## NEC ${ }^{\circledR}$ 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, $0-600 \mathrm{amp}$, time-delay, Class J, "Low-Peak fuse, with a 300,000 amp interrupting rating. The TCF is a $600 \mathrm{Vac}, 1-100 \mathrm{amp}$ 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 $200,000 \mathrm{amp}$ interrupting rating. The LPS-RK_SP and LPNRK_SP are 600 and 250Vac, 0-600 amp, time-delay, Class RK1, Low-Peak fuses with interrupting ratings of $300,000 \mathrm{amps}$. FRS-R and FRN-R are 600 and 250 Vac , $0-600 \mathrm{amp}$, time-delay, Class RK5, Fusetron Dual-Element fuses with interrupting ratings of $200,000 \mathrm{amps}$. The KRP-C_SP is a $600 \mathrm{Vac}, 601-6000 \mathrm{amp}$, time-delay, Class L, Low-Peak fuse, with a $300,000 \mathrm{amp}$ AC interrupting rating. The DC listed ratings for these fuses are:

| LPJ | 1 to 600 SP | 300 Vdc | LPN-RK 0 to 60 SP | 125 Vdc |
| :--- | :--- | :--- | :--- | :--- |
| TCF | 1 to 100 | 300 Vdc | LPN-RK | 70 to 600 SP |
| 250 Vdc |  |  |  |  |
| LP-CC | $1 /$ to $2 \%$ | 300 Vdc | LPS-RK | 0 to 600 SP |
| 300 Vdc |  |  |  |  |
| LP-CC | 3 to 15 | 150 Vdc | FRN-R | 0 to 600 |
| LP-CC | 20 to 30 | 300 Vdc | FRS-R | 0 to 600 |

## Column 4-Optimal Branch Circuit Protection

There are two distinct levels of protection philosophy provided in this Column. LPSRK_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, LPNRK_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 $1 / 2$ to 15 A: $\mathbf{2 0 0 \%}$ ( $150 \%$ 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 groundfault 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 ${ }^{\circledR}$ 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 $\mathbf{2 4 0 . 6}$ standard fuse amp rating if $175 \%$ ( $150 \%$ for DC motors) does not correspond to a standard fuse amp rating.
LP-CC: $\mathbf{3 0 0 \%}$ ( $150 \%$ 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: $\mathbf{2 2 5 \%}$ 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: $\mathbf{3 0 0 \%}$ 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.

## Motor Circuit Protection Tables

## NEC ${ }^{\circledR}$ 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 $75^{\circ} \mathrm{C}$ terminals. Although the $\mathrm{NEC}{ }^{\circledR}$ allows $60^{\circ} \mathrm{C}$ terminations for equipment rated 100 amp or less, most equipment terminations have been rated for $75^{\circ} \mathrm{C}$ conductors. If equipment terminations are rated for $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ 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).

200Vac Three-Phase Motors \& Circuits

## Column 10

These rigid metallic conduit sizes are based upon copper conductors with THWN or THHN insulation, Table C8 of Annex C, and $75^{\circ} \mathrm{C}$ 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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ 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.)

| 1 | 2 | 3 |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Motor FLA <br> Table 430.250 AMPS | Fuse |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC ${ }^{\circledR}$ Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | $\begin{gathered} \hline \text { NEC }^{\ominus} \text { Max } \\ \text { for Heavy } \\ \text { Start } \\ \text { 430.52(C)(1) } \\ \text { Exc. No. } 2 \\ \text { AMPS }^{1} \\ \hline \end{gathered}$ | $\begin{gathered} \hline \text { Minimum } \\ \text { Switch } \\ \text { Size } \\ 430.110 \\ \\ \text { AMPS } \\ \hline \end{gathered}$ | Minimum <br> NEMA <br> Starter <br> NEMA ICS 2- <br> 2000 <br> Size | Minimum <br> Copper Wire <br> THWN or THHN AWG <br> or KCMIL <br> Table 310.16 <br> Size | Minimum Rigid Metallic Conduit Annex C Table C8 Inches |
| 1/2 | 2.5 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \mathrm{CC} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 4 \\ 6 \\ 5 \\ 5 \\ 31 / 2 \\ 3210 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 3/4 | 3.7 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 5 \% \\ 6 \\ 71 / 2 \\ 5 \\ 5 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 1 | 4.8 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 8 \\ 10 \\ 10 \\ 61 / 4 \\ 6 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| $11 / 2$ | 6.9 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 12 \\ 15 \\ 15 \\ 9 \\ 9 \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 2 | 7.8 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 12 \\ & 15 \\ & 25 \\ & 12 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 171 / 2 \\ & 171 / 2 \\ & 30 \\ & 171 / 2 \\ & 171 / 2 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 3 | 11 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $171 / 2$ $171 / 2$ 25 15 15 | $\begin{aligned} & 20 \\ & 20 \\ & - \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & - \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 5 | 17.5 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 30 \\ & 30 \\ & 25 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ | $30^{*}$ | 1 | 12 | 1/2 |
| $71 / 2$ | 25.3 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 40 \\ & 40 \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $\begin{aligned} & 50 \\ & 50 \\ & 50 \\ & 50 \\ & \hline \end{aligned}$ | 60 | 1 | $10^{* *}$ | 1/2* |
| 10 | 32.2 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 50 \\ & 50 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 70 \\ & - \\ & 70 \\ & 70 \end{aligned}$ | 60* | 2 | 8** | 1/2* |
| 15 | 48.3 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 80 \\ & 80 \\ & 70 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 90 \\ & 90 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | $\begin{aligned} & 100 \\ & 100 \\ & 100 \\ & 100 \\ & \hline \end{aligned}$ | 100 | 3 | 6* | 3/4* |
| 20 | 62.1 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 100 \\ & 100 \\ & 90 \\ & 80 \\ & \hline \end{aligned}$ | $\begin{gathered} 110 \\ - \\ 110 \\ 110 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 125 \\ - \\ 125 \\ 125 \\ \hline \end{gathered}$ | 100* | 3 | 4** | 1 |

[^0]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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.
f Class J performance, special finger-safe dimensions.

## Motor Circuit Protection Tables

## 200Vac Three-Phase Motors \& Circuits continued

| 1 | 2 | 3 |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor Size | Motor FLA | Fuse |  | Optimal Branch Ckt Protection | NEC ${ }^{\text {® }}$ | NEC ${ }^{\ominus}$ Max | Minimum | Minimum | Minimum | Minimum |
|  |  |  |  |  | Max for | for Heavy | Switch | NEMA | Copper Wire | Rigid Metallic |
|  |  |  |  |  | Gen. Applic | Start | Size | Starter | THWN or THHN AWG | Conduit |
| $\begin{aligned} & \text { Table } \\ & 430.250 \\ & \hline 10 \end{aligned}$ | $\begin{gathered} \text { Table } \\ \Delta 30250 \end{gathered}$ |  |  |  | 430.52(C)(1) | 430.52(C)(1) | 430.110 | NEMA ICS 2- | or KCMIL | Annex C |
|  |  | Type | Class |  | Exc. No. 1 | Exc. No. 2 |  | 2000 | Table 310.16 | Table C8 |
|  | AMPS |  |  | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS | Size | Size | Inches |
| 25 | 78.2 | LPJ_SP | J | 125 | 150 | 175 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 110 | 150 | 175 | 100* | 3 | 3** | 1** |
|  |  | FRN-R | RK5 | 100 | 150 | 175 |  |  |  |  |
| 30 | 92 | LPJ_SP | J | 150 | 175 | 200 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 125 | 175 | 200 | 200 | 4 | 2** | 1** |
|  |  | FRN-R | RK5 | 125 | 175 | 200 |  |  |  |  |
| 40 | 120 | LPJ_SP | J | 200 | 225 | 250 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 175 | 225 | 250 | 200* | 4 | 1/0 | $11 / 4$ |
|  |  | FRN-R | RK5 | 150 | 225 | 250 |  |  |  |  |
| 50 | 150 | LPJ_SP | J | 225 | 300 | 300 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 200 | 300 | 300 | 200* | 5 | 3/0 | $11 / 2$ |
|  |  | FRN-R | RK5 | 200 | 300 | 300 |  |  |  |  |
| 60 | 177 | LPJ_SP | J | 300 | 350 | 350 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 250 | 350 | 350 | 400 | 5 | 4/0 | 2 |
|  |  | FRN-R | RK5 | 225 | 350 | 350 |  |  |  |  |
| 75 | 221 | LPJ_SP | J | 350 | 400 | 450 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 300 | 400 | 450 | 400* | 5 | 300 | 2 |
|  |  | FRN-R | RK5 | 300 | 400 | 450 |  |  |  |  |
|  |  | KRP-C_SP | L | - | - | 650 |  |  |  |  |
| 100 | 285 | LPJ_SP | J | 450 | 500 | 600 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 400 | 500 | 600 | 400* | 6 | 500 | 3 |
|  |  | FRN-R | RK5 | 400 | 500 | 600 |  |  |  |  |
|  |  | KRP-C_SP | L | - | - | 800 |  |  |  |  |
| 125 | 359 | LPJ_SP | J | 600 | - | - |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 500 | - | - | 600* | 6 | 4/0 2/PHASE | (2)2 |
|  |  | FRN-R | RK5 | 450 | - | - |  |  |  |  |
|  |  | KRP-C_SP | L | - | 700 | 1000 |  |  |  |  |
| 150 | 414 | LPN-RK_SP | RK1 | 600 | - | - |  |  |  |  |
|  |  | 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 |

[^1]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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ 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 <br> Size <br>  <br> Table <br> 430.250 <br> HP |  | Fuse |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC <br> Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | NEC ${ }^{\ominus}$ Max for Heavy Start 430.52(C)(1) Exc. No. 2 AMPS ${ }^{1}$ | $\begin{aligned} & \text { Minimum } \\ & \text { Switch } \\ & \text { Size } \\ & 430.110 \\ & \\ & \text { AMPS } \\ & \hline \end{aligned}$ | Minimum <br> NEMA <br> Starter <br> NEMA ICS 2- <br> 2000 <br> Size2 |  | Minimum Rigid Metallic Conduit Annex C Table C8 Inches |
| 1/2 | 2.4 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \mathrm{CC} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 4 \\ 6 \\ 5 \\ 51 / 2 \\ 3 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 3/4 | 3.5 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 5 \% \\ 6 \\ 7 \\ 5 \\ 41 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 1 | 4.6 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \mathrm{CC} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 7 \\ 10 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| $11 / 2$ | 6.6 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 9 \\ & 9 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 20 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |

*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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ 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.

