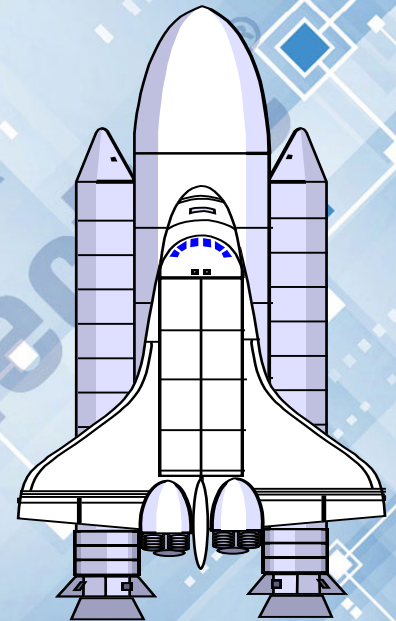


Transformer Seminar

Buck-Boost Applications



COMMERCIAL CONSTRUCTION



What Are Buck-Boost Transformers?

BUCK-BOOST TRANSFORMERS START OUT AS ISOLATION TRANSFORMERS WITH OUTPUTS FROM 12 TO 48 VOLTS, WHICH GET FIELD CONNECTED AS “AUTO” TRANSFORMERS TO INCREASE OR DECREASE VOLTAGE WITHIN A RANGE OF 5 TO 20 PERCENT. (ie, 208 TO 230 V)

THEY DO NOT PROVIDE ISOLATION FROM THE SUPPLY BECAUSE THEY ARE “AUTO” CONNECTED DURING INSTALLATION!



COMMERCIAL CONSTRUCTION



Industry Standard Buck-Boost Groups

Group 1 Primary 120 x 240 and Secondary 12/24

Group 2 Primary 120 x 240 and Secondary 16/32

Group 3 Primary 240 x 480 and Secondary 24/48

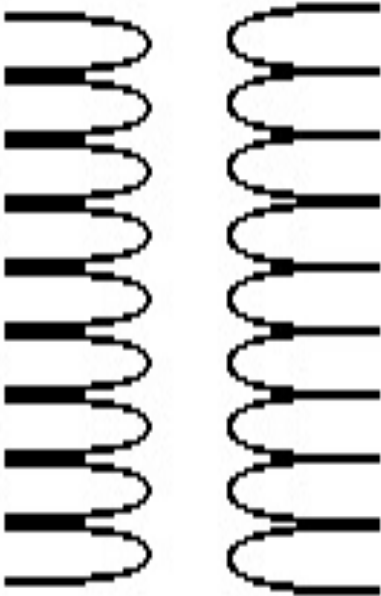


COMMERCIAL CONSTRUCTION



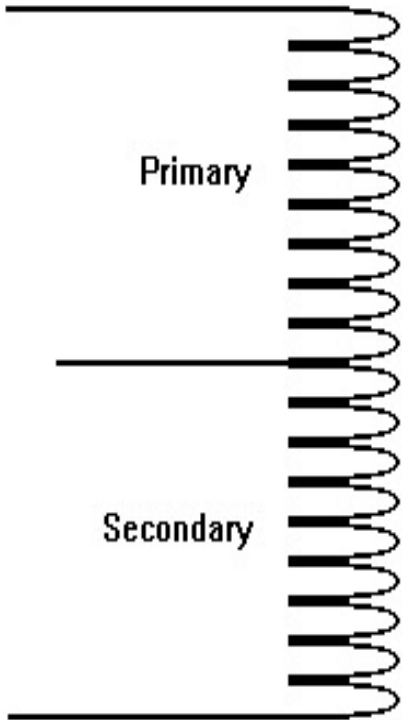
Isolation vs "Auto"

