

Type FEC Epoxy Encapsulated, Copper-Wound Industrial Control Transformers



ISO 9001:2008
REGISTERED

Industrial Control Transformer Selector Guide

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Regulation & Inrush

Selecting a transformer for industrial control circuit applications requires knowledge of the following terms:

INRUSH VA is the product of load voltage (**V**) multiplied by the current (**A**) that is required during circuit start-up. It is calculated by adding the **inrush VA** requirements of all devices (contactors, timers, relays, pilot lights, solenoids, etc.), which will be energized together. **Inrush VA** requirements are best obtained from the component manufacturer.

SEALED VA is the product of load voltage (**V**) multiplied by the current (**A**) that is required to operate the circuit after initial start-up or under normal operating conditions. It is calculated by adding the **sealed VA** requirements of all electrical components of the circuit that will be energized at any given time. **SEALED VA** requirements are best obtained from the component manufacturer. **SEALED VA** is also referred to as steady state VA.

PRIMARY VOLTAGE is the voltage available from the electrical distribution system and its operational frequency, which is connected to the transformer supply voltage terminals.

SECONDARY VOLTAGE is the voltage required for load operation which is connected to the transformer load voltage terminals.

Once the circuit variables have been determined, transformer selection is a simple 5-step process as follows:

1. Determine the Application Inrush VA by using the following industry accepted formula:

$$\text{Application Inrush VA} = \sqrt{(\text{INRUSH VA})^2 + (\text{SEALED VA})^2}$$

2. Refer to the Regulation Data Chart. If the primary voltage is basically stable and does not vary by more than 5% from nominal, the 90% secondary voltage column should be used. If the primary voltage varies between 5 and 10% of nominal, the 95% secondary voltage column should be used.

3. After determining the proper secondary voltage column, read down until a value equal to or greater than the Application Inrush VA is found. In no case should a figure less than the Application Inrush VA be used.

4. Read left to the Transformer VA Rating column to determine the proper transformer for this application. As a final check, make sure that the Transformer VA rating is equal to or greater than the total sealed requirements. If not, select a transformer with a VA rating equal to or greater than the total sealed VA.

5. Refer to the specification section of this catalog to determine the proper catalog number based on the transformer VA, and primary and secondary voltage requirements.

To comply with NEMA standards, which require all magnetic devices to operate successfully at 85% of rated voltage, the 90% secondary voltage column is most often used in selecting a transformer.

Regulation and Inrush Data Chart

Transformer VA Rating	Inrush VA at 20% Power Factor		
	95% Sec. Voltage	90% Sec. Voltage	85% Sec. Voltage
25	100	130	150
50	170	200	240
75	310	410	540
100	370	540	730
150	780	930	1150
200	810	1150	1450
250	1400	1900	2300
300	1900	2700	3850
350	3100	3650	4800
500	4000	5300	7000
750	8300	11000	14000

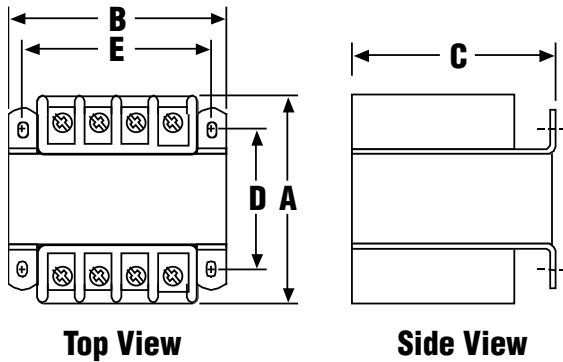
Type FEC Epoxy Encapsulated Copper-Wound Industrial Control Transformers

- Laminations of the finest silicon steel minimize core losses and increase performance and efficiency.
- Copper magnet wire assures efficient operation.
- UL 506 Listed
- CSA Certified
- Insulation materials of the highest rating available for the temperature class.
- Mounting brackets are heavy gauge steel to add strength to core construction and provide stable mounting. Slotted mounting feet permit easy installation.
- Attractive black finish; easy-to read nameplate with complete rating data and wiring diagram.

