Buck-Boost Transformer Selection Information

How to select the proper transformer

To select the proper transformer for buck-boost applications, determine the following first:

Line Voltage

The voltage that you want to buck (decrease) or boost (increase). This can be found by measuring the supply line voltage with a voltmeter.

Load Voltage

The voltage at which your equipment is designed to operate. This is listed on the nameplate of the load equipment.

Load kVA or load Amps

You do not need to know both. One is sufficient for selection purposes. This information usually can be found on the nameplate of the equipment that you want to operate.

Supply Line and Equipment Frequencies

The supply line frequency must be the same as the frequency of the equipment to be operated. This will be 60 Hz for buck-boost transformers.

Number of Phases

Single-phase or three-phase line and load should match because a transformer is not capable of converting single-phase to three-phase.

The Type of Electrical Configuration

Delta or Wye.

How to use the selection charts on the following pages

1. Find the appropriate single-phase, three-phase delta or three-phase wye table.
2. Read across the appropriate input/output voltage rows and find the nearest ratio of required load voltage to line voltage for the application desired. (High voltage (HV) and low voltage (LV) may be either input or output voltage depending on the circumstances.)
3. Reading vertically down the column beginning with your application voltage ratio, locate in one of the kVA rows a kVA capacity equal to or larger than your load requirement.
4. Now move left across the kVA row to locate the appropriate transformer catalog number for your application.

Example:

(Assume the following information)

1. A reasonably constant line voltage of 200 volts.
2. A required equipment voltage of 236 volts.
3. 1.6 kVA load capacity needed.
4. Single-phase line and equipment.

In the voltage rows, 208 is closest to our line voltage of 200. The 236 high voltage meets our requirements.

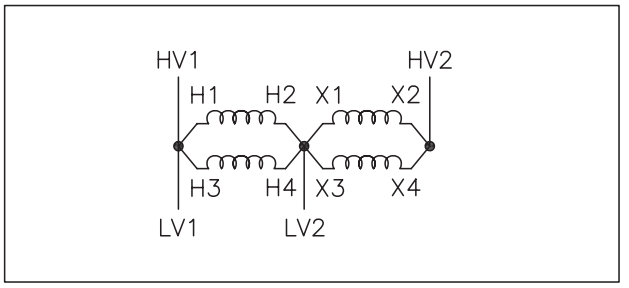
Reading vertically down this column, find 1.8 kVA, the closest larger kVA to our required 1.6 load kVA.

Moving left across this row, you will find the transformer catalog number to be 416-1221-000.

