		FRN-R	RK5	17 ½	20	25				
		LPJ_SP	J	30	30	35				
		TCF	J[f]	30	30	35				
2	17	LP-CC	CC	30	30	30[5]	30*	1	12	½
		LPN-RK_SP	RK1	25	30	35				
		FRN-R	RK5	25	30	35				
		LPJ_SP	J	40	40	50				
3	25	TCF	J[f]	40	40	50	60	1	10**	½
		LPN-RK_SP	RK1	35	40	50				
		FRN-R	RK5	35	40	35				
		LPJ_SP	J	60	60	90				
5	40	TCF	J[f]	60	60	60	60*	2	8**	½**
		LPN-RK_SP	RK1	60	60	90				
		FRN-R	RK5	50	60	90				
		LPJ_SP	J	90	90	125				
7 ½	58	TCF	J[f]	90	90	–	100*	3	4**	¾**
		LPN-RK_SP	RK1	80	90	125				
		FRN-R	RK5	80	90	125				
		LPJ_SP	J	125	125	150				
10	76	LPN-RK_SP	RK1	100	125	150	100*	3	3**	1
		FRN-R	RK5	100	125	150				

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 Reduced voltage magnetic controller ratings

3 All equipment manufacturers should be consulted about DC voltage ratings of their equipment.

5 Largest LP-CC Fuse 30 amp. With other type fuse, could use larger amp rating in this application.

f Class J performance, special finger-safe dimensions.

180Vdc[3] Motors & Circuits

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.257 HP	Motor FLA Table 430.257 AMPS	Fuse Type	Fuse Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
¼	2.0	LPJ_SP TCF LPS-RK_SP FRS-R	J J*f* RK1 RK5	3 3 2 9/10 2 ½	3 3 3 3	4 ½ 3 4 ½ 4 ½	30	1	14	½
⅓	2.6	LPJ_SP TCF LPS-RK_SP FRS-R	J J*f* RK1 RK5	4 6 3 ½ 3 ½	6 6 6 6	6 6 6 6	30	1	14	½
½	3.4	LPJ_SP TCF LPS-RK_SP FRS-R	J J*f* RK1 RK5	5 9/10 6 4 ½ 4 ½	6 6 6 6	6 6 6 ¼ 7 ½	30	1	14	½
¾	4.8	LPJ_SP TCF LPS-RK_SP FRS-R	J J*f* RK1 RK5	8 10 6 ¼ 6	10 10 10 10	10 10 10 10	30	1	14	½
1	6.1	LPJ_SP TCF LPS-RK_SP FRS-R	J J*f* RK1 RK5	10 10 8 8	10 10 10 10	12 10 12 12	30	1	14	½
1 ½	8.3	LPJ_SP TCF LP-CC LPS-RK_SP FRS-R	J J*f* CC RK1 RK5	15 15 – 12 12	15 15 – 15 15	17 ½ 15 30 17 ½ 17 ½	30	1	14	½
2	10.8	LPJ_SP TCF LP-CC LPS-RK_SP FRS-R	J J*f* CC RK1 RK5	15 15 20 15 15	20 20 20 20 20	20 20 30 20 20	30	1	14	½
3	16	LPJ_SP TCF LP-CC LPS-RK_SP FRS-R	J J*f* CC RK1 RK5	25 25 25 20 20	25 25 25 25 25	35 35 30 35 35	30*	1	14	½
5	27	LPJ_SP TCF LPS-RK_SP FRS-R	J J*f* RK1 RK5	40 40 40 35	45 45 45 45	60 60 60 60	60	2	10**	½

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 These sizes are typical. They are not shown in NEMA ICS 2-2000.

3 All equipment manufacturers should be consulted about DC voltage ratings of their equipment.

f Class J performance, special finger-safe dimensions.

240Vdc[3] Motors & Circuits

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.257 HP	Motor FLA Table 430.257 AMPS	Fuse Type	Fuse Class	Optimal Branch Ckt Protection AMPS[1]	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS[1]	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS[1]	Minimum Switch Size 430.110 AMPS	Minimum NEMA Starter NEMA ICS 2-2000 Size[2]	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16 Size	Minimum Rigid Metallic Conduit Annex C Table C8 Inches
¼	1.6	LPJ_SP TCF LPN-RK_SP FRS-R	J J*f* RK1 RK5	2 ½ 3 2 ¼ 2	3 3 3 3	3 ½ 3 3 ½ 3 ½	30	1	14	½
⅓	2.0	LPJ_SP TCF LPS-RK_SP FRS-R	J J*f* RK1 RK5	3 3 2 9/10 2 ½	3 3 3 3	4 ½ 3 4 ½ 4 ½	30	1	14	½

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

2 Reduced voltage magnetic DC controller ratings.

3 All equipment manufacturers should be consulted about DC voltage ratings of their equipment.

f Class J performance, special finger-safe dimensions.

240Vdc[3] Motors & Circuits continued

1	2	3		4	5	6	7	8	9	10
Motor Size Table 430.257 HP	Motor FLA Table 430.257 AMPS	Fuse		Optimal Branch Ckt Protection	NEC® Max for Gen. Applic 430.52(C)(1) Exc. No. 1	NEC® Max for Heavy Start 430.52(C)(1) Exc. No. 2	Minimum Switch Size 430.110	Minimum NEMA Starter NEMA ICS 2-2000	Minimum Copper Wire THWN or THHN AWG or KCMIL Table 310.16	Minimum Rigid Metallic Conduit Annex C Table C8
		Type	Class	AMPS[1]	AMPS[1]	AMPS[1]	AMPS	Size[2]	Size	Inches
		LPJ_SP	J	4 ½	6	6				
½	2.7	TCF	Jf	6	6	6	30	1	14	½
		LPS-RK_SP	RK1	4	6	6				
		FRS-R	RK5	3 ½	6	6				
		LPJ_SP	J	6	6	8				
		TCF	Jf	6	6	6				
¾	3.8	LP-CC	CC	—	—	15	30	1	14	½
		LPS-RK_SP	RK1	5	6	8				
		FRS-R	RK5	5	6	8				
		LPJ_SP	J	8	10	10				
1	4.7	TCF	Jf	10	10	10	30	1	14	½
		LPS-RK_SP	RK1	6 ¼	10	10				
		FRS-R	RK5	6	10	10				
		LPJ_SP	J	10	10	12				
1 ½	6.6	TCF	Jf	10	10	10	30	1	14	½
		LPS-RK_SP	RK1	9	10	12				
		FRS-R	RK5	9	10	12				
		LPJ_SP	J	15	15	17 ½				
2	8.5	TCF	Jf	15	15	15	30	1	14	½
		LPS-RK_SP	RK1	12	15	17 ½				
		FRS-R	RK5	12	15	17 ½				
		LPJ_SP	J	20	20	25				
		TCF	Jf	20	20	25				
3	12.2	LP-CC	CC	20	20	30	30	1	14	½
		LPS-RK_SP	RK1	17 ½	20	25				
		FRS-R	RK5	17 ½	20	25				
		LPJ_SP	J	30	30	45				
		TCF	Jf	30	30	45				
5	20	LP-CC	CC	30	30	30	30*	1	12	½
		LPS-RK_SP	RK1	30	30	45				
		FRS-R	RK5	25	30	45				
		LPJ_SP	J	45	45	60				
7 ½	29	TCF	Jf	45	45	60	60	2	8	½
		LPS-RK_SP	RK1	40	45	60				
		FRS-R	RK5	40	45	60				
		LPJ_SP	J	60	60	80				
10	38	TCF	Jf	60	60	60	60*	2	8**	½**
		LPS-RK_SP	RK1	50	60	80				
		FRS-R	RK5	50	60	80				
		LPJ_SP	J	90	90	110				
15	55	TCF	Jf	90	90	–	100*	3	4	3/4**
		LPN-RK_SP	RK1	80	90	110				
		FRS-R	RK5	70	90	110				
		LPJ_SP	J	110	110	150				
20	72	LPN-RK_SP	RK1	100	110	150	100*	3	3**	1
		FRS-R	RK5	90	110	150				
		LPJ_SP	J	150	150	200				
25	89	LPN-RK_SP	RK1	125	150	200	200	3	2**	1**
		FRS-R	RK5	125	150	200				
		LPJ_SP	J	175	175	225				
30	106	LPN-RK_SP	RK1	150	175	225	200*	4	1/0**	1 ¼
		FRS-R	RK5	150	175	225				
		LPJ_SP	J	225	225	300				
40	140	LPN-RK_SP	RK1	200	225	300	200*	4	2/0**	1 ¼**
		FRS-R	RK5	175	225	300				
		LPJ_SP	J	300	300	350				
50	173	LPN-RK_SP	RK1	225	300	350	400	5	4/0**	1 ½**
		FRS-R	RK5	225	300	350				
		LPJ_SP	J	350	350	450				
60	206	LPN-RK_SP	RK1	300	350	450	400*	5	300**	2**
		FRS-R	RK5	300	350	450				
		LPJ_SP	J	400	400	500				
75	255	LPN-RK_SP	RK1	350	400	500	400*	5	400**	2**
		FRS-R	RK5	350	400	500				
		LPJ_SP	J	600	600	–				
100	341	LPN-RK_SP	RK1	450	600	–	600	6	4/0 2/PHASE	(2) 1 ½**
		FRS-R	RK5	450	600	–				

* Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

1 Per 430.52(C)(2), if the motor controller manufacturer's overload relay tables state a maximum branch circuit protective device of a lower rating, that lower rating must be used in lieu of the sizes shown in Columns 4, 5, or 6.

** If equipment terminations are rated for 60°C conductors only, the 60°C conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

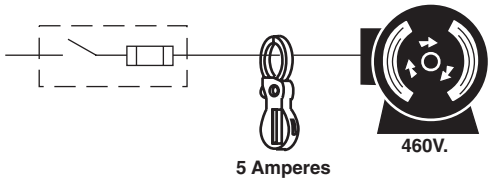
2 Reduced voltage magnetic DC controller ratings.

3 All equipment manufacturers should be consulted about DC voltage ratings of their equipment.

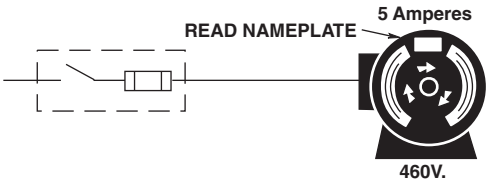
f Class J performance, special finger-safe dimensions.

Recommendations for Electrician and Maintenance Crews

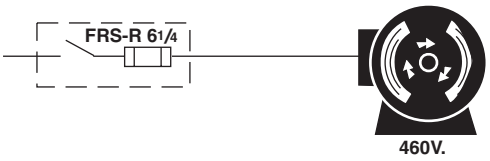
Often, for various reasons, motors are oversized for applications. For instance, a 5Hp motor is installed when the load demand is only 3Hp. In these cases a much higher degree of protection can be obtained by sizing the overload relay elements and/or Fusetron and Low-Peak dual-element, time-delay fuses based on the actual full-load current draw.



1. Preferable – With a clamp-on meter, determine running RMS current when the motor is at normal full-load. (Be sure this current does not exceed nameplate current rating.) The advantage of this method is realized when a lightly loaded motor (especially those over 50 HP) experiences a single-phase condition. Even though the relays and fuses may be sized correctly based on motor nameplate, circulating currents within the motor may cause damage.



Alternate – if unable to meter the motor current, then take the current rating off the nameplate.



2. Then size the overload relay elements and Fusetron FRS-R and FRN-R or Low-Peak LPS-RK_SP and LPN-RK_SP dual-element fuses based on this current. For optimum motor circuit protection offering a high degree of "back-up overload" protection, use the table that follows to assist in sizing dual-element fuses. The other fuses in the table LPJ_SP, TCF and LP-CC can provide excellent short circuit protection when sized for Optimum Motor Circuit Protection. However, they typically can not be sized close enough to provide motor back-up overload protection.
3. Use a labeling system to mark the type and amp rating of the fuse that should be in the fuse clips, such as FRS-R 6 1/4. This simple step makes it easy to run spot checks for proper fuse replacement. When installing the proper fuses in the switch to give the desired level of protection, it often is advisable to leave spare fuses on top of the disconnect, the starter enclosure or in a cabinet adjacent to the motor control center. In this way, should the fuses open, the problem can be corrected and proper size fuses easily reinstalled.

* Abnormal installations may require Fusetron or Low-Peak dual-element fuses of a larger size than shown providing only short circuit protection. These applications include:

(a) Fusetron or Low-Peak dual-element fuses in high ambient temperature environments.

(b) A motor started frequently or rapidly reversed.

(c) Motor is directly connected to a machine that cannot be brought up to full speed quickly (large fans, centrifugal machines such as extractors and pulverizers, machines having large fly wheels such as large punch presses.)

(d) Motor has a high Code Letter (or possibly no Code Letter) with full voltage start.

(e) WYE delta open transition start.

(f) Motor has a large inrush current, such as a Design B.

Selection of Fusetron or Low-Peak Dual-Element Fuses based upon Motor FLA for Optimum Motor Circuit Protection*

Fusetron or Low-Peak Dual-Element Fuse Size	Motor Current			
	FRN-R FRS-R Class RK5	LPN-RK_SP LPS-RK_SP Class RK1	LPJ_SP Class J	LP-CC Class CC
1/10	0-0.08	0.0000-0.0769	—	—
1/8	0.09-0.10	0.0770-0.0961	—	—
15/100	0.11-0.12	0.0962-0.1153	—	—
2/10	0.13-0.16	0.1154-0.1538	—	—
1/4	0.17-0.20	0.1539-0.1923	—	—
3/10	0.21-0.24	0.1924-0.2307	—	—
1/10	0.25-0.32	0.2308-0.3076	—	—
1/2	0.33-0.40	0.3077-0.3846	—	0.0000-0.2500
5/10	0.41-0.48	0.3847-0.4615	—	0.2501-0.3000
6/10	0.49-0.64	0.4616-0.6153	—	0.3001-0.4000
1	0.65-0.80	0.6154-0.7692	0.0-0.6666	0.4001-0.5000
1 1/8	0.81-0.90	0.7693-0.8653	0.6667-0.7500	0.5001-0.5625
1 1/4	0.91-1.00	0.8654-0.9615	0.7501-0.8333	0.5626-0.6250
1 1/10	1.01-1.12	0.9616-1.076	0.8334-0.9333	0.6251-0.7000
1 1/2	1.13-1.20	1.077-1.153	0.9334-1.000	0.7001-0.7500
1 6/10	1.21-1.28	1.154-1.230	1.001-1.066	0.7501-0.8000
1 9/10	1.29-1.44	1.231-1.384	1.067-1.200	0.8001-0.9000
2	1.45-1.60	1.385-1.538	1.201-1.333	0.9001-1.000
2 1/4	1.61-1.80	1.539-1.730	1.334-1.500	1.001-1.125
2 1/2	1.81-2.00	1.731-1.923	1.501-1.666	1.126-1.250
2 9/10	2.01-2.24	1.924-2.153	1.667-1.866	1.251-1.400
3	2.25-2.40	2.154-2.307	1.867-2.000	1.401-1.500
3 3/10	2.41-2.56	2.308-2.461	2.001-2.133	1.501-1.600
3 1/2	2.57-2.80	2.462-2.692	2.134-2.333	1.601-1.750
4	3.81-3.20	2.693-3.076	2.334-2.666	1.751-2.000
4 1/2	3.21-3.60	3.077-3.461	2.667-3.000	2.001-2.250
5	3.61-4.00	3.462-3.846	3.001-3.333	2.251-2.500
5 5/10	4.01-4.48	3.847-4.307	3.334-3.733	2.501-2.800
6	4.49-4.80	4.308-4.615	3.734-4.000	2.801-3.000
6 1/4	4.81-5.00	4.616-4.807	—	3.001-3.125
7	5.01-5.60	4.808-5.384	4.001-4.666	3.126-3.500
7 1/2	5.61-6.00	—	—	3.501-3.750
8	6.01-6.40	5.385-6.153	4.667-5.333	3.751-4.000
9	6.41-7.20	6.154-6.923	5.334-6.000	4.001-4.500
10	7.21-8.00	6.924-7.692	6.001-6.666	4.501-5.000
12	8.01-9.60	7.693-9.230	6.667-8.000	5.001-6.000
15	9.61-12.00	9.231-11.53	8.001-10.00	6.001-7.500
17 1/2	12.01-14.00	11.54-13.46	10.01-11.66	7.501-8.750
20	14.01-16.00	13.47-15.38	11.67-13.33	8.751-10.00
25	16.01-20.00	15.39-19.23	13.34-16.66	10.01-12.50
30	20.01-24.00	19.24-23.07	16.67-20.00	12.51-15.00
35	24.01-28.00	23.08-26.92	20.01-23.33	—
40	28.01-32.00	26.93-30.76	23.34-26.66	—
45	32.01-36.00	30.77-34.61	26.67-30.00	—
50	36.01-40.00	34.62-38.46	30.01-33.33	—
60	40.01-48.00	38.47-46.15	33.34-40.00	—
70	48.01-56.00	46.16-53.84	40.01-46.66	—
75	56.01-60.00	—	—	—
80	60.01-64.00	53.85-61.53	46.67-53.33	—
90	64.01-72.00	61.54-69.23	53.34-60.00	—
100	72.01-80.00	69.24-76.92	60.01-66.66	—
110	80.01-88.00	76.93-84.61	66.67-73.33	—
125	88.01-100.00	84.62-96.15	73.34-83.33	—
150	100.01-120.00	96.16-115.3	83.34-100.0	—
175	120.01-140.00	115.4-134.6	100.1-116.6	—
200	140.01-160.00	134.7-153.8	116.7-133.3	—
225	160.01-180.00	153.9-173.0	133.4-150.0	—
250	180.01-200.00	173.1-192.3	150.1-166.6	—
300	200.01-240.00	192.4-230.7	166.7-200.0	—
350	240.01-280.00	230.8-269.2	200.1-233.3	—
400	280.01-320.00	269.3-307.6	233.4-266.6	—
450	320.01-360.00	307.7-346.1	266.7-300.0	—
500	360.01-400.00	346.2-384.6	300.1-333.3	—
600	400.01-480.00	384.7-461.5	333.4-400.0	—