Features

- Epoxy encapsulated coils
- Secondary fuse clips where applicable
- Optional Primary Fusing
- Molded terminal barriers
- 10-32 screw terminals
- Molded-in terminals
- Phil-slot screws

Construction Diagrams

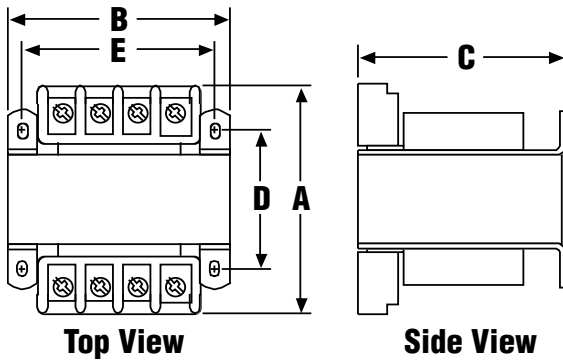


Top View

Side View

Figure A

Class 105° C Insulation System
55° C Temperature Rise
Epoxy Encapsulated Coils

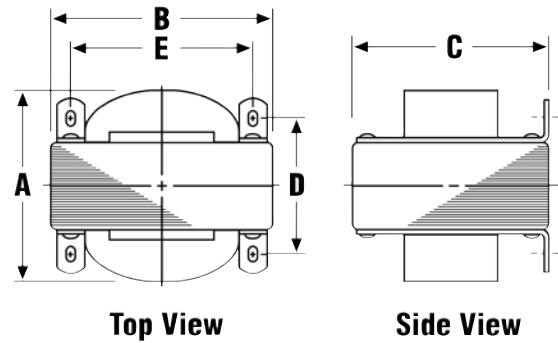


Top View

Side View

Figure B

Class 105° C Insulation System
55° C Temperature Rise
Epoxy Encapsulated Coils

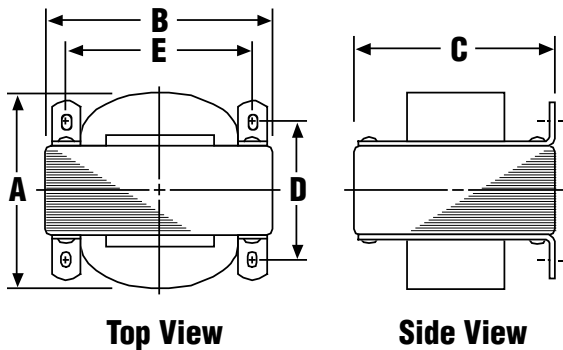


Top View

Side View

Figure E

Class 105° C Insulation System
55° C Temperature Rise
Epoxy Encapsulated Coils

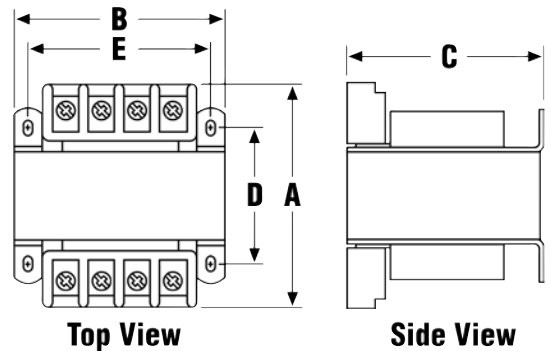


Top View

Side View

Figure C

Class 105° C Insulation System
55° C Temperature Rise
Epoxy Encapsulated Coils



Top View

Side View

Figure V

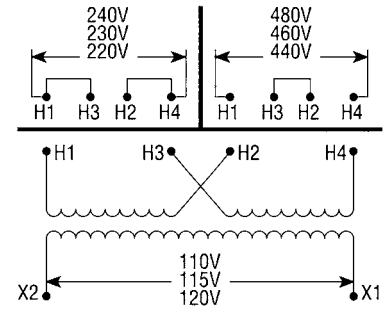
Class 105° C Insulation System
55° C Temperature Rise
Epoxy Encapsulated Coils

Group A

Primary Volts.....240 x 480, 230 x 460, 220 x 440
 Secondary Volts 120 • 115 • 110