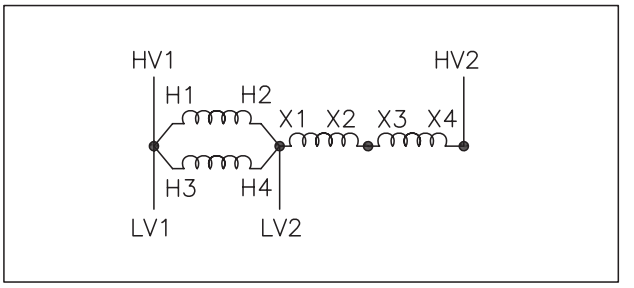
Buck-Boost Single-Phase Selection Chart

Single-Phase Connection										
Part Number	Input or Output	LV	100	109	120	120	208	218	240	240
		HV	120	120	132	144	230	240	252	264
416-1100-000	LV Amps		2.5	4.6	4.6	2.5	2.3	2.3	4.4	2.3
	kVA		0.3	0.5	0.6	0.3	0.5	0.5	1.1	0.6
	HV Amps		2.1	4.2	4.2	2.1	2.1	2.1	4.2	2.1
416-1101-000	LV Amps		5.0	9.2	9.2	5.0	4.6	4.6	8.8	4.6
	kVA		0.5	1.0	1.1	0.6	1.0	1.0	2.1	1.1
	HV Amps		4.2	8.3	8.3	4.2	4.2	4.2	8.3	4.2
416-1111-000	LV Amps		7.5	13.8	13.8	7.5	6.9	6.9	13.1	6.9
	kVA		0.8	1.5	1.7	0.9	1.4	1.5	3.2	1.7
	HV Amps		6.3	12.5	12.5	6.3	6.3	6.3	12.5	6.3
416-1121-000	LV Amps		12.5	22.9	22.9	12.5	11.5	11.5	21.9	11.5
	kVA		1.3	2.5	2.8	1.5	2.4	2.5	5.3	2.8
	HV Amps		10.4	20.8	20.8	10.4	10.4	10.4	20.8	10.4
416-1131-000	LV Amps		25.0	45.8	45.8	25.0	22.9	22.9	43.8	22.9
	kVA		2.5	5.0	5.5	3.0	4.8	5.0	10.5	5.5
	HV Amps		20.8	41.7	41.7	20.8	20.8	20.8	41.7	20.8
416-1141-000	LV Amps		37.5	68.8	68.8	37.5	34.4	34.4	65.6	34.4
	kVA		3.8	7.5	8.3	4.5	7.2	7.5	15.8	8.3
	HV Amps		31.3	62.5	62.5	31.3	31.3	31.3	62.5	31.3
416-1151-000	LV Amps		50.0	92.0	92.0	50.0	46.0	46.0	88.0	46.0
	kVA		5.0	10.0	11.0	6.0	9.5	10.0	21.0	11.0
	HV Amps		42.0	83.0	83.0	42.0	42.0	42.0	83.0	42.0
416-1161-000	LV Amps		75.0	138.0	138.0	75.0	69.0	69.0	131.0	69.0
	kVA		7.5	15.0	16.5	9.0	14.3	15.0	31.5	16.5
	HV Amps		63.0	125.0	125.0	63.0	63.0	63.0	125.0	63.0
416-1171-000	LV Amps		100.0	183.0	183.0	100.0	92.0	92.0	175.0	92.0
	kVA		10.0	22.0	22.0	12.0	19.1	20.0	42.0	22.0
	HV Amps		83.0	167.0	167.0	83.0	83.0	83.0	167.0	83.0
Wiring Diagram			2	1	1	2	4	4	3	4
Part Number	Input or Output	LV	95	106	120	120	208	212	225	240
		HV	120	120	136	152	236	240	240	272
416-1201-000	LV Amps		4.0	7.1	7.1	4.0	3.5	3.5	6.7	3.5
	kVA		0.4	0.8	0.9	0.5	0.7	0.8	1.5	0.9
	HV Amps		3.1	6.3	6.3	3.1	3.1	3.1	6.3	3.1
416-1211-000	LV Amps		5.9	10.6	10.6	5.9	5.3	5.3	10.0	5.3
	kVA		0.6	1.1	1.3	0.7	1.1	1.1	2.3	1.3
	HV Amps		4.7	9.4	9.4	4.7	4.7	4.7	9.4	4.7
416-1221-000	LV Amps		9.9	17.7	17.7	9.9	8.9	8.9	16.7	8.9
	kVA		0.9	1.9	2.1	1.2	1.8	1.9	3.8	2.1
	HV Amps		7.8	15.6	15.6	7.8	7.8	7.8	15.6	7.8
416-1231-000	LV Amps		19.8	35.4	35.4	19.8	17.7	17.7	33.3	17.7
	kVA		1.9	3.8	4.3	2.4	3.7	3.8	7.5	4.3
	HV Amps		15.6	31.3	31.3	15.6	15.6	15.6	31.3	15.6
416-1241-000	LV Amps		29.7	53.1	53.1	29.7	26.6	26.6	50.0	26.6
	kVA		2.8	5.6	6.4	3.6	5.5	5.6	11.3	6.4
	HV Amps		23.4	46.9	46.9	23.4	23.4	23.4	46.9	23.4
416-1251-000	LV Amps		40.0	71.0	71.0	40.0	35.0	35.0	67.0	35.0
	kVA		3.8	7.5	8.5	4.8	7.4	7.5	15.0	8.5
	HV Amps		31.0	63.0	63.0	31.0	31.0	31.0	63.0	31.0
416-1261-000	LV Amps		59.0	106.0	106.0	59.0	53.0	53.0	100.0	53.0
	kVA		5.6	11.3	12.8	7.1	11.1	11.3	22.5	12.8
	HV Amps		47.0	94.0	94.0	47.0	47.0	47.0	94.0	47.0
416-1271-000	LV Amps		79.0	142.0	142	79	71.0	71.0	133.0	71.0
	kVA		7.5	15.0	17.0	9.5	14.7	15.0	30.0	17.0
	HV Amps		63.0	125.0	125.0	63.0	63.0	63.0	125.0	63.0
Wiring Diagram			2	1	1	2	4	4	3	4