Transformers — 600V or Less

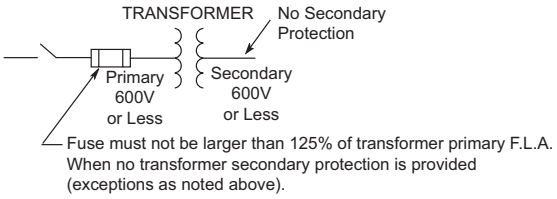
The requirements of 450.3 cover only transformer protection. In practice, other components must be considered in applying circuit overcurrent protection. For circuits with transformers, requirements for conductor protection per Articles 240 and 310 and for panelboards per Article 408, must be observed. Refer to 240.4(F), 240.21(B)(3), 240.21(C), 408.36(A) & (B).

Primary Fuse Protection Only [450.3(B)] (See Figure below) If secondary fuse protection is not provided (as discussed in the next Section) then the primary fuses must not be sized larger than as shown below.

Individual transformer primary fuses are not necessary where the primary circuit fuse provides this protection.

Primary Fuse Only

Primary Current	Primary Fuse Rating
9 amps or more	125% or next higher standard rating if 125% does not correspond to a standard fuse size.
2 amps to 9 amps	167% maximum
Less than 2 amps	300% maximum

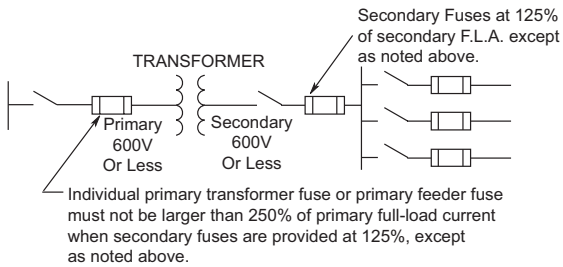


Note: Section 450.3 requirements pertain only to transformer protection. Additional circuit overcurrent protection for conductors or panelboards may be required per Articles 240, 310, 408, 430.72.

* Primary Fuse (600V or less) and Secondary Fuse (600V or less). If secondary (600V or less) fuses are sized not greater than 125% of transformer secondary current, individual transformer fuses are not required in the primary (600V or less) provided the primary feeder fuses are not larger than 250% of the transformer rated primary current. [See Note 3 of Table 450.3(B) for overcurrent protection requirements of thermally protected transformers].

Primary and Secondary Fuses

Secondary Current	Primary Fuse Rating	Secondary Fuse Rating
9 amps or more	250% max.	125% or next higher standard rating if 125% does not correspond to a standard fuse size
Less than 9 amps	250% max.	167% max.



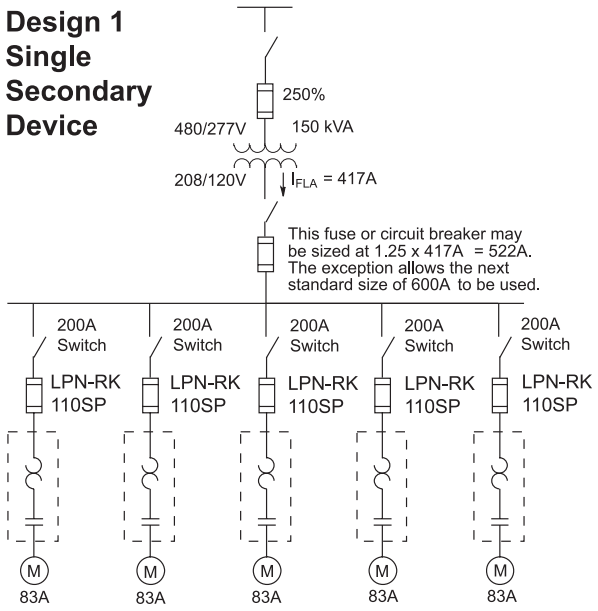
Note: Transformer overload protection will be sacrificed by using overcurrent protective devices sized much greater than the transformer F.L.A. The limits of 150%, 167%, 250% and 300% may not adequately protect transformers. It is suggested that for the highest degree of transformer overload protection the fuse size should be within 125% of the transformer full-load amps.

Normal magnetizing inrush currents for power transformers can range from 10 times to 12 times the transformer full load current, for up to 6 cycles, and as high as 25 times transformer full load current at 0.01 seconds. Some transformers may have inrush magnitudes substantially greater. Severe inrush should be compared with melting times to assure that unnecessary opening of the device does not occur.

There is a wide fuse amp rating range available to properly protect transformers. Fusetron Class RK5 and Low-Peak Class RK1 dual-element fuses can be sized on the transformer primary and/or secondary rated at 125% of the transformer F.L.A. These dual-element fuses have sufficient time-delay to withstand the high magnetizing inrush currents of transformers. There is a wide amp rating selection in the 0 to 15A range for these dual-element fuses to provide protection for even small control transformers.