## Motor Circuit Protection Tables

## 208Vac Three-Phase Motors \& Circuits continued

| 1 | 2 | 3 |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor | Motor | Fuse |  | Optimal Branch Ckt Protection | NEC ${ }^{\text {® }}$ | NEC ${ }^{\circledR}$ Max | Minimum | Minimum | Minimum | Minimum |
| Size | FLA |  |  | Max for | for Heavy | Switch | NEMA | Copper Wire | Rigid Metallic |
|  |  |  |  | Gen. Applic | Start | Size | Starter | THWN or THHN AWG | Conduit |
| Table | Table |  |  | 430.52(C)(1) | 430.52(C)(1) | 430.110 | NEMA ICS 2- | or KCMIL | Annex C |
| 430.250 | 430.250 | Type | Class |  | Exc. No. 1 | Exc. No. 2 |  | 2000 | Table 310.16 | Table C8 |
| HP | AMPS |  |  |  | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS | Size ${ }^{2}$ | Size | Inches |
| 2 | 7.5 | LPJ_SP | J |  | 12 | 15 | 15 | 30 | 0 | 14 | 1/2 |
|  |  | TCF | Jf |  | 15 | 15 | 15 |  |  |  |  |
|  |  | LP-CC | CC |  | 15 | 25 | 30 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 10 | 15 | 15 |  |  |  |  |
|  |  | FRN-R | RK5 | 10 | 15 | 15 |  |  |  |  |
| 3 | 10.6 | LPJ_SP | J | $171 / 2$ | 20 | 20 | 30 | 0 | 14 | 1/2 |  |
|  |  | TCF | Jf | $171 / 2$ | 20 | 20 |  |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 15 | 20 | 20 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 15 | 20 | 20 |  |  |  |  |  |
| 5 | 16.7 | LPJ_SP | J | 30 | 30 | 35 | $30^{*}$ | 1 | 12 | 1/2 |  |
|  |  | TCF | Jf | 30 | 30 | 35 |  |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 25 | 30 | 35 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 25 | 30 | 35 |  |  |  |  |  |
| $71 / 2$ | 24.2 | LPJ_SP | J | 40 | 45 | 50 | 60 | 1 | 10** | 1/2 |  |
|  |  | TCF | Jf | 40 | 45 | 50 |  |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 35 | 45 | 50 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 35 | 45 | 50 |  |  |  |  |  |
| 10 | 30.8 | LPJ_SP | J | 50 | 60 | 60 | 60 | 2 | 8 | 1/2* |  |
|  |  | TCF | Jf | 50 | 60 | 60 |  |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 45 | 60 | 60 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 40 | 60 | 60 |  |  |  |  |  |
| 15 | 46.2 | LPJ_SP | J | 70 | 90 | 100 | $60^{*}$ | 3 | 6* | 3/4* |  |
|  |  | TCF | Jf | 70 | 90 | 100 |  |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 70 | 90 | 100 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 60 | 90 | 100 |  |  |  |  |  |
| 20 | 59.4 | LPJ_SP | J | 90 | 110 | 125 | 100* | 3 | 4** | 1 |  |
|  |  | TCF | Jf | 90 | - | - |  |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 80 | 110 | 125 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 80 | 110 | 125 |  |  |  |  |  |
| 25 | 74.8 | LPJ_SP | J | 125 | 150 | 150 | 100* | 3 | 3** | 1** |  |
|  |  | LPN-RK_SP | RK1 | 100 | 150 | 150 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 100 | 150 | 150 |  |  |  |  |  |
| 30 | 88 | LPJ_SP | J | 150 | 175 | 175 | 200 | 4 | 2** | 1** |  |
|  |  | LPN-RK_SP | RK1 | 125 | 175 | 175 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 110 | 175 | 175 |  |  |  |  |  |
| 40 | 114 | LPJ_SP | J | 175 | 200 | 250 | 200* | 4 | $1 / 0$ | $11 / 4$ |  |
|  |  | LPN-RK_SP | RK1 | 150 | 200 | 250 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 150 | 200 | 250 |  |  |  |  |  |
| 50 | 143 | LPJ_SP | J | 225 | 300 | 300 | 200* | 5 | $3 / 0$ | $11 / 2$ |  |
|  |  | LPN-RK_SP | RK1 | 200 | 300 | 300 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 200 | 300 | 300 |  |  |  |  |  |
| 60 | 169 | LPJ_SP | J | 300 | 300 | 350 | 400 | 5 | 4/0 | 2 |  |
|  |  | LPN-RK_SP | RK1 | 225 | 300 | 350 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 225 | 300 | 350 |  |  |  |  |  |
| 75 | 211 | LPJ_SP | J | 350 | 400 | 450 | 400* | 5 | 300 | 2 |  |
|  |  | LPN-RK_SP | RK1 | 300 | 400 | 450 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 300 | 400 | 450 |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | - | 601 |  |  |  |  |  |
| 100 | 273 | LPJ_SP | J | 450 | 500 | 600 | 400* | 6 | 500 | 3 |  |
|  |  | LPN-RK_SP | RK1 | 400 | 500 | 600 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 350 | 500 | 600 |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | - | 800 |  |  |  |  |  |
| 125 | 343 | LPJ_SP | J | 600 | - | - | 600* | 6 | 4/0 2/PHASE | (2)2 |  |
|  |  | LPN-RK_SP | RK1 | 450 | - | - |  |  |  |  |  |
|  |  | FRN-R | RK5 | 450 | - | - |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | 601 | 1000 |  |  |  |  |  |
| 150 | 396 | LPJ_SP | J | 600 | - | - | 600* | 6 | 250 2/PHASE | (2)2 |  |
|  |  | LPN-RK_SP | RK1 | 600 | - | - |  |  |  |  |  |
|  |  | FRN-R | RK5 | 500 | - | - |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | 700 | 1100 |  |  |  |  |  |
| 200 | 528 | KRP-C_SP | L | - | 1000 | 1500 | 1200* | 7 | 400 2/PHASE | (2)2-21/2 |  |
| *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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{array}{ll}2 & \text { These sizes are typical. They are not shown in NEMA ICS 2-2000. } \\ \text { f } & \text { Class J performance, special finger-safe dimensions. }\end{array}$ |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Motor Circuit Protection Tables

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

| 1 | 2 | Fuse |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor <br> Size <br>  <br> Table <br> 430.250 <br> HP | $\begin{gathered} \text { Motor } \\ \text { FLA } \\ \\ \text { Table } \\ 430.250 \\ \text { AMPS } \end{gathered}$ |  |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | $\begin{aligned} & \text { NEC }{ }^{\circledR} \text { Max } \\ & \text { for Heavy } \\ & \text { Start } \\ & 430.52(\mathrm{C})(1) \\ & \text { Exc. No. } 2 \\ & \text { AMPS } \end{aligned}$ | $\begin{gathered} \text { Minimum } \\ \text { Switch } \\ \text { Size } \\ 430.110 \\ \\ \text { AMPS } \end{gathered}$ | 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 |
| 1/2 | 2.2 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 31 / 2 \\ 6 \\ 41 / 2 \\ 3 \\ 28 / 10 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 3/4 | 3.2 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 5 \\ 6 \\ 7 \\ 41 / 2 \\ 4 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 7 \\ 6 \\ 12 \\ 7 \\ 7 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 1 | 4.2 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 7 \\ 10 \\ 9 \\ 5 \% 10 \\ 5 \% \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| $11 / 2$ | 6 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 9 \\ 10 \\ 10 \\ 12 \\ 8 \\ 71 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 20 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 20 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 2 | 6.8 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 12 \\ & 15 \\ & 15 \\ & 9 \\ & 9 \\ & 9 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 3 | 9.6 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \mathrm{CC} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 30 \\ & 15 \\ & 12 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 5 | 15.2 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 25 \\ & 25 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| $71 / 2$ | 22 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 35 \\ & 34 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | $\begin{aligned} & 40 \\ & 40 \\ & 40 \\ & 40 \\ & \hline \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $30^{*}$ | 1 | 10 | 1/2 |
| 10 | 28 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 45 \\ & 45 \\ & 40 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 50 \\ & 50 \\ & 50 \\ & 50 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | 60 | 2 | $10^{* *}$ | 1/2 |
| 15 | 42 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 70 \\ & 70 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 80 \\ & 80 \\ & 80 \\ & 80 \\ & \hline \end{aligned}$ | $\begin{aligned} & 90 \\ & 90 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | 60* | 2 | 6 | 3/4 |
| 20 | 54 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 90 \\ & 90 \\ & 80 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 100 \\ & 100 \\ & 100 \\ & 100 \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 110 \\ - \\ 110 \\ 110 \\ \hline \end{gathered}$ | 100* | 3 | 4 | 1 |
| 25 | 68 | LPJ_SP LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 110 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | $\begin{aligned} & 125 \\ & 125 \\ & 125 \\ & \hline \end{aligned}$ | $\begin{aligned} & 150 \\ & 150 \\ & 150 \\ & \hline \end{aligned}$ | 100* | 3 | 4** | 1 |
| 30 | 80 | $\begin{gathered} \text { LPJ_SP } \\ \text { LPN-RK_SP } \\ \text { FRN-R } \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 125 \\ & 110 \\ & 100 \\ & \hline \end{aligned}$ | $\begin{array}{r} 150 \\ 150 \\ 150 \\ \hline \end{array}$ | $\begin{aligned} & 175 \\ & 175 \\ & 175 \\ & \hline \end{aligned}$ | 100* | 3 | 3** | 1** |
| 40 | 104 | $\begin{gathered} \text { LPJ_SP } \\ \text { LPN-RK_SP } \\ \text { FRN-R } \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 175 \\ & 150 \\ & 150 \end{aligned}$ | $\begin{aligned} & 200 \\ & 200 \\ & 200 \end{aligned}$ | $\begin{aligned} & 225 \\ & 225 \\ & 225 \end{aligned}$ | 200* | 4 | 1** | $1^{1 / 4 *}$ |
| 50 | 130 | LPJ_SP LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 200 \\ & 175 \\ & 175 \\ & \hline \end{aligned}$ | $\begin{aligned} & 250 \\ & 250 \\ & 250 \\ & \hline \end{aligned}$ | $\begin{aligned} & 250 \\ & 250 \\ & 250 \\ & \hline \end{aligned}$ | 200* | 4 | $2 / 0$ | $11 / 2$ |
| 60 | 154 | $\begin{gathered} \text { LPJ_SP } \\ \text { LPN-RK_SP } \\ \text { FRN-R } \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 250 \\ & 225 \\ & 200 \\ & \hline \end{aligned}$ | $\begin{aligned} & 300 \\ & 300 \\ & 300 \\ & \hline \end{aligned}$ | $\begin{aligned} & 300 \\ & 300 \\ & 300 \\ & \hline \end{aligned}$ | 200* | 5 | 3/0 | $11 / 2$ |
| *Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch. <br> 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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. <br> 2 These sizes are typical. They are not shown in NEMA ICS 2-2000. <br> ${ }^{f} \quad$ Class $J$ performance, special finger-safe dimensions. <br> 4 Limited by 600 amp being the largest amp rating for FRN-R and LPN-RK_SP. |  |  |  |  |  |  |  |  |  |  |

