

How to Connect High Power Furnace to AC Power Supply Properly in USA

High power furnace, especially designed for a three phase feed, must be connected to power supply correctly; otherwise AC power supply may lose its balance and raises the current above the normal level in one or two of three phases power supply.

- Fundamentals of AC Power supply in USA**

There are two kinds of three phase AC voltage (480V and 208V) and two kinds of single phase AC voltage (208V and 110V) in AC Power system of USA. The following schematic will give you general ideas of obtaining **Single Phase 208V/110V AC** and **Three Phases 208V AC** power supplies from outside **Three Phases 480V AC Input**. **A-B** make sure your device's voltage and phase requirement before make connection. Please always contract a professional electrician to make power connection, never do it by yourself.

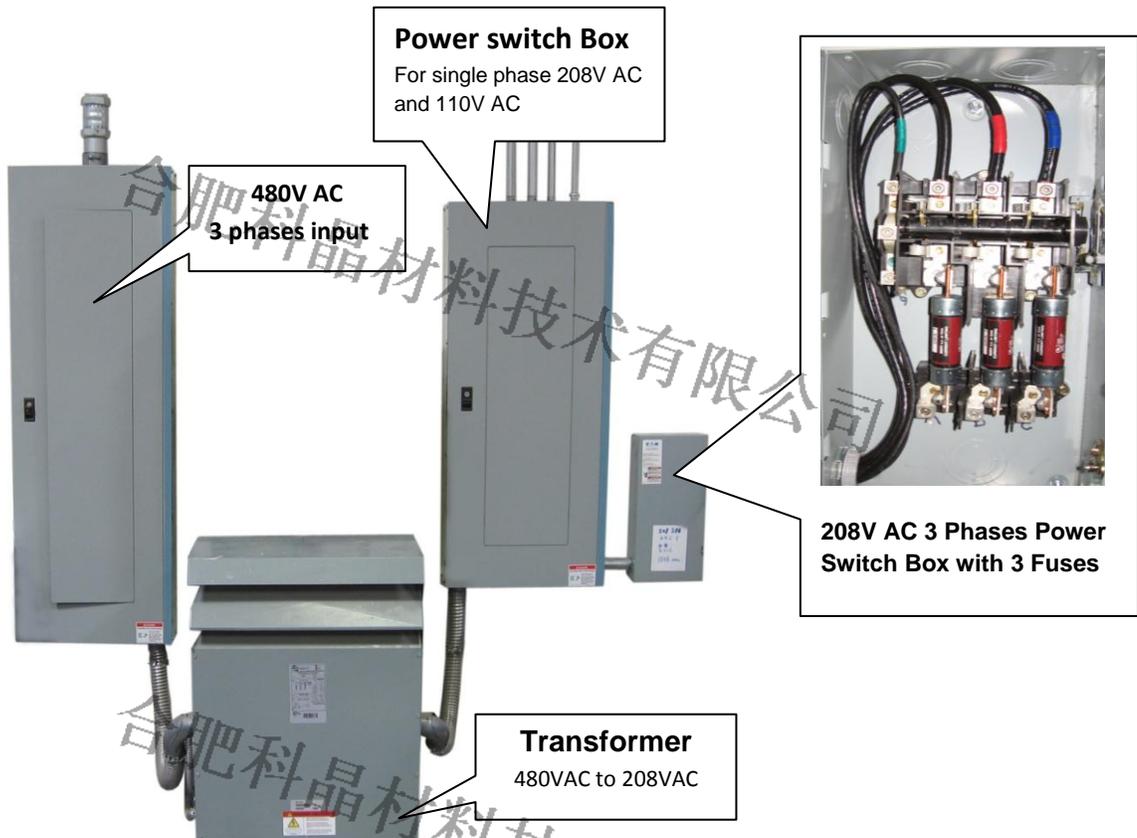
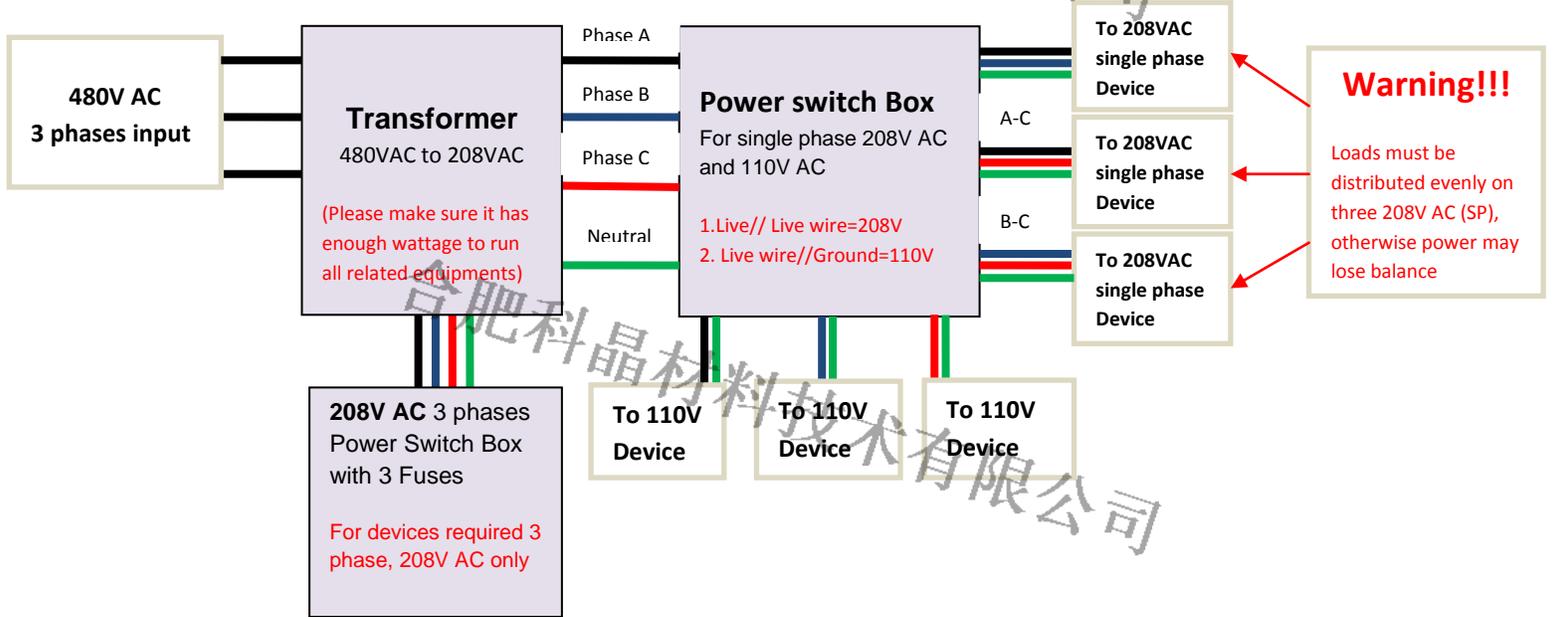