PRIMARY



SECONDARY

ISOLATION



Primary

Secondary

AUTO

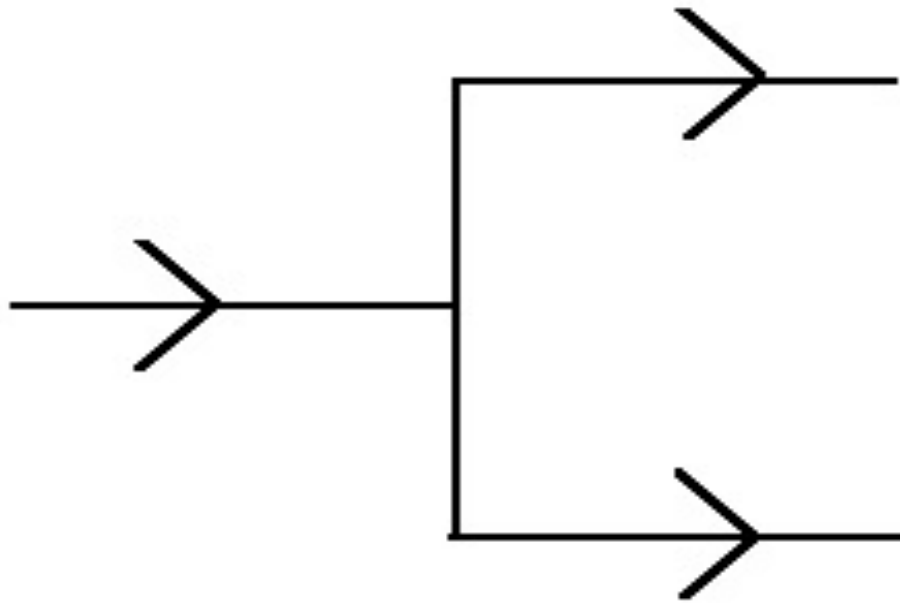


COMMERCIAL CONSTRUCTION



Basic Principle

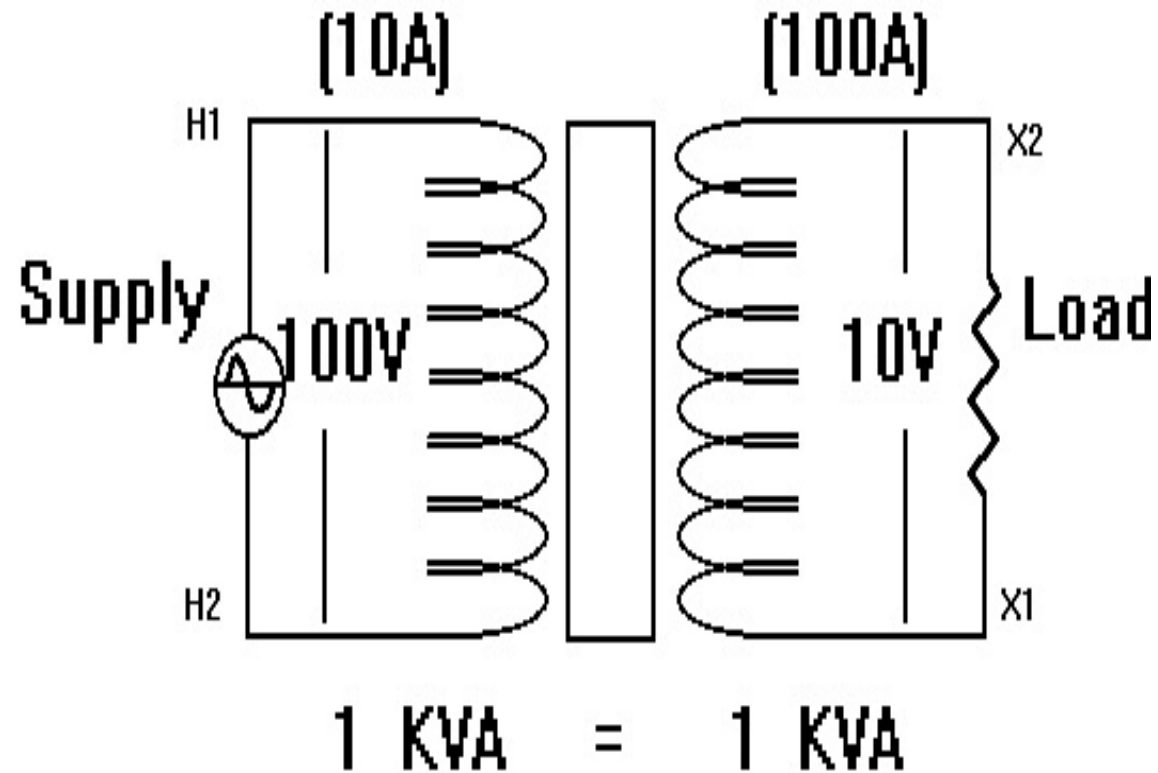
CURRENT WILL FOLLOW PATH OF LEAST RESISTANCE



COMMERCIAL CONSTRUCTION



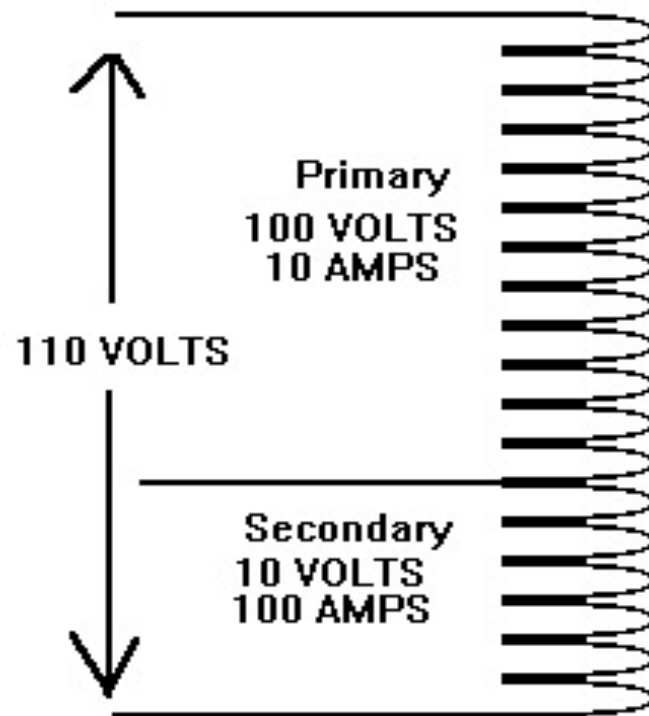
Primary and Secondary Have Same Capacity