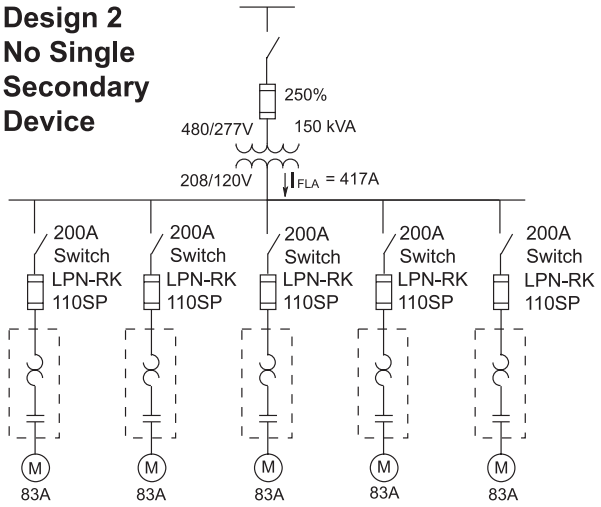
The required secondary protection may be satisfied with multiple overcurrent devices that protect feeders fed from the transformer secondary. The total amp rating of these multiple devices may not exceed the allowed value of a single secondary overcurrent device. If this method is chosen, dual-element, time-delay fuse protection offers much greater flexibility. Note the following examples:

Design 1
Single Secondary Device



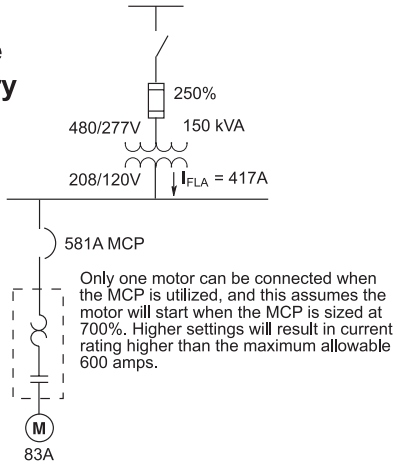
Design 1 utilizes a single secondary overcurrent device. It provides the greatest degree of selective coordination, transformer protection, secondary cable protection, and switchboard/panelboard/load center protection. The transformer cannot be overloaded to a significant degree if future loads are added (improperly). With this arrangement the transformer's full capacity is utilized.

Design 2 No Single Secondary Device



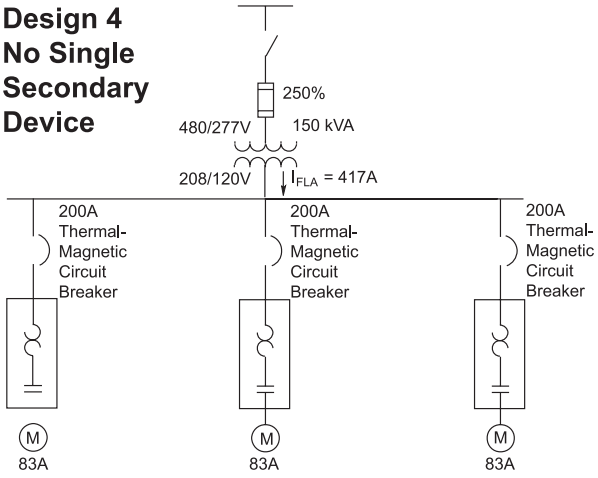
Design 2 In this case the single secondary overcurrent device is eliminated, much of the protection described in Design 1 will be reduced. If dual-element fuses are utilized as branch circuit protection, the transformer can continue to be loaded with the five 83A motors because 5 x 110 = 550A, (less than the maximum 600A). If additional loads are improperly added in the future, overload protection will be lost because the primary device can be sized at 250%.

Design 3 No Single Secondary Device



Design 3 If the single secondary overcurrent device is eliminated and MCPs are utilized as branch circuit protection, the transformer will be seriously under-utilized because only one motor can be connected. For one motor, 1 x 700% of 83 = 581 amps. For two motors, 2 x 700% of 83 = 1162 amps. Since the sum of the devices cannot exceed 600 amps, only one motor can be connected when the motor circuit is protected by an MCP.

Design 4 No Single Secondary Device



Design 4 Using the same procedure, if the single secondary main is eliminated and thermal magnetic circuit breakers are utilized as branch circuit protection per 430.52, only three of the motors can be connected because the thermal magnetic breakers will have been sized at approximately 250% of the motor F.L.A. (83 x 250% = 207.5A.)

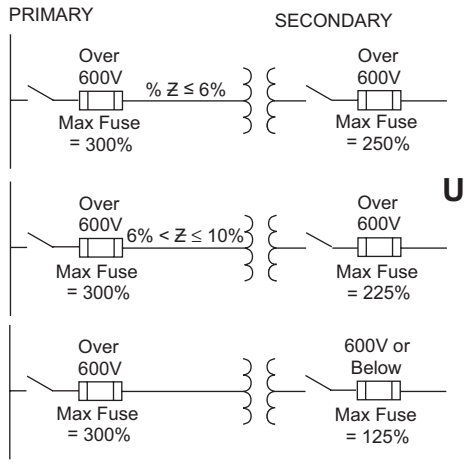
Note: If sized less than permitted by 430.52, nuisance tripping may result since the new energy efficient motors have higher inrush currents.

Using a 200A circuit breaker would allow only three (600 ÷ 200) motors to be connected. To add two additional motors of the same type as shown in Design 1 and Design 2 requires a larger transformer - one that would have a 1000A or more secondary capability. A 300kVA 208V transformer has a 830A secondary rating which is not sufficient. Therefore, the next standard size 3Ø transformer is a 400kVA with a 1110A capacity to meet the new rule.

Transformers — Over 600V

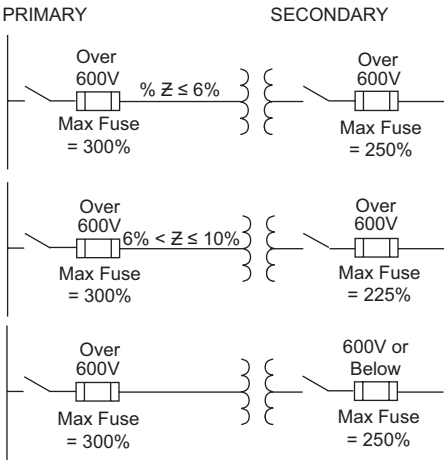
Primary and Secondary Protection

In unsupervised locations, with primary over 600V, the primary fuse can be sized at a maximum of 300%. If the secondary is also over600V, the secondary fuses can be sized at a maximum of 250% for transformers with impedances not greater than 6% or 225% for transformers with impedances greater than 6% and not more than 10%. If the secondary is 600V or below, the secondary fuses can be sized at a maximum of 125%. Where these ratings do not correspond to a standard fuse size, the next higher standard size is permitted.



Unsupervised Locations

In supervised locations, the maximum ratings are as shown in the next diagram. These are the same maximum settings as the unsupervised locations except for secondary voltages of 600V or less, where the secondary fuses can be sized at maximum of 250%.



Supervised Locations

Primary Protection Only

In supervised locations, the primary fuses can be sized at a maximum of 250%, or the next larger standard size if 250% does not correspond to a standard fuse size.

Note: The use of "Primary Protection Only" does not remove the requirements for compliance with Articles 240 & 408. See (FPN) in Section 450.3, which references 240.4, 240.21, 240.100 and 240.101 for proper protection for secondary conductors.

E-Rated Fuses for Medium Voltage Potential & Small Power Transformers

Low amperage, E-Rated medium voltage fuses are general purpose current-limiting fuses. A general purpose current-limiting fuse is capable of interrupting all current from the rated interrupting current down to the current that causes melting of the fusible element in 1 hour (ANSI C37.40). The E rating defines the melting-time-current characteristic of the fuse and permits electrical interchangeability of fuses with the same E Rating. For a general purpose fuse to have an E Rating the following condition must be met:

The current responsive element shall melt in 300 seconds at an RMS current within the range of 200% to 240% of the continuous current rating of the fuse, fuse refill, or link (ANSI C37.46).

Cooper Bussmann low amperage, E-Rated fuses are designed to provide primary protection for potential, small service, and control transformers. These fuses offer a high level of fault current interruption in a self-contained non-venting package which can be mounted indoors or in an enclosure.

Application

As for all current-limiting fuses, the basic application rules found in the fuseology section of this brochure should be adhered to. In addition, potential transformer fuses must have sufficient inrush capacity to successfully pass through the magnetizing inrush current of the transformer. If the fuse is not sized properly, it will open before the load is energized. The maximum magnetizing inrush currents to the transformer at system voltage, and the duration of this inrush current varies with the transformer design. Magnetizing inrush currents are usually denoted as a percentage of the transformer full-load current, i.e., 10x, 12x, 15x, etc. The inrush current duration is usually given in seconds. Where this information is available, an easy check can be made on the appropriate Cooper Bussmann minimum melting curve to verify proper fuse selection. In lieu of transformer inrush data, the rule of thumb is to select a fuse size rated at 300% of the primary full-load current and round up to the next larger standard size.