UL and **SP**® Certified
 LISTED

50 / 60 HZ



VA Rating	Catalog Number	Construction Figure	Output Amps	Dimensions					Mounting Slots	Approx. Wt. (lbs)
				A	B	C	D	E		
50	FA050JK	B	0.43	3	3	2.562	2	2.5	.203 x .375	2.6
75	FA075JK	B	0.65	3.5	3	2.562	2.5	2.5	.203 x .375	3.5
100	FA100JK	B	0.87	3.375	3.375	2.875	2.375	2.812	.203 x .375	4.2
150	FA150JK	B	1.30	4	3.75	3.187	2.875	3.125	.203 x .375	6.7
200	FA200JK	B	1.74	4	4.5	3.812	2.5	3.75	.203 x .375	8.5
250	FA250JK	B	2.17	4.375	4.5	3.812	2.875	3.75	.203 x .375	10.0
300	FA300JK	B	2.61	4.75	4.5	3.812	3.25	3.75	.203 x .375	11.3
350	FA350JK	B	3.04	5.25	4.5	3.812	3.75	3.75	.203 x .375	13.6
500	FA500JK	B	4.35	5.5	5.25	4.75	4.25	4.375	.312 x .687	19.2
750	FA750JK	B	6.52	7	5.25	4.75	5.75	4.375	.312 x .687	28.1

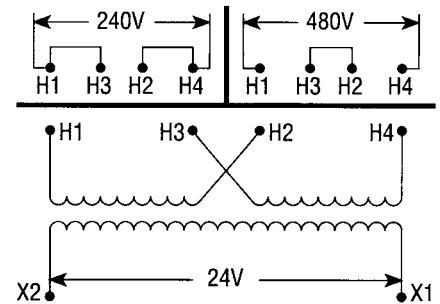
JK suffix denotes transformer supplied with primary J-2 jumpers and secondary fuse clips for a 13/32 x 1-1/2 fuse.
 Construction Figure E units rated for 60 Hz at 240 x 480 input and do not come with secondary fuse clips.

Group B

Primary Volts.....240 x 480
 Secondary Volts24

UL and **SP**® Certified
 LISTED

50 / 60 HZ



VA Rating	Catalog Number	Construction Figure	Output Amps	Dimensions					Mounting Slots	Approx. Wt. (lbs)
				A	B	C	D	E		
50	FB050JK	B	2.08	3	3	2.562	2	2.5	.203 x .375	2.7
75	FB075JK	B	3.13	3.5	3	2.562	2.5	2.5	.203 x .375	3.5
100	FB100JK	B	4.17	3.375	3.375	2.875	2.375	2.812	.203 x .375	4.2
150	FB150JK	B	6.25	4	3.75	3.187	2.875	3.125	.203 x .375	6.7
200	FB200JK	B	8.33	4	4.5	3.812	2.5	3.75	.203 x .375	8.5
250	FB250JK	B	10.42	4.375	4.5	3.812	2.875	3.75	.203 x .375	10.1
300	FB300JK	B	12.50	4.75	4.5	3.812	3.25	3.75	.203 x .375	11.4
350	FB350JK	B	14.58	5.25	4.5	3.812	3.75	3.75	.203 x .375	13.4
500	FB500JK	B	20.83	5.625	5.25	4.75	4.125	4.375	.312 x .687	17.5

JK suffix denotes transformer supplied with primary J-2 jumpers and secondary fuse clips for a 13/32 x 1-1/2 fuse.