COMMERCIAL CONSTRUCTION



Boosting Connection Coil Voltages Add



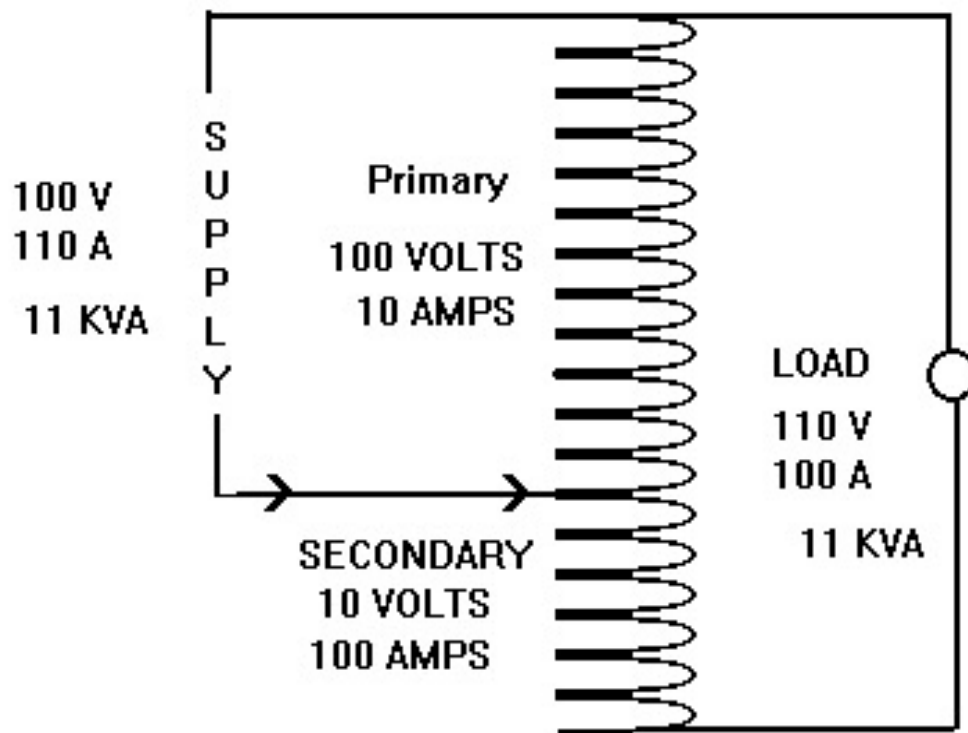
Autotransformer



COMMERCIAL CONSTRUCTION



Auto Connection Increases kVA Capacity



Autotransformer



COMMERCIAL CONSTRUCTION



Data Needed to Select Buck-Boost Transformer

1. SYSTEM PHASE
2. SYSTEM FREQUENCY
3. LINE VOLTAGE
4. LOAD VOLTAGE
5. LOAD KVA, AMPS, OR HORSEPOWER

(Available line voltage should be measured whenever possible)



COMMERCIAL CONSTRUCTION



Selection Example #1

1. 1-PHASE
2. 60 HZ