Example:

The transformer manufacturer states that an 800VA 2400V, single phase potential transformer has a magnetizing inrush current of 12x lasting for 0.1 second.

A. I_{FL} = 800VA/2400V = 0.333A

Inrush Current = 12 x 0.333 = 4A

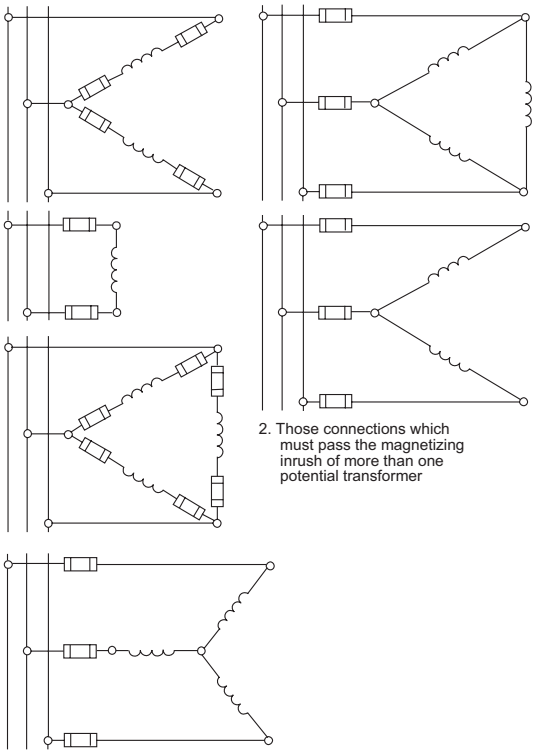
Since the voltage is 2400 volts we can use either a JCW-1E or JCD-1 E.

B. Using the rule of thumb–300% of 0.333A is 0.999A.

Therefore we would choose a JCW-1E or JCD-1E.

Typical Potential Transformer Connections

The typical potential transformer connections encountered in industry can be grouped into two categories:



2. Those connections which must pass the magnetizing inrush of more than one potential transformer

1. Those connections which require the fuse to pass only the magnetizing inrush of one potential transformer

E-Rated Fuses for Medium Voltage Transformers & Feeders

Cooper Bussmann E-Rated medium voltage fuses are general purpose current-limiting fuses. A general purpose current-limiting fuse is capable of interrupting all currents from the rated interrupted current down to the current that causes melting of the fusible element in 1 hour (ANSI C37.40). The fuses carry either an 'E' or an 'X' rating which defines the melting-time-current characteristic of the fuse. The ratings are used to allow electrical interchangeability among different manufacturers' fuses.

For a general purpose fuse to have an E rating, the following conditions must be met:

1. 100E and below - the fuse element must melt in 300 seconds at 200% to 240% of its rating (ANSI C37.46).
2. Above 100E - the fuse element must melt in 600 seconds at 220% to 264% of its rating (ANSI C37.46).

Cooper Bussmann E-Rated Medium Voltage Fuse.

A fuse with an 'X' rating does not meet the electrical inter-changeability for an 'E' rated fuse but offers the user other ratings that may provide better protection for a particular application.

Application

Transformer protection is the most popular application of E-Rated fuses. The fuse is applied to the primary of the transformer and is used solely to prevent rupture of the transformer due to short circuits. It is important, therefore, to size the fuse so that it does not clear on system inrush or permissible overload currents. See section on transformers over 600V for applicable sizing recommendations. Magnetizing inrush must also be considered when sizing a fuse. In general, power transformers have a magnetizing inrush current of 12x the full-load rating for a duration of 1/10 second.

Three-Phase Transformers (Or Transformer Bank)

Transformer kVA Rating	System Voltage 2.4kV Full-load Fuse Amps		4.16kV Full-load Fuse Amps		4.8kV Full-load Fuse Amps	
9	2.17	**JCX-7E**	1.25	**JCY-5E**	1.08	**JCY-5E**
15	3.6	**JCX-10E**	2.08	**JCY-7E**	1.8	**JCY-7E**
30	7.3	**JCX-20E**	4.2	**JCY-15E**	3.6	**JCY-10E**
45	10.8	**JCX-25E**	6.2	**JCY-15E**	5.4	**JCY-15E**
75	18.0	**JCX-40E**	10.4	**JCY-25E**	9.0	**JCY-20E**
112.5	27.0	**JCX-65E**	15.6	**JCY-40E**	13.5	**JCY-30E**
150	36.0	**JCX-65E**	20.8	**JCY-40E**	18.0	**JCY-40E**
225	54.0	**JCX-100E**	31.2	**JCY-65E**	27.0	**JCY-65E**
300	72.0	**JCX-125E**	41.6	**JCY-80E**	36.0	**JCY-65E**
500	120.0	**JCX-200E**	69.4	**JCY-125E**	60.0	**JCY-100E**
750	—	—	104.0	**JCY-150E**	90.0	**JCY-125E**
1000	—	—	139.0	**JCY-200E**	120.0	**JCY-200E**
Single-Phase Transformers						
3	1.25	**JCX-5E**	0.72	**JCY-3E**	0.63	**JCY-3E**
5	2.08	**JCX-7E**	1.20	**JCY-5E**	1.04	**JCY-5E**
10	4.17	**JCX-15E**	2.40	**JCY-7E**	2.08	**JCY-7E**
15	6.25	**JCX-15E**	3.61	**JCY-10E**	3.13	**JCY-10E**
25	10.4	**JCX-25E**	6.01	**JCY-15E**	5.21	**JCY-15E**
37.5	15.6	**JCX-40E**	9.01	**JCY-20E**	7.81	**JCY-20E**
50	20.8	**JCX-40E**	12.0	**JCY-25E**	10.4	**JCY-25E**
75	31.3	**JXC-65E**	18.0	**JCY-40E**	15.6	**JCY-30E**
100	41.7	**JCX-80E**	24.0	**JCY-80E**	20.8	**JCY-40E**
167	70.0	**JCX-100E**	40.0	**JCY-100E**	35.0	**JCY-65E**
250	104.0	**JCX-150E**	60.0	**JCY-125E**	52.0	**JCY-100E**
333	139.0	**JCX-200E**	80.0	**JCY-125E**	69.5	**JCY-100E**
500	—	—	120.0	**JCY-200E**	104.0	**JCY-150E**
667	—	—	—	—	139.0	**JCY-200E**

Table 430.72(B). Maximum Rating of Overcurrent Protective Device-Amperes

	Column A Basic Rule		Column B Exception No. 1		Column C Exception No. 2	
Control Circuit Conductor Size, AWG	Copper	Alum. or Copper-Clad Alum.	Copper	Alum. or Copper-Clad Alum.	Copper	Alum. or Copper-Clad Alum.
18	7	–□	25	–□	7	–□
16	10	–□	40	–□	10	–□
14	Note 1	–□	100	–□	45	–□
12	Note 1	Note 1	120	100	60	45
10	Note 1	Note 1	160	140	90	75
larger than 10	Note 1	Note 1	Note 2	Note 2	Note 3	Note 3

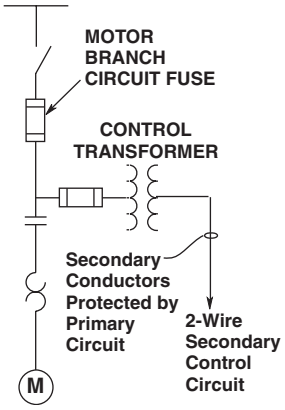
Note 1: Value specified in Section 310-15, as applicable.
Note 2: 400 percent of value specified in Table 310-17 for 60°C conductors.
Note 3: 300 percent of value specified in Table 310-16 for 60°C conductors.