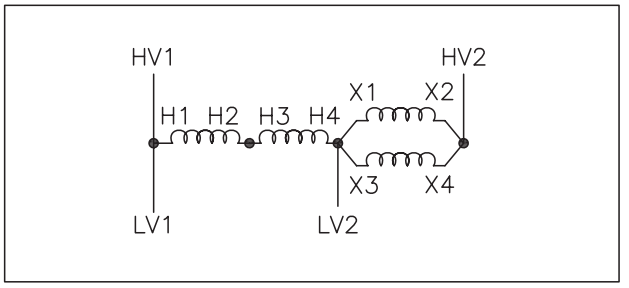
Buck-Boost Wiring Diagrams



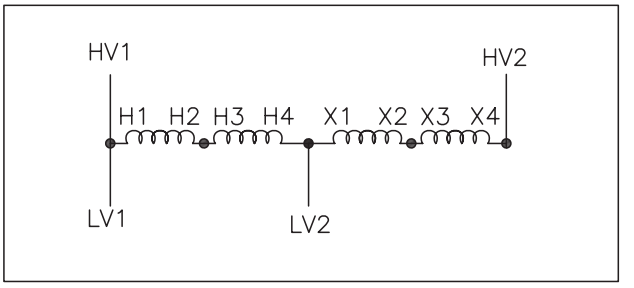
Wiring Diagram 1



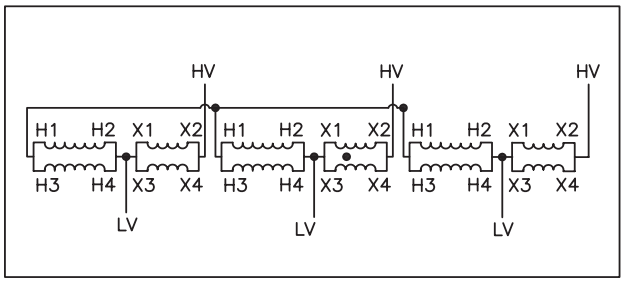
Wiring Diagram 2



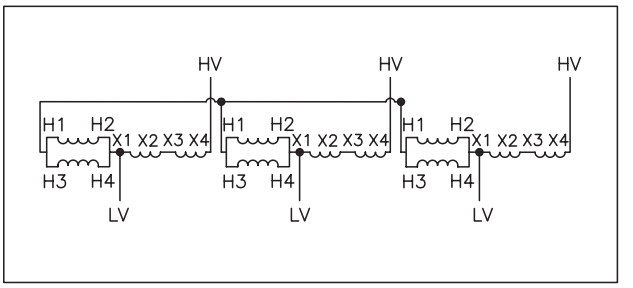
Wiring Diagram 3



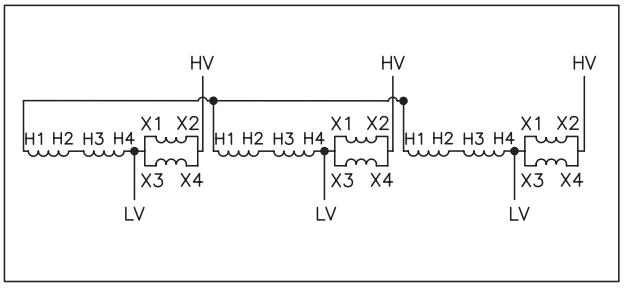
Wiring Diagram 4



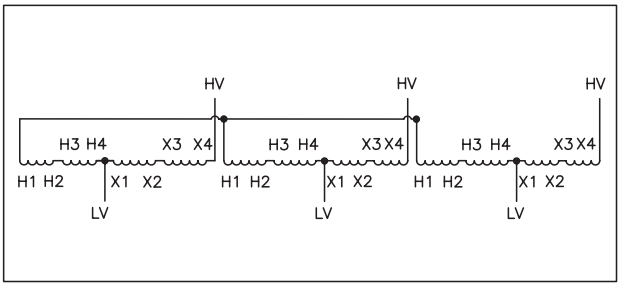
Wiring Diagram 5



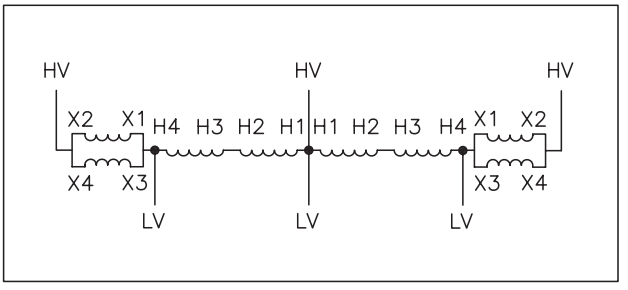
Wiring Diagram 6



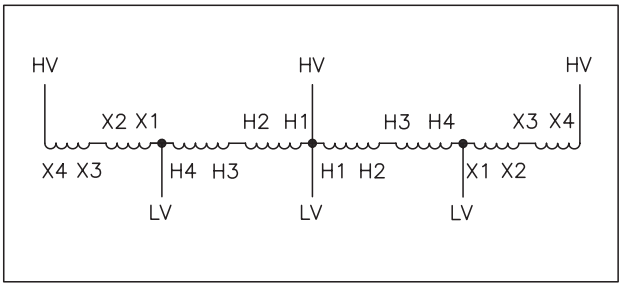
Wiring Diagram 7



Wiring Diagram 8



Wiring Diagram 9



Wiring Diagram 10

Note: Wiring diagrams 11 and 12 can be found in the product insert.

Buck-Boost Transformers General Specifications and Terminations

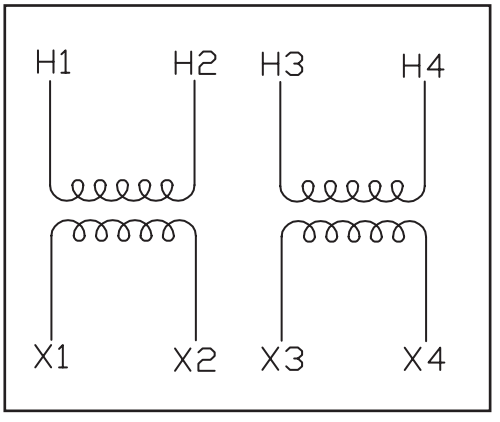
Single-Phase - 600V Class Transformers General Specifications										
	KVA	Part Number	Temp. Rise °C	Termination		Height (in.)	Width (in.)	Depth (in.)	Shipping Weight (lbs.)	Price
				HV	LV					
120 x 240 V - 12/24 V 60 Hz	0.05	416-1100-000	95	#18 AWG Leads	#18 AWG Leads	8.03	3.31	3.08	4.4	$53.00
	0.10	416-1101-000		#18 AWG Leads	#18 AWG Leads	8.03	3.31	3.08	4.8	$62.00
	0.15	416-1111-000		#18 AWG Leads	#18 AWG Leads	8.03	3.31	3.08	5.6	$63.00