## Motor Circuit Protection Tables

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

| 1 | 2 |  |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor | Motor | Fuse |  | Optimal | NEC ${ }^{\text {® }}$ | NEC ${ }^{\ominus}$ Max | Minimum | Minimum | Minimum | Minimum |
| Size | FLA |  |  | Branch Ckt | Max for | for Heavy | Switch | NEMA | Copper Wire | Rigid Metallic |
|  |  |  |  | Protection | Gen. Applic | Start | Size | Starter | THWN or THHN AWG | Conduit |
| Table | Table |  |  |  | 430.52(C)(1) | 430.52(C)(1) | 430.110 | NEMA ICS 2- | or KCMIL | Annex C |
| 430.250 | 430.250 | Type | Class |  | Exc. No. 1 | Exc. No. 2 |  | 2000 | Table 310.16 | Table C8 |
| HP | AMPS |  |  | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS | Size ${ }^{2}$ | Size | Inches |
| 75 | 192 | LPJ_SP | J | 300 | 350 | 400 | 400 | 5 | 250 | 2 |
|  |  | LPN-RK_SP | RK1 | 250 | 350 | 400 |  |  |  |  |
|  |  | FRN-R | RK5 | 250 | 350 | 400 |  |  |  |  |
| 100 | 248 | LPJ_SP | J | 400 | 450 | 500 | 400* | 5 | 350 | $21 / 2$ |
|  |  | LPN-RK_SP | RK1 | 350 | 450 | 500 |  |  |  |  |
|  |  | FRN-R | RK5 | 350 | 450 | 500 |  |  |  |  |
|  |  | KRP-C_SP | L | - | - | 700 |  |  |  |  |
| 125 | 312 | LPJ_SP | $J$ | 500 | 600 | - | 400* | 6 | 3/0 2/PHASE | (2) $11 / 2$ |
|  |  | LPN-RK_SP | RK1 | 450 | 600 | - |  |  |  |  |
|  |  | FRN-R | RK5 | 400 | 600 | - |  |  |  |  |
|  |  | KRP-C_SP | L | - | - | 900 |  |  |  |  |
| 150 | 360 | LPJ_SP | $J$ | 600 | - | - | 600* | 6 | 4/0 2/PHASE | (2) 2 |
|  |  | LPN-RK_SP | RK1 | 500 | 6004 | - |  |  |  |  |
|  |  | FRN-R | RK5 | 450 | 6004 | - |  |  |  |  |
|  |  | KRP-C_SP | L | - | 700 | 1000 |  |  |  |  |
| 200 | 480 | FRN-R | RK5 | 600 | - |  | $600^{*}$ | 6 | 350 2/PHASE | (2) $2-21 / 2$ |
|  |  | 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. <br> 1 Per $430.52(\mathrm{C})(2)$, 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 . <br> ${ }^{* *}$ If equipment terminations are rated for $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. <br> 2 These sizes are typical. They are not shown in NEMA ICS 2-2000. <br> 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 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \hline \text { Motor } \\ & \text { Size } \\ & \\ & \text { Table } \\ & 430.250 \\ & \text { HP } \\ & \hline \end{aligned}$ | Motor FLA <br> Table 430.250 AMPS | Fuse |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC ${ }^{\circledR}$ Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | $\begin{gathered} \hline \text { NEC }^{\ominus} \text { Max } \\ \text { for Heavy } \\ \text { Start } \\ 430.52(C)(1) \\ \text { Exc. No. } 2 \\ \text { AMPS }{ }^{1} \\ \hline \end{gathered}$ | $\begin{gathered} \hline \text { Minimum } \\ \text { Switch } \\ \text { Size } \\ 430.110 \\ \\ \text { AMPS } \end{gathered}$ | 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 |
| 1/2 | 1.1 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 18 / 10 \\ 3 \\ 21 / 4 \\ 111 / 2 \\ 14 / 10 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 3 \\ & 3 \\ & 6 \\ & 3 \\ & 3 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 3 \\ & 3 \\ & 6 \\ & 3 \\ & 3 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 3/4 | 1.6 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 21 / 2 \\ 3 \\ 3210 \\ 21 / 4 \\ 2 \\ \hline \end{gathered}$ | $\begin{aligned} & 3 \\ & 3 \\ & 6 \\ & 3 \\ & 3 \\ & \hline \end{aligned}$ | $\begin{gathered} 31 / 2 \\ 3 \\ 61 / 4 \\ 31 / 2 \\ 31 / 2 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 1 | 2.1 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 32 / 10 \\ 6 \\ 41 / 2 \\ 2 \% 10 \\ 2 \% 10 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| $11 / 2$ | 3 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 41 / 2 \\ 6 \\ 6 \\ 4 \\ 4 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 12 \\ 61 / 4 \\ 61 / 4 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 2 | 3.4 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 5 \% \\ 6 \\ 71 \\ 41 / 2 \\ 41 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 6 \\ & 6 \\ & 5 \\ & 6 \\ & 6 \\ & \hline \end{aligned}$ | $\begin{gathered} 7 \\ 6 \\ 15 \\ 7 \\ 7 \\ 71 / 2 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 3 | 4.8 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 8 \\ 10 \\ 10 \\ 61 / 4 \\ 6 \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 5 | 7.6 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 12 \\ & 15 \\ & 25 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 30 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |

[^2]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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ 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 | Fuse |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor <br> Size <br>  <br> Table <br> 430.250 <br> HP | $\begin{gathered} \text { Motor } \\ \text { FLA } \\ \\ \text { Table } \\ 430.250 \\ \text { AMPS } \end{gathered}$ |  |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | $\begin{gathered} \text { NEC }^{\ominus} \text { Max } \\ \text { for Heavy } \\ \text { Start } \\ \text { 430.52(C)(1) } \\ \text { Exc. No. } 2 \\ \text { AMPS }{ }^{1} \end{gathered}$ | $\begin{aligned} & \text { Minimum } \\ & \text { Switch } \\ & \text { Size } \\ & 430.110 \\ & \\ & \text { AMPS } \end{aligned}$ | 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 |
| $71 / 2$ | 11 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 171 / 2 \\ 171 / 2 \\ 15 \\ 15 \\ \hline \end{gathered}$ | $\begin{aligned} & 20 \\ & 20 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 10 | 14 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 25 \\ 25 \\ 20 \\ 171 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & 25 \\ & 25 \\ & 25 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 15 | 21 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 35 \\ & 35 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | $\begin{aligned} & 40 \\ & 40 \\ & 40 \\ & 40 \\ & \hline \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $30^{*}$ | 2 | 10 | 1/2 |
| 20 | 27 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 45 \\ & 45 \\ & 40 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 50 \\ & 50 \\ & 50 \\ & 50 \\ & \hline \end{aligned}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | 60 | 2 | 10** | 1/2 |
| 25 | 34 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 60 \\ & 60 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 70 \\ & 70 \\ & 70 \\ & 70 \\ & \hline \end{aligned}$ | 60* | 2 | 8** | 1/2* |
| 30 | 40 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 50 \\ & \hline \end{aligned}$ | $\begin{aligned} & 70 \\ & 70 \\ & 70 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 90 \\ & 90 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | 60* | 3 | 8** | 1/2* |
| 40 | 52 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 80 \\ & 80 \\ & 70 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 100 \\ & 100 \\ & 100 \\ & 100 \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 110 \\ - \\ 110 \\ 110 \\ \hline \end{gathered}$ | 100* | 3 | 6** | 3/4* |
| 50 | 65 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 100 \\ & 100 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 125 \\ - \\ 125 \\ 125 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 125 \\ - \\ 125 \\ 125 \\ \hline \end{gathered}$ | 100* | 3 | 4** | 1 |
| 60 | 77 | LPJ_SP LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 125 \\ & 110 \\ & 100 \\ & \hline \end{aligned}$ | $\begin{aligned} & 150 \\ & 150 \\ & 150 \\ & \hline \end{aligned}$ | $\begin{aligned} & 150 \\ & 150 \\ & 150 \\ & \hline \end{aligned}$ | 100* | 4 | 3** | 1** |
| 75 | 96 | $\begin{aligned} & \text { LPJ_SP } \\ & \text { LPS-RK_SP } \\ & \text { FRS-R } \end{aligned}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 150 \\ & 125 \\ & 125 \end{aligned}$ | $\begin{aligned} & 175 \\ & 175 \\ & 175 \end{aligned}$ | $\begin{aligned} & 200 \\ & 200 \\ & 200 \end{aligned}$ | 200 | 4 | 1** | $11 / 4 *$ |
| 100 | 124 | $\begin{gathered} \hline \text { LPJ_SP } \\ \text { LPS-RK_SP } \\ \text { FRS-R } \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 200 \\ & 175 \\ & 175 \end{aligned}$ | $\begin{aligned} & 225 \\ & 225 \\ & 225 \\ & \hline \end{aligned}$ | $\begin{aligned} & 250 \\ & 250 \\ & 250 \end{aligned}$ | 200* | 4 | $2 / 0$ | $11 / 2$ |
| 125 | 156 | $\begin{gathered} \hline \text { LPJ_SP } \\ \text { LPS-RK_SP } \\ \text { FRS-R } \\ \hline \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 250 \\ & 225 \\ & 200 \\ & \hline \end{aligned}$ | $\begin{aligned} & 300 \\ & 300 \\ & 300 \\ & \hline \end{aligned}$ | $\begin{aligned} & 350 \\ & 350 \\ & 350 \\ & \hline \end{aligned}$ | 200* | 5 | 3/0 | $11 / 2$ |
| 150 | 180 | $\begin{gathered} \text { LPJ_SP } \\ \text { LPS-RK_SP } \\ \text { FRS-R } \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 300 \\ & 250 \\ & 225 \end{aligned}$ | $\begin{aligned} & 350 \\ & 350 \\ & 350 \end{aligned}$ | $\begin{aligned} & 400 \\ & 400 \\ & 400 \end{aligned}$ | 400 | 5 | 4/0 | 2 |
| 200 | 240 | LPJ_SP LPS-RK_SP FRS-R KRP-C_SP | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \text { L } \end{gathered}$ | $\begin{gathered} 400 \\ 350 \\ 300 \\ - \end{gathered}$ | $\begin{gathered} 450 \\ 450 \\ 450 \\ - \end{gathered}$ | $\begin{aligned} & 500 \\ & 500 \\ & 500 \\ & 700 \\ & \hline \end{aligned}$ | 400* | 5 | 350 | $21 / 2$ |
| 250 | 302 | LPJ_SP LPS-RK_SP FRS-R KRP-C_SP | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \text { L } \\ \hline \end{gathered}$ | $\begin{gathered} 500 \\ 400 \\ 400 \\ - \\ \hline \end{gathered}$ | $\begin{gathered} 600 \\ 600 \\ 600 \\ - \\ \hline \end{gathered}$ | $\begin{gathered} - \\ - \\ - \\ 900 \end{gathered}$ | 400* | 6 | 3/0 2/PHASE | (2) $11 / 2$ |
| 300 | 361 | LPJ_SP LPS-RK_SP FRS-R KRP-C_SP | $\begin{gathered} J \\ \text { RK1 } \\ \text { RK5 } \\ \text { L } \end{gathered}$ | $\begin{gathered} 600 \\ 500 \\ 500 \\ - \\ \hline \end{gathered}$ | 6004 <br> 6004 <br> 700 | $\begin{gathered} - \\ - \\ - \\ 1000 \\ \hline \end{gathered}$ | 600* | 6 | 4/0 2/PHASE | (2) 2 |
| 350 | 414 | LPS-RK_SP FRS-R KRP-C_SP | $\begin{gathered} \text { RK1 } \\ \text { RK5 } \\ \text { L } \end{gathered}$ | $\begin{gathered} \hline 600 \\ 600 \\ - \end{gathered}$ | $\begin{gathered} - \\ \overline{8} \end{gathered}$ | $\begin{gathered} - \\ - \\ 1200 \end{gathered}$ | 600* | 6 | 300 2/PHASE | (2) 2 |
| 400 | 477 | $\begin{gathered} \text { KRP-C_SP } \\ \text { FRS-R } \end{gathered}$ | $\begin{gathered} \mathrm{L} \\ \text { RK5 } \\ \hline \end{gathered}$ | $6 \overline{0}$ | $1000$ | $1400$ | 600* | 6 | 350 2/PHASE | (2) $2^{1 / 2}$ |
| 450 | 515 | KRP-C_SP | L | - | 1000 | 1500 | 1200* | 7 | 400 2/PHASE | (2) $21 / 2$ |
| 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. <br> 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 . <br> ** If equipment terminations are rated for $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. <br> 4 Limited by 600 amp being the largest amp rating for FRS-R and LPS-RK_SP. <br> $f \quad$ Class $J$ performance, special finger-safe dimensions. |  |  |  |  |  |  |  |  |  |  |