3. LINE - 189 VOLTS
4. LOAD - 208 VOLTS
5. LOAD - 4 KVA



COMMERCIAL CONSTRUCTION



1-Phase Group I Chart

REFER TO 1-PHASE GROUP I SELECTION CHART ON PAGE 127
IN SECTION 8 OF 2017 ACME CATALOG.

Catalog number T181051 is selected from chart.

Nameplate data for this unit is:

Primary 120 x 240 and Secondary is 12/24.

Nameplate kva is 0.5kva

(500va divided by 24v = 20.8 amps load capacity)

(Load volts 208 times load amps 20.8 = 4.33kva

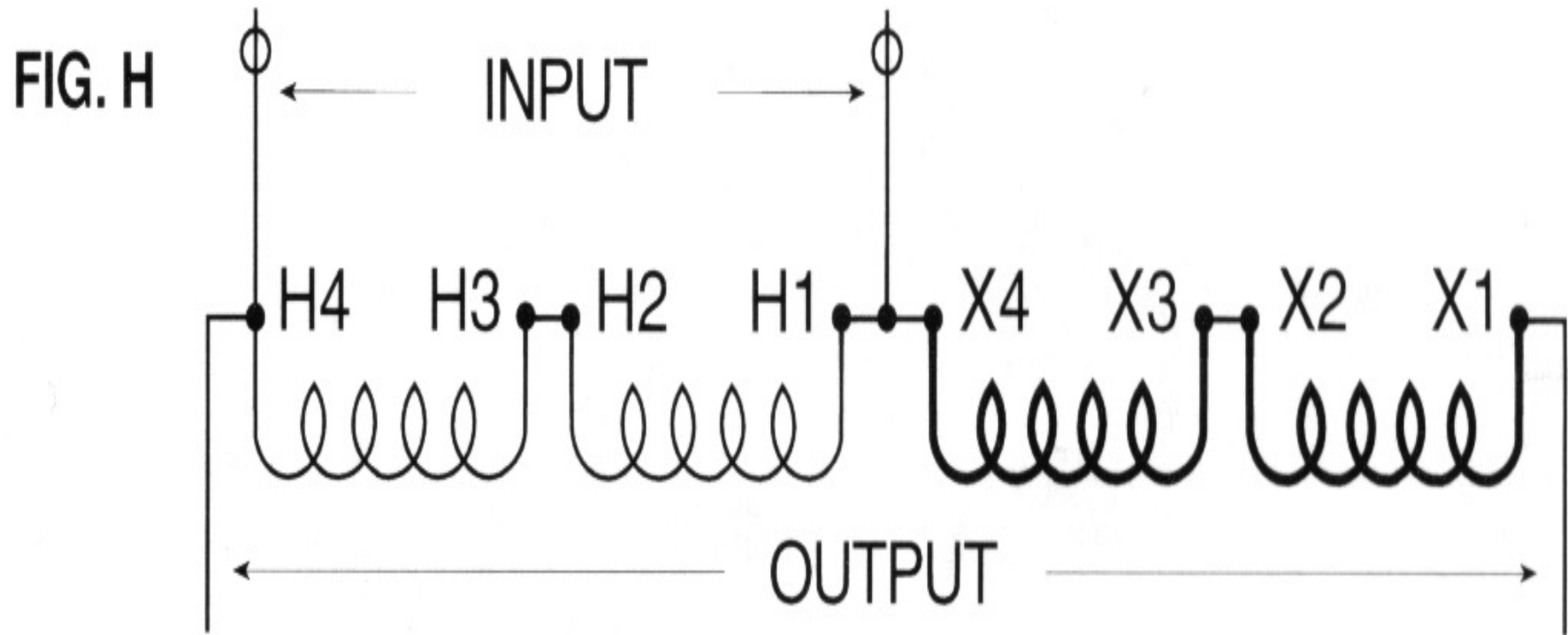
when boosting 189v to 208v and wired, per figure H.