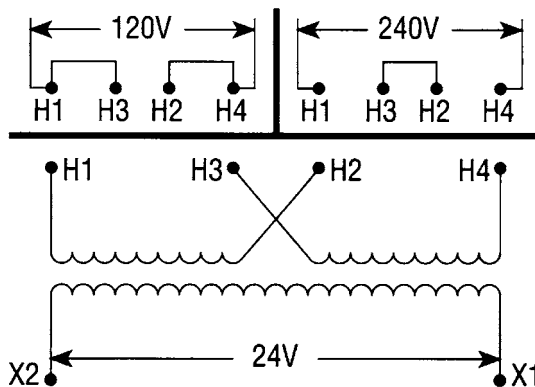
Group C

Primary Volts.....120 x 240
 Secondary Volts24



and Certified

50 / 60 HZ



VA Rating	Catalog Number	Construction Figure	Output Amps	Dimensions					Mounting Slots	Approx. Wt. (lbs)
				A	B	C	D	E		
50	FC050JK	B	2.08	3	3	2.562	2	2.5	.203 x .375	2.6
75	FC075JK	B	3.13	3.5	3	2.562	2.5	2.5	.203 x .375	3.6
100	FC100JK	B	4.17	3.375	3.375	2.875	2.375	2.812	.203 x .375	4.4
150	FC150JK	B	6.25	4	3.75	3.187	2.875	3.125	.203 x .375	6.7
200	FC200JK	B	8.33	4	4.5	3.812	2.5	3.75	.203 x .375	8.3
250	FC250JK	B	10.42	4.375	4.5	3.812	2.875	3.75	.203 x .375	10.1
300	FC300JK	B	12.50	4.75	4.5	3.812	3.25	3.75	.203 x .375	11.2
350	FC350JK	B	14.58	5.25	4.5	3.812	3.75	3.75	.203 x .375	13.2
500	FC500JK	B	20.83	5.625	5.25	4.75	4.125	4.375	.312 x .687	17.5

JK suffix denotes transformer supplied with primary J-2 jumpers and secondary fuse clips for a 13/32 x 1-1/2 fuse.

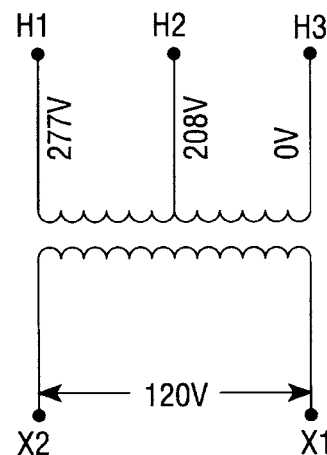
Group F

Primary Volts..... 208 / 277
 Secondary Volts120



and Certified

50 / 60 HZ



VA Rating	Catalog Number	Construction Figure	Output Amps	Dimensions					Mounting Slots	Approx. Wt. (lbs)
				A	B	C	D	E		
50	FF050XK	B	0.42	3	3	2.562	2	2.5	.203 x .375	2.9
75	FF075XK	B	0.63	3.5	3	2.562	2.5	2.5	.203 x .375	3.8
100	FF100XK	B	0.83	3.375	3.375	2.875	2.375	2.812	.203 x .375	4.5
150	FF150XK	B	1.25	4	3.75	3.187	2.875	3.125	.203 x .375	6.9
200	FF200XK	B	1.67	4	4.5	3.812	2.5	3.75	.203 x .375	8.7
250	FF250XK	B	2.08	4.375	4.5	3.812	2.875	3.75	.203 x .375	10.2
300	FF300XK	B	2.50	4.75	4.5	3.812	3.25	3.75	.203 x .375	11.4
350	FF350XK	B	2.92	5.25	4.5	3.812	3.75	3.75	.203 x .375	13.7
500	FF500XK	B	4.17	5.375	5.25	4.75	4.125	4.375	.312 x .687	17.2
750	FF750XK	B	6.25	7	5.25	4.75	5.75	4.375	.312 x .687	25.7

XK suffix denotes transformer supplied with secondary fuse clips for a 13/32 x 1-1/2 fuse; primary jumpers not applicable.