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

| 1 | 2 | Fuse |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor <br> Size <br>  <br> Table <br> 430.250 <br> HP | $\begin{gathered} \text { Motor } \\ \text { FLA } \\ \\ \text { Table } \\ 430.250 \\ \text { AMPS } \end{gathered}$ |  |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ |  | $\begin{aligned} & \text { Minimum } \\ & \text { Switch } \\ & \text { Size } \\ & 430.110 \\ & \\ & \text { AMPS } \end{aligned}$ | 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 |
| $1 / 2$ | 0.9 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 14 / 10 \\ 3 \\ 1 \frac{1 / 10}{} \\ 11 / 4 \\ 11 / 8 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 3 \\ & 3 \\ & 3 \\ & 3 \\ & 3 \\ & \hline \end{aligned}$ | $\begin{gathered} 3 \\ 3 \\ 31 / 2 \\ 3 \\ 3 \\ \hline \end{gathered}$ | 30 | 0 | 14 | 1/2 |
| 3/4 | 1.3 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 2 \\ 3 \\ 2 \% 10 \\ 1 \% 10 \\ 1 \% \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 3 \\ & 3 \\ & 6 \\ & 3 \\ & 3 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 3 \\ & 3 \\ & 6 \\ & 3 \\ & 3 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 1 | 1.7 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 23 / 10 \\ 3 \\ 31 / 2 \\ 21 / 4 \\ 21 / 4 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 3 \\ & 3 \\ & 6 \\ & 3 \\ & 3 \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 1 / 2 \\ 3 \\ 61 / 4 \\ 31 / 2 \\ 31 / 2 \end{gathered}$ | 30 | 0 | 14 | 1/2 |
| $11 / 2$ | 2.4 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 4 \\ 6 \\ 5 \\ 3 \% 10 \\ 3 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | 30 | 0 | 14 | 1/2 |
| 2 | 2.7 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 41 / 2 \\ 6 \\ 5 \% \\ 4 \\ 31 / 2 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | 30 | 0 | 14 | 1/2 |
| 3 | 3.9 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 5 \\ 5 \% \\ 5 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 5 | 6.1 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 10 \\ 10 \\ 15 \\ 8 \\ 8 \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 20 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 20 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| $71 / 2$ | 9 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 30 \\ & 12 \\ & 12 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 10 | 11 | $\begin{array}{\|c\|} \hline \text { LPJ_SP } \\ \text { TCF } \\ \text { LPS-RK_SP } \\ \text { FRS-R } \\ \hline \end{array}$ | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{gathered} 171 / 2 \\ 171 / 2 \\ 15 \\ 15 \end{gathered}$ | $\begin{aligned} & 20 \\ & 20 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 15 | 17 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 30 \\ & 30 \\ & 25 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ | 30* | 2 | 12 | 1/2 |
| 20 | 22 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 35 \\ & 35 \\ & 30 \\ & 30 \\ & 30 \end{aligned}$ | $\begin{aligned} & 40 \\ & 40 \\ & 40 \\ & 40 \\ & \hline \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 45 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | 30* | 2 | 10 | 1/2 |
| 25 | 27 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 45 \\ & 45 \\ & 40 \\ & 40 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 50 \\ & 50 \\ & 50 \\ & 50 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | 60 | 2 | 10** | 1/2* |
| 30 | 32 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 50 \\ & 50 \\ & 45 \\ & 45 \\ & 40 \\ & \hline \end{aligned}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 70 \\ & 70 \\ & 70 \\ & 70 \\ & \hline \end{aligned}$ | 60* | 3 | 8 | 1/2 |
| 40 | 41 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 70 \\ & 70 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 80 \\ & 80 \\ & 80 \\ & 80 \end{aligned}$ | $\begin{aligned} & 90 \\ & 90 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | 60* | 3 | 6 | 3/4 |
| 50 | 52 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 80 \\ & 80 \\ & 70 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 100 \\ & 100 \\ & 100 \\ & 100 \\ & \hline \end{aligned}$ | $\begin{gathered} 110 \\ - \\ 110 \\ 110 \end{gathered}$ | 100* | 3 | 6** | 3/4* |
| *Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch. <br> 1 Per $430.52(\mathrm{C})(2)$, 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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. <br> 2 These sizes are typical. They are not shown in NEMA ICS 2-2000. <br> f Class J performance, special finger-safe dimensions. |  |  |  |  |  |  |  |  |  |  |

## Motor Circuit Protection Tables

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

|  | 2 | 3 |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor | Motor | Fuse |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ |  | NEC ${ }^{8}$ Max | Minimum | Minimum | Minimum | Minimum |
| Size | FLA |  |  | Max for | for Heavy | Switch | NEMA | Copper Wire | Rigid Metallic |
|  |  |  |  | Gen. Applic | Start | Size | Starter | THWN or THHN AWG | Conduit |
| Table | Table |  |  | 430.52(C)(1) | 430.52(C)(1) | 430.110 | NEMA ICS 2- | or KCMIL | Annex C |
| 430.250 | 430.250 | Type | Class |  | Exc. No. 1 | Exc. No. 2 |  | 2000 | Table 310.16 | Table C8 |
| HP | AMPS |  |  |  | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS | Size ${ }^{2}$ | Size | Inches |
| 60 | 62 | LPJ_SP | J |  | 100 | 110 | 125 | 100* | 4 | 4** | 1 |
|  |  | LPS-RK_SP | RK1 |  | 90 | 110 | 125 |  |  |  |  |
|  |  | FRS-R | RK5 |  | 80 | 110 | 125 |  |  |  |  |
| 75 | 77 | LPJ_SP | J | 125 | 150 | 150 | 100* | 4 | 3** | 1** |  |
|  |  | LPS-RK_SP | RK1 | 110 | 150 | 150 |  |  |  |  |  |
|  |  | FRS-R | RK5 | 100 | 150 | 150 |  |  |  |  |  |
| 100 | 99 | LPJ_SP | J | 150 | 175 | 200 | 200 | 4 | 1** | $11 / 4 *$ |  |
|  |  | LPS-RK_SP | RK1 | 150 | 175 | 200 |  |  |  |  |  |
|  |  | FRS-R | RK5 | 125 | 175 | 200 |  |  |  |  |  |
| 125 | 125 | LPJ_SP | J | 200 | 225 | 250 | 200* | 5 | 2/0 | $11 / 2$ |  |
|  |  | LPS-RK_SP | RK1 | 175 | 225 | 250 |  |  |  |  |  |
|  |  | FRS-R | RK5 | 175 | 225 | 250 |  |  |  |  |  |
| 150 | 144 | LPJ_SP | J | 225 | 300 | 300 | 200* | 5 | 3/0 | $11 / 2$ |  |
|  |  | LPS-RK_SP | RK1 | 200 | 300 | 300 |  |  |  |  |  |
|  |  | FRS-R | RK5 | 200 | 300 | 300 |  |  |  |  |  |
| 200 | 192 | LPJ_SP | J | 300 | 350 | 400 | 400 | 5 | 250 | 2 |  |
|  |  | LPS-RK_SP | RK1 | 250 | 350 | 400 |  |  |  |  |  |
|  |  | FRS-R | RK5 | 250 | 350 | 400 |  |  |  |  |  |
| 250 | 242 | LPJ_SP | J | 400 | 450 | 500 | 400* | 6 | 350 | $21 / 2$ |  |
|  |  | LPS-RK_SP | RK1 | 350 | 450 | 500 |  |  |  |  |  |
|  |  | FRS-R | RK5 | 350 | 450 | 500 |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | - | 700 |  |  |  |  |  |
| 300 | 289 | LPJ_SP | J | 450 | 600 | 600 | 400* | 6 | 500 | 3 |  |
|  |  | LPS-RK_SP | RK1 | 400 | 600 | 600 |  |  |  |  |  |
|  |  | FRS-R | RK5 | 400 | 600 | 600 |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | - | 800 |  |  |  |  |  |
| 350 | 336 | LPJ_SP | $J$ | 600 | 600 | - | 600* | 6 | 4/0 2/PHASE | (2) 2 |  |
|  |  | LPS-RK_SP | RK1 | 450 | 600 | - |  |  |  |  |  |
|  |  | FRS-R | RK5 | 450 | 600 | - |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | 601 | 1000 |  |  |  |  |  |
| 400 | 382 | LPJ_SP | J | 600 | - | - | $600^{*}$ | 6 | 250 2/PHASE | (2) 2 |  |
|  |  | LPS-RK_SP | RK1 | 500 | - | - |  |  |  |  |  |
|  |  | FRS-R | RK5 | 500 | - | - |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | 700 | 1100 |  |  |  |  |  |
| 450 | 412 | LPS-RK_SP | RK1 | 600 | - | - | 600* | 7 | 300 2/PHASE | (2) 2 |  |
|  |  | FRS-R | RK5 | 600 | - | - |  |  |  |  |  |
|  |  | KRP-C_SP | L | - | 800 | 1200 |  |  |  |  |  |
| 500 | 472 | FRS-R | RK5 | 600 | - | - | 600* | 7 | 350 2/PHASE | (2) $21 / 2$ |  |
|  |  | 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. <br> 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 . <br> ** If equipment terminations are rated for $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. <br> 2 These sizes are typical. They are not shown in NEMA ICS 2-2000. |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Motor Circuit Protection Tables