COMMERCIAL CONSTRUCTION



Connection Diagram



COMMERCIAL CONSTRUCTION



Selection Example 2

1. 1 - PHASE
2. 60 HZ
3. LINE - 208 VOLTS
4. LOAD - 240 VOLTS
5. LOAD - 60 AMPS



COMMERCIAL CONSTRUCTION



1-Phase Group II Chart

REFER TO 1-PHASE GROUP II SELECTION CHART ON PAGE 128
OF SECTION 8 OF 2017 ACME CATALOG.

Chart says use T113075 wired, per figure H.

Nameplate says 2kva and 120 x 240 to 16/32.

(2000va divided by 32v = 62.5 amps)

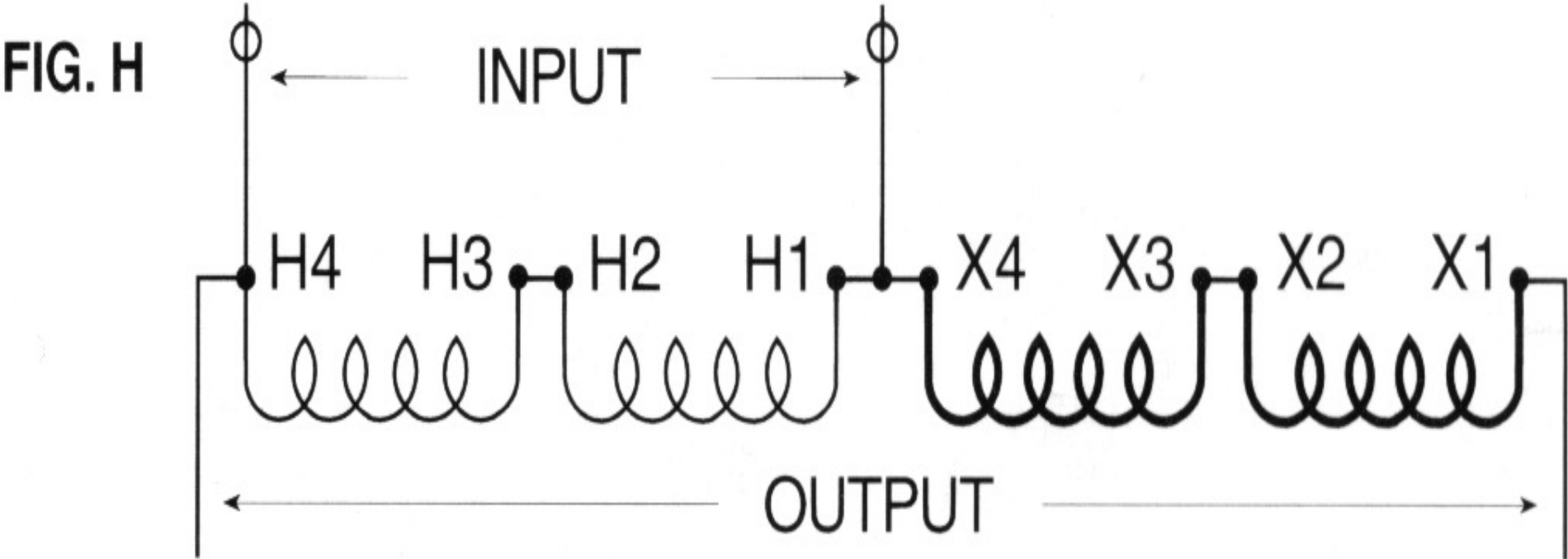
Load volts 240v times 62.5 amps = 15kva when boosting
208v to 240v wired, per figure H.