	0.25	416-1121-000		#18 AWG Leads	#14 AWG Leads	8.03	3.31	3.08	6.7	$69.00
	0.50	416-1131-000		#18 AWG Leads	#10 AWG Leads	10.19	5.06	4.59	15.0	$98.00
	0.75	416-1141-000		#18 AWG Leads	#8 AWG Leads	10.19	5.06	4.59	17.0	$101.00
	1	416-1151-000		#18 AWG Leads	#8 AWG Leads	10.19	5.06	4.59	19.5	$124.00
	1.5	416-1161-000	135	#18 AWG Leads	#6 AWG Leads	12.50	6.69	5.34	35.0	$167.00
	2	416-1171-000		#16 AWG Leads	#4 AWG Leads	12.50	6.69	5.34	41.2	$229.00
	KVA	Part Number	Temp. Rise °C	Termination		Height (in.)	Width (in.)	Depth (in.)	Shipping Weight (lbs.)	Price
				HV	LV					
120 x 240 V - 16/32 V 60 Hz	0.10	416-1201-000	95	#18 AWG Leads	#18 AWG Leads	8.03	3.31	3.08	4.8	$55.00
	0.15	416-1211-000		#18 AWG Leads	#18 AWG Leads	8.03	3.31	3.08	5.6	$58.00
	0.25	416-1221-000		#18 AWG Leads	#14 AWG Leads	8.03	3.31	3.08	6.7	$63.00
	0.50	416-1231-000		#18 AWG Leads	#10 AWG Leads	10.19	5.06	4.59	15.0	$91.00
	0.75	416-1241-000		#18 AWG Leads	#10 AWG Leads	10.19	5.06	4.59	17.0	$101.00
	1	416-1251-000		#18 AWG Leads	#8 AWG Leads	10.19	5.06	4.59	19.5	$125.00
	1.5	416-1261-000	135	#18 AWG Leads	#6 AWG Leads	12.50	6.69	5.34	35.0	$164.00
	2	416-1271-000		#16 AWG Leads	#6 AWG Leads	12.50	6.69	5.34	41.2	$203.00