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

| 1 | 2 |  |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor <br> Size <br>  <br> Table <br> 430.248 <br> HP | Motor FLA <br> Table 430.248 AMPS | Type | Class | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC ${ }^{\circledR}$ Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | $\begin{gathered} \text { NEC }^{\circledR} \text { Max } \\ \text { for Heavy } \\ \text { Start } \\ 430.52(C)(1) \\ \text { Exc. No. } 2 \\ \text { AMPS } \end{gathered}$ | $\begin{gathered} \hline \text { Minimum } \\ \text { Switch } \\ \text { Size } \\ 430.110 \\ \\ \text { AMPS } \\ \hline \end{gathered}$ | 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 |
| 1/6 | 4.4 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{gathered} 8 \\ 10 \\ 9 \\ 6 \\ 56 / 10 \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 1/4 | 5.8 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 9 \\ 10 \\ 12 \\ 8 \\ 71 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 20 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 20 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 1/3 | 7.2 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 12 \\ & 15 \\ & 15 \\ & 15 \\ & 10 \\ & 9 \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 1/2 | 9.8 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 30 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 3/4 | 13.8 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 25 \\ 25 \\ 20 \\ 171 / 2 \end{gathered}$ | $\begin{aligned} & 25 \\ & 25 \\ & 25 \\ & 25 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 1 | 16 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 25 \\ & 25 \\ & 25 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ | $30^{*}$ | 0 | 14 | 1/2 |
| $11 / 2$ | 20 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | 30* | 1 | 12 | 1/2 |
| 2 | 24 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 40 \\ & 40 \\ & 35 \\ & 30 \\ & \hline \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $\begin{aligned} & 50 \\ & 50 \\ & 50 \\ & 50 \\ & \hline \end{aligned}$ | 30* | 1 | 10 | 1/2 |
| 3 | 34 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 60 \\ & 60 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 70 \\ & 70 \\ & 70 \\ & 70 \end{aligned}$ | 60* | 2 | 8** | 1/2* |
| 5 | 56 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 90 \\ & 90 \\ & 80 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 100 \\ & 100 \\ & 100 \\ & 100 \\ & \hline \end{aligned}$ | $\begin{gathered} 125 \\ - \\ 125 \\ 125 \\ \hline \end{gathered}$ | $100 *$ | 3 | 4 | 3/4* |
| $71 / 2$ | 80 | $\begin{aligned} & \text { LPJSP } \\ & \text { LPN-RK_SP } \\ & \text { FRN-R } \end{aligned}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 125 \\ & 110 \\ & 100 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 150 \\ & 150 \\ & 150 \\ & \hline \end{aligned}$ | $\begin{aligned} & 175 \\ & 175 \\ & 175 \\ & \hline \end{aligned}$ | 100* | 3 | 3** | 1** |
| 10 | 100 | $\begin{aligned} & \text { LPJ_SP } \\ & \text { LPN-RK_SP } \\ & \text { FRN-R } \end{aligned}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 150 \\ & 150 \\ & 125 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 175 \\ & 175 \\ & 175 \\ & \hline \end{aligned}$ | $\begin{aligned} & 225 \\ & 225 \\ & 225 \\ & \hline \end{aligned}$ | 200* | 42 | 1 | $11 / 4$ |
| * Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch. <br> 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 . <br> ** If equipment terminations are rated for $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. <br> 2 These sizes are typical. They are not shown in NEMA ICS 2-2000. <br> ${ }^{f}$ Class J performance, special finger-safe dimensions. |  |  |  |  |  |  |  |  |  |  |

## Motor Circuit Protection Tables

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

| 1 | 2 | 3 |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor <br> Size <br>  <br> Table <br> 430.248 <br> HP | Motor <br> FLA <br> Table <br> 430.248 <br> AMPS | Fuse |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC ${ }^{\circledR}$ <br> Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | ```NEC}\mp@subsup{}{}{\circledR}\mathrm{ Max for Heavy Start 430.52(C)(1) Exc. No.2 AMPS'``` | $\begin{aligned} & \text { Minimum } \\ & \text { Switch } \\ & \text { Size } \\ & 430.110 \\ & \\ & \text { AMPS } \\ & \hline \end{aligned}$ | 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 |
| 1/6 | 2.2 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 31 / 2 \\ 6 \\ 41 / 2 \\ 3 \\ 2 \% \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 1/4 | 2.9 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 41 / 2 \\ 6 \\ 6 \\ 4 \\ 4 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 6 \\ 6 \\ \hline \end{gathered}$ | $\begin{gathered} \hline 6 \\ 6 \\ 10 \\ 61 / 4 \\ 61 / 4 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| 1/3 | 3.6 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 5 \% \\ 6 \\ 7 \\ 5 \\ 41 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 1/2 | 4.9 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{gathered} \hline 8 \\ 10 \\ 10 \\ 8 \\ 61 / 4 \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 3/4 | 6.9 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline J \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 12 \\ & 15 \\ & 15 \\ & 9 \\ & 9 \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \end{aligned}$ | 30 | 00 | 14 | 1/2 |
| 1 | 8 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 12 \\ & 15 \\ & 25 \\ & 12 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 25 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{gathered} 171 / 2 \\ 171 / 2 \\ 30 \\ 171 / 2 \\ 171 / 2 \\ \hline \end{gathered}$ | 30 | 00 | 14 | 1/2 |
| $11 / 2$ | 10 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 30 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 2 | 12 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{gathered} 20 \\ 20 \\ 25 \\ 171 / 2 \\ 15 \\ \hline \end{gathered}$ | $\begin{aligned} & 25 \\ & 25 \\ & - \\ & 25 \\ & 25 \end{aligned}$ | $\begin{aligned} & 25 \\ & 25 \\ & - \\ & 25 \\ & 25 \end{aligned}$ | 30 | 0 | 14 | 1/2 |
| 3 | 17 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 30 \\ & 30 \\ & 25 \\ & 25 \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \\ & 35 \\ & 35 \end{aligned}$ | 30* | 1 | 12 | 1/2 |
| 5 | 28 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 45 \\ & 45 \\ & 40 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 50 \\ & 50 \\ & 50 \\ & 50 \\ & \hline \end{aligned}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | 60 | 2 | 10** | 1/2 |
| $71 / 2$ | 40 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 60 \\ & 60 \\ & 60 \\ & 50 \\ & \hline \end{aligned}$ | $\begin{aligned} & 70 \\ & 70 \\ & 70 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 90 \\ & 90 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | 60* | 2 | 8** | 1/2* |
| 10 | 50 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 80 \\ & 80 \\ & 70 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 90 \\ & 90 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 110 \\ - \\ 110 \\ 110 \\ \hline \end{gathered}$ | 100* | 3 | 6** | 1/2* |

[^3]
## Motor Circuit Protection Tables

Bussmann

## 90Vdc ${ }^{3}$ Motors \& Circuits

| 1 | 2 |  |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor | Motor | Fuse |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC ${ }^{\text {® }}$ | NEC ${ }^{\text {® }}$ Max | Minimum | Minimum | Minimum | Minimum |
| Size | FLA |  |  | Max for | for Heavy | Switch | NEMA | Copper Wire | Rigid Metallic |
| $\begin{aligned} & \text { Table } \\ & 430.257 \\ & \text { HP } \end{aligned}$ | $\begin{gathered} \text { Table } \\ 430.257 \\ \text { AMPS } \end{gathered}$ |  |  | Gen. Applic | Start | Size | Starter | THWN or THHN AWG | Conduit |
|  |  |  |  | 430.52(C)(1) | 430.52(C)(1) | 430.110 | NEMA ICS 2- | or KCMIL | Annex C |
|  |  | Type | Class |  | Exc. No. 1 | Exc. No. 2 |  | 2000 | Table 310.16 | Table C8 |
|  |  |  |  |  | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS | Size ${ }^{2}$ | Size | Inches |
| 1/4 | 4.0 | LPJ_SP | J |  | 6 | 6 | 6 | 30 | 1 | 14 | 1/2 |
|  |  | TCF | Jf |  | 6 | 6 | 6 |  |  |  |  |
|  |  | LPC_CC | CC |  | 6 | 6 | 15 |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 6 | 6 | 9 |  |  |  |  |
|  |  | FRN-R | RK5 | 5 | 6 | 9 |  |  |  |  |
| 1/3 | 5.2 | LPJ_SP | J | 8 | 10 | 10 | 30 | 1 | 14 | 1/2 |  |
|  |  | TCF | Jf | 10 | 10 | 10 |  |  |  |  |  |
|  |  | LP-CC | CC | 10 | 10 | 20 |  |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 8 | 10 | 10 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 7 | 10 | 10 |  |  |  |  |  |
| 1/2 | 6.8 | LPJ_SP | J | 12 | 15 | 15 | 30 | 1 | 14 | 1/2 |  |
|  |  | TCF | Jf | 15 | 15 | 15 |  |  |  |  |  |
|  |  | LP-CC | CC | 15 | 15 | 25 |  |  |  |  |  |
|  |  | LPN-RK_SP | RK1 | 9 | 15 | 15 |  |  |  |  |  |
|  |  | FRN-R | RK5 | 9 | 15 | 15 |  |  |  |  |  |
| 3/4 | 9.6 | LPJ_SP | J | 15 | 15 | 20 | 30 | 1 | 14 | $1 / 2$ |  |
|  |  | TCF | Jf | 15 | 15 | 20 |  |  |  |  |  |
|  |  | LP-CC | CC | 15 | 15 | 30 |  |  |  |  |  |
|  |  | 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 . <br> ** If equipment terminations are rated for $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. <br> 2 These sizes are typical. They are not shown in NEMA ICS 2-2000. <br> 3 All equipment manufacturers should be consulted about DC voltage ratings of their equipment. <br> f Class J performance, special finger-safe dimensions. |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Motor Circuit Protection Tables
Bussmann

## 120 Vdc $^{3}$ Motors \& Circuits

| 1 | 2 | Fuse |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \hline \begin{array}{l} \text { Motor } \\ \text { Size } \end{array} \\ & \\ & \text { Table } \\ & 430.257 \\ & \text { HP } \\ & \hline \end{aligned}$ | $\begin{gathered} \text { Motor } \\ \text { FLA } \\ \\ \text { Table } \\ 430.257 \\ \text { AMPS } \end{gathered}$ |  |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ |  | $\begin{gathered} \text { Minimum } \\ \text { Switch } \\ \text { Size } \\ 430.110 \\ \\ \text { AMPS } \end{gathered}$ | 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 |
| 1/4 | 3.1 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 5 \\ 6 \\ 6 \\ 41 / 2 \\ 4 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 6 \\ & 6 \\ & 6 \\ & 6 \\ & 6 \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 6 \\ 6 \\ 12 \\ 61 / 4 \\ 61 / 4 \\ \hline \end{gathered}$ | 30 | 1 | 14 | 1/2 |
| 1/3 | 4.1 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 7 \\ 10 \\ 9 \\ 5 \% 10 \\ 5 \% \\ \hline \% \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 1/2 | 5.4 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 9 \\ 10 \\ 10 \\ 71 / 2 \\ 7 \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 12 \\ & 10 \\ & 20 \\ & 12 \\ & 12 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 3/4 | 7.6 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 12 \\ & 15 \\ & 15 \\ & 15 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 15 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 30 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 1 | 9.5 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline J \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 15 \\ & 15 \\ & 12 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 15 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30^{5} \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| $11 / 2$ | 13.2 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \hline \mathrm{J} \\ \mathrm{Jf} \\ \mathrm{CC} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 20 \\ 20 \\ 20 \\ 171 / 2 \\ 171 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & 20 \\ & 20 \\ & 20 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 25 \\ & 25 \\ & 30^{5} \\ & 25 \\ & 25 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 2 | 17 | LPJ_SP TCF LP-CC LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 25 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \\ & 30^{5} \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ | $30^{*}$ | 1 | 12 | 1/2 |
| 3 | 25 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 40 \\ & 40 \\ & 35 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 40 \\ & 40 \\ & 40 \\ & 40 \\ & \hline \end{aligned}$ | $\begin{aligned} & 50 \\ & 50 \\ & 50 \\ & 35 \\ & \hline \end{aligned}$ | 60 | 1 | $10^{* *}$ | 1/2 |
| 5 | 40 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 50 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 90 \\ & 60 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | 60* | 2 | 8** | 1/2* |
| $71 / 2$ | 58 | LPJ_SP TCF LPN-RK_SP FRN-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 90 \\ & 90 \\ & 80 \\ & 80 \\ & \hline \end{aligned}$ | $\begin{aligned} & 90 \\ & 90 \\ & 90 \\ & 90 \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 125 \\ - \\ 125 \\ 125 \\ \hline \end{gathered}$ | 100* | 3 | 4** | 3/4* |
| 10 | 76 | $\begin{aligned} & \text { LPJ_SP } \\ & \text { LPN-RK_SP } \\ & \text { FRN-R } \\ & \hline \end{aligned}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{array}{r} 125 \\ 100 \\ 100 \\ \hline \end{array}$ | $\begin{aligned} & 125 \\ & 125 \\ & 125 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 150 \\ & 150 \\ & 150 \\ & \hline \end{aligned}$ | 100* | 3 | 3** | 1 |
| * Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch. <br> 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 . <br> ** If equipment terminations are rated for $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required. <br> 2 Reduced voltage magnetic controller ratings <br> 3 All equipment manufacturers should be consulted about $D C$ voltage ratings of their equipment. <br> 5 Largest LP-CC Fuse 30 amp . With other type fuse, could use larger amp rating in this application. <br> $f \quad$ Class J performance, special finger-safe dimensions. |  |  |  |  |  |  |  |  |  |  |