430.72(C)

Secondary conductors of a single-phase transformer having only a 2-wire secondary are protected by the primary fuse (600V or less) if the primary fuse rating is:

1. Not larger than that determined in Table 430.72(B), multiplied by secondary-to-primary voltage ratio and,
2. not more than the following percent of transformer rated primary current:

Control conductors are permitted to be protected by the motor branch circuit overcurrent device where the opening of the control circuit would create a hazard.

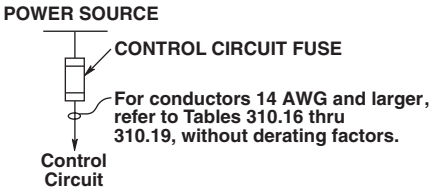


Transformer Primary Current	Primary Fuse Ampacity Must Not Exceed†
Less than 2 amps	500%
2 to 9 amps	167%
9 amps or more	125%*

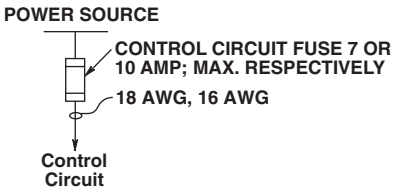
* If 125% of rated primary current does not correspond to a standard fuse rating, then the next higher standard fuse rating is permitted.
† Refer to Section 8.12 of NFPA79 for the allowable sizing for control transformers in Industrial Machinery.

Class 1 POWER LIMITED, Class 2 and Class 3 Remote Motor Control Circuits

1. Control circuit conductors shall be protected from overcurrent in accordance with Article 725.



2. Control circuit conductors 18 AWG and 16 AWG, shall be protected by a control circuit fuse not to exceed 7 and 10 amps respectively.



Exception No. 2 Relative to Transformer Protection

Refer to Exception 3, [430.72(B)], covered in preceding paragraphs.

Motor Control Circuit Transformers [430.72(C)]

Control circuit transformers (600V or less) shall be protected as shown previously in Exception No. 3 under 430.72(B).

430.72(C)(3): Control circuit transformers rated less than 50VA can be protected by a primary fuse, impedance limiting means, or other inherent means. The transformer must be an integral part of the motor controller, and be located within the controller.

430.72(C)(4): Allows transformers with primary currents less than 2 amps to be protected with primary fuses at 500% or less of primary full-load amps.

430.72(C)(1): Allows the control transformer to be protected by the motor branch circuit overcurrent device when the transformer supplies a Class 1 power-limited, circuit [see 725.11(A)] Class 2, or Class 3 remote control circuit conforming with the requirements of Article 725.

430.72(C)(5): Allows the control transformer to be protected by the motor branch circuit overcurrent device where protection is provided by other approved means.

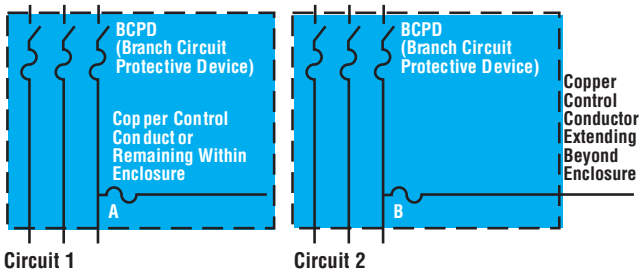
430.72(C) Exception: States that overcurrent protection shall be omitted where the opening of the control circuit would create a hazard, as for example, the control circuit of a fire pump motor and the like.

Catalog Number Designations for Fuse Blocks.

Fuse		Amp Rating	Single Pole	Double Pole	Single Pole Dove Tail for Ganging
Supplementary	13/32" x 1 1/2"	1/10-30A	BM6031SQ	BM6032SQ	
Branch Circuit	FRN-R	1/10-30A	R25030-1SR	R25030-2SR	
	LPN-RK_SP	1/10-30A	R25030-1SR	R25030-2SR	
	FRS-R	1/10-30A	R60030-1SR	R60030-2SR	
	LPS-RK_SP	1/10-30A	R60030-1SR	R60030-2SR	
	SC	1/2-15A	BG3011SQ	BG3012SQ	
		20A	BG3021SQ	BG3022SQ	
	KTK-R	1/10-30A	BC6031S	BC6032S	
	FNQ-R	1/10-30A			
	LP-CC	1/2-30A			
	TCF	1-30A			TCFH 30
		1-60A			TCFH 60

The following Selection Guide Tables simplify and permit easy application of fuses for the protection of the motor control circuits in accordance within the National Electrical Code®. Apply fuses per Table 1 for control circuit without a control transformer (see Circuit Diagrams 1 and 2). Apply fuses per Table 2 for a control circuit with a control transformer (see Circuit Diagrams 3 and 4).

Control Circuit Without Control Transformer (See Table 1)



Control Circuit With Control Transformer (See Table 2)

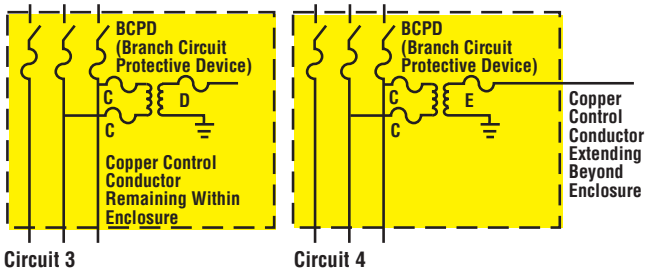


Table 1. Fuse Selection Guide–ControlCircuit WithoutControl Transformer (See Circuit Diagrams 1 & 2)

Ampere Rating of Branch Circuit Protective Device (BCPD)	Circuit 1 (Control Conductor (AWG) Not Extending Beyond Enclosure)				Circuit 2 (Control Conductor (AWG) Extending Beyond Enclosure)			
	18 Wire	16 Wire	14 Wire	12 Wire	18 Wire	16 Wire	14 Wire	12 Wire
Fuse Size	7A	10A	15A	20A	7A	10A	15A	20A
Requirements For Control Circuit Protection (See footnote data)								
1/10 – 7	■	■	■	■	■	■	■	■
7 1/2 – 10	■	■	■	■	▲	■	■	■
12 – 25	■	■	■	■	▲	▲	■	■
30 – 40	▲	■	■	■	▲	▲	■	■
45	▲	▲	■	■	▲	▲	■	■
50 – 60	▲	▲	■	■	▲	▲	▲	■
65 – 100	▲	▲	■	■	▲	▲	▲	▲
110	▲	▲	▲	■	▲	▲	▲	▲
125 – up	▲	▲	▲	▲	▲	▲	▲	▲

▲ Control circuit fuse protection required.

■ Protection recommended but not mandatory when BCPD is a Class CC, G, J, R, or T fuse. Protection is mandatory when BCPD is a thermal magnetic or a magnetic-only circuit breaker (MCP), and available short-circuit current exceeds the values in the table below.

Control Circuit Conductor (AWG Copper)	Available Short-Circuit Current At Branch Circuit Protective Device (BCPD)	
	1 Cycle Clearing Time†	1/2 Cycle Clearing Time†
18	660A	940A
16	1050A	1500A
14	1700A	2400A
12	2700A	3800A

*Thermoplastic Insulation. †Based on ICEA Conductor Withstand Data.