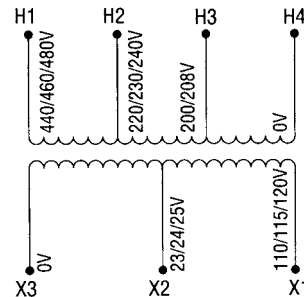
Group J

Primary Volts....200 / 220 / 440, 208 / 230 / 460, 240 / 480

Secondary Volts 23 / 110, 24 / 115, 25 / 120

 and  Certified

50 / 60 HZ



VA Rating	Catalog Number	Construction Figure	Output Amps	Dimensions					Mounting Slots	Approx. Wt. (lbs)
				A	B	C	D	E		
50	FJ050XK	B	2.08/0.44	3.25	3	2.562	2.25	2.5	.203 x .375	3.4
75	FJ075XK	B	3.13/0.65	3.5	3.375	2.875	2.5	2.812	.203 x .375	4.8
100	FJ100XK	B	4.17/0.87	3.625	3.75	3.187	2.5	3.125	.203 x .375	5.9
150	FJ150XK	B	6.25/1.30	4.375	3.75	3.187	3.25	3.125	.203 x .375	7.9
200	FJ200XK	B	8.33/1.74	4.5	4.5	3.812	3	3.75	.203 x .375	10.6
250	FJ250XK	B	10.42/2.17	5.25	4.5	3.812	3.75	3.75	.203 x .375	13.9
300	FJ300XK	B	12.50/2.61	5.125	5.25	4.75	3.875	4.375	.312 x .687	15.5
350	FJ350XK	B	14.58/3.04	5.375	5.25	4.75	4.125	4.375	.312 x .687	16.8
500	FJ500XK	B	20.84/4.35	6.875	5.25	4.75	5.25	4.375	.312 x .687	23.4

XK suffix denotes transformer supplied with secondary fuse clips for a 13/32 x 1-1/2 fuse; primary jumpers not applicable.

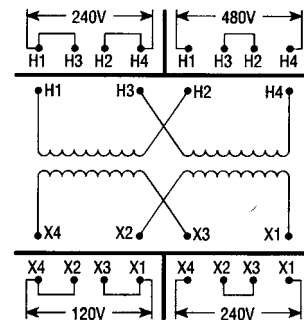
Group K

Primary Volts.....240 x 480

Secondary Volts120 x 240

 and  Certified

50 / 60 HZ



VA Rating	Catalog Number	Construction Figure	Output Amps	Dimensions					Mounting Slots	Approx. Wt. (lbs)
				A	B	C	D	E		
50	FK050JJ	B	0.42/0.21	3	3	2.562	2	2.5	.203 x .375	2.6
75	FK075JJ	B	0.63/0.31	3.5	3	2.562	2.5	2.5	.203 x .375	3.5
100	FK100JJ	B	0.83/0.42	3.375	3.375	2.875	2.375	2.812	.203 x .375	4.2
150	FK150JJ	B	1.25/0.63	4	3.75	3.187	2.875	3.125	.203 x .375	6.7
200	FK200JJ	B	1.67/0.83	4	4.5	3.812	2.5	3.75	.203 x .375	8.5
250	FK250JJ	B	2.08/1.04	4.375	4.5	3.812	2.875	3.75	.203 x .375	10.0
300	FK300JJ	B	2.50/1.25	4.875	4.5	3.812	3.375	3.75	.203 x .375	11.8
350	FK350JJ	B	2.92/1.46	5.25	4.5	3.812	3.75	3.75	.203 x .375	13.6
500	FK500JJ	B	4.17/2.08	5.25	5.25	4.75	4.125	4.375	.312 x .687	17.5
750	FK750JJ	B	6.25/3.12	7	5.25	4.75	5.75	4.375	.312 x .687	26.4

JJ suffix denotes transformer supplied with primary and secondary J-2 jumpers ; secondary fuse clips not applicable.