## Motor Circuit Protection Tables

## 180Vdc ${ }^{3}$ Motors \& Circuits

| 1 | 2 | 3 |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor <br> Size <br>  <br> Table <br> 430.257 <br> HP |  | Fuse |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC ${ }^{\circledR}$ Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | $\begin{gathered} \text { NEC } \text { Max } \\ \text { for Heavy } \\ \text { Start } \\ \text { 430.52(C)(1) } \\ \text { Exc. No. } 2 \\ \text { AMPS }{ }^{1} \end{gathered}$ | $\begin{gathered} \hline \text { Minimum } \\ \text { Switch } \\ \text { Size } \\ 430.110 \\ \\ \text { AMPS } \end{gathered}$ | 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 |
| 1/4 | 2.0 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 3 \\ 3 \\ 2810 \\ 21 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & 3 \\ & 3 \\ & 3 \\ & 3 \\ & \hline \end{aligned}$ | $\begin{gathered} 41 / 2 \\ 3 \\ 41 / 2 \\ 41 / 2 \end{gathered}$ | 30 | 1 | 14 | 1/2 |
| 1/3 | 2.6 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{gathered} 4 \\ 6 \\ 31 / 2 \\ 31 / 2 \end{gathered}$ | $\begin{aligned} & 6 \\ & 6 \\ & 6 \\ & 6 \\ & 6 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 6 \\ & 6 \\ & 6 \\ & 6 \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 1/2 | 3.4 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 5 \% 10 \\ 6 \\ 41 / 2 \\ 41 / 2 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 6 \\ & 6 \\ & 6 \\ & 6 \\ & \hline \end{aligned}$ | $\begin{gathered} 6 \\ 6 \\ 61 / 4 \\ 71 / 2 \\ \hline \end{gathered}$ | 30 | 1 | 14 | 1/2 |
| $3 / 4$ | 4.8 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 8 \\ 10 \\ 61 / 4 \\ 6 \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 1 | 6.1 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} \hline 10 \\ 10 \\ 8 \\ 8 \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 12 \\ & 10 \\ & 12 \\ & 12 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| $11 / 2$ | 8.3 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & - \\ & 12 \\ & 12 \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & - \\ & 15 \\ & 15 \end{aligned}$ | $\begin{gathered} 12 \\ \hline 17 / 2 \\ 15 \\ 30 \\ 171 / 2 \\ 171 / 2 \end{gathered}$ | 30 | 1 | 14 | 1/2 |
| 2 | 10.8 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \hline J \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 20 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 20 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 20 \\ & 20 \\ & 30 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 3 | 16 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{~J} f \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 25 \\ & 25 \\ & 25 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 25 \\ & 25 \\ & 25 \\ & 25 \\ & 25 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{aligned} & 35 \\ & 35 \\ & 30 \\ & 35 \\ & 35 \\ & 35 \end{aligned}$ | $30^{*}$ | 1 | 14 | 1/2 |
| 5 | 27 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 40 \\ & 40 \\ & 40 \\ & 45 \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 45 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | 60 | 2 | 10** | 1/2 |
| ```* 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 }6\mp@subsup{0}{}{\circ}\textrm{C}\mathrm{ conductors only, the }6\mp@subsup{0}{}{\circ}\textrm{C}\mathrm{ 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 |  |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Motor Size | Motor FLA | Fuse |  | Optimal | NEC ${ }^{\text {® }}$ | NEC ${ }^{\ominus}$ Max | Minimum | Minimum | Minimum | Minimum |
|  |  |  |  | Branch Ckt | Max for | for Heavy | Switch | NEMA | Copper Wire | Rigid Metallic |
|  |  |  |  | Protection | Gen. Applic | Start | Size | Starter | THWN or THHN AWG | Conduit |
| Table | Table |  |  |  | 430.52(C)(1) | 430.52(C)(1) | 430.110 | NEMA ICS 2- | or KCMIL | Annex C |
| 430.257 | 430.257 | Type | Class |  | Exc. No. 1 | Exc. No. 2 |  | 2000 | Table 310.16 | Table C8 |
| HP | AMPS |  |  | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS ${ }^{1}$ | AMPS | Size ${ }^{2}$ | Size | Inches |
| 1/4 | 1.6 | LPJ_SP | J | $21 / 2$ | 3 | $31 / 2$ |  |  |  |  |
|  |  | TCF | Jf | 3 | 3 | 3 | 30 | 1 | 14 | 1/2 |
|  |  | LPN-RK_SP | RK1 | $21 / 4$ | 3 | $31 / 2$ |  |  |  |  |
|  |  | FRS-R | RK5 | 2 | 3 | $31 / 2$ |  |  |  |  |
| 1/3 | 2.0 | LPJ_SP | J | 3 | 3 | $41 / 2$ |  |  |  |  |
|  |  | TCF | Jf | 3 | 3 | 3 | 30 | 1 | 14 | 1/2 |
|  |  | LPS-RK_SP | RK1 | $2 \%$ | 3 | $41 / 2$ |  |  |  |  |
|  |  | FRS-R | RK5 | $21 / 2$ | 3 | $41 / 2$ |  |  |  |  |
| * 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 . <br> ** If equipment terminations are rated for $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ 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. |  |  |  |  |  |  |  |  |  |  |
| ${ }^{5}$ Class | formance, | finger-safe dime |  |  |  |  |  |  |  |  |