Buck-Boost Transformer Connections

Used as an Isolation Transformer

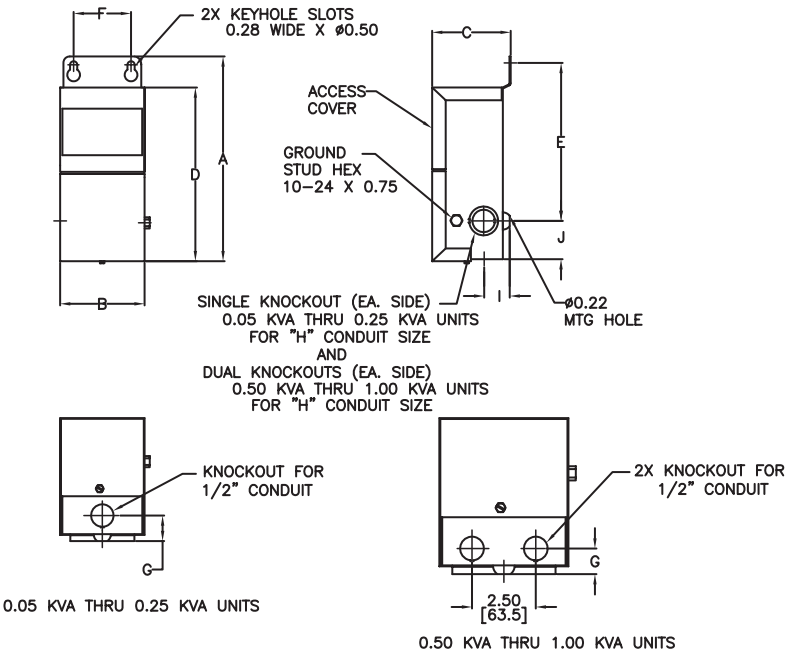
Maximum Secondary Current			
KVA	Part Number	Maximum Secondary Amperage	
		12V	24V
0.05	416-1100-000	4.16	2.08
0.10	416-1101-000	8.33	4.16
0.15	416-1111-000	12.5	6.25
0.25	416-1121-000	20.8	10.4
0.50	416-1131-000	41.6	20.8
0.75	416-1141-000	62.5	31.2
1	416-1151-000	83.3	41.6
1.5	416-1161-000	125	62.5
2	416-1171-000	166.6	83.3
KVA	Part Number	Maximum Secondary Amperage	
		16V	32V
0.10	416-1201-000	6.25	3.12
0.15	416-1211-000	9.38	4.69
0.25	416-1221-000	15.6	7.81
0.50	416-1231-000	31.2	15.6
0.75	416-1241-000	46.8	23.4
1	416-1251-000	62.5	31.2
1.5	416-1261-000	93.7	46.8
2	416-1271-000	125	62.5