Primary Fusing

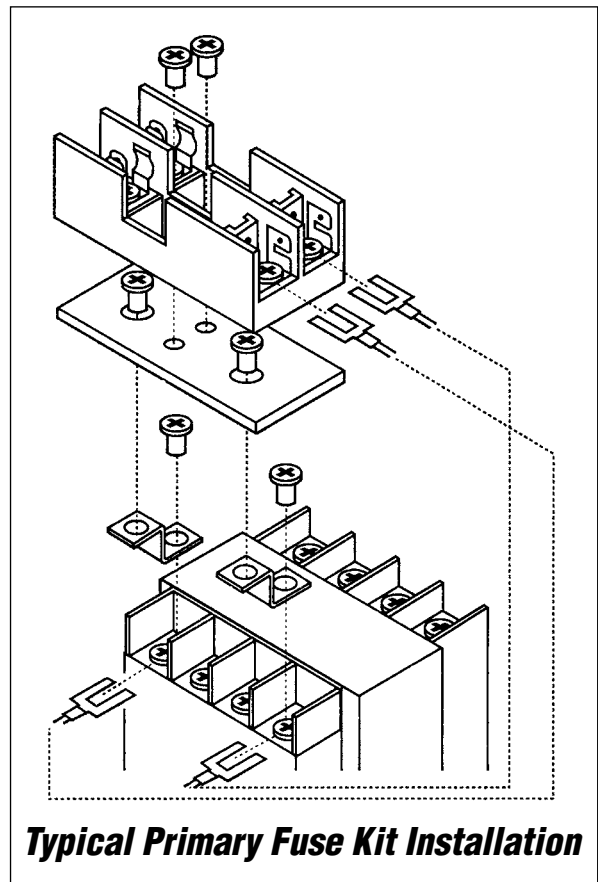
Primary Fusing Capability

In compliance with the requirements of UL508 and the National Electrical Code, Intertran® transformers, rated 50VA and larger, can be ordered with the provision for factory-mounted dual primary class cc fusing capability. The primary fuse block is mounted on the transformer and wired to the primary terminals. To indicate this option, replace the standard part number suffix with the appropriate interchange as shown below. The primary fusing option will add 1-3/8" to the "C" dimension of the transformer.

To indicate Primary Fusing Capability, the part number suffix should be changed as shown.		
Standard P/N Suffix		Dual Primary Fused P/N Suffix
JK	>>	RB
XK	>>	RK
XX	>>	RX
XJ	>>	RJ
JJ	>>	RR
JM	>>	RY
XM	>>	RG
JQ	>>	RL
XQ	>>	RN
JX	>>	RC
-1	>>	-8

Primary Fuse Kit

In addition to factory installed primary fusing capability, Federal Pacific offers a primary fuse kit for field installation. The primary fuse kit includes a 2-pole class cc fuse block, instructions and all associated mounting and wiring hardware. Additionally, this fuse kit will fit most competitor's units. To order this kit, use catalog number FPFK-1. The primary fuse kit, when installed, will add a maximum of 11/16" to the transformer "A" dimension and 1-15/16" to the "C" dimension.



Primary Overcurrent Protection for Transformers

Overcurrent protection on both the primary and secondary sides of transformers is specified in UL508 and the National Electrical Code. The maximum acceptable ratings are shown below. Due

to high inrush currents present when a transformer is initially energized, it is recommended that the primary fuse be time delay, to prevent nuisance trips during startup.

MAXIMUM ACCEPTABLE RATING OF PRIMARY OVERCURRENT PROTECTION

Primary Voltage	50	75	100	150	200	250	300	350	500	750
115	1-1/4 (2)	1-8/10 (3-2/10)	2-1/2 (4)	3-1/2 (6-1/4)	5 (8)	5	6-1/4	7-1/2	10	15
120	1-1/4 (2)	1-8/10 (3)	2-1/4 (4)	3-1/2 (6-1/4)	5 (8)	5	6-1/4	7	10	15
200	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	2-1/4 (3-1/2)	3 (5)	3-1/2 (6-1/4)	4-1/2 (7-1/2)	5 (8)	6-1/4	9
208	6/10 (1-1/8)	1 (1-8/10)	1-4/10 (2-1/4)	2 (3-1/2)	2-8/10 (4-1/2)	3-1/2 (6)	4 (7)	5 (8)	6	9
220	6/10 (1-1/8)	1 (1-6/10)	1-1/4 (2-1/4)	2 (3-2/10)	2-1/2 (4-1/2)	3-2/10 (5-6/10)	4 (6-1/4)	4-1/2 (7-1/2)	5-6/10	8
230	6/10 (1)	8/10 (1-6/10)	1-1/4 (2)	1-8/10 (3-2/10)	2-1/2 (4)	3-2/10 (5)	3-1/2 (6-1/4)	4-1/2 (7-1/2)	5	8
240	6/10 (1)	8/10 (1-1/2)	1-1/4 (2)	1-8/10 (3)	2-1/2 (4)	3 (5)	3-1/2 (6-1/4)	4 (7)	5	7-1/2
277	1/2 (8/10)	8/10 (1-1/4)	1 (1-8/10)	1-6/10 (2-1/2)	2 (3-1/2)	2-1/2 (4-1/2)	3-2/10 (5)	3-1/2 (6-1/4)	5 (9)	6-1/4
380	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	1-8/10 (3-2/10)	2-1/4 (3-1/2)	2-1/2 (4-1/2)	3-1/2 (6-1/4)	5-6/10 (9)
400	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	1-8/10 (3)	2-1/4 (3-1/2)	2-1/2 (4)	3-1/2 (6-1-4)	5-6/10 (9)
415	3/10 (6/10)	1/2 (8/10)	6/10 (1-1/8)	1 (1-8/10)	1-4/10 (2-1/4)	1-8/10 (3)	2 (3-1/2)	2-1/2 (4)	3-1/2 (6)	5 (9)
440	3/10 (1/2)	1/2 (8/10)	6/10 (1-1/8)	1 (1-6/10)	1-1/4 (2-1/4)	1-6/10 (2-8/10)	2 (3-2/10)	2-1/4 (3-1/2)	3-2/10 (5-6/10)	5 (8)
460	3/10 (1/2)	4/10 (8/10)	6/10 (1)	8/10 (1-6/10)	1-1/4 (2)	1-6/10 (2-1/2)	1-8/10 (3-2/10)	2-1/4 (3-1/2)	3-2/10 (5)	4-1/2 (8)
480	3/10 (1/2)	4/10 (3/4)	6/10 (1)	8/10 (1-1/2)	1-1/4 (2)	1-1/2 (2-1/2)	1-8/10 (3)	2 (3-1/2)	3 (5)	4-1/2 (7-1/2)
550	1/4 (4/10)	4/10 (6/10)	1/2 (8/10)	8/10 (1-1/4)	1 (1-8/10)	1-1/4 (2-1/4)	1-6/10 (2-1/2)	1-8/10 (3)	2-1/2 (4-1/2)	4 (6-1/4)
575	1/4 (4/10)	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1 (1-6/10)	1-1/4 (2)	1-1/2 (2-1/2)	1-8/10 (3)	2-1/2 (4)	3-1/2 (6-1/4)
600	2/10 (4/10)	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	8/10 (1-6/10)	1-1/4 (2)	1-1/2 (2-1/2)	1-6/10 (2-8/10)	2-1/4 (4)	3-1/2 (6-1/4)