## 240Vdc ${ }^{3}$ Motors \& Circuits continued

| 1 | 2 | 3 |  | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \hline \text { Motor } \\ & \text { Size } \\ & \\ & \text { Table } \\ & 430.257 \\ & \text { HP } \\ & \hline \end{aligned}$ | $\begin{gathered} \text { Motor } \\ \text { FLA } \\ \\ \text { Table } \\ 430.257 \\ \text { AMPS } \end{gathered}$ | Fuse |  | Optimal Branch Ckt Protection <br> AMPS ${ }^{1}$ | NEC ${ }^{\circledR}$ Max for Gen. Applic 430.52(C)(1) Exc. No. 1 AMPS ${ }^{1}$ | $\begin{gathered} \text { NEC }^{\ominus} \text { Max } \\ \text { for Heavy } \\ \text { Start } \\ 430.52(\mathrm{C})(1) \\ \text { Exc. } \text { No. }{ }^{2} \\ \text { AMPS }{ }^{1} \end{gathered}$ | $\begin{aligned} & \hline \text { Minimum } \\ & \text { Switch } \\ & \text { Size } \\ & 430.110 \\ & \\ & \text { AMPS } \end{aligned}$ | 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 |
| 1/2 | 2.7 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 41 / 2 \\ 6 \\ 4 \\ 31 / 2 \end{gathered}$ | $\begin{aligned} & \hline 6 \\ & 6 \\ & 6 \\ & 6 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 6 \\ & 6 \\ & 6 \\ & 6 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 3/4 | 3.8 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{gathered} 6 \\ 6 \\ \hline 5 \\ \hline 5 \\ \hline \end{gathered}$ | $\begin{gathered} 6 \\ 6 \\ \hline 6 \\ \hline 6 \end{gathered}$ | $\begin{gathered} \hline 8 \\ 6 \\ 15 \\ 8 \\ 8 \\ \hline \end{gathered}$ | 30 | 1 | 14 | 1/2 |
| 1 | 4.7 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{gathered} 8 \\ 10 \\ 61 / 4 \\ 6 \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| $11 / 2$ | 6.6 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{gathered} 10 \\ 10 \\ 9 \\ 9 \\ \hline \end{gathered}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \\ & 10 \\ & \hline \end{aligned}$ | $\begin{aligned} & 12 \\ & 10 \\ & 12 \\ & 12 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 2 | 8.5 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 15 \\ & 15 \\ & 12 \\ & 12 \\ & \hline \end{aligned}$ | $\begin{aligned} & 15 \\ & 15 \\ & 15 \\ & 15 \\ & \hline \end{aligned}$ | $\begin{gathered} 171 / 2 \\ 15 \\ 171 / 2 \\ 171 / 2 \\ \hline \end{gathered}$ | 30 | 1 | 14 | 1/2 |
| 3 | 12.2 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{gathered} 20 \\ 20 \\ 20 \\ 171 / 2 \\ 171 / 2 \end{gathered}$ | $\begin{aligned} & 20 \\ & 20 \\ & 20 \\ & 20 \\ & 20 \\ & \hline \end{aligned}$ | $\begin{aligned} & 25 \\ & 25 \\ & 30 \\ & 25 \\ & 25 \\ & \hline \end{aligned}$ | 30 | 1 | 14 | 1/2 |
| 5 | 20 | LPJ_SP TCF LP-CC LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { CC } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & 25 \\ & \hline \end{aligned}$ | $\begin{aligned} & 30 \\ & 30 \\ & 30 \\ & 30 \\ & 30 \\ & \hline \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 30 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | 30* | 1 | 12 | 1/2 |
| $71 / 2$ | 29 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 45 \\ & 45 \\ & 40 \\ & 40 \end{aligned}$ | $\begin{aligned} & 45 \\ & 45 \\ & 45 \\ & 45 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 60 \\ & 60 \\ & 60 \\ & 60 \end{aligned}$ | 60 | 2 | 8 | 1/2 |
| 10 | 38 | LPJ_SP TCF LPS-RK_SP FRS-R | $\begin{gathered} \mathrm{J} \\ \mathrm{Jf} \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 60 \\ & 60 \\ & 50 \\ & 50 \\ & \hline \end{aligned}$ | $\begin{aligned} & 60 \\ & 60 \\ & 60 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 80 \\ & 60 \\ & 80 \\ & 80 \\ & \hline \end{aligned}$ | 60* | 2 | 8** | 1/2* |
| 15 | 55 | LPJ_SP TCF LPN-RK_SP FRS-R | $\begin{gathered} \text { J } \\ \text { Jf } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 90 \\ & 90 \\ & 80 \\ & 70 \\ & \hline \end{aligned}$ | $\begin{aligned} & 90 \\ & 90 \\ & 90 \\ & 90 \end{aligned}$ | $\begin{gathered} 110 \\ - \\ 110 \\ 110 \end{gathered}$ | $100^{*}$ | 3 | 4 | $3 / 4 * *$ |
| 20 | 72 | $\begin{gathered} \hline \text { LPJ_SP } \\ \text { LPN-RK_SP } \\ \text { FRS-R } \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 110 \\ & 100 \\ & 90 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 110 \\ & 110 \\ & 110 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 150 \\ & 150 \\ & 150 \\ & \hline \end{aligned}$ | 100* | 3 | 3** | 1 |
| 25 | 89 | $\begin{gathered} \text { LPJ_SP } \\ \text { LPN-RK_SP } \\ \text { FRS-R } \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 150 \\ & 125 \\ & 125 \\ & \hline \end{aligned}$ | $\begin{aligned} & 150 \\ & 150 \\ & 150 \\ & \hline \end{aligned}$ | $\begin{aligned} & 200 \\ & 200 \\ & 200 \\ & \hline \end{aligned}$ | 200 | 3 | 2** | 1** |
| 30 | 106 | $\begin{aligned} & \text { LPJ_SP } \\ & \text { LPN-RK_SP } \\ & \text { FRS-R } \end{aligned}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{array}{r} 175 \\ 150 \\ 150 \\ \hline \end{array}$ | $\begin{aligned} & 175 \\ & 175 \\ & 175 \\ & \hline \end{aligned}$ | $\begin{aligned} & 225 \\ & 225 \\ & 225 \\ & \hline \end{aligned}$ | 200* | 4 | 1/0** | $11 / 4$ |
| 40 | 140 | $\begin{gathered} \hline \text { LPJ_SP } \\ \text { LPN-RK_SP } \\ \text { FRS-R } \end{gathered}$ | $\begin{gathered} \hline \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 225 \\ & 200 \\ & 175 \\ & \hline \end{aligned}$ | $\begin{aligned} & 225 \\ & 225 \\ & 225 \end{aligned}$ | $\begin{aligned} & \hline 300 \\ & 300 \\ & 300 \end{aligned}$ | 200* | 4 | 2/0** | $11 / 4 *$ |
| 50 | 173 | $\begin{gathered} \text { LPJ_SP } \\ \text { LPN-RK_SP } \\ \text { FRS-R } \end{gathered}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 300 \\ & 225 \\ & 225 \\ & \hline \end{aligned}$ | $\begin{aligned} & 300 \\ & 300 \\ & 300 \\ & \hline \end{aligned}$ | $\begin{aligned} & 350 \\ & 350 \\ & 350 \\ & \hline \end{aligned}$ | 400 | 5 | 4/0** | $11 /{ }^{* *}$ |
| 60 | 206 | $\begin{aligned} & \text { LPJ_SP } \\ & \text { LPN-RK_SP } \\ & \text { FRS-R } \end{aligned}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \\ \hline \end{gathered}$ | $\begin{aligned} & 350 \\ & 300 \\ & 300 \\ & \hline \end{aligned}$ | $\begin{aligned} & 350 \\ & 350 \\ & 350 \\ & \hline \end{aligned}$ | $\begin{aligned} & 450 \\ & 450 \\ & 450 \\ & \hline \end{aligned}$ | 400* | 5 | 300** | 2** |
| 75 | 255 | $\begin{aligned} & \hline \text { LPJ_SP } \\ & \text { LPN-RK_SP } \\ & \text { FRS-R } \end{aligned}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 400 \\ & 350 \\ & 350 \end{aligned}$ | $\begin{aligned} & 400 \\ & 400 \\ & 400 \end{aligned}$ | $\begin{aligned} & 500 \\ & 500 \\ & 500 \end{aligned}$ | 400* | 5 | 400** | 2** |
| 100 | 341 | $\begin{aligned} & \text { LPJ_SP } \\ & \text { LPN-RK_SP } \\ & \text { FRS-R } \end{aligned}$ | $\begin{gathered} \text { J } \\ \text { RK1 } \\ \text { RK5 } \end{gathered}$ | $\begin{aligned} & 600 \\ & 450 \\ & 450 \\ & \hline \end{aligned}$ | $\begin{aligned} & 600 \\ & 600 \\ & 600 \end{aligned}$ | - | 600 | 6 | 4/0 2/PHASE | (2) $11 /{ }^{\text {*** }}$ |

[^4]
## Motor Protection

## Tips For Electricians \& Maintenance Crews

## Recommendations for Electrician and Maintenance Crews

Often, for various reasons, motors are oversized for applications. For instance, a 5 Hp motor is installed when the load demand is only 3 Hp . 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 LowPeak 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 $61 / 4$. 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- <br> Element <br> Fuse Size | Motor Current |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | FRN-R | LPN-RK_SP |  |  |
|  | FRS-R | LPS-RK_SP | LPJ_SP | LP-CC |
|  | Class RK5 | Class RK1 | Class J | 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 | - | - |
| 4/10 | 0.25-0.32 | 0.2308-0.3076 | - | - |
| 1/2 | 0.33-0.40 | 0.3077-0.3846 | - | 0.0000-0.2500 |
| \% | 0.41-0.48 | 0.3847-0.4615 | - | 0.2501-0.3000 |
| \% | 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 |
| 11/8 | 0.81-0.90 | 0.7693-0.8653 | 0.6667-0.7500 | 0.5001-0.5625 |
| $11 / 4$ | 0.91-1.00 | 0.8654-0.9615 | 0.7501-0.8333 | 0.5626-0.6250 |
| 14/10 | 1.01-1.12 | 0.9616-1.076 | 0.8334-0.9333 | 0.6251-0.7000 |
| 11/2 | 1.13-1.20 | 1.077-1.153 | 0.9334-1.000 | 0.7001-0.7500 |
| 1\%/10 | 1.21-1.28 | 1.154-1.230 | 1.001-1.066 | 0.7501-0.8000 |
| 1\%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 |
| 21/4 | 1.61-1.80 | 1.539-1.730 | 1.334-1.500 | 1.001-1.125 |
| $21 / 2$ | 1.81-2.00 | 1.731-1.923 | 1.501-1.666 | 1.126-1.250 |
| 28/10 | 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 |
| 32/10 | 2.41-2.56 | 2.308-2.461 | 2.001-2.133 | 1.501-1.600 |
| $31 / 2$ | 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 |
| $41 / 2$ | 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\% | 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 |
| $61 / 4$ | 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 |
| $71 / 2$ | 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 |
| $171 / 2$ | 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 | - |

## Equipment Protection

## 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 <br> $125 \%$ does not correspond to a standard fuse <br> size. |
| 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 ( 600 V or less) and Secondary Fuse ( 600 V or less). If secondary ( 600 V or less) fuses are sized not greater than $125 \%$ of transformer secondary current, individual transformer fuses are not required in the primary ( 600 V 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 <br> rating if $125 \%$ does not corre- <br> spond 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 timedelay to withstand the high magnetizing inrush currents of transformers. There is a wide amp rating selection in the 0 to 15 A 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, timedelay fuse protection offers much greater flexibility. Note the following examples:


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.

Equipment Protection

## Transformers - 600V or Less



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 83 A motors because $5 \times 110=550 \mathrm{~A}$, (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


581A MCP
Only one motor can be connected when the MCP is utilized, and this assumes the motor will start when the MCP is sized at $700 \%$. Higher settings will result in current rating higher than the maximum allowable 600 amps.
$-1$
83A
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, $1 \times 700 \%$ of $83=581 \mathrm{amps}$. For two motors, $2 \times 700 \%$ 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 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. ( $83 \times 250 \%=207.5 \mathrm{~A}$.
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 $(600 \div 200)$ 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 $3 \varnothing$ transformer is a 400 kVA with a 1110 A capacity to meet the new rule.

## Equipment Protection

## Transformers - Over 600V

## Primary and Secondary Protection

In unsupervised locations, with primary over 600 V , the primary fuse can be sized at a maximum of $300 \%$. If the secondary is also over 600 V , 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 600 V 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.


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 600 V or less, where the secondary fuses can be sized at maximum of $250 \%$.


## 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 currentlimiting 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 nonventing 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., $10 \mathrm{x}, 12 \mathrm{x}, 15 \mathrm{x}$, 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 800 VA 2400 V , single phase potential transformer has a magnetizing inrush current of $12 x$ lasting for 0.1 second.
A. $I_{F L}=800 \mathrm{VA} / 2400 \mathrm{~V}=0.333 \mathrm{~A}$

$$
\text { Inrush Current }=12 \times 0.333=4 \mathrm{~A}
$$

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 0.333 A is 0.999 A .

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

## Transformers - Over 600V

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

[^5]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 $12 x$ the full-load rating for a duration of $1 / 10$ second.

| Transformer kVA Rating | System Voltage 2.4 kV <br> Full-load Fuse Amps |  | 4.16kV <br> Full-load Fuse <br> Amps |  | 4.8kV <br> Full-Ioad Fuse <br> 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 DeviceAmperes

|  | Column Basic R |  | Column Exceptio | $\text { No. } 1$ | Column Excepti | $\text { No. } 2$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Control |  | Alum. or |  | Alum. or |  | Alum. or |
| Circuit |  | Copper- |  | Copper- |  | Copper- |
| Conductor |  | Clad |  | Clad |  | Clad |
| Size, AWG | Copper | Alum. | Copper | Alum. | Copper | 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. <br> Note 2: 400 percent of value specified in Table $310-17$ for $60^{\circ} \mathrm{C}$ conductors <br> Note 3: 300 percent of value specified in Table $310-16$ for $60^{\circ} \mathrm{C}$ conductors |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

### 430.72(C)

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

1. Not larger than that determined in Table 430.72(B), multiplied by secondary-toprimary 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.


