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

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

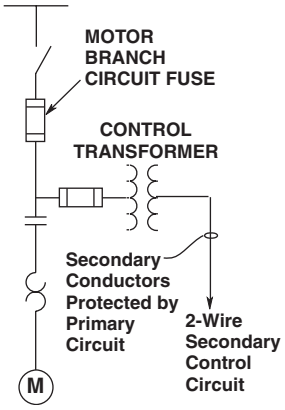
Note 1: Value specified in Section 310-15, as applicable.
Note 2: 400 percent of value specified in Table 310-17 for 60°C conductors.
Note 3: 300 percent of value specified in Table 310-16 for 60°C conductors.

430.72(C)

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

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

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

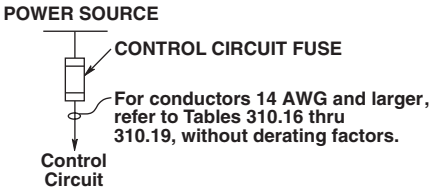


Transformer Primary Current	Primary Fuse Ampacity Must Not Exceed†
Less than 2 amps	500%
2 to 9 amps	167%
9 amps or more	125%*

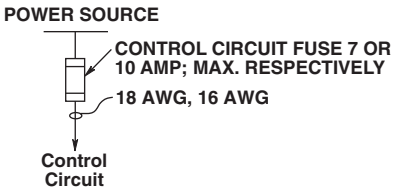
* If 125% of rated primary current does not correspond to a standard fuse rating, then the next higher standard fuse rating is permitted.
† Refer to Section 8.12 of NFPA79 for the allowable sizing for control transformers in Industrial Machinery.

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

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



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



Exception No. 2 Relative to Transformer Protection

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

Motor Control Circuit Transformers [430.72(C)]

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

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

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

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

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

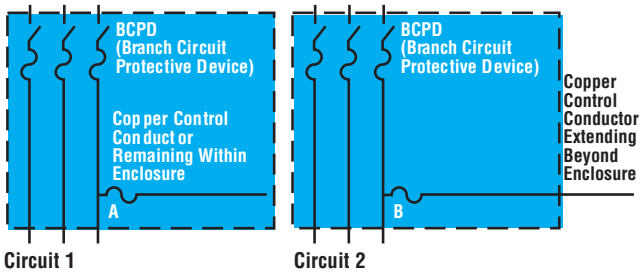
430.72(C) Exception: States that overcurrent protection shall be omitted where the opening of the control circuit would create a hazard, as for example, the control circuit of a fire pump motor and the like.

Catalog Number Designations for Fuse Blocks.

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

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

Control Circuit Without Control Transformer (See Table 1)



Control Circuit With Control Transformer (See Table 2)

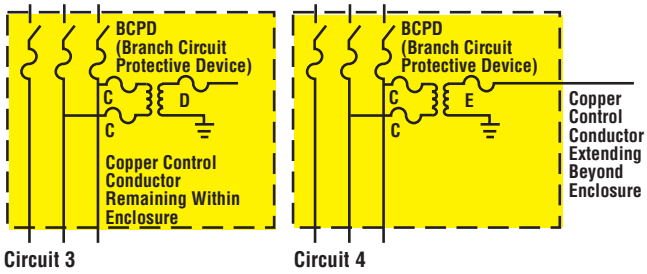


Table 1. Fuse Selection Guide–ControlCircuit WithoutControl Transformer (See Circuit Diagrams 1 & 2)

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

▲ Control circuit fuse protection required.

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

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

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

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

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

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

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

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

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

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

Dual-Element, Time-Delay

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

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

Time-Delay

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

FNW
12-30A
250V*

Non-Time-Delay

BAF
½-15A
250V†
20-30A
125V*

BAN
2/10-30A
250V††

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

MIC
1-15A
250V†
20-30A
32V**

MIN
1-15A
250V†
20-30A
32V**

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

Class R Dual-Element, Time-Delay

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

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

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

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

Class G

SC
½-20A 600V§
25-30A 480V§
100K AIR

Class CC Fast-Acting, Time-Delay

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

FNQ-R
¼-30A
600V
200K AIR

LP-CC
½-30A
600V
200K AIR

TCF
1-30A
600V
300K AIR

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