If the rated primary current is less than 2 amps, the maximum rating of the overcurrent device is 300% for power circuits, shown above, or 500% for control circuits, shown above in *(brackets)*. If the rated primary current is 2 amps or more, the maximum rating of the overcurrent device is 250%.

All figures assume secondary overcurrent protection per UL/NEC.

Reference: NEC 430 - 72(c) exception #2, 450 - 3(b) 1 & 2, UL508 32.7, UL845 11.16 & 11.17

Secondary Overcurrent Protection for Transformers

MAXIMUM ACCEPTABLE RATING OF SECONDARY OVERCURRENT PROTECTION

Primary Voltage	50	75	100	150	200	250	300	350	500	750
23	3-1/2	5	7	10	12	15	20	20	30	45
24	3-2/10	5	6-1/4	10	12	15	20	20	30	40
25	3-2/10	5	6-1/4	10	12	15	15	20	25	40
90	8/10	1-1/4	1-8/10	2-1/2	3-1/2	4-1/2	5	6-1/4	9	12
95	8/10	1-1/4	1-6/10	2-1/2	3-1/2	4	5	6	8	12
100	8/10	1-1/4	1-6/10	2-1/2	3-2/10	4	5	5-6/10	8	12
110	3/4	1-1/8	1-1/2	2-1/4	3	3-1/2	4-1/2	5	7-1/2	10
115	6/10	1	1-4/10	2	2-8/10	3-1/2	4	5	7	10
120	6/10	1	1-1/4	2	2-1/2	3-2/10	4	4-1/2	6-1/4	10
220	3/10	1/2	3/4	1-1/8	1-1/2	1-8/10	2-1/4	2-1/2	3-1/2	5-6/10
230	3/10	1/2	6/10	1	1-4/10	1-8/10	2	2-1/2	3-1/2	5
240	3/10	1/2	6/10	1	1-1/4	1-6/10	2	2-1/4	3-2/10	5

If the rated secondary current is less than 9 amps, the maximum rating of the overcurrent device is 167%.

If the rated secondary current is 9 amps or more, the maximum rating of the overcurrent device is 125%.

If 125% does not correspond to a standard fuse rating, the next highest standard rating may be used.

Reference: NEC 430 - 72(c) exception #2, 450 - 3(b) 1 & 2, UL508 32.7, UL845 11.16 & 11.17.