Isolation Transformer Connections

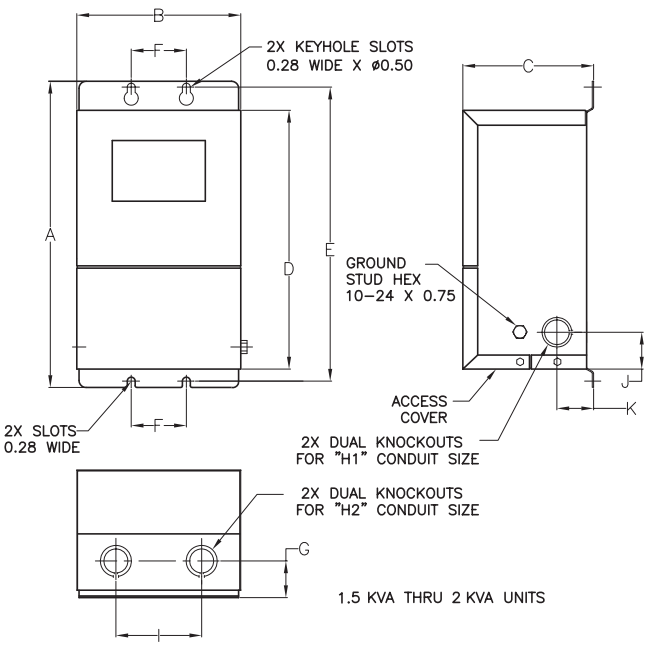


Connections			
Primary Volts		Interconnect	Primary Lines to Connect to
240		H2 to H3	H1-H4
120		H1 to H3	H1-H4
		H2 to H4	
Secondary Volts		Interconnect	Secondary Lines to Connect to
24	32	X2 to X3	X1-X4
12	16	X1 to X3	X1-X4
		X2 to X4	

Dimensional Diagrams



Housing Dimensions Inches (mm)		
Part Numbers	416-1100-000 416-1101-000 416-1111-000 416-1121-000 416-1201-000 416-1211-000 416-1221-000	416-1131-000 416-1141-000 416-1151-000 416-1231-000 416-1241-000 416-1251-000
A	8.03 (203.96)	10.19 (258.83)
B	3.31 (80.07)	5.06 (128.52)
C	3.08 (78.23)	4.56 (115.82)
D	6.81 (172.97)	9.06 (230.12)
E	6.19 (157.23)	8.38 (212.85)
F	2.25 (57.15)	2.25 (57.15)
G	1.00 (25.4)	1.00 (25.4)
H	1/2" (12.7)	1/2" (12.7) & 3/4" (19.05)
I	1.00 (25.4)	1.25 (31.75)
J	1.50 (38.1)	1.50 (38.1)



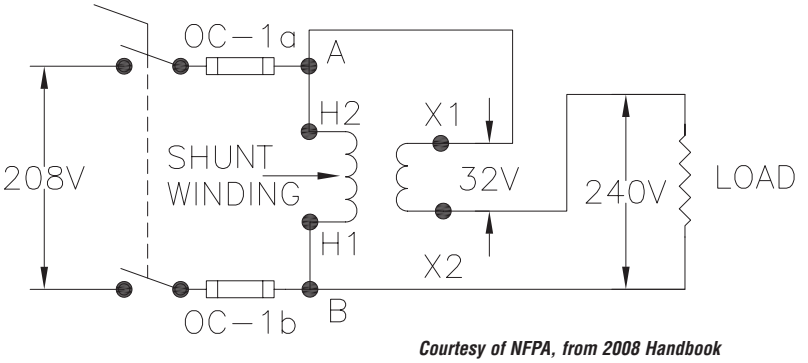
Housing Dimensions Inches (mm)		
Part Numbers	416-1161-000 416-1171-000	416-1261-000 416-1271-000
A	12.50 (317.5)	
B	6.69 (169.93)	
C	5.34 (135.64)	
D	10.56 (268.22)	
E	12.00 (304.8)	
F	2.25 (57.15)	
G	1.50 (38.1)	
H1	3/4" (19.05) & 1" (25.4)	1/2" (12.7) & 3/4" (19.05)
H2	1/2" (12.7) & 3/4" (19.05)	1/2" (12.7) & 3/4" (19.05)
I	3.5 (88.9)	
J	1.50 (38.1)	
K	1.50 (38.1)	

Fusing Buck-Boost Transformers

The method for determining the correct size overcurrent protection for an autotransformer is covered in the 2008 National Electric Code (NEC) 450.4 Autotransformers 600 Volts, Nominal, or Less.