## 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.

## POWER SOURCE

For conductors 14 AWG and larger,
refer to Tables 310.16 thru
310.19, without derating factors.
Control
2. Control circuit conductors 18 AWG and 16 AWG, shall be protected by a contro 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 ( 600 V 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 | ${ }^{13 / 32^{\prime \prime}} \times 11 / 2^{\prime \prime}$ | 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 |  |
|  | SC | 20A | BG3021SQ | BG3022SQ |  |
|  | KTK-R | 1/10-30A |  |  |  |
|  | FNQ-R | 1/10-30A | BC6031S | BC6032S |  |
|  | 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 ${ }^{\circledR}$. 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 <br> Circuit <br> Protective | Circuit 1 <br> (Control Conductor (AWG) Not <br> Extending Beyond <br> Enclosure) |  |  |  | Circuit 2 <br> (Control Conductor (AWG) <br> Extending Beyond <br> Enclosure) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Device | 18 | 16 | 14 | 12 | 18 | 16 | 14 | 12 |
| (BCPD) | Wire | Wire | Wire | Wire | Wire | Wire | Wire | Wire |
| Fuse Size | 7A | 10A | 15A | 20A | 7A | 10A | 15A | 20A |
| Requirements For Control Circuit Protection (See footnote data) |  |  |  |  |  |  |  |  |
| 1/10-7 | - | $\square$ | $\square$ | $\square$ | ■ | ■ | $\square$ | $\square$ |
| 71/2-10 | - | ■ | $\square$ | $\square$ | $\Delta$ | - | ■ | $\square$ |
| 12-25 | $\square$ | $\square$ | $\square$ | $\square$ | $\triangle$ | $\Delta$ | $\square$ | $\square$ |
| 30-40 | $\Delta$ | $\square$ | $\square$ | $\square$ | $\triangle$ | $\triangle$ | $\square$ | $\square$ |
| 45 | - | $\Delta$ | ■ | $\square$ | $\Delta$ | - | ■ | $\square$ |
| 50-60 | $\triangle$ | $\triangle$ | $\square$ | ■ | $\triangle$ | $\triangle$ | $\wedge$ | ■ |
| 65-100 | $\triangle$ | $\Delta$ | $\square$ | $\square$ | $\triangle$ | $\triangle$ | $\Delta$ | $\triangle$ |
| 110 | $\triangle$ | $\Delta$ | $\triangle$ | $\square$ | $\Delta$ | $\triangle$ | $\Delta$ | $\triangle$ |
| 125 - up | $\triangle$ | $\triangle$ | $\triangle$ | $\triangle$ | $\triangle$ | $\triangle$ | $\triangle$ | $\triangle$ |

$\Delta$ 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 <br> Conductor <br> (AWG Copper) | Available Short-Circuit Current <br> At Branch Circuit Protective Device (BCPD) |  |
| :--- | :---: | :---: |
|  | 1 Cycle Clearing Time† | $1 / 2$ Cycle Clearing Time† |
| $\mathbf{1 6}$ | 660 A | 940 A |
| $\mathbf{1 4}$ | 1050 A | 1500 A |
| $\mathbf{1 2}$ | 1700 A | 2400 A |
| *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 | $V_{\text {pri }} V_{\text {sec }}$ | Ipri | $\mathrm{I}_{\text {se }}$ | ${ }^{1}$ Fuse C |  | Fuse D or E |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Xfmr <br> Rating | (Volts) | (Amps) | (Amps) | ${ }^{2}$ Req'd. If BCPD Exceeds | 4.5Maximum Amps | Required if <br> Provided) | BCPD and F ceed These | C (When <br> p Values |  | Recom | Amps |
|  |  |  |  | These Amps Values |  | 18 AWG Wire | 16 AWG Wire | 14 AWG Wire | 12 AWG Wire | Time Delay ${ }^{1}$ | Non-Time Delay ${ }^{3}$ |
|  | 480/120 | 0.05 | 0.21 | ${ }^{6} \mathrm{See}$ | 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 | Except 1 | 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 |
|  | 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 |
|  | 480/120 | 0.21 | 0.83 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.0 |
| 100VA | 480/24 | 0.21 | 4.20 | 1.0 | 1.0 | 1.0/.35 ${ }^{\text {a }}$ | 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 | $12.0{ }^{7}$ |
|  | 480/120 | 0.31 | 1.25 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.50 | 3.50 |
| 150VA | 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 | $15.0{ }^{7}$ |
|  | 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 |
| 200VA | 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 ${ }^{\text {9 }}$ | 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 | $20.0^{8}$ |

[^6]Cooper Bussmann FNQ-R Maximum Primary Fuse Selection Guide for Motor Control Circuit Transformer Protection***

| XFMR VA | 600 V | 550V | 480V | 460 V | 415V | 380V | 277V | 240V | 230V | 208V |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 50 | 410 A | 4/10A | $1 / 2 \mathrm{~A}$ | $1 / 2 \mathrm{~A}$ | \% 10 | \% 10 | 810A | 1A | 1A | $11 / 8 \mathrm{~A}$ |
| 75 | $\%$ A | $\%$ A | 3/4A | $3 / 10 \mathrm{~A}$ | 810 A | 8/10A | $1 \%$ A | $11 / 2 \mathrm{~A}$ | $1 \%$ A | $18 / 10 \mathrm{~A}$ |
| 100 | 810 A | $8 / 10 \mathrm{~A}$ | 1A | 1A | $11 / 8 \mathrm{~A}$ | $13 / 10 \mathrm{~A}$ | 1810 A | 2A | 2A | $21 / 4 \mathrm{~A}$ |
| 150 | $11 / 4 \mathrm{~A}$ | 1310 A | $11 / 2 \mathrm{~A}$ | $1 \% 0 \mathrm{~A}$ | 1810 A | $1 \%$ A | $21 / 2 A$ | 3A | 3210 A | $31 / 2 \mathrm{~A}$ |
| 200 | $1 \% 10 \mathrm{~A}$ | 1810 A | 2A | 2A | $21 / 4 \mathrm{~A}$ | $21 / 2 A$ | $31 / 2 A$ | 4A | 4A | $41 / 2 A$ |
| 250 | 2A | $21 / 4 \mathrm{~A}$ | $21 / 2 \mathrm{~A}$ | $21 / 2 \mathrm{~A}$ | 3A | $3 \%$ A | $41 / 2 \mathrm{~A}$ | 5A | 5A | 6A |
| 300 | $21 / 2 A$ | $2 \%$ A | 3A | $3 \%$ A | $31 / 2 A$ | $31 / 2 A$ | 5A | $61 / 4 \mathrm{~A}$ | $61 / 4 \mathrm{~A}$ | 7A |
| 350 | 2810 A | 3A | $31 / 2 \mathrm{~A}$ | $31 / 2 A$ | 4A | $41 / 2 A$ | $61 / 4 \mathrm{~A}$ | 7A | $71 / 2 \mathrm{~A}$ | 8A |
| 500 | 4A | $41 / 2 \mathrm{~A}$ | 5A | 5A | 6A | $61 / 4 \mathrm{~A}$ | 9A | $3 \% 10{ }^{* *}$ | $31 / 2 A^{* *}$ | 4A** |
| 750 | $61 / 4 \mathrm{~A}$ | $61 / 4 \mathrm{~A}$ | $71 / 2 \mathrm{~A}$ | 8A | 9A | 9A | $41 / 2 A^{*}$ | 5A** | $5 A^{* *}$ | $6 A^{* *}$ |
| 1000 | 8A | 9A | $32 / 10{ }^{*}$ | $31 / 2 A^{*}$ | 4A* | 4A* | $6 A^{*}$ | $61 / 4 A^{* *}$ | 7A** | 8A** |
| 1500 | 4A* | $41 / 2 A^{*}$ | 5A* | 5A* | $6 A^{*}$ | $61 / 4 A^{*}$ | 9A* | 10A** | 10A** | 12A** |
| 2000 | 5A* | 6A* | $611 / 4{ }^{*}$ | 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 ${ }^{\circledR}$
Supplementary Fuses ( $\left(1 / 33{ }^{\prime \prime} \times 11 / 2^{\prime \prime}\right)$ (All Voltage and Interrupting Ratings are AC)

| Dual-Element, Time-Delay |  | Time-Delay |  | Non-Time-Delay |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & \text { FNA } \\ & 1 / 10 \cdot \frac{10 \mathrm{~A}}{} \\ & \frac{20 V^{2}}{1-15 \mathrm{~A}} \\ & \frac{125 \mathrm{~V}^{*}}{20-30 \mathrm{~A}} \\ & 32 \mathrm{~V}^{* *} \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { FNM } \\ & 1 / 0-10 \mathrm{~A} \\ & \frac{205 V^{*}}{12-15 \mathrm{~A}} \\ & \frac{125 \mathrm{~V}^{*}}{20-30 \mathrm{~A}} \\ & 32 \mathrm{~V}^{* *} \\ & \hline \end{aligned}$ | FNQ <br> $1 / 10-30 \mathrm{~A}$ <br> 500 V <br> 10 KAR <br> (FNQ \% \% 3 3 \% <br> Dual-Element) | FNW <br> 12-30A <br> $250 \mathrm{~V}^{*}$ | BAF <br> $1 / 2-15 \mathrm{~A}$ <br> $\frac{250 \mathrm{~V}^{+}}{20-30 \mathrm{~A}}$ <br> $125 \mathrm{~V}^{*}$ | BAN <br> 2/10-30A <br> $250 \mathrm{~V}^{-1}$ | KTK <br> 1/10-30A <br> 600 V <br> 100K AIR | $\begin{aligned} & \text { MIC } \\ & 1-15 \mathrm{~A} \\ & 250 \mathrm{~V}^{+} \\ & \hline 20-30 \mathrm{~A} \\ & 32 \mathrm{~V}^{* *} \end{aligned}$ | $\begin{aligned} & \text { MIN } \\ & 1-15 \mathrm{~A} \\ & \frac{250 \mathrm{~V}}{} \\ & \frac{20-30 \mathrm{~A}}{} \\ & 32 \mathrm{~V}^{* *} \end{aligned}$ |

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

| Class R <br> Dual-Element, Time-Delay |
| :--- |

[^7]${ }^{\text {Ho }} 0$ to $3.5 \mathrm{amp}-35$ AIR; 3.6 to $10 \mathrm{amp}-100$ AIR; 10.1 to $15 \mathrm{amp}-200$ AIR; 15.1-30 amp-750 AIR

## Fuse Diagnostic Sizing Charts

## Transformers 600V Nominal or Less (NEC ${ }^{\circledR} 450.3$ )



## Fuse Diagnostic Sizing Charts

## Transformers Over 600V Nominal (NEC ${ }^{\circledR} 450.3$ )



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

| Short-Circuit Protection Only |  | Fuse Recommendations |  |
| :---: | :---: | :---: | :---: |
|  | "F," "S," "K," \& 170M Series fuses sized up to several sizes larger | 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 |


[^0]:    Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

[^1]:    Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

[^2]:    Switch size must be increased if the amp rating of the fuse exceeds the amp rating of the switch.

[^3]:    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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.

    Class J performance, special finger-safe dimensions.

[^4]:    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 $60^{\circ} \mathrm{C}$ conductors only, the $60^{\circ} \mathrm{C}$ conductor ampacities must be utilized and therefore larger conductor sizes or conduit sizes may be required.
    2 Reduced voltage magnetic $D C$ controller ratings.
    3 All equipment manufacturers should be consulted about DC voltage ratings of their equipment.
    Class J performance, special finger-safe dimensions.

[^5]:    Cooper Bussmann E-Rated Medium Voltage Fuse.

[^6]:    ${ }^{1}$ 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, SC $1 / 2-5-$ 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 $10,000 \mathrm{amps}$ 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 " $E$ ".

[^7]:    t0 to 1 amp-35 AIR; 1.1 to $3.5 \mathrm{amp-100} \mathrm{AIR;} 3.6$ to $10 \mathrm{amp}-200 \mathrm{AlR} ; 10.1$ to $15 \mathrm{amp}-750 \mathrm{AlR} ; 15.1$ to $30 \mathrm{amps}-1500 \mathrm{AlR}$ *10K AIR. ${ }^{* * 1 \mathrm{~K}}$ AIR.
    $\S 1 / 2$ thru 6 amp fuses are Non-Time-Delay Type; 7 thru 60 amp fuses are Time-Delay Type.