Figure 1: Typical Three Phase AC Power Supply System in USA

- **Power Distribution for high power device of 208V single Phase.**

When you connect high power device ($> 5000\text{KW}$) to a single phase 208V power supply, you must pay attention to power balance, e.g. three independent 208V single phases from three phase power switch box shall have even *power load roughly*. *Never connect all high power devices to one or two of three phases.*

For example, if you have two 7KW, 208V furnaces and one 5 KW, 208V device in your lab, you shall connect one 7KW furnace to A-C, the other 7KW to A-B, and 5KW device to B-C separately. (Refer to Fig. 2 right side). If you connect all high power devices to one phase, three phase power supply (transformer) will lose its balance and cause low voltage and high current output, which usually result in air breaker tripped.

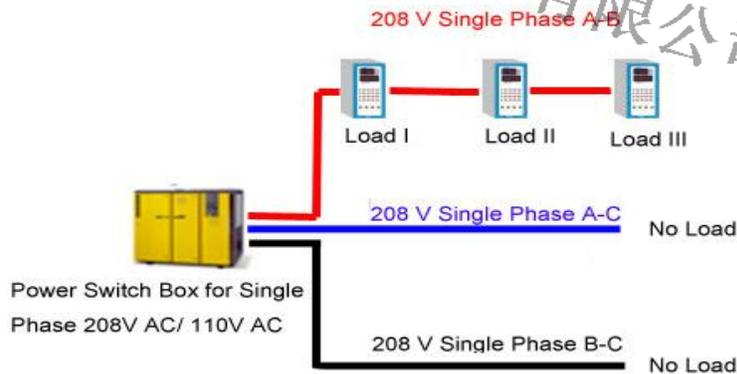


Figure 2: Wrong way of electrical load distribution



Figure 3: Single-phase loads should be distributed evenly between the phases of the three-phase system for efficient use of the supply transformer and supply conductors.

- **Trouble Shooting**

If you find your 208V single phase air breaker always tripped in specified current rating, you shall check as the followings:

- **Check Air breaker rating.** It shall be 1.5 times larger than the average current rating in the device. For example, device is 8KW, 208V, its breaker's current rating shall be $> 58\text{A}$ (60A)
- **Check transformer rating.** (480V AC to 208V AV). Please count total power consuming (wattage) in the devices related to the transformer, and power consuming at each single phase. The transformer's power rating shall be 1.2 larger than total power consuming, and power load in each single phase shall less than 30% transformer's wattage rating. Please change a larger power transformer if necessary.
- **Check high power device's connection to three phase power switch separately.** Please count power load (wattage) on each single phase. Please reconnect devices to the each single phase with even distribution if the unbalanced phase occurred.