COMMERCIAL CONSTRUCTION



Connection Diagram



COMMERCIAL CONSTRUCTION



Selection Example 3

1. 1 - PHASE
2. 60 HZ
3. LINE - 240 VOLTS
4. LOAD - 208 VOLTS
5. LOAD - 14 KVA



COMMERCIAL CONSTRUCTION



1-Phase Group II Chart

REFER TO 1-PHASE GROUP II SELECTION CHART
IN SECTION 8 OF 2017 ACME CATALOG.

Note that this becomes a reverse connection
of the previous application we just did.
(wiring diagram I is a reverse connection of figure H)



COMMERCIAL CONSTRUCTION



Connection Diagram

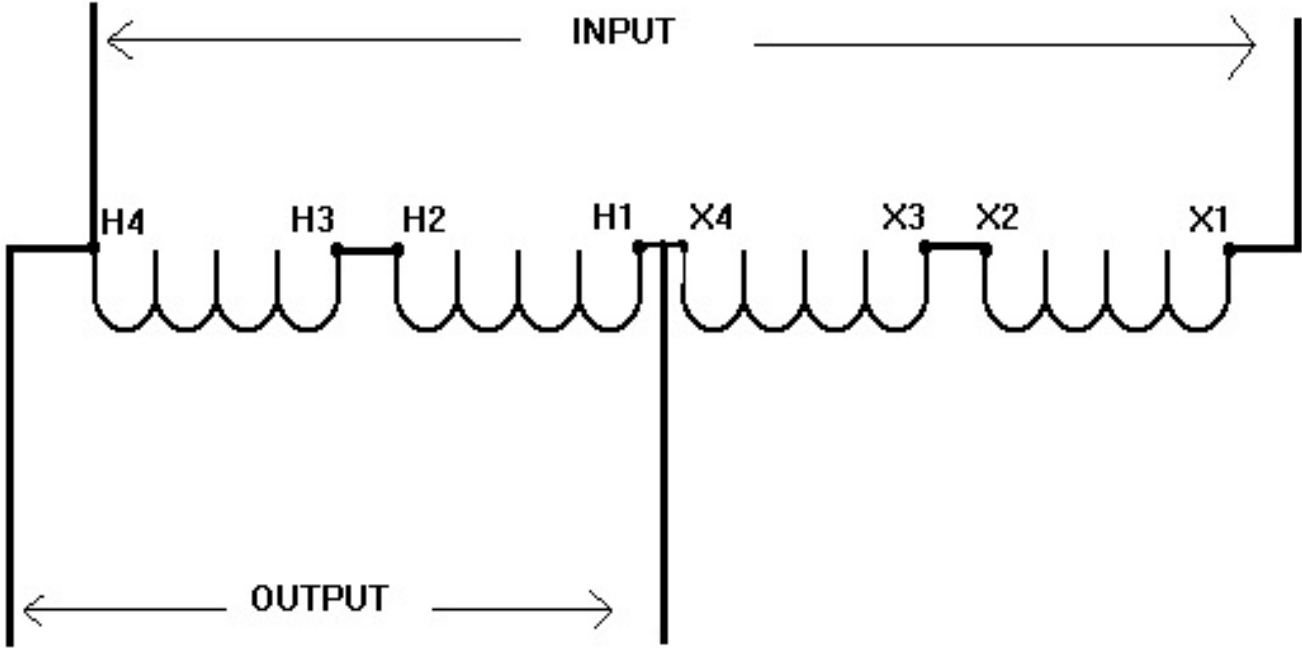


Fig. 1



COMMERCIAL CONSTRUCTION



Selection Example 4

1. 3 - PHASE
2. 60 HZ
3. LINE - 208 VOLTS
4. LOAD - 230 VOLTS
5. LOAD - 80 KVA



COMMERCIAL CONSTRUCTION



3-Phase Group I Chart

REFER TO 3-PHASE GROUP I SELECTION CHART
IN SECTION 8 OF ACME 2017 CATALOG.

Chart says use two pieces of T111687 wired
per figure B-B.