Table 2. Fuse Selection Guide–Control Circuit With Control Transformer (See Circuit Diagrams 3 and 4)

Control Xfmr Rating	V_{pri}/V_{sec} (Volts)	Ipri (Amps)	I_{sec} (Amps)	[1]Fuse C [2]Req'd. If BCPD Exceeds These Amps Values	[4,5]Maximum Amps	Fuse D or E Required if BCPD and Fuse C (When Provided) Exceed These Amp Values 18 AWG Wire	16 AWG Wire	14 AWG Wire	12 AWG Wire	Recommended Amps Time Delay[1]	Non-Time Delay[3]
25VA	480/120	0.05	0.21	[6]See 430-72(C) Except. 1	0.25	0.25	0.25	0.25	0.25	0.25	0.60
	480/24	0.05	1.00		0.25	0.25	0.25	0.25	0.25	1.25	3.0
	240/120	0.10	0.21		0.50	0.50	0.50	0.50	0.50	0.25	0.60
	240/24	0.10	1.00		0.50	0.50	0.50	0.50	0.50	1.25	3.0
50VA	480/120	0.10	0.42	0.5	0.50	0.50	0.50	0.50	0.50	0.50	1.0
	480/24	0.10	2.10	0.5	0.50	0.50	0.50	0.50	0.50	2.5	6.0
	240/120	0.21	0.42	1.0	1.0	1.0	1.0	1.0	1.0	0.50	1.0
	240/24	0.21	2.10	1.0	1.0	1.0	1.0	1.0	1.0	2.5	6.0
100VA	480/120	0.21	0.83	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0
	480/24	0.21	4.20	1.0	1.0	1.0/.35[9]	1.0/.50[9]	1.0	1.0	5.0	12.0[7]
	240/120	0.42	0.83	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0
	240/24	0.42	4.20	2.0	2.0	2.0/.70[9]	2.0/1.0[9]	2.0	2.0	5.0	12.0[7]
150VA	480/120	0.31	1.25	1.5	1.5	1.5	1.5	1.5	1.5	1.50	3.50
	480/24	0.31	6.25	1.5	1.5	—	1.5/0.5[9]	1.5	1.5	7.50	15.0[7]
	240/120	0.62	1.25	3.0	3.0	3.0	3.0	3.0	3.0	1.50	3.50
	240/24	0.62	6.25	3.0	3.0	—	3.0/1.0[9]	3.0	3.0	7.50	15.0[7]
200VA	480/120	0.42	1.67	2.0	2.0	2.0/1.75[9]	2.0	2.0	2.0	2.0	5.0
	480/24	0.42	8.33	2.0	2.0	—	—	2.0	2.0	10.0	20.0[8]
	240/120	0.84	1.67	4.0	4.0	4.0/3.5[9]	2.0	4.0	4.0	2.0	5.0
	240/24	0.84	8.33	4.0	4.0	—	—	4.0	4.0	10.0	20.0[8]

[1] Time-Delay Fuses: FNQ, FNW, FNM, FNA–Supplementary Type; FNQ-R, FRN-R, FRS-R, LPN-RK_SP, LPS-RK_SP, LPJ_SP, LP-CC, SC6 & above–Branch Circuit Fuses (Rejection Type).
[2] For exceptions, see 430.72(C).
[3] Non-Time-Delay Fuses: KTK, BAN, BAF, MIN, MIC–Supplementary Fuses; KTK-R, JJN, JJS, SC½-5–Branch Circuit Fuses (Rejection Types).
[4] These are maximum values as allowed by 430.72(C). Closer sizing at 125%-300% may be possible for better overload protection using time-delay branch circuit fuses.
[5] Fuse shall be a rejection type branch circuit fuse when withstand rating of controller is greater than 10,000 amps RMS symmetrical
[6] These transformers less than 50VA still need protection–either primary overcurrent protection, inherent protection, or the equivalent. Note that the primary conductors may be protected as shown in Circuit 1 Table 1. [7] Minimum copper secondary control conductor for this application is 14 AWG. [8] Minimum copper secondary control conductor for this application is 12 AWG.
[9] Smaller value applied to Fuse "E".

Cooper Bussmann FNQ-R Maximum Primary Fuse Selection Guide for Motor Control Circuit Transformer Protection***

XFMR VA	600V	550V	480V	460V	415V	380V	277V	240V	230V	208V
50	4/10A	4/10A	½A	½A	5/10A	5/10A	5/10A	1A	1A	1 ⅛A
75	5/10A	5/10A	3/4A	5/10A	5/10A	5/10A	1 3/10A	1 ½A	1 5/10A	1 8/10A
100	8/10A	8/10A	1A	1A	1 ⅛A	1 3/10A	1 8/10A	2A	2A	2 ¼A
150	1 ¼A	1 3/10A	1 ½A	1 6/10A	1 8/10A	1 8/10A	2 ½A	3A	3 2/10A	3 ½A
200	1 6/10A	1 8/10A	2A	2A	2 ¼A	2 ½A	3 ½A	4A	4A	4 ½A
250	2A	2 ¼A	2 ½A	2 ½A	3A	3 2/10A	4 ½A	5A	5A	6A
300	2 ½A	2 6/10A	3A	3 2/10A	3 ½A	3 ½A	5A	6 ¼A	6 ¼A	7A
350	2 8/10A	3A	3 ½A	3 ½A	4A	4 ½A	6 ¼A	7A	7 ½A	8A
500	4A	4 ½A	5A	5A	6A	6 ¼A	9A	3 2/10A**	3 ½A**	4A**
750	6 ¼A	6 ¼A	7 ½A	8A	9A	9A	4 ½A*	5A**	5A**	6A**
1000	8A	9A	3 2/10A*	3 ½A*	4A*	4A*	6A*	6 ¼A**	7A**	8A**
1500	4A*	4 ½A*	5A*	5A*	6A*	6 ¼A*	9A*	10A**	10A**	12A**
2000	5A*	6A*	6 ¼A*	7A*	8A*	8A*	12A*	12A**	12A**	15A**

*For increased time-delay, use FRS-R, LPS-RK_SP, LPJ_SP, or TCF **For increased time-delay, use FRN-R, LPN-RK_SP ***Based upon the NEC®

Supplementary Fuses (13/32" x 1½") (All Voltage and Interrupting Ratings are AC)

Dual-Element, Time-Delay

FNA
1/10-8/10A
250V†
1-15A
125V*
20-30A
32V**

FNM
1/10-10A
250V†
12-15A
125V*
20-30A
32V**

Time-Delay

FNQ
1/10-30A
500V
10K AIR
(FNQ 1/10 - 3 2/10 Dual-Element)

FNW
12-30A
250V*

Non-Time-Delay

BAF
½-15A
250V†
20-30A
125V*

BAN
2/10-30A
250V††

KTK
1/10-30A
600V
100K AIR

MIC
1-15A
250V†
20-30A
32V**

MIN
1-15A
250V†
20-30A
32V**

Branch Circuit Fuses (All Voltage and Interrupting Ratings are AC)