> (A) *Overcurrent Protection: Each autotransformer 600 volts, nominal, or less shall be protected by an individual overcurrent device installed in series with each ungrounded input conductor. Such overcurrent device shall be rated or set at not more than 125 percent of the rated full-load input current of the autotransformer. Where this calculation does not correspond to a standard rating of a fuse or nonadjustable circuit breaker and the rated input current is 9 amperes or more, the next higher standard rating described in 240.6 shall be permitted. An overcurrent device shall not be installed in series with the shunt winding (the winding common to both the input and the output circuits) of the autotransformer between Points A and B as shown in Exhibit 450.6 (below).*

Exhibit 450.6 provides an example of overcurrent protection for an autotransformer. It shows a



Courtesy of NFPA, from 2008 Handbook

Buck-Boost Transformer Cross-reference

Automation Direct	Hammond	Acme	Federal	Square D	Siemens	Micron	GE	Sola-Hevi Duty	Cuttler Hammer
416-1100-000	QC05ERCB	T1-81047	SB12N.050F	50SV43A	050BB1224	J050A1EA1A01	9T51B0102	HS19B50	S10N04A81N
416-1101-000	QC10ERCB	T1-81048	SB12N.100F	100SV43A	100BB1224	J100A1EA1A01	9T51B0104	HS19B100	S10N04A82N
416-1111-000	QC15ERCB	T1-81049	SB12N.150F	150SV43A	150BB1224	J150A1EA1A01	9T51B0105	HS19B150	S10N04A83N
416-1121-000	QC25ERCB	T1-81050	SB12N.250F	250SV43B	205BB1224	J250A1EA1A02	9T51B0107	HS19B250	S10N04A26N
416-1131-000	QC50ERCB	T1-81051	SB12N.500F	500SV43B	505BB1224	J500A1EA1A02	9T51B0108	HS19F500B	S10N04A51N
416-1141-000	QC75ERCB	T1-81052	SB12N.750F	750SV43F	705BB1224	J750A1EA1A02	9T51B0109	HS19F750B	S10N04A76N
416-1151-000	Q1C0ERCB	T1-11683	SB12N1F	1S43F	1BB1224	J001K1EA1A02	9T51B0110	HS19F1B	S10N04A01N
416-1161-000	Q1C5ERCF	T1-11684	SB12N1.5F	1.5S43F	105BB1224	J1X5K1EA1A02	9T51B0111	HS19F1.5A	S10N04A16N
416-1171-000	Q002ERCF	T-1-11685	SB12N2F	2S43F	2BB1224	J002K1EA1A02	9T51B0112	HS19F2A	S10N04A02N
416-1201-000	QC10ESCB	T-1-81055	SB16N.100F	100SV46A	100BB1632	J100A1EB1A01	9T51B0124	HS20B100	S10N06A82N
416-1211-000	QC15ESCB	T-1-81056	SB16N.150F	150SV46A	150BB1632	J150A1EB1A01	9T51B0125	HS20B150	S10N06A83N
416-1221-000	QC25ESCB	T1-81057	SB16N.250F	250SV46B	205BB1632	J250A1EB1A02	9T51B0127	HS20B250	S10N06A26N
416-1231-000	QC50ESCB	T1-81058	SB16N.500F	500SV46B	505BB1632	J500A1EB1A02	9T51B0128	HS20F500B	S10N06A51N
416-1241-000	QC75ESCB	T1-81059	SB16N.750F	750SV46F	705BB1632	J750A1EB1A02	9T51B0129	HS20F750B	S10N06A76N
416-1251-000	Q1C0ESCB	T1-13073	SB16N1F	1S46F	1BB1632	J001K1EB1A02	9T51B0130	HS20F1B	S10N06A01N
416-1261-000	Q1C5ESCF	T1-13074	SB16N1.5F	1.5S46F	105BB1632	J1X5K1EB1A02	9T51B0131	HS20F1.5A	S10N06A16N
416-1271-000	Q002ESCF	T-1-13075	SB16N2F	2S46F	2BB1632	J002K1EB1A02	9T51B0132	HS20F2A	S10N06A02N

Note: All cross reference results are to the best of our knowledge. Please compare and verify all product specifications before selecting.