We can also use the new 3 Phase unit (quantity 1)
to do this application. Catalog number A3112K0310B.
(See slides 22 and 23)



COMMERCIAL CONSTRUCTION



Connection Diagram B-B

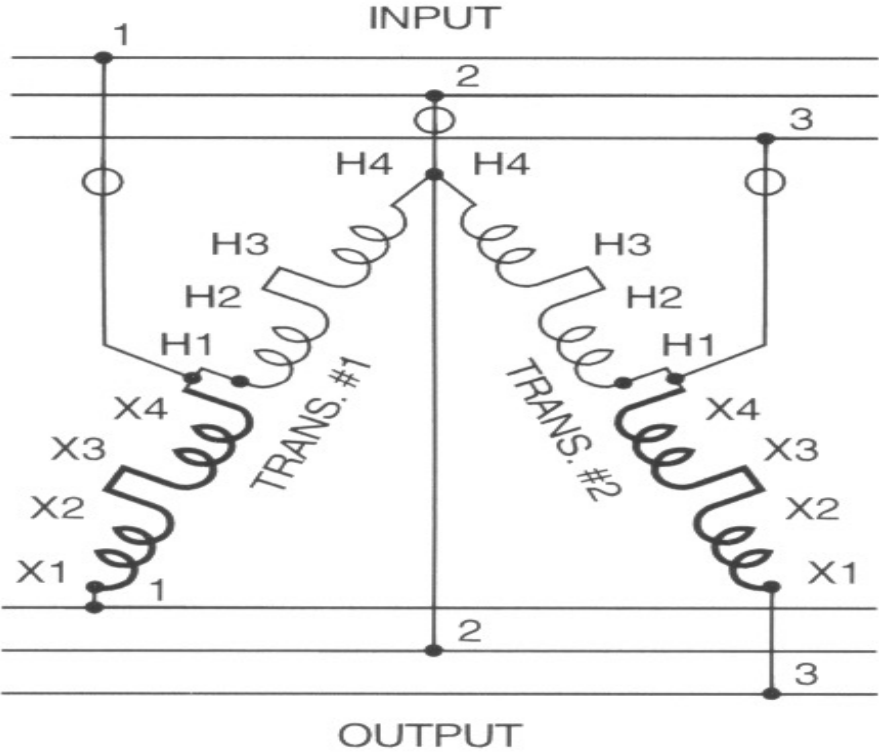


FIG. BB

OPEN DELTA



COMMERCIAL CONSTRUCTION



Three Phase Buck-Boost

240 PRIMARY VOLTS — 208 SECONDARY VOLTS

kVA	Catalog Number	Height (Inches)(Cm.)	Width (Inches)(Cm.)	Depth (Inches)(Cm.)	Weight (Lbs.)(Kg.)	Dimensional Drawing
3	A3003K0310B	15.19(38.6)	13.50(34.3)	10.84(27.5)	120(54.0)	D
6	A3006K0310B	15.19(38.6)	13.50(34.3)	10.84(27.5)	120(54.0)	D
9	A3009K0310B	15.19(38.6)	13.50(34.3)	10.84(27.5)	130(58.5)	D
15	A3015K0310B	15.19(38.6)	13.50(34.3)	10.84(27.5)	130(58.5)	D
30	A3030K0310B	18.86(47.9)	20.30(51.6)	9.03(22.9)	250(112.5)	I
45	A3045K0310B	18.86(47.9)	20.30(51.6)	9.03(22.9)	270(121.5)	I
75	A3075K0310B	24.81(63.0)	27.13(68.9)	11.14(28.3)	400(180.0)	I
112.5	A3112K0310B	24.81(63.0)	27.13(68.9)	11.14(28.3)	600(270.0)	I
150	A3150K0310B	24.81(63.0)	27.13(68.9)	11.14(28.3)	650(292.5)	I

