

Jefferson Electric Buck-Boost Transformers

What is a buck-boost transformer?

Buck-boost transformers are designed to maximize the performance and life of electrical equipment. They are typically used to power loads with specific voltage requirements that differ from the available line voltage.

The 2008 NEC Handbook Section 210.9 provides the following definition for a buck-boost transformer:

A buck-boost transformer is classified as an autotransformer. A buck-boost transformer provides a means of raising (boosting) or lowering (bucking) a supply line voltage by a small amount (usually no more than 20 percent).

A buck-boost is a transformer with two primary windings (H1-H2 and H3-H4) and two secondary windings (X1-X2 and X3-X4). Its primary and secondary windings are connected so that the electrical characteristics are changed from a transformer that has its primary and secondary windings isolated from each other to one that has primary and secondary windings connected to buck or boost the voltage as an autotransformer, correcting voltage by up to 20 percent.

A single unit is used to boost or buck single-phase voltage. Two or three units are used to boost or buck three-phase voltage. An autotransformer requires little physical space, is economical, and above all, is efficient.

A Buck-Boost transformer can have two main applications:

1. When connected as an auto-transformer, you can buck (lower) or boost (raise) available line voltage anywhere from 5 to 20 percent.
2. When connected as an isolation transformer, they can be used to step-down supply power to low voltage circuits at the nameplate rating listed.

Standards/Approvals

- Built in accordance with UL1446, CAN/CSA - C22.2 No. 0
- Agency Approval UL File #E4466



Applications*

- Air conditioners
- Heating elements
- Motor applications (not motor control circuits per NFPA 79 9.1.1.1)
- 277 volt supply for lighting systems

Features

- Encapsulated with electrical grade resin
- Cores of high-quality electrical steel
- Aluminum/copper windings (see nameplate for product specific information)
- 60 Hz operation
- NEMA 3R-rated enclosures
- 135°C temperature rise, 180°C insulation class or 95°C temperature rise, 130°C insulation class depending on kVA size
- Heat-cured ASA-61 gray powder coat finish
- Slotted mounting holes for quick and easy mounting
- Permanently affixed wiring diagram
- 10-year limited warranty (limited to mfg. defects)
- Single-phase encapsulated isolation transformer ratings 50VA to 2kVA
- Ambient temperature 0 - 25°C (32 - 77°F) (Per UL506, UL5085-1, 2 General Purpose Transformers)

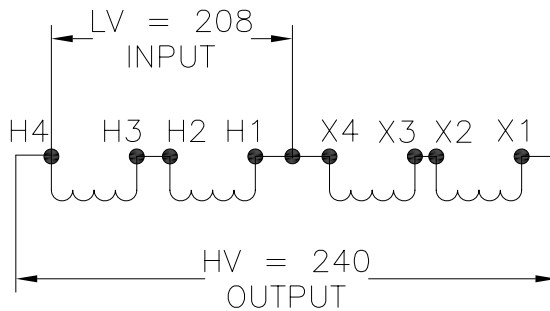


* Note: Buck-boost transformers do not compensate for fluctuating line voltages. They should only be used when line voltage is relatively constant.

Buck-Boost Single-phase Connections

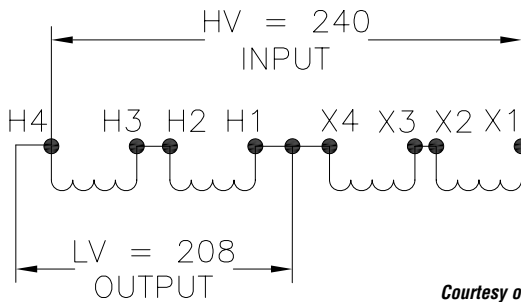
NEC Handbook 2008 Exhibit 210.18 Typical single-phase connection diagrams for buck or boost transformers connected as autotransformers to change 240 volts single-phase to 208 volts and vice versa.

Boost (increase)



HV = High Voltage
LV = Low Voltage

Buck (decrease)



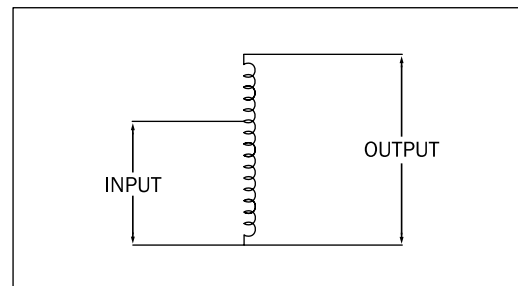
Courtesy of NFPA, from 2008 Handbook

Difference between an autotransformer and an isolation transformer

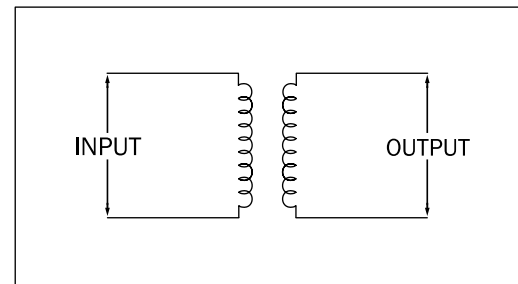
The principal difference between an autotransformer and an isolation transformer is the separation of secondary windings. In an autotransformer, the input (or primary) and the output (or secondary) are electrically connected, while in an isolation transformer they are completely separated, as shown to the right.

Because autotransformers require fewer windings and smaller cores, they are typically lighter and less costly than conventional isolation transformers with the same ratings. Autotransformers do have some performance advantages too. They have increased power handling capability, flatter frequency response, lower insertion loss and lower distortion than conventional transformers of similar size and cost. They do not, however, provide electrical isolation or stabilize fluctuating supply line voltages.

Autotransformers are best suited for applications where the line voltage needs to be matched to a protected piece of equipment, for example to adapt a piece of equipment manufactured in one country to operate in another where the line voltage is slightly different. Autotransformers are a smart choice if the difference between the input and desired output voltages is nominal.



Autotransformer ("Autoformers")



Isolation (or Insulating) Transformer