Class R Dual-Element, Time-Delay

LPN-RK_SP
1/10-30A
250V
300K AIR

FRN-R
1/10-30A
250V
200K AIR

FRS-R
1/10-30A
600V
200K AIR

LPS-RK_SP
1/10-30A
600V
300K AIR

Class G

SC
½-20A 600V§
25-30A 480V§
100K AIR

Class CC Fast-Acting, Time-Delay

KTK-R
1/10-30A
600V
200K AIR

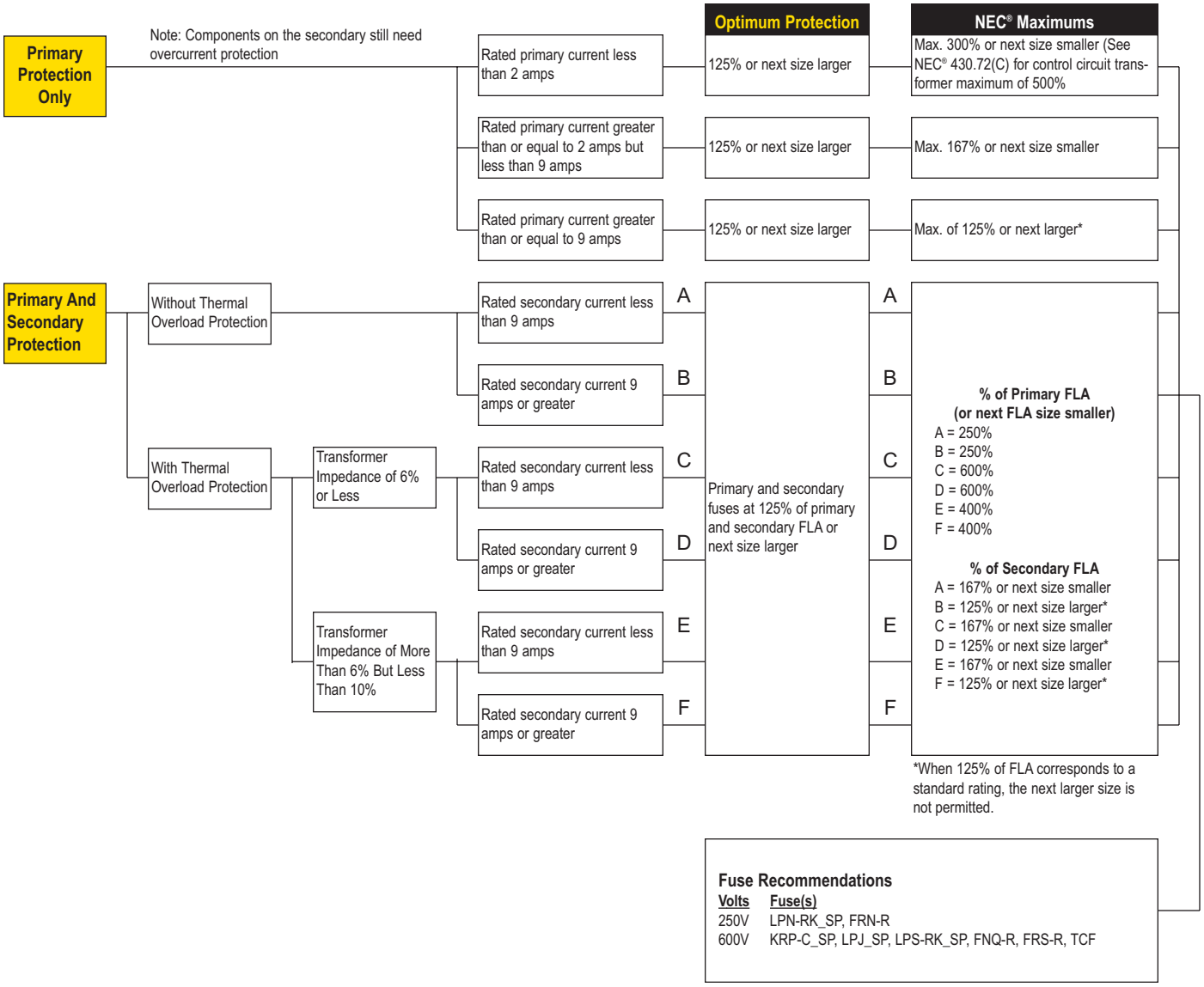
FNQ-R
¼-30A
600V
200K AIR

LP-CC
½-30A
600V
200K AIR

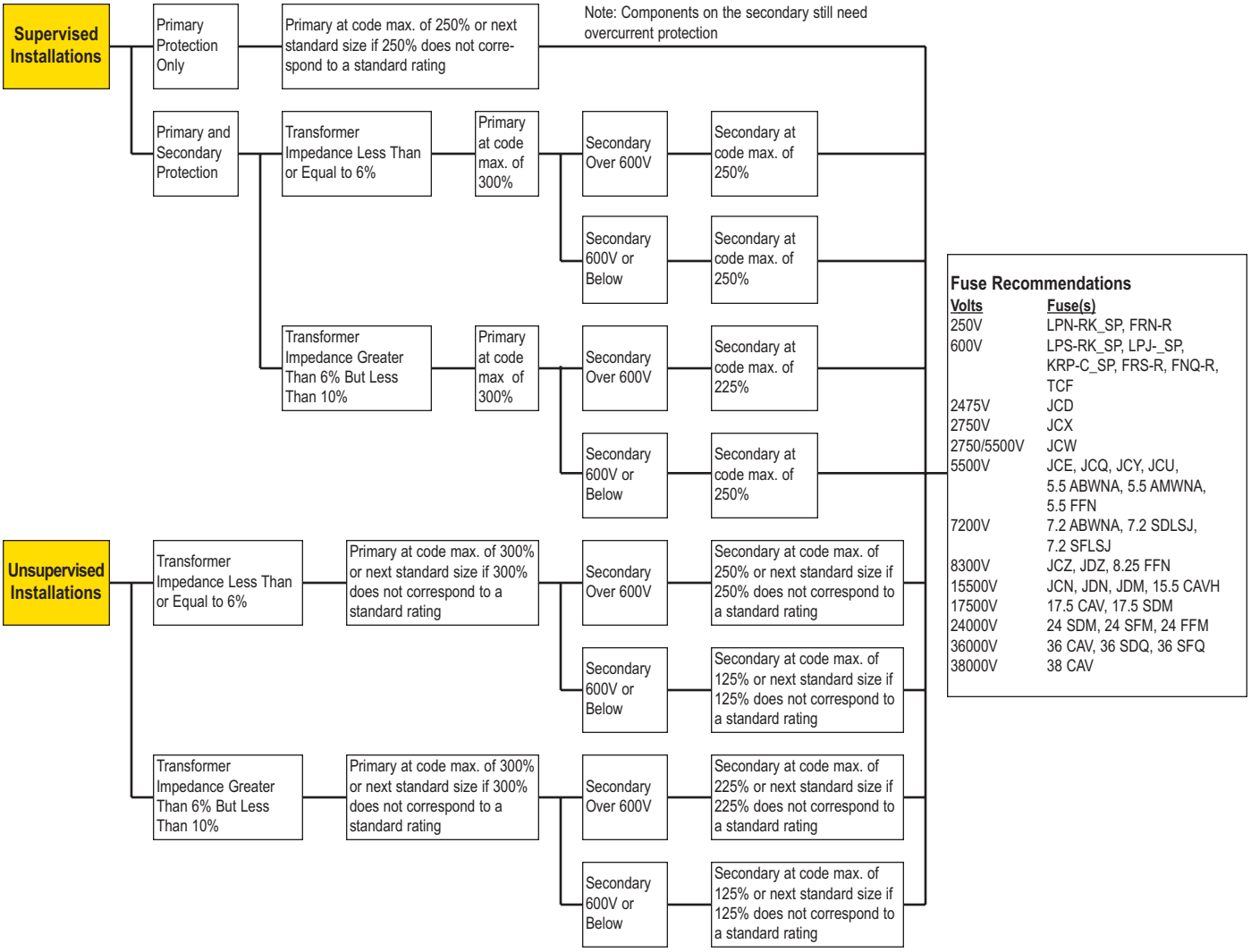
TCF
1-30A
600V
300K AIR

† 0 to 1 amp–35 AIR; 1.1 to 3.5 amp–100 AIR; 3.6 to 10 amp–200 AIR; 10.1 to 15 amp–750 AIR; 15.1 to 30 amps–1500AIR *10K AIR. **1K AIR.
§ ½ thru 6 amp fuses are Non-Time-Delay Type; 7 thru 60 amp fuses are Time-Delay Type.
††0 to 3.5 amp-35 AIR; 3.6 to 10 amp-100 AIR; 10.1 to 15 amp-200 AIR; 15.1-30 amp-750 AIR

Transformers 600V Nominal or Less (NEC® 450.3)



Transformers Over 600V Nominal (NEC® 450.3)



Fuse Recommendations

Volts	Fuse(s)
250V	LPN-RK_SP, FRN-R
600V	LPS-RK_SP, LPJ-_SP, KRP-C_SP, FRS-R, FNQ-R, TCF
2475V	JCD
2750V	JCX
2750/5500V	JCW
5500V	JCE, JCQ, JCY, JCU, 5.5 ABWNA, 5.5 AMWNA, 5.5 FFN
7200V	7.2 ABWNA, 7.2 SDLSJ, 7.2 SFLSJ
8300V	JCZ, JDZ, 8.25 FFN
15500V	JCN, JDN, JDM, 15.5 CAVH
17500V	17.5 CAV, 17.5 SDM
24000V	24 SDM, 24 SFM, 24 FFM
36000V	36 CAV, 36 SDQ, 36 SFQ
38000V	38 CAV

Solid State Devices (Diodes, SCRs, Triacs, Transistors)

Fuse Recommendations

Volts	Fuse(s)
0-130	FWA
0-250	FWX
0-500	FWH
0-600	FWC, KAC, KBC
0-700	FWP, 170M Series, SPP
0-1000	FWJ, 170M Series, SPJ