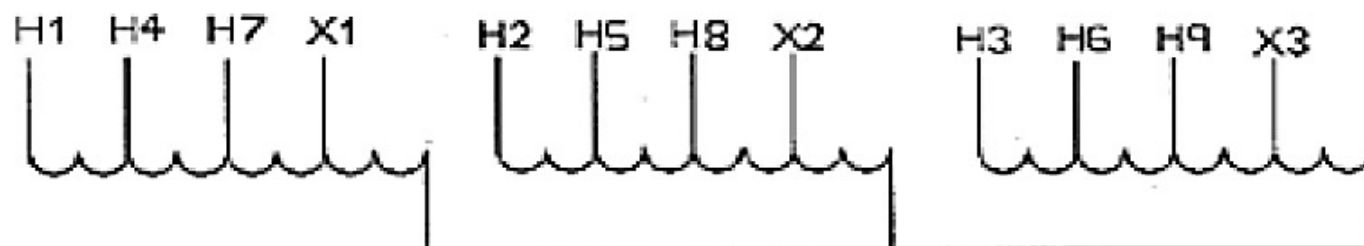


COMMERCIAL CONSTRUCTION

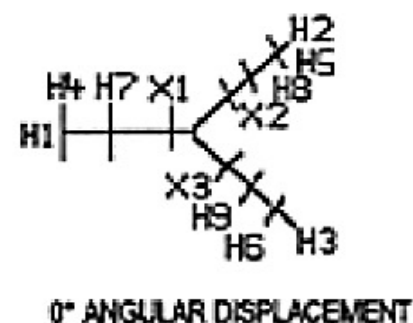


Three Phase Buck-Boost Wiring Diagram

CONNECTION DIAGRAM



PRIMARY VOLTS	%	CONNECT LEADS TO TAP NO.
252	105	H1-H2-H3
240	100	H4-H5-H6
228	95	H7-H8-H9
SECONDARY LINES TO X1-X2-X3		



COMMERCIAL CONSTRUCTION



Typical Applications for Buck-Boost Transformers

1. AIR CONDITIONERS
2. AC MOTORS
3. PUMPS
4. TANNING BEDS (No. 1 application)
5. CONTROL CIRCUITS



COMMERCIAL CONSTRUCTION



General Application Comparison

STANDARD ISOLATION TRANSFORMER

- Handle large increases or decreases in voltage
- Provide electrical isolation and shielding if required

BUCK-BOOST TRANSFORMERS

- Handle small increases or decreases in voltage (+/- 5 to 20%)
- Do not provide electrical isolation (because they get “auto” connected)



COMMERCIAL CONSTRUCTION



Effect of Low Voltage on Motor Operation

<u>VOLTAGE</u>	<u>CURRENT</u>	<u>TEMPERATURE</u>
- 5 %	+ 5 %	+ 11 %
- 10 %	+ 11 %	+ 23 %
- 15 %	+ 17 %	+ 38 %



COMMERCIAL CONSTRUCTION



Other Effects of Low Voltage on Motors

DETERIORATE INSULATION

NUISANCE TRIPPING OF BREAKERS

INSUFFICIENT MOTOR TORQUE

WASTED ENERGY AND MONEY



COMMERCIAL CONSTRUCTION



Effects of Low Voltage on Motor Torque

<u>% RATED VOLTS</u>	<u>% RATED TORQUE</u>
100%	100%
90%	81%
80%	64%



COMMERCIAL CONSTRUCTION



Causes of Voltage Mismatch

SERVICE VOLTAGE CHANGED AFTER EQUIPMENT INSTALLED

VOLTAGE DROP IN POWER LINE

ERRORS IN ORDERING EQUIPMENT

UTILITY CUTBACK IN SOURCE VOLTAGE



COMMERCIAL CONSTRUCTION



General Size Comparison

STANDARD ISOLATION TRANSFORMER

16"H X 14"W X 11"D

125 LBS

10 KVA RATING

BUCK-BOOST TRANSFORMER

10"H X 6"W X 5"D

24 LBS

1 KVA RATING



COMMERCIAL CONSTRUCTION



Acme Buck-Boost Features

- UL LISTED/CSA CERTIFIED
- UL 3R ENCLOSURES
- ALLOWABLE UNDER NEC
- EPOXY ENCAPSULATED
(EXCEPT 50, 100, 150 VA)
- BROAD RANGE OF VOLTAGES
- TEN YEAR WARRANTY

New Three Phase Version Available



COMMERCIAL CONSTRUCTION



Questions or Comments

Tech Service contact number:
800-334-5214 option 1



COMMERCIAL CONSTRUCTION

